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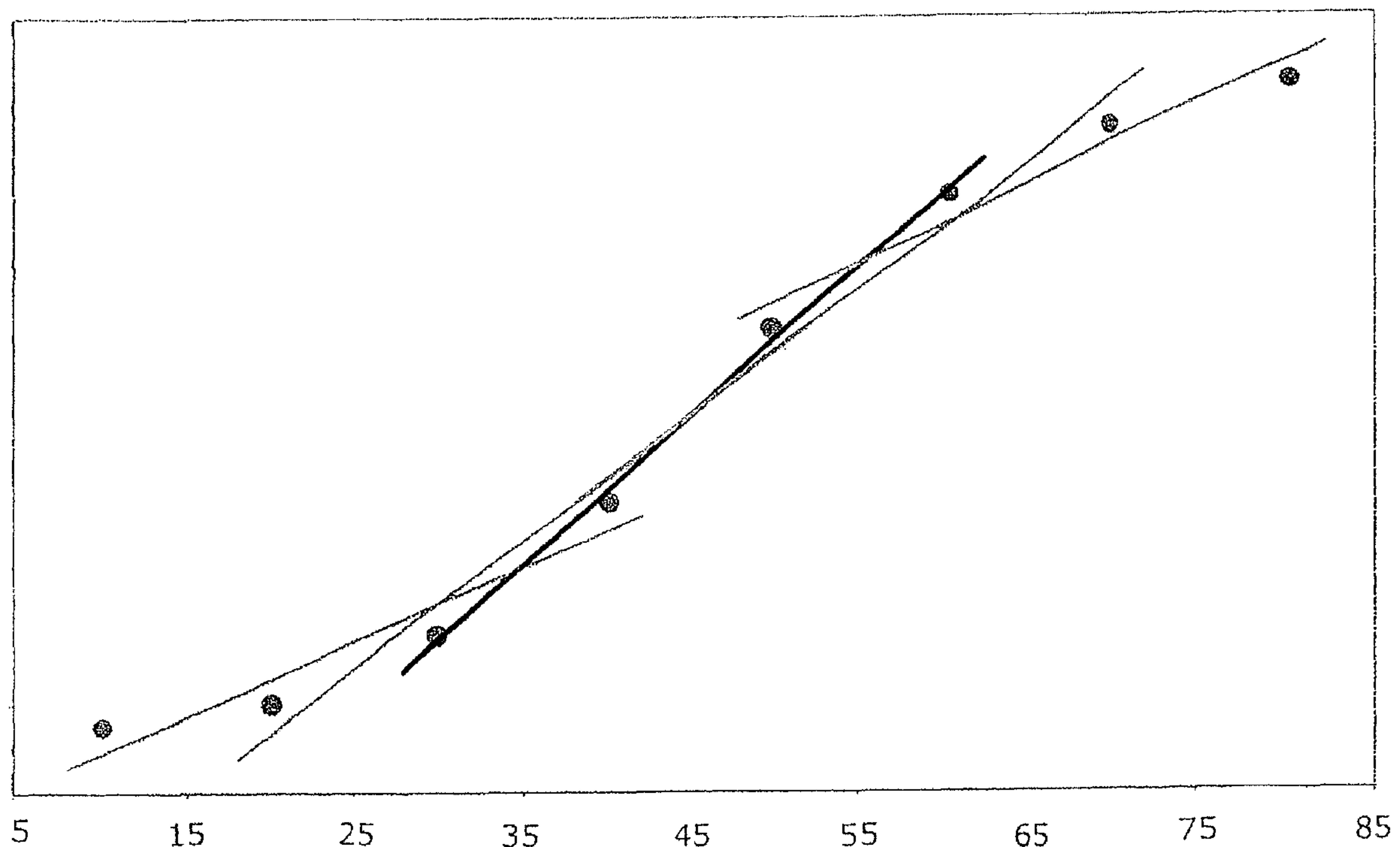
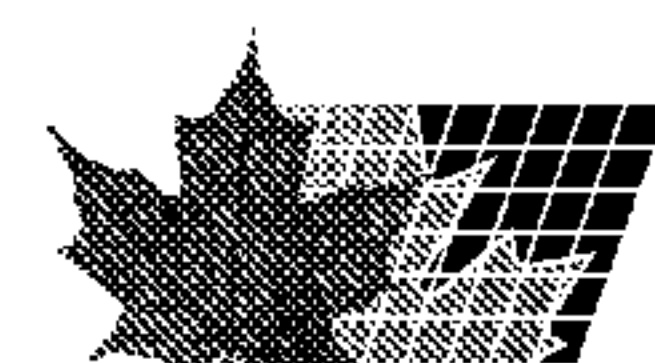


Figure 1

Time in green house in days

(57) Abrégé/Abstract:

The present invention pertains to a novel and extensive analytical platform for selecting genes with a possible commercial phenotype from a large group of candidate genes identified using tools in bioinformatics, data from EST sequencing and DNA



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array. An aspect of the invention provides methods of producing a transgenic plant having an increased growth compared to its wild type. The method comprises altering in the plant the level of a gene product of at least one gene specifically expressed during different phases of wood formation. This may be done with transgenic methods or by specific crossing methods. Further aspects of the invention provide a plant cell or plant progeny and wood having modulated gene expression according to the invention. Other aspects pertain a DNA construct comprising a nucleotide sequence of the invention and a plant cell or plant progeny comprising the DNA construct.

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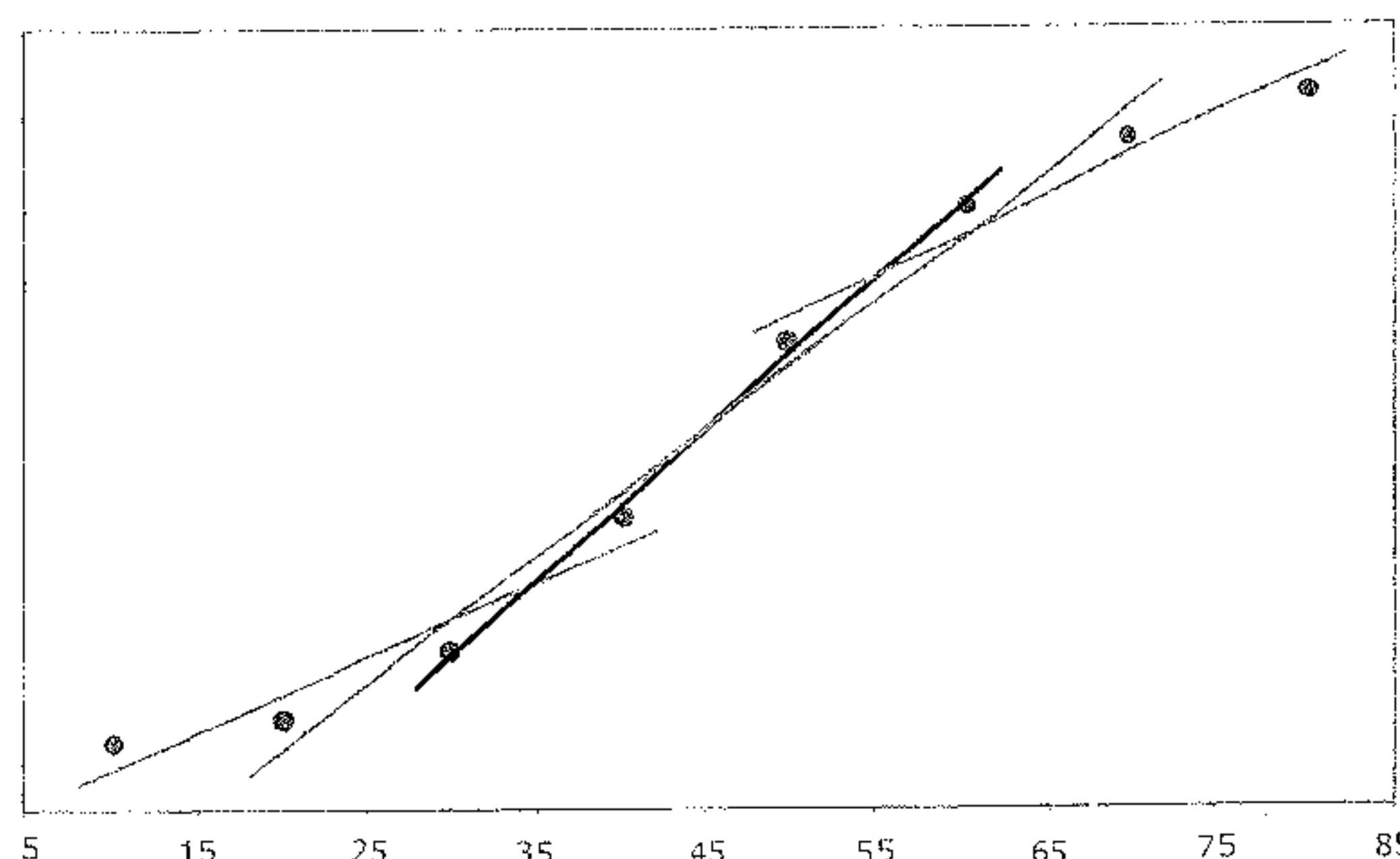


Figure 1  
Time in green house in days

(57) Abstract: The present invention pertains to a novel and extensive analytical platform for selecting genes with a possible commercial phenotype from a large group of candidate genes identified using tools in bioinformatics, data from EST sequencing and DNA array. An aspect of the invention provides methods of producing a transgenic plant having an increased growth compared to its wild type. The method comprises altering in the plant the level of a gene product of at least one gene specifically expressed during different phases of wood formation. This may be done with transgenic methods or by specific crossing methods. Further aspects of the invention provide a plant cell or plant progeny and wood having modulated gene expression according to the invention. Other aspects pertain a DNA construct comprising a nucleotide sequence of the invention and a plant cell or plant progeny comprising the DNA construct.

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## WOODY PLANTS HAVING IMPROVED GROWTH CHARACTERISTICS AND METHOD FOR MAKING THE SAME USING TRANSCRIPTION FACTORS

### Technical field of the invention

5 The present invention relates generally to the field of molecular biology and relates to a method for improving plant growth characteristics. More specifically, the invention relates to methods for phenotypically modifying plants and transgenic plants and plants obtained by a specific crossing method having altered expression of a gene resulting in a modified growth phenotype. The invention also provides constructs useful in the method of the  
10 invention. Further, the invention relates to a plant cell or plant progeny of the plants and wood produced by the plants according to the invention.

### Background of the invention

At present, the primary objectives of forest-tree engineering and molecular breeding are to  
15 improve wood quality and yield. The global demand for wood products is growing at around 1.7% annually, and this increase in wood consumption is occurring despite the fact that the maximum sustainable rate of harvesting from the worlds forests has already been reached or exceeded. Therefore, there is a need for increases in plantation wood production worldwide. Forestry plantations may also have advantages as a carbon  
20 sequestration crop in response to increasing atmospheric CO<sub>2</sub>. Similarly, increased production of biomass from non-woody plants is desirable, for instance in order to meet the demand for raw material for energy production. Modification of specific processes during cell development in higher species is therefore of great commercial interest, not only when it comes to improving the properties of trees, but also other plants.

25 Plant growth by means of apical meristems results in the development of sets of primary tissues and in lengthening of the stem and roots. In addition to this primary growth, tree species undergo secondary growth and produce the secondary tissue "wood" from the cambium. The secondary growth increases the girth of stems and roots.

Perennial plants such as long-lived trees have a life style considerably different from  
30 annual plants such as *Arabidopsis* in that perennial plants such as trees has an indeterminate growth whereas plants like *Arabidopsis* have an terminate end of growth when the plant flowers. The final size of an *Arabidopsis* plant is in many ways dependent on the developmental program from germination to flowering and seed set. One example

is that any change in the timing of these events can drastically change the size of the plant.

Perennial plants also cycle between periods of active growth and dormancy. During active growth leaves perform photosynthesis to capture energy which then used to drive various cellular processes. The fixed carbon which converted to sucrose is transferred to stem tissues and apical bud where it is stored during the dormant state initially as starch and later as sucrose. As growth reinitiates after release from dormancy, this sucrose is translocated to actively growing tissues since early stages of reactivation occur before photosynthesis starts. Similarly for nitrogen, amino acids are translocated also to stem and apical tissues and stored as storage proteins during dormancy and broken down as growth starts. Thus the life cycle of long lived trees differs significantly from annual crops which often translocate carbon and nitrogen to seeds. Due to these differences between annual crops and perennial plants such as trees, determinants of yield and the ability to measure them are likely to considerably different. Actually, in many instances is a model system such as *Populus tremula x tremuloides* much better for reliably finding genes that can be used for increasing biomass production. For example for annual crops, seed size/yield has been proposed to be a measure of plant size and productivity but this is unlikely to be the case since perennial plants such as trees take several years to flower and thus seed yield, if at all, is only indicator of growth conditions that prevail during the year the plant flowered. Thus direct translation of research and findings from annual crops are unlikely to be useful in case of trees.

A very important part of the biomass of trees is present in stem tissues. This biomass accumulation is a result of leaf photosynthesis and nitrogen acquisition and redistribution of nutrients to various cellular processes. As such leaf size, leaf photosynthesis, ability to acquire nitrogen size of root system can all be important players in determination of plant productivity and biomass production. However none by themselves can account for the entire biomass production. For example, leaf size is not always related to biomass as significant variation can be found in leaf size. Moreover the ability to cope with stress is an important determinant of biomass production. Thus there are several factors that need to be altered in order to enhance biomass production in trees.

Furthermore, wood density is an important trait in increased biomass production, an increased wood density gives less volume that have to be transported and contain more energy content per volume. Therefore increased density is of interest even if the total

biomass is not increased. Density is also a important in showing that an increased metrical growth in height and diameter is not coupled to an decrease in wood density.

One way to increase growth is to learn more about gene function and use that information to increase growth and biomass production. Such gene function knowledge and ways to  
5 use the knowledge is described in this patent.

Most genes have now been identified in a number of plants such as *Arabidopsis thaliana* (*Arabidopsis Genome Initiative 2000*) and *Populus tremula x tremuloides* (Sterky et al. 2004 ) and *Populus trichocarpa* (Tuskan et al. 2006).

Hertzberg et al. 2001, and Schrader et al. 2005 have used transcript profiling to reveal a  
10 transcriptional hierarchy for thousands of genes during xylem development as well as providing expression data. Such data can facilitate further elucidation of many genes with unknown function White et al. 1999; Aharoni et al. 2000.

One problem remaining is how to identify the potentially most important genes involved in regulation of cell division and other processes related to growth. In this present invention  
15 we examined a number of transcription factors for their use, which resulted in an unexpectedly increased growth when over expressed. The reason to select transcription factors for analysis is because they are known to be part regulators of many if not most processes in living organisms including plants. It is predictive that *Arabidopsis thaliana* contains 1500 different transcription factors that can be divided into ~30 subclasses  
20 based on sequence homologies (Riechmann et al. 2000). The function a certain transcription factor have within a plant is closely connected to which genes it regulates, e.g. although transcription factors within a transcription factor sub group as the MYB class are similar, they are known to regulate several different processes in plants. Transcription factors are proteins that regulate transcription of genes by either repressing or activating  
25 transcription initiation of specific genes or genomic regions containing different genes.

Specifically targeting transcription factors in plants in order to find genes that can be used to alter plant characteristics have been done before. In for example WO 02/15675, a large numbers of transcription factors have been analysed and the possible use for many of them been mentioned. US2007/0039070 describes and lists a large number of  
30 transcription factor genes from Eucalyptus and *Pinus radiata* and speculates in the use of such genes. Here we present specific transcription factors that have an industrially relevant effect in substantially increasing growth, which is supported with experimental data.

Although it is obvious that results from EST programs, genome sequencing and expression studies using DNA array technologies can verify where and when a gene is expressed it is rarely possible to clarify the biological and/or technical function of a gene only from these types of analytical tools. In order to analyze and verify the gene function a functional characterization must be performed, e.g. by gene inactivation and/or gene over-expression. However, in order to be able to identify genes with interesting and most often unexpected commercial features, candidate genes has to be evaluated based on functional analysis and measuring increased growth with multiple criteria.

10 MYB transcription factors. One of the genes presented here (SEQ ID:12) belongs to the MYB class of transcription factors. The MYB transcription factor family is predicted to have ~180 members in *Arabidopsis* (Riechmann et al 2000). Several different functions have been found for MYB genes in plants (Jin and Martin 1999). More specifically genes closely related to SEQ ID: 12 have not to our knowledge been shown to be involved in  
15 regulating growth rates and biomass production. The closely related genes AT2G01060 and AB192880 are implicated to be involved in biotic stress responses, US2003101481 and Katou et al 2005.

SET domain transcription factors (Ng et al. 2007). One of the genes presented here SEQ ID: 11 belong to the SET domain class of transcription factors. SET domain proteins  
20 regulate transcription by modulating chromatin structure. The *Arabidopsis* genome is known to contain at least 29 active set domain proteins. Genes closely related to SEQ ID: 11 have not to our knowledge been shown to be involved in regulating growth rates and biomass production.

The bHLH class of transcriptional regulators is an large group of transcription factors in  
25 plants, for example is *Arabidopsis thaliana* predicted to contain ~139 members (Riechmann et al 2000). bHLH proteins have been implicated in many different processes se Xiaoxing et al 2006 for an overview in rice. One of the genes presented here SEQ ID: 10 belong to the bHLH class of transcription factors. Genes closely related to SEQ ID:10 have not to our knowledge been shown to be involved in regulating growth rates and  
30 biomass production.

The gene SEQ ID: 9 belong to the Homeobox class of genes. The closest *Arabidopsis thaliana* homolog to the gene over-expressed with construct TF0013 is predicted to be AT1G23380. Over-expression of a related *Solanum tuberosum* homolog to the gene over-expressed with construct TF0013 decreases growth, internode length and leaf size (US

7265263). Over-expression of a related *Arabidopsis thaliana* homolog to the gene over-expressed with construct TF0013 alters leaf morphology (US 7265263, US 20070022495, and WO01036444). The use to increase yield and biomass production by altering the expression level of the gene over-expressed with construct TF0013 is previously  
5 unknown.

The IAA/AUX group of transcription factors is a small group of transcription factors mainly found in plants (26 members predicted in *Arabidopsis* by Riechmann et al. 2000). The gene corresponding to SEQ ID: 13 belong to this group and is described in Moyle et al 2002. Genes closely related to SEQ ID: 13 have not to our knowledge been shown to be  
10 involved in regulating growth rates and biomass production.

The WRKY gene family group. The WRKY transcription factor family is a large family of genes in plants. Rice is predicted to have more than 90 members and *Arabidopsis* is predicted to have 74 members (Ülker and Somssich 2004). One of the functions that have been mostly associated with WRKY genes are wound and pathogen defence signalling,  
15 but also signalling coupled to abiotic stress, and resistance against both abiotic and biotic stress.

Eight of the genes presented here belong to the WRKY class of transcription factors.

SEQ ID:4 and SEQ ID:7 belongs to one sub group of WRKY genes. Genes closely related to SEQ ID:4 and SEQ ID:7 have not, to our knowledge, been shown to be involved in  
20 regulating growth rates and biomass production.

SEQ ID:1 belongs to another sub group of WRKY genes. A closely related *Arabidopsis thaliana* homolog (AT2G23320) to the gene SEQ ID:1 is believed to be involved in C/N sensing (US 20060272060), altering leaf size (US 7238860, US 20030226173, US 20040019927, and WO02015675) and altering seed protein content (US 20030226173).  
25 AT2G23320 is also believed to be involved in the reaction and adaptation to peroxide stress according to Patent Application No. WO04087952. US 20040019927, US 7238860, US 20030226173, WO02015675 mention the gene AT2G23320 in combination with increased leaf size and increased stature and speculate that over expression of this gene can be used to increase growth and biomass production. We have here shown that SEQ  
30 ID:1 can be used in trees to increase growth to an industrial significant degree.

SEQ ID:6 belongs to an sub group of WRKY genes that is related to the subgroup that SEQ ID:1 belongs to but clearly different from that group of genes. Genes closely related to this gene are known to be negative regulators of basal resistance in *Arabidopsis*

*thaliana*. Journot-Catalino et al 2006. The closely related gene AT4G31550 is believed to be related to seed prenol lipid and seed lutein levels (US 20060195944 and US 20070022495, and WO01035727). Another predicted *Arabidopsis thaliana* homolog AT2G24570 to SEQ ID:6 is believed to be involved in C/N sensing (US 20070022495 and 5 20060272060). Genes closely related to SEQ ID:6 have not to our knowledge been shown to be involved in regulating growth rates and biomass production.

SEQ ID:2 belongs to another sub group of WRKY genes. Genes closely related to SEQ ID:2 have not to our knowledge been shown to be involved in regulating growth rates and biomass production.

10 SEQ ID:3 and SEQ ID:5 belongs to a large group of WRKY genes containing 2 WRKY domains. A number of related homologs to SEQ ID:3 and SEQ ID:5 containing two WRKY-domains are believed to be involved in altering seed yield and number of flowers in *Oryza sativa* according to Patent Application No. WO 2007003409. The use to increase growth and biomass production by altering the expression level is previously unknown.

15 SEQ ID:8 belongs to another sub group of WRKY genes. The closely related *Arabidopsis thaliana* gene AT4G23810 is known to reduce plant size and be involved in altering seed protein content (US 20030226173). Another related *Arabidopsis thaliana* homolog (AT5G24110) is known to be involved in altering seed protein content and inducing early flowering (US 20030226173). Genes closely related to SEQ ID:8 have not to our 20 knowledge been shown to be involved in regulating growth rates and biomass production.

### Summary of the invention

The present invention pertains to novel genes that can be used to increase growth. The genes are found by using an analytical platform that is concentrated on analysing growth 25 behavior based on a combination of multiple criteria. The invention provides methods for producing a transgenic plant by changing the expression of one or more genes selected from a group of genes which fulfil said criteria. Thus, the invention relates to methods for phenotypically modifying plants and transgenic plants and plants obtained by a specific crossing method having altered expression of a gene resulting in a modified growth 30 phenotype. The invention also provides constructs useful in the method of the invention. Further, the invention relates to a plant cell or plant progeny of the plants and wood produced with unexpectedly good properties by the plants according to the invention.

A number of genes analyzed using the analytical platform show interesting and most often unexpected commercial features. Thus, an aspect of the present invention provides a method of producing a plant having an unexpectedly high growth compared to its wild type, comprising altering (increasing) in the plant the level of a gene product of at least

5 one gene belonging to one of the transcription factor sequences SEQ ID:1-13, 97-115.

The increase in growth can be observed when comparing a group of transgenic plants grown for 8 weeks in a greenhouse under a photoperiod of 18 hours, a temperature of 22°C/15°C (day/ night) and a weekly fertilization Weibulls Rika S NPK 7-1-5 diluted 1 to 100 with a group of wild-type plants grown under identical conditions;

10 Another aspect of the invention provides a plant cell or plant progeny of a transgenic plant or a plant with intentionally changed (increased) levels of one gene's SEQ ID: 1-13, 97-115 according to the invention and comprising a recombinant polynucleotide.

A further aspect of the invention provides biomass and products thereof produced by a intentionally plant having the characteristics described above.

15 Still another aspect of the invention provides a DNA construct comprising at least one sequence as described as described herein.

Finally, one aspect of the invention provides a plant cell or plant progeny comprising the DNA construct according to the invention.

## 20 **Description of the figures**

Fig. 1 shows an example of a height growth curve with four different data point linear regression lines shown, the black regression line shows the maximum height growth rate;

## **Detailed description of the invention**

### 25 *Definitions*

Prior to discussing the present invention in further details, the following terms and conventions will first be defined:

The term "transgenic plant" refers to a plant that contains genetic material, not found in a wild type plant of the same species, variety or cultivar. The genetic material may include a  
30 transgene, an insertional mutagenesis event (such as by transposon or T-DNA insertional mutagenesis), an activation tagging sequence, a mutated sequence, a homologous

recombination event or a sequence modified by chimeraplasty. Typically, the foreign genetic material has been introduced into the plant by human manipulation. The term also refers to plants in which genetic material has been inserted to function as a selection marker. Examples of such selectable markers include kanamycin, hygromycin,  
5 phosphoinotricin, chlorsulfuron, methotrexate, gentamycin, spectinomycin, imidazolinones, d-aminoacids and glyphosate.

In the present context the term "growth" includes primary growth, including a lengthening of the stem and roots, as well as secondary growth of a plant, including production of secondary tissue, "wood", from the cambium and an increase in the girth of stems and  
10 roots. Thus, the expression "increased growth" relates in the present context to an increase growth of a transgenic plant relative to the wild-type plant from which the transgenic plant is derived, when grown under the same growth conditions. As described below, a transgenic plant is characterized to have an increased growth if the plant meets at least one of the "growth difference selection criteria" as defined in the below Examples.

15 The term "phenotype" refers in the present context to an individual plant's total physical appearance, such as growth. Examples of different growth phenotypes used in the present context are listed in the below table 1.2.

The term "gene" broadly refers to any segment of DNA associated with a biological function. Genes include coding sequences and/or regulatory sequences required for their  
20 expression. Genes also include non-expressed DNA nucleic acid segments that, e.g., form recognition sequences for other proteins (e.g., promoter, enhancer, or other regulatory regions). Genes can be obtained from a variety of sources, including cloning from a source of interest or synthesizing from known or predicted sequence information, and may include sequences designed to have desired parameters.

25 "Overexpression" refers to the expression of a polypeptide or protein encoded by a DNA of SEQ ID NO: 1-13, 97-115 or similar sequences introduced into a host cell, wherein said polypeptide or protein is either not normally present in the host cell, or wherein said polypeptide or protein is present in said host cell at a higher level than that normally expressed from the endogenous gene encoding said polypeptide or protein.

30 Overexpression of the proteins of the instant invention may be accomplished by first constructing a chimeric gene in which the coding region is operably linked to a promoter capable of directing expression of a gene in the desired tissues at the desired stage of development. The chimeric gene may comprise promoter sequences and translation leader sequences derived from the same genes. 3' Non-coding sequences encoding

transcription termination signals may also be provided. The instant chimeric gene may also comprise one or more introns in order to facilitate gene expression. A suitable promoter may be the CaMV 35 S promoter which may be used with *Agrobacterium* as a vector.

- 5 The term "RNA interference" or "RNAi" refers generally to a process in which a double-stranded RNA molecule or a short hairpin RNA changes the expression of a nucleic acid sequence with which they share substantial or total homology.

The term "RNAi down-regulation" refers to the reduction in the expression of a nucleic acid sequence mediated by one or more RNAi species. The term "RNAi species" refers to  
10 a distinct RNA sequence that elicits RNAi.

The term "photoperiod" refers to the daily cycle of light and darkness.

The terms "nucleic acid construct", "DNA construct" and "vector" refer to a genetic sequence used to transform plants or other organisms. The nucleic acid construct or DNA construct may be able to direct, in a transformed plant the expression of a protein or a  
15 nucleic acid sequence, such as for example an antisense RNA. Typically, such a nucleic acid construct or DNA construct comprises at least a coding region for a desired gene product or a desired nucleic acid product operably linked to 5' and 3' transcriptional regulatory elements. In some embodiments, such nucleic acid constructs or DNA constructs are chimeric, i.e. consisting of a mixture of sequences from different sources.  
20 However, non-chimeric nucleic acid constructs or DNA constructs may also be used in the present invention.

The term "recombinant" when used with reference, e.g., to a cell, nucleotide, vector, protein, or polypeptide typically indicates that the cell, nucleotide, or vector has been modified by the introduction of a heterologous (or foreign) nucleic acid or the alteration of  
25 a native nucleic acid, or that the protein or polypeptide has been modified by the introduction of a heterologous amino acid, or that the cell is derived from a cell so modified. Recombinant cells express nucleic acid sequences (e.g., genes) that are not found in the native (non-recombinant) form of the cell or express native nucleic acid sequences (e.g. genes) that would be abnormally expressed under-expressed, or not  
30 expressed at all. The term "recombinant" when used with reference to a cell indicates that the cell replicates a heterologous nucleic acid, or expresses a peptide or protein encoded by a heterologous nucleic acid. Recombinant cells can contain genes that are not found within the native (non-recombinant) form of the cell. Recombinant cells can also contain genes found in the native form of the cell wherein the genes are modified and re-

introduced into the cell by artificial means. The term also encompasses cells that contain a nucleic acid endogenous to the cell that has been modified without removing the nucleic acid from the cell; such modifications include those obtained by gene replacement, site-specific mutation, and related techniques.

- 5 The term "nucleic acid sequence" refers to a polymer of deoxyribonucleotides or ribonucleotides in either single- or double-stranded form. Unless specifically limited, the term encompasses nucleic acid sequences containing known analogues of natural nucleotides which have similar binding properties as the reference nucleic acid and are metabolized in a manner similar to naturally occurring nucleotides. Unless otherwise  
10 indicated, a particular nucleic acid sequence also implicitly encompasses conservatively modified variants thereof (e.g., degenerate codon substitutions) and complementary sequences and as well as the sequence explicitly indicated.

A "polynucleotide" is a nucleic acid sequence comprising a plurality of polymerized nucleotide residues, e. g., at least about 15 consecutive polymerized nucleotide residues,  
15 optionally at least about 30 consecutive nucleotides, at least about 50 consecutive nucleotides. In many instances, a polynucleotide comprises a nucleotide sequence encoding a polypeptide (or protein) or a domain or fragment thereof. Additionally, the polynucleotide may comprise a promoter, an intron, an enhancer region, a polyadenylation site, a translation initiation site, 5' or 3' untranslated regions, a reporter  
20 gene, a selectable marker, or the like. The polynucleotide can be single stranded or double stranded DNA or RNA. The polynucleotide optionally comprises modified bases or a modified backbone. The polynucleotide can be e. g. genomic DNA or RNA, a transcript (such as an mRNA), a cDNA, a PCR product, a cloned DNA, a synthetic DNA or RNA, or the like. The polynucleotide can comprise a sequence in either sense or antisense  
25 orientation.

The term "polypeptide" is used broadly to define linear chains of amino acid residues, including occurring in nature and synthetic analogues thereof.

In the context of the present invention "complementary" refers to the capacity for precise pairing between two nucleotides sequences with one another. For example, if a nucleotide  
30 at a certain position of an oligonucleotide is capable of hydrogen bonding with a nucleotide at the corresponding position of a DNA or RNA molecule, then the oligonucleotide and the DNA or RNA are considered to be complementary to each other at that position. The DNA or RNA strand are considered complementary to each other when a sufficient number of nucleotides in the oligonucleotide can form hydrogen bonds

with corresponding nucleotides in the target DNA or RNA to enable the formation of a stable complex.

In the present context the expressions "complementary sequence" or "complement" therefore also refer to nucleotide sequences which will anneal to a nucleic acid molecule  
5 of the invention under stringent conditions.

The term "stringent conditions" refers to general conditions of high, weak or low stringency.

The term "stringency" is well known in the art and is used in reference to the conditions (temperature, ionic strength and the presence of other compounds such as organic  
10 solvents) under which nucleic acid hybridisations are conducted. With "high stringency" conditions, nucleic acid base pairing will occur only between nucleic acid fragments that have a high frequency of complementary base sequences, as compared to conditions of "weak" or "low" stringency. Suitable conditions for testing hybridization involve pre-soaking in 5xSSC and pre-hybridizing for 1 hour at ~40°C in a solution of 20% formamide,  
15 5xDenhardt's solution, 50mM sodium phosphate, pH 6.8, and 50mg of denatured sonicated calf thymus DNA, followed by hybridization in the same solution supplemented with 100mM ATP for 18 hours at ~40°C, followed by three times washing of the filter in 2xSSC, 0.2% SDS at 40°C for 30 minutes (low stringency), preferred at 50°C (medium stringency), more preferably at 65°C (high stringency), even more preferably at ~75°C  
20 (very high stringency). More details about the hybridization method can be found in Sambrook et al., Molecular Cloning: A Laboratory Manual, 2nd Ed., Cold Spring Harbor, 1989.

The terms "hybridization" and "hybridize" are used broadly to designate the association between complementary or partly complementary nucleic acid sequences, such as in a  
25 reversal of the process of denaturation by which they were separated. Hybridization occurs by hydrogen bonding, which may be Watson-Crick, Hoogsteen, reversed Hoogsteen hydrogen bonding, etc., between complementary nucleoside or nucleotide bases. The four nucleobases commonly found in DNA are G, A, T and C of which G pairs with C, and A pairs with T. In RNA T is replaced with uracil (U), which then pairs with A.  
30 The chemical groups in the nucleobases that participate in standard duplex formation constitute the Watson-Crick face. Hoogsteen showed a couple of years later that the purine nucleobases (G and A) in addition to their Watson-Crick face have a Hoogsteen face that can be recognised from the outside of a duplex, and used to bind pyrimidine oligonucleotides via hydrogen bonding, thereby forming a triple helix structure.

A “subsequence” or a “fragment” is any portion of an entire sequence. Thus, a fragment or subsequence refers to a sequence of amino acids or nucleic acids that comprises a part of a longer sequence of amino acids (e.g. polypeptide) or nucleic acids (e.g. polynucleotide), respectively.

- 5 In the present context, the term “homology” indicates similarities between two amino acid sequences or between two nucleotide sequences is described by the parameter “sequence identity”.

The term “sequence identity” indicates a quantitative measure of the degree of homology between two amino acid sequences or between two nucleic acid sequences of equal  
10 length. If the two sequences to be compared are not of equal length, they must be aligned to give the best possible fit, allowing the insertion of gaps or, alternatively, truncation at the ends of the polypeptide sequences or nucleotide sequences. The sequence identity

can be calculated as  $\frac{(N_{ref} - N_{dif})100}{N_{ref}}$ , wherein  $N_{dif}$  is the total number of non-identical residues in the two sequences when aligned and wherein  $N_{ref}$  is the number of residues in one of  
15 the sequences. Hence, the DNA sequence AGTCAGTC will have a sequence identity of 75% with the sequence AATCAATC ( $N_{dif}=2$  and  $N_{ref}=8$ ). A gap is counted as non-identity of the specific residue(s), i.e. the DNA sequence AGTGTC will have a sequence identity of 75% with the DNA sequence AGTCAGTC ( $N_{dif}=2$  and  $N_{ref}=8$ ).

With respect to all embodiments of the invention relating to nucleotide sequences, the  
20 percentage of sequence identity between one or more sequences may also be based on alignments using the clustalW software (<http://www.ebi.ac.uk/clustalW/index.html>) with default settings. For nucleotide sequence alignments these settings are:

Alignment=3Dfull, Gap Open 10.00, Gap Ext. 0.20, Gap separation Dist. 4, DNA weight matrix: identity (IUB). Alternatively, the sequences may be analysed using the program  
25 DNASIS Max and the comparison of the sequences may be done at <http://www.paralign.org/>. This service is based on the two comparison algorithms called Smith-Waterman (SW) and ParAlign. The first algorithm was published by Smith and Waterman (1981) and is a well established method that finds the optimal local alignment of two sequences. The other algorithm, ParAlign, is a heuristic method for sequence  
30 alignment; details on the method is published in Rognes (2001). Default settings for score matrix and Gap penalties as well as E-values were used.

The phrase “substantially identical” or “substantial identity” in the context of two nucleic acids or polypeptides, refers to two or more sequences or sub-sequences that have at

least about 60%, 70%, 75%, preferably 80% or 85%, more preferably 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, 99.5%, or greater nucleotide or amino acid residue percent identity, respectively, when compared and aligned for maximum correspondence, as measured using one of the following sequence comparison  
5 algorithms or by visual inspection. In certain aspects, the substantial identity exists over a region of amino acid sequences of at least about 50 residues in length, such as, at least about 100, 110, 120, 125, 130, 135, 140, 145, 150, 155, 160, or 165 amino acid residues. In certain aspects, substantial identity exists over a region of nucleic acid sequences of at least about 150 nucleic acid residues, such as at least about 200, 250, 300, 330, 360,  
10 375, 400, 425, 450, 460, 480, 500, 600, 700, 800 such as at least about 900 nucleotides or such as at least about 1 kb, 1.1 kb, 1.2 kb, 1.3 kb, 1.4 kb, 1.5 kb, 1.6 kb, 1.7 kb, 1.8 kb, 1.9 kb, 2 kb, 2.1 kb, 2.2 kb, 2.3 kb, 2.4 kb, 2.5 kb, 2.6 kb, 2.7 kb, 2.8 kb, 2.9 kb or such as at least about 3 kb. In some aspects, the amino acid or nucleic acid sequences are substantially identical over the entire length of the polypeptide sequence or the  
15 corresponding coding region.

The term "Conservative substitutions" are within the group of basic amino acids (arginine, lysine and histidine), acidic amino acids (glutamic acid and aspartic acid), polar amino acids (glutamine and asparagine), hydrophobic amino acids (leucine, isoleucine, valine and methionine), aromatic amino acids (phenylalanine, tryptophan and tyrosine), and  
20 small amino acids (glycine, alanine, serine and threonine). Amino acid substitutions which do not generally alter the specific activity are known in the art and are described, for example, by Neurath and Hill, 1979. The most commonly occurring exchanges are Ala/Ser, Val/Ile, Asp/Glu, Thr/Ser, Ala/Gly, Ala/Thr, Ser/Asn, Ala/Val, Ser/Gly, Tyr/Phe, Ala/Pro, Lys/Arg, Asp/Asn, Leu/Ile, Leu/Val, Ala/Glu, and Asp/Gly as well as these in  
25 reverse.

The term "conservatively substituted variant" as used herein refers to a variant of a nucleotide sequence comprising one or more conservative substitutions.

Generally and in the present context, the term "silent substitution" refers to a base substitution which does not affect the sense of a codon and thus has no effect on  
30 polypeptide structure. As the skilled person will know silent substitutions are possible because of the degeneracy of the genetic code.

The term "conserved domain" refers to a sequence of amino acids in a polypeptide or a sequence of nucleotides in DNA or RNA that is similar across multiple species. A known set of conserved sequences is represented by a consensus sequence. Amino acid motifs

are often composed of conserved sequences. Additionally, the term "conserved sequence" refers to a base sequence in a nucleic acid sequence molecule or an amino acid sequence in a protein that has remained essentially unchanged throughout evolution. A "consensus sequence" is defined in terms of an idealized sequence that represents the base most often present at each position in a nucleic acid sequence or the amino acid most often present at each position in a protein. A "consensus sequence" is identified by aligning all known examples of a nucleic acid sequence or a protein so as to maximise their sequence identity. For a sequence to be accepted as a consensus sequence each particular base or amino acid must be reasonably predominant at its position and most of the sequences must be related to the consensus by only few substitutions, such as 1 or 2.

A homologue may also be in the form of an "insertional variant" of a protein, i.e. where one or more amino acid residues are introduced into a predetermined site in a protein. Insertions may comprise N-terminal and/or C-terminal fusions as well as intra-sequence insertions of single or multiple amino acids. Generally, insertions within the amino acid sequence will be smaller than N- or C-terminal fusions, of the order of about 1 to 10 residues. Examples of N- or C-terminal fusion proteins or peptides include the binding domain or activation domain of a transcriptional activator as used in the yeast two-hybrid system, phage coat proteins, (histidine)-6-tag, glutathione S-transferase-tag, protein A, maltose-binding protein, dihydrofolate reductase, Tag- 100 epitope, c-myc epitope, FLAG®- epitope, lacZ, CMP (calmodulin-binding peptide), HA epitope, protein C epitope and VSV epitope.

Homologues in the form of "deletion variants" of a protein are characterised by the removal of one or more amino acids from a protein.

Homologues in the form of "addition variants" of a protein are characterised by the addition of one or more amino acids from a protein, whereby the addition may be at the end of the sequence.

Amino acid variants of a protein may readily be made using peptide synthetic techniques well known in the art, such as solid phase peptide synthesis and the like, or by recombinant DNA manipulations. Methods for the manipulation of DNA sequences to produce substitution, insertion or deletion variants of a protein are well known in the art. For example, techniques for making substitution mutations at predetermined sites in DNA are well known to those skilled in the art and include M13 mutagenesis, T7-Gen in vitro mutagenesis (USB, Cleveland, OH), QuickChange Site-Directed mutagenesis

(Stratagene, San Diego, CA), PCR-mediated site-directed mutagenesis or other site-directed mutagenesis protocols.

The terms "Orthologs" and "Paralogs" -sequences are also a type of homologous sequences as described above. Several different methods are known by those of skill in the art for identifying and defining these functionally homologous sequences. Three general methods for defining orthologs and paralogs are described; an ortholog, paralog or homolog may be identified by one or more of the methods described below.

Orthologs and paralogs are evolutionarily related genes that have similar sequence and similar functions. Orthologs are structurally related genes in different species that are derived by a speciation event. Paralogs are structurally related genes within a single species that are derived by a duplication event.

Within a single plant species, gene duplication may cause two copies of a particular gene, giving rise to two or more genes with similar sequence and often similar function known as paralogs. A paralog is therefore a similar gene formed by duplication within the same species. Paralogs typically cluster together or in the same clade (a group of similar genes) when a gene family phylogeny is analyzed using programs such as CLUSTAL (Thompson et al.; Higgins et al.). Groups of similar genes can also be identified with pair-wise BLAST analysis (Feng and Doolittle. For example, a clade of very similar MADS domain transcription factors from Arabidopsis all share a common function in flowering time (Ratcliffe et al.), and a group of very similar AP2 domain transcription factors from Arabidopsis are involved in tolerance of plants to freezing (Gilmour et al.). Analysis of groups of similar genes with similar function that fall within one clade can yield sub-sequences that are particular to the clade. These sub-sequences, known as consensus sequences, can not only be used to define the sequences within each clade, but define the functions of these genes; genes within a clade may contain paralogous sequences, or orthologous sequences that share the same function (see also, for example, Mount (2001), in Bioinformatics: Sequence and Genome Analysis Cold Spring Harbor Laboratory Press, Cold Spring Harbor, N.Y., page 543.)

Speciation, the production of new species from a parental species, can also give rise to two or more genes with similar sequence and similar function. These genes, termed orthologs, often have an identical function within their host plants and are often interchangeable between species without losing function. Because plants have common ancestors, many genes in any plant species will have a corresponding orthologous gene in another plant species. Once a phylogenetic tree for a gene family of one species has

been constructed using a program such as CLUSTAL potential orthologous sequences can be placed into the phylogenetic tree and their relationship to genes from the species of interest can be determined. Orthologous sequences can also be identified by a reciprocal BLAST strategy. Once an orthologous sequence has been identified, the  
5 function of the ortholog can be deduced from the identified function of the reference sequence.

Orthologous genes from different organisms have highly conserved functions, and very often essentially identical functions (Lee et al. and Remm et al.). Paralogous genes, which have diverged through gene duplication, may retain similar functions of the encoded  
10 proteins. In such cases, paralogs can be used interchangeably with respect to certain embodiments of the instant invention (for example, transgenic expression of a coding sequence). An example of such highly related paralogs is the CBF family, with three well-defined members in *Arabidopsis* and at least one ortholog in *Brassica napus*, all of which control pathways involved in both freezing and drought stress (Gilmour et al. and Jaglo et  
15 al.)

The following references represent a small sampling of the many studies that demonstrate that conserved transcription factor genes from diverse species are likely to function similarly (i.e., regulate similar target sequences and control the same traits), and that transcription factors may be transformed into diverse species to confer or improve traits.

20 (1) The *Arabidopsis* NPR1 gene regulates systemic acquired resistance (SAR); over-expression of NPR1 leads to enhanced resistance in *Arabidopsis*. When either *Arabidopsis* NPR1 or the rice NPR1 ortholog was overexpressed in rice (which, as a monocot, is diverse from *Arabidopsis*), challenge with the rice bacterial blight pathogen *Xanthomonas oryzae* pv. *Oryzae*, the transgenic plants displayed enhanced resistance  
25 (Chern et al.). NPR1 acts through activation of expression of transcription factor genes, such as TGA2 (Fan and Dong).

(2) E2F genes are involved in transcription of plant genes for proliferating cell nuclear antigen (PCNA). Plant E2Fs share a high degree of similarity in amino acid sequence between monocots and dicots, and are even similar to the conserved domains of the  
30 animal E2Fs. Such conservation indicates a functional similarity between plant and animal E2Fs. E2F transcription factors that regulate meristem development act through common cis-elements, and regulate related (PCNA) genes (Kosugi and Ohashi).

The term "closely related" genes is used for genes that are orthologous or paralogous.

The term "promoter," as used herein, refers to a region of sequence determinants located upstream from the start of transcription of a gene and which are involved in recognition and binding of RNA polymerase and other proteins to initiate and modulate transcription. Promoters useful in plants need not be of plant origin. A "basal promoter" is the minimal  
5 sequence necessary for assembly of a transcription complex required for transcription initiation. Basal promoters frequently include a TATA box" element usually located between 15 and 35 nucleotides upstream from the site of initiation of transcription. Basal promoters also sometimes include a CCAAT box" element (typically a sequence CCAAT) and/or a GGGCG sequence, usually located between 40 and 200 nucleotides, preferably  
10 60 to 120 nucleotides, upstream from the start site of transcription.

Promoters referred to herein as "constitutive promoters" actively promote transcription under most, but not necessarily all, environmental conditions and states of development or cell differentiation. Examples of constitutive promoters include the cauliflower mosaic virus (CaMV) 35S transcript initiation region and the 1' or 2' promoter derived from T-DNA  
15 of *Agrobacterium tumefaciens*, and other transcription initiation regions from various plant genes, such as the maize ubiquitin-1 promoter, known to those of skill. Organ-specific promoters may be, for example, a promoter from storage sink tissues such as seeds, potato tubers, and fruits , or from metabolic sink tissues such as meristems , a seed specific promoter such as the glutelin, prolamin, globulin, or albumin promoter from rice ,  
20 a *Vicia faba* promoter from the legumin B4 and the unknown seed protein gene from *Vicia faba* , a promoter from a seed oil body protein, the storage protein napA promoter from *Brassica napus*, or any other seed specific promoter known in the art, e.g., as described in WO 91/14772. Furthermore, the promoter may be a leaf specific promoter such as the *rbcs* promoter from rice or tomato, the chlorella virus adenine methyltransferase gene  
25 promoter , or the *aldP* gene promoter from rice, or a wound inducible promoter such as the potato pin2 promoter.

An "inducible promoter" in the context of the present invention refers to a promoter which is regulated under certain conditions, such as light, chemical concentration, protein concentration, conditions in an organism, cell, or organelle, etc. An example of an  
30 inducible promoter is the HSP promoter and the PARSK1, the promoter from the *Arabidopsis* gene encoding a serine-threonine kinase enzyme and which is induced by dehydration, abscissic acid and sodium chloride. In essence, expression under the control of an inducible promoter is "switched on" or increased in response to an applied stimulus. The nature of the stimulus varies between promoters and may include the above  
35 environmental factors. Whatever the level of expression is in the absence of the stimulus,

expression from any inducible promoter is increased in the presence of the correct stimulus.

As used herein, the term "tissue specific" refers to a characteristic of a particular tissue that is not generally found in all tissues, or may be exclusive found in a tissue of interest.

5 In the present application, "tissue specific" is used in reference to a gene regulatory element (promoter or promoter plus enhancer and/or silencer), the gene it encodes, or the polypeptide product of such a gene. In the context of a gene regulatory element or a "tissue specific promoter", the term means that the promoter (and also other regulatory elements such as enhancer and/or silencer elements) directs the transcription of a linked  
10 sequence in a cell of a particular lineage, tissue, or cell type, but is substantially inactive in cells or tissues not of that lineage, tissue, or cell type. A tissue specific promoter useful according to the invention is at least 5-fold, 10-fold, 25-fold, 50fold, 100-fold, 500-fold or even 1,000 times more active in terms of transcript production in the particular tissue than it is in cells of other tissues or in transformed or malignant cells of the same lineage. In the  
15 context of a gene or the polypeptide product of a gene, the term tissue specific means that the polypeptide product of the gene is detectable in cells of that particular tissue or cell type, but not substantially detectable in certain other cell types. Particularly relevant tissue specific promoters include promoter sequences specifically expressed or active in the xylem forming tissue in a plant. Examples of such promoters are the Lmp1, Lmx2,  
20 Lmx3, Lmx4 and Lmx5 promoters, described in WO2004097024.

A "terminator sequence" refers to a section of genetic sequence that marks the end of gene or operon on genomic DNA for transcription. Terminator sequences are recognized by protein factors that co-transcriptionally cleave the nascent RNA at a polyadenylation signal, halting further elongation of the transcript by RNA polymerase. A nucleic acid is  
25 "operably linked" when it is placed into a functional relationship with another nucleic acid sequence. For instance, a promoter or enhancer is operably linked to a coding sequence if it increases the transcription of the coding sequence. Operably linked means that the DNA sequences being linked are typically contiguous and, where necessary to join two protein coding regions, contiguous and in reading frame. However, since enhancers  
30 generally function when separated from the promoter by several kilobases and intronic sequences may be of variable lengths, some polynucleotide elements may be operably linked but not contiguous.

In the context of the present invention the terms "transformation" and "transforming" are used interchangeably and as synonyms to "transfecting" and "transfection", respectively,

to refer to the process of introducing DNA into a cell. The DNA constructs, including at least a portion of the gene or promoter of interest, can be introduced into host cells, which as stated previously, can be individual cells, cells in culture, cells as part of a host organism, a fertilized oocyte or gametophyte or an embryonic cell. By the term

5 "introduction" when used in reference to a host cell is meant to refer to standard procedures known in the art for introducing recombinant vector DNA into the target host cell. Such procedures include, but are not limited to, transfection, infection, transformation, natural uptake, electroporation, biolistics and *Agrobacterium*.

By "regenerable cell" is meant a plant cell from which a whole plant can be regenerated. It

10 will be understood that the regenerable cell is a cell that has maintained its genetic potential, also known in the art as "totipotency". It will further be understood that the regenerable cells, when grown in culture, may need the appropriate stimuli to express the total genetic potential of the parent plant.

#### 15 Method of producing a transgenic plant

In specific embodiments of the invention advantageous plant phenotypes are generated by modifying, relative to the corresponding wild-type plant, the expression level of candidate genes that have been evaluated and selected according to the above criteria. According to these aspects a method is provided which comprises altering in the plant the

20 level of a gene product of at least one gene comprising a nucleotide sequence selected from the group consisting of:

- a) a nucleotide sequence from SEQ ID NO: 1-13, 97-115;
- b) a nucleotide sequence being at least 60% identical to a nucleotide sequence from SEQ ID NO 1-13, 97-115 ;
- 25 c) a subsequence or fragment of a nucleotide sequence of a) or b).

This may be done by following technically modified crossing method comprising

- i) selecting plant species expressing at least one of the nucleotide sequences selected from the group consisting of
- 30 a) a nucleotide sequence from SEQ ID NO 1-13, 97-115 ;
- b) a nucleotide sequence being at least 60% identical to a nucleotide

sequence from SEQ ID NO 1-13, 97-115 ;

- c) a subsequence or fragment of a nucleotide sequence of a) or b,
- ii) crossing a plant species selected in i) with the same or another plant species selected in i),
- 5 iii) selecting plants with modulated expression of at least one of the nucleotide sequences selected from the group consisting of
  - a) nucleotide sequence from SEQ ID NO 1-13, 97-115;
  - b) a nucleotide sequence being at least 60% identical to a nucleotide sequence from SEQ ID NO 1-13, 97-115;
  - 10 c) a subsequence or fragment of a nucleotide sequence of a) or b.compared to the plant species selected under i)
- iv) optionally backcrossing one or more times the plants obtained in iii) and selecting plants with modulated expression of at least one of the nucleotide sequences  
15 selected from the group consisting of
  - a) a nucleotide sequence from SEQ ID NO 1-13, 97-115;
  - b) a nucleotide sequence being at least 60% identical to a nucleotide sequence from SEQ ID NO 1-13, 97-115 ;
  - c) a subsequence or fragment of a nucleotide sequence of a) or b)
  - 20 compared to any of the plant species used in i) and/or plants obtained in iii).

According to one aspect of the invention a method is provided comprising the following steps:

- 25 (i) providing an expression vector comprising a nucleotide sequence selected from the group consisting of
  - a) a nucleotide sequence from SEQ ID NO 1-13, 97-115 ;; or
  - b) a nucleotide sequence being at least 60% identical to a nucleotide sequence from SEQ ID NO 1-13, 97-115 ; or

- c) a subsequence or fragment of a nucleotide sequence of a) or b) and
  - d) at least one regulatory element operably linked to the polynucleotide sequence, wherein said at least one regulatory element controls expression of the polynucleotide sequence in a target plant;
- 5 (ii) introducing the expression vector into at least one plant; and
- (iii) selecting at least one transgenic plant that has a modulated growth and/or biomass compared to its wild type.

The sequences specified by sequence ID numbers 1-13, 97-115; represent sequences of  
10 the candidate genes as predicted from *Populus trichocarpa* and seq ID numbers 73-95 as cloned from hybrid aspen. As the skilled person will understand, additional sequence from these genes 5' as well as 3' to the sequence described in SEQ ID NOs: 73-95 is readily achievable using conventional cloning techniques, such as those described in Sambrook et al.

15

According to one embodiment the modulated expression is effected by introducing a genetic modification preferably in the locus of a gene encoding a polypeptide comprising SEQ ID NO: 1-13, 97-115 or a homologue of such polypeptide.

The modification may be effected by one of: T-DNA activation, TILLING, homologous  
20 recombination, site-directed mutagenesis or directed breeding using one or more of SEQ ID NO: 1-13, 97-115 as markers in any step of the process.

The effect of the modulation may be increased yield in growth and/or in biomass.

#### *Nucleic acid constructs*

25 According to more particular embodiments of the invention, the method comprises the step of providing a nucleic acid construct, such as a recombinant DNA construct, comprising a nucleotide sequence selected from the group consisting of:

- a) a nucleotide sequence comprising a sequence selected from SEQ ID NO: 1-13, 97-115 ;
- 30 b) a complementary nucleotide sequence of a nucleotide sequence of a);
- c) a sub-sequence or fragment of a nucleotide sequence of b) or c);

d) a nucleic acid sequence being at least 60% identical to any one of the sequences in a), b) and c); and

e) a nucleotide sequence which hybridizes under stringent conditions to a nucleotide sequence of a), b) or c).

- 5 In further embodiments of the invention the nucleic acid sequence in c) or g) is at least 65% identical to any one of the sequences in a), c), d), e) or f), such as at least 70% identical, at least 75% identical, at least 80% identical, at least 85% identical, at least 87% identical, at least 90% identical, at least 95% identical, at least 97% identical, at least 98% identical, at least 99% identical, or at least 99.5% identical to any one of the sequences in  
10 a), c), d), e) or f).

In preferred embodiments of this aspect of the invention the nucleotide sequence of a) is selected from the group consisting of SEQ ID NOs: 1,4,6,7,9,10, 101, 102, 104, 106 and 107.

A variety of methods exist in the art for producing the nucleic acid sequences and nucleic  
15 acid/DNA constructs of the invention. Procedures for identifying and isolating DNA clones are well known to those of skill in the art, and are described in, e. g. Sambrook et al., Molecular Cloning-A Laboratory Manual (2nd Ed.), Vol. 1-3, Cold Spring Harbor Laboratory, Cold Spring Harbor, New York, 1989. Alternatively, the nucleic acid sequences of the invention can be produced by a variety of *in vitro* amplification methods  
20 adapted to the present invention by appropriate selection of specific or degenerate primers. Examples of protocols sufficient to direct persons of skill through *in vitro* amplification methods, including the polymerase chain reaction (PCR) the ligase chain reaction (LCR), Qbeta-replicase amplification and other RNA polymerase mediated techniques (e. g., NASBA), e. g., for the production of the homologous nucleic acids of the  
25 invention are found in Sambrook, *supra*.

Alternatively, nucleic acid constructs of the invention can be assembled from fragments produced by solid-phase synthesis methods. Typically, fragments of up to approximately 100 bases are individually synthesized and then enzymatically or chemically ligated to produce a desired sequence, e. g., a polynucleotide encoding all or part of a transcription  
30 factor. For example, chemical synthesis using the phosphoramidite method is well known to the skilled person. According to such methods, oligonucleotides are synthesized, purified, annealed to their complementary strand, ligated and then optionally cloned into suitable vectors. The invention also relates to vectors comprising the DNA constructs.

As mentioned, the above described sequences are from hybrid aspen and *Populus trichocarpa*. As the skilled person will understand, homologues of the described sequences may be isolated from other species, non-limiting examples of which include acacia, eucalyptus, hornbeam, beech, mahogany, walnut, oak, ash, hickory, birch, chestnut, alder, maple, sycamore, ginkgo, palm tree, sweet gum, cypress, Douglas fir, fir, sequoia, hemlock, cedar, juniper, larch, pine, redwood, spruce and yew, apple, plum, pear, banana, orange, kiwi, lemon, cherry, grapevine, fig, cotton, bamboo, switch grass, red canary grass and rubber plants. Useful homologues of the described sequences may also be isolated from hardwood plants from the *Salicaceae* family, e.g. from the salix and populus genus. Members of this genus are known by their common names: willow, poplar and aspen.

Examples of other suitable plants for use in accordance with any aspect of the invention described herein include monocotyledons, dicotyledons, gymnosperms and algae, ferns and mosses. Of particular interest are transgenic higher plants, especially agricultural crops, for example cereals, and flowers, which have been engineered to carry a heterologous nucleic acid as described above, including tobacco, cucurbits, carrot, vegetable brassica, melons, capsicums, grape vines, lettuce, strawberry, oilseed brassica, sugar beet, wheat, barley, maize, rice, sugar cane, soybeans, peas, sorghum, sunflower, tomato, potato, pepper, chrysanthemum, carnation, linseed, hemp and rye.

In some preferred embodiments, the plant is a perennial plant, for example a woody perennial plant. A woody perennial plant is a plant which has a life cycle which takes longer than 2 years and involves a long juvenile period in which only vegetative growth occurs. This is contrasted with an annual or herbaceous plant such as *Arabidopsis thaliana* or *Lycopersicon esculentum* (tomato), which have a life cycle which is completed in one year.

In particular, the method according to the present invention may comprise a step of providing a nucleic acid construct, such as a recombinant DNA construct, comprising a nucleotide sequence which relative to the particular sequences described, comprises conservative variations altering only one, or a few amino acids in the encoded polypeptide may also be provided and used according to the present invention. Accordingly, it is within the scope of the invention to provide and use a recombinant DNA construct comprising a nucleotide sequence which encodes a polypeptide comprising a conservatively substituted variant of a polypeptide of a).

Sequence alterations that do not change the amino acid sequence encoded by the polynucleotide are termed "silent" substitutions. With the exception of the codons ATG and TGG, encoding methionine and tryptophan, respectively, any of the possible codons for the same amino acid can be substituted by a variety of techniques, e. g., site-directed  
5 mutagenesis, available in the art. Accordingly, the present invention may also provide a recombinant nucleic acid construct, wherein the nucleotide sequence comprises a silent substitution in a nucleotide sequence.

In certain further embodiments of the invention, the sub-sequences or fragments have at least 65% sequence identity to a conserved domain of a nucleotide sequence as  
10 described above under item a) or d), such as at least 70% identical, at least 75% identical, at least 80% identical, at least 85% identical, at least 87% identical, at least 90% identical, at least 95% identical, at least 97% identical, at least 98% identical, at least 99% identical, or at least 99.5% identical to a conserved domain of a nucleotide sequence as described above under item a) or d).

15 Thus, there are methods for identifying a sequence similar or paralogous or orthologous or homologous to one or more polynucleotides as noted herein, or one or more target polypeptides encoded by the polynucleotides, or otherwise noted herein and may include linking or associating a given plant phenotype or gene function with a sequence. In the methods, a sequence database is provided (locally or across an internet or intranet) and a  
20 query is made against the sequence database using the relevant sequences herein and associated plant phenotypes or gene functions.

#### *Approaches to obtaining altering the level of a gene product*

This invention is used by increasing the expression of certain genes, non limiting  
25 examples how this can be done are presented here. The nucleic acid construct or recombinant DNA construct as described above may be used for the identification of plants having altered growth characteristics as compared to the wild-type. Such plants may for instance be naturally occurring variants or plants that have been modified genetically to exhibit altered growth properties. For such purposes the nucleic acid  
30 construct or recombinant DNA construct according to the invention may be used e.g. as a probe in conventional hybridization assays or as a primer for specific amplification of nucleic acid fragments.

Although the main part of this invention is how an up regulation of the gene products gives the desired effect. It also shows that changing the expression of the genes presented here can be used to modify the desired properties, this is another way to look at the data, and an effect of this view is that also decreasing the gene products within the plant is a way to  
5 modify the desired trait. There are different ways to increase the levels of a gene product, these are described below in parallel with the ways to up-regulate a gene product.

One of the genes SEQ ID NO:1-13, 97-115; could also be used as targets for marker assisted breeding because changes in the gene regulatory sequences can give changes in the expression patterns and changes in the coding sequences can give changes in the  
10 gene function, and we have shown that manipulating these genes gives changes in the desired traits. This is usually referred to that the genes SEQ ID No 1-13, 97-115 ; can be used as candidate genes Brady and Provart 2007, and Varshney et al 2005

One particular way to use this invention is to measure the expression of one or more of the genes SEQ ID NO:1-13, 97-115; using for example quantitative RT-PCR in natural  
15 populations and select for unusual high expression of the measured gene and use such plants as parents in a breeding program, this could be repeated for each breeding cycle. Methods to quantify gene expression, including real time PCR, are described in Sambrook et al.

The genes presented here can also be used in candidate gene-based association studies,  
20 the result from such studies can then be used in marker assisted breeding. Burke et al 2007.

Up regulation or over expression of a gene can be achieved by placing the full open reading frame of the gene behind a suitable promoter, which are described elsewhere, and usually placing terminator and poly-adenylation signal sequence 3' of the gene to be  
25 over expressed.

In addition, the nucleic acid construct or recombinant DNA construct according to the invention may be used for the purpose of gene replacement in order to modify the plant growth phenotype.

Suppression of endogenous gene expression can for instance be achieved using a  
30 ribozyme. Ribozymes are RNA molecules that possess highly specific endoribonuclease activity. The production and use of ribozymes are disclosed in US 4987071 and US 5543508. While antisense techniques are discussed below, it should be mentioned that synthetic ribozyme sequences including antisense RNAs can be used to confer RNA cleaving activity on the antisense RNA, such that endogenous mRNA molecules that

hybridize to the antisense RNA are cleaved, which in turn leads to an enhanced antisense inhibition of endogenous gene expression.

Vectors in which RNA encoded by a relevant gene homologue is over-expressed can also be used to obtain co-suppression of a corresponding endogenous gene, e. g., in the manner described in US 5231020 to Jorgensen. Such co-suppression (also termed sense suppression) does not require that the entire gene sequence be introduced into the plant cells, nor does it require that the introduced sequence be exactly identical to the endogenous sequence of interest. However, the suppressive efficiency will be enhanced as specificity of hybridization is increased, e. g., as the introduced sequence is lengthened, and/or as the sequence similarity between the introduced sequence and the endogenous transcription factor gene is increased.

Vectors expressing an untranslatable form of gene, e. g., sequences comprising one or more stop codons, or nonsense mutation, can also be used to suppress expression of an endogenous transcription factor, thereby reducing or eliminating its activity and modifying one or more traits. Methods for producing such constructs are described in U. S. Patent No. 5,583,021. In particular, such constructs can be made by introducing a premature stop codon into the gene.

One way of performing targeted DNA insertion is by use of the retrovirus DNA integration machinery as described in WO2006078431. This technology is based on the possibility of altering the integration site specificity of retroviruses and retrotransposons integrase by operatively coupling the integrase to a DNA-binding protein (tethering protein). Engineering of the integrase is preferably carried out on the nucleic acid level, via modification of the wild type coding sequence of the integrase by PCR. The integrase complex may thus be directed to a desired portion or be directed away from an undesired portion of genomic DNA thereby producing a desired integration site characteristic.

Another technology that can be used to alter and preferably, in this invention, increase gene expression is the "Targeting Induced Local Lesions in Genomes", which is a non-transgenic way to alter gene function in a targeted way. This approach involves mutating a plant with for example ethyl methanesulfonate (EMS) and later locating the individuals in which a particular desired gene has been modified. The technology is described for instance in Slade and Knauf, 2005 and Henikoff, et al.

A method for abolishing the expression of a gene is by insertion mutagenesis using the T-DNA of *Agrobacterium tumefaciens*. After generating the insertion mutants, the mutants can be screened to identify those containing the insertion in an appropriate gene. Plants

containing a single transgene insertion event at the desired gene can be crossed to generate homozygous plants for the mutation.

As will be apparent to the skilled person, a plant trait can also be modified by using the cre-lox system. A plant genome can be modified to include first and second lox sites that  
5 are then contacted with a Cre recombinase. Provided that the lox sites are in the same orientation, the intervening DNA sequence between the two sites will be excised. If the lox sites are in the opposite orientation, the intervening sequence is inverted.

The polynucleotides and polypeptides of this invention can also be expressed in a plant in the absence of an expression cassette by manipulating the activity or expression level of  
10 the endogenous gene by other means, for example, by ectopically expressing a gene by T-DNA activation tagging, Ichikawa et al. (1997); Kakimoto et al. (1996). This method entails transforming a plant with a gene tag containing multiple transcriptional enhancers and once the tag has inserted into the genome, expression of a flanking gene coding sequence becomes deregulated. In another example, the transcriptional machinery in a  
15 plant can be modified so as to increase transcription levels of a polynucleotide of the invention (See, e. g., PCT Publications WO 96/06166 and WO 98/53057 which describe the modification of the DNA binding specificity of zinc finger proteins by changing particular amino acids in the DNA binding motif).

## 20 *Antisense suppression of expression*

However, the recombinant DNA construct, comprising a nucleotide sequence as described above is particularly useful for sense and anti-sense suppression of expression, e. g., to down-regulate expression of a particular gene, in order to obtain a plant phenotype with increased growth. That is, the nucleotide sequence of the invention, or  
25 sub-sequences or anti-sense sequences thereof, can be used to block expression of naturally occurring homologous nucleic acids. Varieties of traditional sense and antisense technologies are known in the art, e. g., as set forth in Lichtenstein and Nellen (1997). The objective of the antisense approach is to use a sequence complementary to the target gene to block its expression and create a mutant cell line or organism in which the level of  
30 a single chosen protein is selectively reduced or abolished.

For more elaborate descriptions of anti-sense regulation of gene expression as applied in plant cells reference is made to US 5107065, the content of which is incorporated herein in its entirety.

*RNA interference*

Gene silencing that is induced by double-stranded RNA is commonly called RNA interference or RNAi. RNA interference is a molecular mechanism in which fragments of double-stranded ribonucleic acid (dsRNA) interfere with the expression of a particular  
5 gene that shares a homologous sequence with the dsRNA. The process that is mediated by the same cellular machinery that processes microRNA, known as the RNA-induced silencing complex (RISC). The process is initiated by the ribonuclease protein Dicer, which binds and cleaves exogenous double-stranded RNA molecules to produce double-stranded fragments of 20-25 base pairs with a few unpaired overhang bases on each end.  
10 The short double-stranded fragments produced by Dicer, called small interfering RNAs (siRNAs), are separated and integrated into the active RISC complex. If one part of an RNA transcript is targeted by an RNAi molecule or construct, the whole transcript is down-regulated.

For more elaborate descriptions of RNAi gene suppression in plants by transcription of a  
15 dsRNA reference is made to US 6506559, US 2002/0168707, and WO 98/53083, WO 99/53050 and WO 99/61631, all of which are incorporated herein by reference in their entirety.

*Construction of vectors*

In general, those skilled in the art are well able to construct vectors of the present  
20 invention and design protocols for recombinant gene expression. For further details on general protocols for preparation of vectors reference is made to: Molecular Cloning: a Laboratory Manual: 2nd edition, Sambrook et al, 1989, Cold Spring Harbor Laboratory Press. The promoter used for the gene may influence the level, timing, tissue, specificity, or inducibility of the over expression.

25 Generally, over expression of a gene can be achieved using a recombinant DNA construct having a promoter operably linked to a DNA element comprising a sense element of a segment of genomic DNA or cDNA of the gene, e.g., the segment should contain enough of the open reading frame to produce a functional protein and preferably the full open reading frame..

30 In pertinent embodiments of the invention the nucleic acid construct, or recombinant DNA construct, further comprising a constitutive, inducible, or tissue specific promoter operably linked to said nucleotide sequence.

In a presently preferred embodiment of the invention, the nucleic acid construct, or recombinant DNA construct, comprises the sequence of SEQ ID NO: 96 the vector.

The presently preferred nucleic acid construct for over expression, is a vector termed pK2GW7. The vector is described in: Gateway vectors for *Agrobacterium* –mediated  
5 plants transformation, Karimi, 2002.

#### *Transformation of plant cells*

In accordance with the present invention, the method comprise the further step of transforming regenerable cells of a plant with said nucleic acid construct or recombinant  
10 DNA construct and regenerating a transgenic plant from said transformed cell. When introducing the above DNA construct or vector into a plant cell, certain considerations must be taken into account, well known to those skilled in the art. The nucleic acid to be inserted should be assembled within a construct that contains effective regulatory elements that will drive transcription, as described above. There must be available a  
15 method of transporting the construct into the cell. Once the construct is within the cell, integration into the endogenous chromosomal material either will or will not occur.

Transformation techniques, well known to those skilled in the art, may be used to introduce the DNA constructs and vectors into plant cells to produce transgenic plants, in particular transgenic trees, with improved plant growth.

20 A person of skills in the art will realise that a wide variety of host cells may be employed as recipients for the DNA constructs and vectors according to the invention. Non-limiting examples of host cells include cells in embryonic tissue, callus tissue type I, II, and III, hypocotyls, meristem, root tissue, tissues for expression in phloem.

As listed above, *Agrobacterium* transformation is one method widely used by those skilled  
25 in the art to transform tree species, in particular hardwood species such as poplar. Production of stable, fertile transgenic plants is now a routine in the art. Other methods, such as microprojectile or particle bombardment, electroporation, microinjection, direct DNA uptake, liposome mediated DNA uptake, or the vortexing method may be used where *Agrobacterium* transformation is inefficient or ineffective, for example in some  
30 gymnosperm species.

Alternatively, a combination of different techniques may be employed to enhance the efficiency of the transformation process, e.g. bombardment with *Agrobacterium* coated

microparticles or microprojectile bombardment to induce wounding followed by co-cultivation with *Agrobacterium*.

It will be understood, that the particular choice of a transformation technology will be determined by its efficiency to transform certain plant species as well as the experience  
5 and preference of the person practising the invention with a particular methodology of choice. It will be apparent to the skilled person that the particular choice of a transformation system to introduce nucleic acid into plant cells is not essential to or a limitation of the invention, nor is the choice of technique for plant regeneration.

Following transformation, transgenic plants are preferably selected using a dominant  
10 selectable marker incorporated into the transformation vector. Typically, such a marker will confer antibiotic or herbicide resistance on the transformed plants and selection of transformants can be accomplished by exposing the plants to appropriate concentrations of the antibiotic or herbicide. A novel selection marker using the D-form of amino acids and based on the fact that plants can only tolerate the L-form offers a fast, efficient and  
15 environmentally friendly selection system. An interesting feature of this selection system is that it enables both selection and counter-selection.

Subsequently, a plant may be regenerated, e.g. from single cells, callus tissue or leaf discs, as is standard in the art. Almost any plant can be entirely regenerated from cells, tissues and organs of the plant. Available techniques are reviewed in Vasil et al. 1984.

20 After transformed plants are selected and grown to maturity, those plants showing an increase growth phenotype are identified. Additionally, to confirm that the phenotype is due to changes in expression levels or activity of the polypeptide or polynucleotide disclosed herein can be determined by analyzing mRNA expression using Northern blots, RT-PCR or microarrays, or protein expression using immunoblots or Western blots or gel  
25 shift assays.

#### *Plant species*

In accordance with the invention, the present method produces a transgenic plant having an increased growth compared to its wild type plant from which it is derived. In an embodiment of the present method, the transgenic plant is a perennial plant, i.e. a plant  
30 that lives for more than two years. In a specific embodiment, the perennial plant is a woody plant which may be defined as a vascular plant that has a stem (or more than one stem) which is lignified to a high degree.

In a preferred embodiment, the woody plant is a hardwood plant, i.e. broad-leaved or angiosperm trees, which may be selected from the group consisting of acacia, eucalyptus, hornbeam, beech, mahogany, walnut, oak, ash, willow, hickory, birch, chestnut, poplar, alder, maple, sycamore, ginkgo, palm tree and sweet gum. Hardwood plants from the

5 *Salicaceae* family, such as willow, poplar and aspen, including variants thereof, are of particular interest, as these two groups include fast-growing species of tree or woody shrub which are grown specifically to provide timber and bio-fuel for heating. Cellulosic grasses used for bioenergy like Switch grass and Red Canary Grass are also interesting.

In further embodiments, the woody plant is softwood or a conifer which may be selected

10 from the group consisting of cypress, Douglas fir, fir, sequoia, hemlock, cedar, juniper, larch, pine, redwood, spruce and yew.

In useful embodiments, the woody plant is a fruit bearing plant which may be selected from the group consisting of apple, plum, pear, banana, orange, kiwi, lemon, cherry, grapevine and fig.

15 Other woody plants which may be useful in the present method may also be selected from the group consisting of cotton, bamboo and rubber plants.

#### DNA construct

According to a second main aspect of the invention a DNA construct, such as a

20 recombinant DNA construct, is provided comprising at least one sequence as described above. In particular, the recombinant DNA construct may comprise a nucleotide sequence selected from the group consisting of:

- a) a nucleotide sequence comprising a sequence selected from SEQ ID NO: 1-13, 97-115 ;
- 25 b) a complementary nucleotide sequence of a nucleotide sequence of a);
- c) a sub-sequence or fragment of a nucleotide sequence of a) or b);
- d) a nucleic acid sequence being at least 60% identical to any one of the sequences in a), b) and c); and
- e) a nucleotide sequence which hybridizes under stringent conditions to a nucleotide
- 30 sequence of a), b) or c).

In selected embodiments of the invention the nucleic acid sequence in d) is at least 65% identical to any one of the sequences in a), b) and c), such as at least 70% identical, at least 75% identical, at least 80% identical, at least 85% identical, at least 87% identical, at least 90% identical, at least 95% identical, at least 97% identical, at least 98% identical, at least 99% identical, or at least 99.5% identical to any one of the sequences in a), b) and c).

Also, in accordance with the discussion above, the nucleotide sequence encodes a polypeptide comprising a conservatively substituted variant of a polypeptide of (a). Further, the nucleotide sequence comprises a silent substitution in a nucleotide sequence.

10 In additional embodiments of the invention pertaining to this aspect of the invention, the sub-sequences or fragments have at least 65% sequence identity to a conserved domain of a nucleotide sequence as described above under item a). such as at least 70% identical, at least 75% identical, at least 80% identical, at least 85% identical, at least 87% identical, at least 90% identical, at least 95% identical, at least 97% identical, at least 98% identical, at least 99% identical, or at least 99.5% identical to a conserved domain of a nucleotide sequence as described above under item a).

In further embodiments and in accordance with the description above, the recombinant DNA construct further comprising a constitutive, inducible, or tissue specific promoter operably linked to said nucleotide sequence. In particular, the recombinant DNA construct may further comprise a strong constitutive promoter in front of a transcribed cassette consisting of the full open reading frame of the gene followed by an terminator sequence. Such a cassette may comprise a nucleotide sequence as defined in claim 7 and on page 21 and the paragraph bridging pages 21 and 22.

In the presently exemplified embodiments of the invention the recombinant DNA construct comprises the sequence of SEQ ID NO: 96.

#### Transgenic plants

A third aspect of the invention provides a transgenic plant comprising a recombinant polynucleotide (DNA construct) comprising a nucleotide sequence capable of altering in the plant the level of a gene product of at least one of the genes SEQ ID 1-13, 97-115 ; Giving increased growth when comparing said group of transgenic plants grown for 8 weeks in a greenhouse under a photoperiod of 18 hours, a temperature of 22°C/15°C (day/ night) and a weekly fertilization with N 84 g/l, P 2g/l, K 56 g/l, with a group of wild-type plants grown under identical conditions;

According to particular embodiments of the invention the level of a gene product of at least one gene comprising a nucleotide sequence selected from the group consisting of:

- a) a nucleotide sequence from SEQ ID NO: 1-13, 97-115 ;
- b) a nucleotide sequence being at least 60% identical to a nucleotide sequence from  
5 SEQ ID NO 1-13, 97-115 ;
- c) a subsequence or fragment of a nucleotide sequence of a) or b)

has been altered relative to the level found in the respective corresponding wild-type plant.

According to yet another embodiment of the invention, the transgenic plant comprises a  
10 recombinant polynucleotide (DNA construct) comprising a nucleotide sequence selected from the group consisting of:

- a) a nucleotide sequence comprising a sequence selected from SEQ ID NO: 1-13, 97-115 ;
- b) a complementary nucleotide sequence of a nucleotide sequence of a);
- 15 c) a sub-sequence or fragment of a nucleotide sequence of a) or b);
- d) a nucleic acid sequence being at least 60% identical to any one of the sequences in a), b) and c); and
- e) a nucleotide sequence which hybridizes under stringent conditions to a nucleotide sequence of a), b) or c).

20 In further embodiments of this aspect of the invention the nucleic acid sequence in c) or g) is at least 65% identical to any one of the sequences in a), b), c), d) or e), such as at least 70% identical, at least 75% identical, at least 80% identical, at least 85% identical, at least 87% identical, at least 90% identical, at least 95% identical, at least 97% identical, at least 98% identical, at least 99% identical, or at least 99.5% identical to any one of the  
25 sequences in a), b), c), d) or e). The transgenic plant may also comprise a nucleotide sequence encoding a polypeptide comprising a conservatively substituted variant of a polypeptide of a) or b). The nucleotide sequence may comprise a silent substitution in a nucleotide sequence. Further, sub-sequences or fragments may have at least 65% sequence identity to a conserved domain.

30 As mentioned above the skilled person will realize that a variety of methods exist in the art for producing the nucleic acid sequences and polynucleotide constructs of the invention,

e.g. by cloning techniques, assembly of fragments generated by solid phase synthesis. Again, the skilled person will understand, homologues of the described sequences may be isolated from other species, non-limiting examples of which include acacia, eucalyptus, hornbeam, beech, mahogany, walnut, oak, ash, hickory, birch, chestnut, alder, maple, sycamore, ginkgo, palm tree, sweet gum, cypress, Douglas fir, fir, sequoia, hemlock, cedar, juniper, larch, pine, redwood, spruce and yew, apple, plum, pear, banana, orange, kiwi, lemon, cherry, grapevine, fig, cotton, bamboo, switchgrass, red canary grass and rubber plants. Useful homologues of the described sequences may also be isolated from hardwood plants from the *Salicaceae* family, such as from willow, poplar or aspen.

- 10 In particular, the transgenic plant according to the present invention may comprise a recombinant DNA construct comprising a nucleotide sequence which relative to the particular sequences described, comprises conservative variations altering only one, or a few amino acids in the encoded polypeptide may also be provided and used according to the present invention. Accordingly, it is within the scope of the invention to provide a
- 15 transgenic plant comprising a recombinant DNA construct comprising a nucleotide sequence which encodes a polypeptide comprising a conservatively substituted variant of a polypeptide of a) or d).

Accordingly, the present invention may also provide a recombinant DNA construct, wherein the nucleotide sequence comprises a silent substitution in a nucleotide sequence, that is, the recombinant DNA construct may comprise a sequence alteration that does not change the amino acid sequence encoded by the polynucleotide.

In certain further embodiments of the invention, the sub-sequences or fragments have at least 65% sequence identity to a conserved domain of a nucleotide sequence as described above under item a) or d), such as at least 70% identical, at least 75% identical, at least 80% identical, at least 85% identical, at least 87% identical, at least 90% identical, at least 95% identical, at least 97% identical, at least 98% identical, at least 99% identical, or at least 99.5% identical to a conserved domain of a nucleotide sequence as described above under item a) or d).

In the particular embodiments by which the present invention is exemplified the sub-sequences or fragments in c) comprise the sequences of SEQ ID NOs: 18-34.

In further embodiments the transgenic plant provided according to the invention comprises a recombinant polynucleotide construct which further comprises a constitutive, inducible, or tissue specific promoter operably linked to said nucleotide sequence.

In still further embodiments the recombinant polynucleotide construct further comprises a strong constitutive promoter in front of a transcribed cassette. The cassette may comprise a nucleotide sequence, wherein modulated expression is effected by introducing a genetic modification preferably in the locus of a gene encoding a polypeptide comprising SEQ ID  
5 NO: 1-13, 97-115 or a homologue of such polypeptide followed by a plant functional intron followed by a nucleotide sequence encoding a polypeptide comprising a conservatively substituted variant of a polypeptide of a) or d).in reverse orientation.

In a presently preferred embodiment of the invention, the transgenic plant according to the  
10 invention comprises a recombinant DNA construct comprising the sequence of SEQ ID NO: 96

#### *Plant species*

In accordance with the present invention, the transgenic plant may be a perennial plant  
15 which preferable is a woody plant or a woody species. In a useful embodiment, the woody plant is a hardwood plant which may be selected from the group consisting of acacia, eucalyptus, hornbeam, beech, mahogany, walnut, oak, ash, willow, hickory, birch, chestnut, poplar, alder, maple, sycamore, ginkgo, a palm tree and sweet gum. Hardwood plants from the *Salicaceae* family, such as willow, poplar and aspen including variants  
20 thereof, are of particular interest, as these two groups include fast-growing species of tree or woody shrub which are grown specifically to provide timber and bio-fuel for heating.

In further embodiments, the woody plant is a conifer which may be selected from the group consisting of cypress, Douglas fir, fir, sequoia, hemlock, cedar, juniper, larch, pine, redwood, spruce and yew.

25 In useful embodiments, the woody plant is a fruit bearing plant which may be selected from the group consisting of apple, plum, pear, banana, orange, kiwi, lemon, cherry, grapevine and fig.

Other woody plants which may be useful in the present method may also be selected from the group consisting of cotton, bamboo and rubber plants.

30 The present invention extends to any plant cell of the above transgenic plants obtained by the methods described herein, and to all plant parts, including harvestable parts of a plant, seeds and propagules thereof, and plant explant or plant tissue. The present invention

also encompasses a plant, a part thereof, a plant cell or a plant progeny comprising a DNA construct according to the invention. The present invention extends further to encompass the progeny of a primary transformed or transfected cell, tissue, organ or whole plant that has been produced by any of the aforementioned methods, the only  
5 requirement being that progeny exhibit the same genotypic and/or phenotypic characteristic(s) as those produced in the parent by the methods according to the invention.

It should be noted that embodiments and features described in the context of one of the aspects of the present invention also apply to the other aspects of the invention. Thus,  
10 definitions of one embodiment regard mutatis mutandis to all other embodiments comprising or relating to the one embodiment. When for example definitions are made regarding DNA constructs or sequences, such definitions also regard e.g. methods for producing a plant, vectors, plant cells, plants, biomass and wood comprising the DNA construct and vice versa. A DNA construct described in relation to a plant also regards all  
15 other embodiments.

All patent and non-patent references cited in the present application, are hereby incorporated by reference in their entirety.

The invention will now be described in further details in the following non-limiting  
20 examples.

## **Examples**

### Introduction

In order to find and elucidate the function of genes involved in growth, an extensive gene  
25 mining program was performed, resulting in the identification of genes useful in increasing growth which are of industrial application.

### Materials and Methods

#### Gene Selection

30 The first step in this gene mining program was to select a number of genes from a large gene pool in order to narrow the genes to be tested for their function.

We decided to test transcription factors. The reason to select transcription factors for analysis is because they are long known to be part regulators of many if not most processes in living organisms plants.

Although the selection of the genes, for which functions are to be analysed, is an  
5 important part of the discovery of genes with functions interesting for forest biotechnology in an economic efficient way, it is the actual testing of the gene function of the selected genes which is the crucial step for finding their use in industrial applications.

The Transcription Factor genes were identified by BLAST analysis of the genes present in Populus DB, Sterky et al. 2004, against plant genes annotated as transcription factors  
10 present in databases such as <http://plntfdb.bio.uni-potsdam.de/v2.0/>, described in Riano-Pachon et al 2007 and <http://www.ncbi.nlm.nih.gov/>. In some instances were genes also selected based on having an differential expression pattern during wood formation (the genes corresponding to the constructs TFSTT 019, 035, 047 and 051).

#### Cloning of the selected genes

15 The corresponding gene models for the selected genes were extracted from data derived from the genome sequencing of *Populus trichocarpa*, Tuskan et al. 2006 using BLAST analysis. The gene models were compared to, and in some instances corrected based on, information published for homologous genes in *Arabidopsis thaliana* and other plant species. This was done using databases such as <http://www.ncbi.nlm.nih.gov/> and  
20 <http://www.arabidopsis.org/>. Selected genes were subsequently cloned into an over-expression vector under the control of the CaMV 35S promoter. For isolation of cDNA, total RNA was isolated from stem, leaf and bark tissue sampled from hybrid aspen clone T89 plants and reverse transcribed to cDNA using Superscript III First Strand Synthesis System (Invitrogen). cDNA were then amplified by PCR with gene specific forward and  
25 reverse primers using Phusion high fidelity DNA polymerase (Finnzymes). PCR primers were selected as follows, the 5'-primer was placed at the start codon and the 3' reverse primer was placed 3' of the translational stop site. Forward primers were modified by the introduction of a Kozak sequence (5'-AGAACC-3') upstream and next to the start codon of each target gene. The amplified cDNAs were inserted into a Gateway entry vector  
30 pENTR/D-TOPO (Invitrogen), followed by transfer of the genes into the expression vector pK2GW7 (SEQ ID NO:96) using the Gateway LR recombination reaction (Invitrogen). The cloned genes were control sequenced and compared to the selected genes using standard techniques before sub cloning into the plant vector pK2GW7.

The sequences of the genes, the polypeptide sequences and PCR primers for the genes presented here are listed in Table A to C.

Table A. PCR cloning primers

| Construct | Forward cloning primer | Reverse cloning primer |
|-----------|------------------------|------------------------|
| TF0002    | SEQ ID NO: 27          | SEQ ID NO: 40          |
| TF0052    | SEQ ID NO: 28          | SEQ ID NO: 41          |
| TF0065    | SEQ ID NO: 29          | SEQ ID NO: 42          |
| TF0076    | SEQ ID NO: 30          | SEQ ID NO: 43          |
| TF0089    | SEQ ID NO: 31          | SEQ ID NO: 44          |
| TF0109    | SEQ ID NO: 32          | SEQ ID NO: 45          |
| TF0132    | SEQ ID NO: 33          | SEQ ID NO: 46          |
| TFSTT051  | SEQ ID NO: 34          | SEQ ID NO: 47          |
| TF0013    | SEQ ID NO: 35          | SEQ ID NO: 48          |
| TF0097    | SEQ ID NO: 36          | SEQ ID NO: 49          |
| TFSTT019  | SEQ ID NO: 37          | SEQ ID NO: 50          |
| TFSTT035  | SEQ ID NO: 38          | SEQ ID NO: 51          |
| TFSTT047  | SEQ ID NO: 39          | SEQ ID NO: 52          |

| Construct | Forward cloning primer | Reverse cloning primer |
|-----------|------------------------|------------------------|
| TF0003    | SEQ ID NO: 135         | SEQ ID NO: 154         |
| TF0011    | SEQ ID NO: 136         | SEQ ID NO: 155         |
| TF0045    | SEQ ID NO: 137         | SEQ ID NO: 156         |
| TF0058    | SEQ ID NO: 138         | SEQ ID NO: 157         |
| TF0096    | SEQ ID NO: 139         | SEQ ID NO: 158         |
| TF0104    | SEQ ID NO: 140         | SEQ ID NO: 159         |
| TF0116    | SEQ ID NO: 141         | SEQ ID NO: 160         |
| TF0146    | SEQ ID NO: 142         | SEQ ID NO: 161         |
| TF0173    | SEQ ID NO: 143         | SEQ ID NO: 162         |
| TF0247    | SEQ ID NO: 144         | SEQ ID NO: 163         |
| TF0405    | SEQ ID NO: 145         | SEQ ID NO: 164         |
| TFSTT001  | SEQ ID NO: 146         | SEQ ID NO: 165         |
| TFSTT004  | SEQ ID NO: 147         | SEQ ID NO: 166         |
| TFSTT013  | SEQ ID NO: 148         | SEQ ID NO: 167         |
| TFSTT016  | SEQ ID NO: 149         | SEQ ID NO: 168         |
| TFSTT017  | SEQ ID NO: 150         | SEQ ID NO: 169         |
| TFSTT036  | SEQ ID NO: 151         | SEQ ID NO: 170         |
| TFSTT038  | SEQ ID NO: 152         | SEQ ID NO: 171         |
| TFSTT045  | SEQ ID NO: 153         | SEQ ID NO: 172         |

|                                      |               |
|--------------------------------------|---------------|
| Binary destination vector:<br>pK2GW7 | SEQ ID NO: 96 |
|--------------------------------------|---------------|

Table B Over-expressed gene cDNA and polypeptide sequences

| Construct | Gene model for the over-expressed gene cDNA sequence | Predicted sequence of over-expressed protein | Species                    |
|-----------|------------------------------------------------------|----------------------------------------------|----------------------------|
| TF0002    | SEQ ID NO: 1                                         | SEQ ID NO: 14                                | <i>Populus trichocarpa</i> |
| TF0052    | SEQ ID NO: 2                                         | SEQ ID NO: 15                                | <i>Populus trichocarpa</i> |
| TF0065    | SEQ ID NO: 3                                         | SEQ ID NO: 16                                | <i>Populus trichocarpa</i> |
| TF0076    | SEQ ID NO: 4                                         | SEQ ID NO: 17                                | <i>Populus trichocarpa</i> |
| TF0089    | SEQ ID NO: 5                                         | SEQ ID NO: 18                                | <i>Populus trichocarpa</i> |
| TF0109    | SEQ ID NO: 6                                         | SEQ ID NO: 19                                | <i>Populus trichocarpa</i> |
| TF0132    | SEQ ID NO: 7                                         | SEQ ID NO: 20                                | <i>Populus trichocarpa</i> |
| TFSTT051  | SEQ ID NO: 8                                         | SEQ ID NO: 21                                | <i>Populus trichocarpa</i> |
| TF0013    | SEQ ID NO: 9                                         | SEQ ID NO: 22                                | <i>Populus trichocarpa</i> |
| TF0097    | SEQ ID NO: 10                                        | SEQ ID NO: 23                                | <i>Populus trichocarpa</i> |
| TFSTT019  | SEQ ID NO: 11                                        | SEQ ID NO: 24                                | <i>Populus trichocarpa</i> |

|          |               |               |                            |
|----------|---------------|---------------|----------------------------|
| TFSTT035 | SEQ ID NO: 12 | SEQ ID NO: 25 | <i>Populus trichocarpa</i> |
| TFSTT047 | SEQ ID NO: 13 | SEQ ID NO: 26 | <i>Populus trichocarpa</i> |

|          |                |                |                            |
|----------|----------------|----------------|----------------------------|
| TF0003   | SEQ ID NO: 97  | SEQ ID NO: 116 | <i>Populus trichocarpa</i> |
| TF0011   | SEQ ID NO: 98  | SEQ ID NO: 117 | <i>Populus trichocarpa</i> |
| TF0045   | SEQ ID NO: 99  | SEQ ID NO: 118 | <i>Populus trichocarpa</i> |
| TF0058   | SEQ ID NO: 100 | SEQ ID NO: 119 | <i>Populus trichocarpa</i> |
| TF0096   | SEQ ID NO: 101 | SEQ ID NO: 120 | <i>Populus trichocarpa</i> |
| TF0104   | SEQ ID NO: 102 | SEQ ID NO: 121 | <i>Populus trichocarpa</i> |
| TF0116   | SEQ ID NO: 103 | SEQ ID NO: 122 | <i>Populus trichocarpa</i> |
| TF0146   | SEQ ID NO: 104 | SEQ ID NO: 123 | <i>Populus trichocarpa</i> |
| TF0173   | SEQ ID NO: 105 | SEQ ID NO: 124 | <i>Populus trichocarpa</i> |
| TF0247   | SEQ ID NO: 106 | SEQ ID NO: 125 | <i>Populus trichocarpa</i> |
| TF0405   | SEQ ID NO: 107 | SEQ ID NO: 126 | <i>Populus trichocarpa</i> |
| TFSTT001 | SEQ ID NO: 108 | SEQ ID NO: 127 | <i>Populus trichocarpa</i> |
| TFSTT004 | SEQ ID NO: 109 | SEQ ID NO: 128 | <i>Populus trichocarpa</i> |
| TFSTT013 | SEQ ID NO: 110 | SEQ ID NO: 129 | <i>Populus trichocarpa</i> |
| TFSTT016 | SEQ ID NO: 111 | SEQ ID NO: 130 | <i>Populus trichocarpa</i> |
| TFSTT017 | SEQ ID NO: 112 | SEQ ID NO: 131 | <i>Populus trichocarpa</i> |
| TFSTT036 | SEQ ID NO: 113 | SEQ ID NO: 132 | <i>Populus trichocarpa</i> |
| TFSTT038 | SEQ ID NO: 114 | SEQ ID NO: 133 | <i>Populus trichocarpa</i> |
| TFSTT045 | SEQ ID NO: 115 | SEQ ID NO: 134 | <i>Populus trichocarpa</i> |

Table C. Control sequences of cloned cDNA

| Construct | Full control sequence of cloned cDNA | 5' control sequence of cloned cDNA | 3' control sequence of cloned cDNA | Species                              |
|-----------|--------------------------------------|------------------------------------|------------------------------------|--------------------------------------|
| TF0002    | SEQ ID NO: 73                        |                                    |                                    | <i>Populus tremula x tremuloides</i> |
| TF0052    | SEQ ID NO: 74                        |                                    |                                    | <i>Populus tremula x tremuloides</i> |
| TF0065    |                                      | SEQ ID NO: 76                      | SEQ ID NO: 86                      | <i>Populus tremula x tremuloides</i> |
| TF0076    |                                      | SEQ ID NO: 77                      | SEQ ID NO: 87                      | <i>Populus tremula x tremuloides</i> |
| TF0089    |                                      | SEQ ID NO: 78                      | SEQ ID NO: 88                      | <i>Populus tremula x tremuloides</i> |
| TF0109    | SEQ ID NO: 75                        |                                    |                                    | <i>Populus tremula x tremuloides</i> |
| TF0132    |                                      | SEQ ID NO: 79                      | SEQ ID NO: 89                      | <i>Populus tremula x tremuloides</i> |
| TFSTT051  |                                      | SEQ ID NO: 80                      | SEQ ID NO: 90                      | <i>Populus tremula x tremuloides</i> |
| TF0013    |                                      | SEQ ID NO: 81                      | SEQ ID NO: 91                      | <i>Populus tremula x tremuloides</i> |
| TF0097    |                                      | SEQ ID NO: 82                      | SEQ ID NO: 92                      | <i>Populus tremula x tremuloides</i> |
| TFSTT019  |                                      | SEQ ID NO: 83                      | SEQ ID NO: 93                      | <i>Populus tremula x tremuloides</i> |
| TFSTT035  |                                      | SEQ ID NO: 84                      | SEQ ID NO: 94                      | <i>Populus tremula x tremuloides</i> |
| TFSTT047  |                                      | SEQ ID NO: 85                      | SEQ ID NO: 95                      | <i>Populus tremula x tremuloides</i> |

5

|        |                |                |                |                                      |
|--------|----------------|----------------|----------------|--------------------------------------|
| TF0003 | SEQ ID NO: 173 |                |                | <i>Populus tremula x tremuloides</i> |
| TF0011 | SEQ ID NO: 174 |                |                | <i>Populus tremula x tremuloides</i> |
| TF0045 |                | SEQ ID NO: 180 | SEQ ID NO: 192 | <i>Populus tremula x tremuloides</i> |
| TF0058 | SEQ ID NO: 175 |                |                | <i>Populus tremula x tremuloides</i> |
| TF0096 |                | SEQ ID NO: 181 | SEQ ID NO: 193 | <i>Populus tremula x tremuloides</i> |

|          |                |                |                |                                      |
|----------|----------------|----------------|----------------|--------------------------------------|
| TF0104   |                | SEQ ID NO: 182 | SEQ ID NO: 194 | <i>Populus tremula x tremuloides</i> |
| TF0116   |                | SEQ ID NO: 183 | SEQ ID NO: 195 | <i>Populus tremula x tremuloides</i> |
| TF0146   |                | SEQ ID NO: 184 | SEQ ID NO: 196 | <i>Populus tremula x tremuloides</i> |
| TF0173   | SEQ ID NO: 176 |                |                | <i>Populus tremula x tremuloides</i> |
| TF0247   | SEQ ID NO: 177 |                |                | <i>Populus tremula x tremuloides</i> |
| TF0405   |                | SEQ ID NO: 185 | SEQ ID NO: 197 | <i>Populus tremula x tremuloides</i> |
| TFSTT001 |                | SEQ ID NO: 186 | SEQ ID NO: 198 | <i>Populus tremula x tremuloides</i> |
| TFSTT004 |                | SEQ ID NO: 187 | SEQ ID NO: 199 | <i>Populus tremula x tremuloides</i> |
| TFSTT013 | SEQ ID NO: 178 |                |                | <i>Populus tremula x tremuloides</i> |
| TFSTT016 |                | SEQ ID NO: 188 | SEQ ID NO: 200 | <i>Populus tremula x tremuloides</i> |
| TFSTT017 |                | SEQ ID NO: 189 | SEQ ID NO: 201 | <i>Populus tremula x tremuloides</i> |
| TFSTT036 |                | SEQ ID NO: 190 | SEQ ID NO: 202 | <i>Populus tremula x tremuloides</i> |
| TFSTT038 |                | SEQ ID NO: 191 | SEQ ID NO: 203 | <i>Populus tremula x tremuloides</i> |
| TFSTT045 | SEQ ID NO: 179 |                |                | <i>Populus tremula x tremuloides</i> |

### Plant transformation

CaMV 35S: over-expression DNA constructs were transformed into *Agrobacterium* and subsequently into Hybrid aspen, where *Populus tremula* L. x *P. tremuloides* Minch clone T89, hereafter called “poplar”, was transformed and regenerated essentially as described in Nilsson et al. (1992). Approximately 3-8 independent lines were generated for each construct. One such group of transgenic trees produced using one construct is hereafter called a “construction group”, e.g. different transgenic trees emanating from one construct. Each transgenic line within each construction group, e.g. TF0555-2B, TF0555-3A, and so on, are different transformation events and therefore most probably have the recombinant DNA inserted into different locations in the plant genome. This makes the different lines within one construction group partly different. For example it is known that different transformation events will produce plants with different levels of gene over-expression. Construction groups named for example TF0555RP with individuals such as TF0555RP-2B, are the same as the one without the RP part. RP means that this is a re-planting of the same construction group as the one without the rp part. RP2 means the second re-planting, RP3 the third re-planting and so on.

### 20 Plant growth

The transgenic poplar lines were grown together with their wildtype control (wt) trees, in a greenhouse under a photoperiod of 18h and a temperature of 22°C/15°C (day/night). The plants were fertilized weekly with Weibulls Rika S NPK 7-1-5 diluted 1 to 100 (final concentrations NO<sub>3</sub>, 55g/l; NH<sub>4</sub>, 29g/l; P, 12g/l; K, 56g/l; Mg 7,2g/l; S, 7,2g/l; B, 0,18g/l;

Cu, 0,02g/l; Fe, 0,84g/l; Mn, 0,42g/l; Mo, 0,03g/l; Zn, 0,13g/L). The plants were grown for 8-9 weeks before harvest. During this time their height and diameter was measured one to two times per week. In a growth group a number of wildtype trees (typically 35-45 trees) and a number of transgenic trees comprising several construction groups (typically 6-20 construction groups) were grown in parallel in the greenhouse under the same above conditions. All comparisons between the wildtype trees and construction groups are made within each growth group.

### Sampling

10 Two principal types of harvests and samplings were performed. One general type was designed for example chemical analysis, wood morphology analysis, gene expression analysis, wood density analysis and metabolomics analysis. The second type was designed for dry weight measurements of bark, wood, leafs and roots.

### 15 Selection of Construction Groups

In the first round of growth for each group of trees with a specific gene over-expressed, i.e. a construction group, a number of the following analyses were performed: Growth measurements and in many cases wood density. These data were analysed in order to single out the construction groups that showed a phenotypic variation, e.g. increased growth compared to wild type control trees.

### Replant and regrowth

Based on growth data in the first round of greenhouse growth, groups of trees, with a specific gene over-expressed, i.e. a construction group, were selected, replanted and regrown under the same conditions as in the first round of growth. Selected transgenic poplar lines within each construction group were regrown in triplicates. Replant round number and plant line individual replicate numbers were added to the names of the construction group lines to keep them unique, e.g TF0555rp1-2B-1, TF0555rp1-2B-2, TF0555rp1-2B-3, where rp1 means first round of replanting of construction group TF0555 line 2B and -1, -2, -3 denotes plant line individual replicates. Similarly rp2 means second round of replanting. In cases where new construction group lines, not included in the first

round of greenhouse growth, are planted, a suffix (.2nd) is added to construction group name to illustrate this.

Based on growth data a number of analyses and growth rate factors were performed and  
5 calculated in order to select the construction groups and thereby the genes which are possible to use for altering growth characteristics. Selection criteria and methods were as described below.

### Example 1.

#### 10 Growth analysis

##### *Maximum height growth rate*

A height growth rate measure (here named "Maximum height growth rate") was defined as the slope of a linear function fitted over four consecutive height data points. A height growth rate value was calculated for data point 1 – 4, data point 2 – 5 etc. in a step-wise  
15 manner, se Figure 1 for an example. A maximum height growth rate defined as the maximum value produced from step-wise linear regression analysis for each plant was computed. The primary data for high *Maximum height growth rate* values from individual transformants in a construction group were checked so they were not based on bad values. From Figure 1, showing an example of a height growth curve, it can be seen that  
20 the height growth rate increases during the first part of growth then the plants reach their maximum height growth rate and then the growth rate declines as the plants become larger. Because these phases have different timing in different plants and there are some noise added measuring the plants our above described Maximum height growth using rate method is very useful in calculating the maximum growth speed in these conditions  
25 for the different individual trees.

##### *Diameter growth rate*

Under the above defined growth conditions, stem width exhibit a comparatively linear increase over time described by the formula  $d(t) = c * t + d_0$  where  $d_0$  is the initial width  
30 and  $c$  is the rate of diameter growth (slope). Linear regression on diameter data was used for estimating diameter growth rate.

*Final height and diameter*

The final heights and diameters were also used to select construction groups with altered growth characteristics. These values take into account both the trees growth capacity and the trees ability to start growing when transferred from tissue culture into soil and placed

5 in a greenhouse.

Selection parameters

Construction groups that showed a significant or pronounced increase compared to the wild type population in the above mentioned growth parameters, i.e. diameter growth rate,

10 maximum height growth rate, final height and final diameter, were identified as construction groups that have altered growth properties. Therefore, the corresponding genes can be used to alter these properties. The selection criteria's are stated below. Two different selection criteria levels were used, one basic level and one for constructs giving growth phenotypes of extra interest.

15

Growth difference selection criteria

Table 1.2 lists the abbreviations used for the different growth parameters when used to describe construction group phenotypes.

20 Table 1.2. Abbreviations used for the different phenotypes

|              |                                                                                                              |
|--------------|--------------------------------------------------------------------------------------------------------------|
| <i>AFH</i>   | <i>Average final height of the wild type population and each construction group population</i>               |
| <i>AFD</i>   | <i>Average final diameter of the wild type population and each construction group population</i>             |
| <i>AMHGR</i> | <i>Average Maximum height growth rate of the wild type population and each construction group population</i> |
| <i>ADGR</i>  | <i>Average diameter growth rate of the wild type population and each construction group population</i>       |
| <i>MFH</i>   | <i>Maximum final height of the wild type population and each construction group population</i>               |

|              |                                                                                                                 |
|--------------|-----------------------------------------------------------------------------------------------------------------|
| <i>MFD</i>   | <i>Maximum final diameter of the wild type population and each construction group population</i>                |
| <i>MMHGR</i> | <i>Maximum of Maximum height growth rate of the wild type population and each construction group population</i> |
| <i>MDC</i>   | <i>Maximum diameter growth rate of the wild type population and each construction group population</i>          |

The growth difference selection criteria are as follows:

1. If construction group AFH, MFH, AMHGR and MMHGR are at least 5% (or 8% in a second more stringent level) greater than corresponding wild type group AFH, MFH, AMHGR and MMHGR, or
2. If construction group AFD, MFD, ADGR and MDC are at least 5% (or 8% in a second more stringent level) greater than corresponding wild type group AFD, MFD, ADGR and MDC, or
3. If construction group AFH, AFD, AMHGR or ADGR is at least 18% (or 22% in the second more stringent level) greater than corresponding wild type group AFH, AFD, AMHGR or ADGR, or
4. If construction group MFH, MFD, MMHGR or MDC is at least 18% (or 22% in the second more stringent level) greater than corresponding wild type group MFH, MFD, MMHGR or MDC

15

Running a large scale functional genomics program produces a certain amount of variation and uncertainty in the data produced. In this setup variation is originating from sources such as: the different lines within an construction group have different levels of over-expression resulting in that one to all tested lines within an construction group can show the phenotype; the variation in growth that occur during the experimental procedure due to small variations in plant status when transferring the plants from tissue culture to the greenhouse and variations based on different positions in the greenhouse during different time points during the growth cycle. These variations have to be dealt with when analysing the data. Based on this we used two different thresholds of increase 5% and 18% for selecting construction groups with increased growth. The selection criteria 1 and 2 uses an 5% increase, however this increase have to be present in all the phenotypes

AFH, MFH, AMHGR and MMHGR corresponding to height growth or all the phenotypes AFD, MFD, ADGR and MDC corresponding to diameter growth. In the cases that the phenotype only can be seen in some or one of the plants and only in one phenotype class, an higher 18% increase were used to select positive construction groups in order  
 5 not to select construction groups based on random variations (selection criteria's 3 and 4 selecting on average values and maximum individual values respectively).

Construction groups meeting one or more of these criteria were selected.

#### Over-expression level analysis

10 Real-time RT PCR was used to compare construct gene expression levels of the recombinant over-expression construction group with corresponding wild type group. The expression level of 26S proteasome regulatory subunit S2 was used as a reference to which construct gene expression was normalized. The comparative CT method was used for calculation of relative construct gene expression levels, where the ratio between  
 15 construction and reference gene expression levels is described by  $(1 + E_{\text{target}})^{-CT_{\text{target}}} / (1 + E_{\text{reference}})^{-CT_{\text{reference}}}$  where  $E_{\text{target}}$  and  $E_{\text{reference}}$  are the efficiencies of construct and reference gene PCR amplification respectively and  $CT_{\text{target}}$  and  $CT_{\text{reference}}$  are the threshold cycles as calculated for construct and reference gene amplification respectively. The ratios between construct and reference gene expression levels were subsequently normalized to the  
 20 average of wild type group ratios.

For total RNA extraction, stem samples (approx. 50mg) were harvested from greenhouse grown plants and flash frozen in liquid nitrogen. Frozen samples were ground in a bead mill (Retsch MM301). Total RNA was extracted using E-Z 96 Plant RNA kit according to manufacturer's recommendations (Omega Bio-Tek). cDNA synthesis was performed  
 25 using iScript cDNA synthesis kit according to manufacturer's recommendations (Bio-Rad). RNA concentrations were measured and equal amounts were used for cDNA synthesis to ensure equal amounts of cDNA for PCR reactions. The cDNA was diluted 12.5x prior to real-time PCR.

Real-time PCR primers were designed using Beacon Designer 6 (PREMIER Biosoft  
 30 International) using included tool to minimize interference of template secondary structure at primer annealing sites.

For real-time PCR, cDNA template was mixed with corresponding construct gene specific primers (SEQ ID NO: 53-61 and SEQ ID NO: 63-71), internal reference gene specific

primers (SEQ ID NO: 62 and 72) and SYBR Green Supermix (Bio-Rad). Real-time PCR reactions were run on a MyiQ PCR thermocycler (Bio-Rad) and analysed using included software iQ5. Reactions were set up in triplicates, three times using construct gene specific primers and three times using reference gene specific primers for each sample, and the average threshold cycle for each triplicate was subsequently used for calculation of relative construct gene expression levels.

The 96 well plate was covered with microfilm and set in the thermocycler to start the reaction cycle. By way of illustration, the reaction cycle may include the following steps: Initial denaturation at 95°C for 3 minutes 30 seconds followed by 40 rounds of amplification comprising the following steps 95°C for 10 seconds, 55°C for 30 seconds and 72°C for 40 seconds.

Table 1.3 Real-time RT-PCR primers

| Construct                                                                | Forward real-time RT-PCR primer | Reverse real-time RT-PCR primer |
|--------------------------------------------------------------------------|---------------------------------|---------------------------------|
| TF0002                                                                   | SEQ ID NO: 53                   | SEQ ID NO: 63                   |
| TF0052                                                                   | SEQ ID NO: 54                   | SEQ ID NO: 64                   |
| TF0065                                                                   | SEQ ID NO: 55                   | SEQ ID NO: 65                   |
| TF0076                                                                   | SEQ ID NO: 56                   | SEQ ID NO: 66                   |
| TF0089                                                                   | SEQ ID NO: 57                   | SEQ ID NO: 67                   |
| TF0109                                                                   | SEQ ID NO: 58                   | SEQ ID NO: 68                   |
| TFSTT051                                                                 | SEQ ID NO: 59                   | SEQ ID NO: 69                   |
| TF0013                                                                   | SEQ ID NO: 60                   | SEQ ID NO: 70                   |
| TF0097                                                                   | SEQ ID NO: 61                   | SEQ ID NO: 71                   |
| Real-time RT PCR reference gene:<br>26S proteasome regulatory subunit S2 | SEQ ID NO: 62                   | SEQ ID NO: 72                   |

## 15 Results

Growth raw data for the specified construction group and the corresponding wild type group are shown in tables 1.4 to 1.16. Table rows contain height and diameter measurements of individuals of specified construction group (named "TF") and corresponding wild type group (named "T89"). Time of measurement as number of days in greenhouse is shown in table headers.

Real-time RT-PCR was used to confirm over-expression of constructs. Real-time RT-PCR data tables contain gene expression levels of construct gene relative to reference gene

expression. All ratios between construct and reference gene expression levels shown are normalized to the average of wild type group ratios.

#### Construction group TF0002

- 5 This construct induces increased growth. The final height is 12% higher comparing the average of the construction group and wild type control group. The maximum height growth rate is 31% higher comparing the average of the construction group and wild type control group. The TF0002 construction group meets the more stringent level of growth difference selection criterion (3) as shown in table 1.4d.

10

Tables 1.4a and 1.4b contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

15

Table 1.4a Height growth data for TF0002

| Days in greenhouse | Height (cm) |    |    |    |    |    |     |     |     |
|--------------------|-------------|----|----|----|----|----|-----|-----|-----|
|                    | 18          | 22 | 25 | 29 | 32 | 39 | 46  | 50  | 53  |
| TF0002-1B          | 12          | 18 | 23 | 35 | 49 | 82 | 115 | 134 | 150 |
| TF0002-2A          | 15          | 21 | 27 | 40 | 55 | 87 | 122 | 142 | 157 |
| TF0002-2B          | 9           | 12 | 15 | 23 | 36 | 64 | 95  | 113 | 129 |
| TF0002-3A          | 17          | 22 | 29 | 42 | 57 | 92 | 129 | 150 | 166 |
| TF0002-3B          | 16          | 21 | 24 | 39 | 52 | 83 | 117 | 136 | 154 |
| TF0002-4B          | 14          | 19 | 25 | 38 | 52 | 85 | 121 | 141 | 159 |
| T89-01             | 25          | 29 | 34 | 45 | 54 | 79 | 104 | 119 | 132 |
| T89-02             | 28          | 33 | 41 | 54 | 64 | 83 | 109 | 125 | 136 |
| T89-03             | 26          | 34 | 41 | 51 | 61 | 90 | 125 | 143 | 155 |
| T89-04             | 29          | 36 | 42 | 58 | 72 | 98 | 127 | 146 | 159 |
| T89-05             | 21          | 25 | 29 | 37 | 45 | 68 | 93  | 108 | 120 |
| T89-06             | 25          | 31 | 39 | 49 | 60 | 83 | 109 | 125 | 137 |
| T89-07             | 24          | 29 | 34 | 45 | 58 | 83 | 109 | 125 | 138 |
| T89-08             | 24          | 32 | 41 | 53 | 67 | 94 | 121 | 138 | 150 |
| T89-09             | 24          | 32 | 41 | 54 | 66 | 94 | 120 | 135 | 145 |
| T89-10             | 20          | 26 | 30 | 44 | 54 | 79 | 108 | 123 | 135 |
| T89-11             | 21          | 26 | 32 | 42 | 54 | 79 | 107 | 123 | 136 |
| T89-12             | 25          | 32 | 40 | 55 | 66 | 97 | 125 | 140 | 151 |
| T89-13             | 21          | 29 | 35 | 45 | 54 | 75 | 98  | 114 | 124 |
| T89-14             | 25          | 31 | 38 | 50 | 60 | 85 | 111 | 125 | 135 |
| T89-15             | 25          | 33 | 40 | 53 | 64 | 88 | 112 | 126 | 137 |
| T89-16             | 24          | 28 | 33 | 42 | 49 | 68 | 89  | 102 | 112 |
| T89-17             | 26          | 33 | 40 | 50 | 60 | 83 | 109 | 127 | 137 |

|        |    |    |    |    |    |     |     |     |     |
|--------|----|----|----|----|----|-----|-----|-----|-----|
| T89-18 | 24 | 29 | 37 | 47 | 55 | 80  | 108 | 123 | 133 |
| T89-19 | 21 | 26 | 32 | 40 | 49 | 65  | 80  | 95  | 107 |
| T89-20 | 26 | 32 | 40 | 52 | 65 | 98  | 127 | 146 | 159 |
| T89-21 | 24 | 29 | 37 | 45 | 51 | 71  | 100 | 114 | 125 |
| T89-22 | 25 | 30 | 39 | 48 | 63 | 83  | 110 | 125 | 139 |
| T89-23 | 22 | 28 | 34 | 45 | 56 | 83  | 106 | 120 | 130 |
| T89-24 | 24 | 30 | 38 | 49 | 60 | 82  | 106 | 124 | 138 |
| T89-25 | 24 | 29 | 36 | 48 | 56 | 80  | 107 | 123 | 132 |
| T89-26 | 26 | 35 | 41 | 52 | 68 | 87  | 110 | 123 | 136 |
| T89-27 | 22 | 28 | 35 | 47 | 57 | 84  | 111 | 126 | 138 |
| T89-28 | 24 | 29 | 36 | 46 | 58 | 87  | 110 | 123 | 136 |
| T89-29 | 24 | 32 | 40 | 50 | 63 | 81  | 111 | 128 | 141 |
| T89-30 | 26 | 31 | 37 | 46 | 53 | 72  | 95  | 107 | 118 |
| T89-31 | 26 | 32 | 41 | 52 | 63 | 87  | 115 | 130 | 143 |
| T89-32 | 28 | 33 | 41 | 52 | 63 | 88  | 116 | 130 | 142 |
| T89-33 | 20 | 24 | 30 | 41 | 51 | 76  | 102 | 117 | 130 |
| T89-34 | 25 | 30 | 39 | 51 | 63 | 90  | 117 | 130 | 138 |
| T89-35 | 26 | 31 | 38 | 49 | 59 | 83  | 106 | 119 | 129 |
| T89-36 | 25 | 33 | 40 | 52 | 59 | 73  | 91  | 104 | 116 |
| T89-37 | 29 | 37 | 45 | 60 | 73 | 100 | 128 | 146 | 156 |

Table 1.4b Diameter growth data for TF0002

| Days in greenhouse | Diameter (mm) |     |     |     |     |      |
|--------------------|---------------|-----|-----|-----|-----|------|
|                    | 29            | 32  | 39  | 46  | 50  | 53   |
| TF0002-1B          | 3,4           | 4,7 | 6,0 | 7,3 | 7,5 | 8,1  |
| TF0002-2A          | 3,5           | 4,1 | 5,7 | 7,0 | 7,4 | 7,3  |
| TF0002-2B          | 2,9           | 3,3 | 4,3 | 5,7 | 6,2 | 7,0  |
| TF0002-3A          | 3,8           | 4,8 | 6,2 | 7,4 | 8,3 | 8,8  |
| TF0002-3B          | 3,5           | 4,4 | 5,7 | 6,7 | 7,4 | 8,1  |
| TF0002-4B          | 3,4           | 4,8 | 5,8 | 7,1 | 7,5 | 8,0  |
| T89-01             | 3,8           | 4,6 | 5,9 | 7,2 | 7,6 | 8,1  |
| T89-02             | 5,0           | 5,9 | 7,0 | 8,4 | 9,5 | 8,9  |
| T89-03             | 4,9           | 6,4 | 7,3 | 8,8 | 8,8 | 9,6  |
| T89-04             | 5,1           | 6,2 | 8,1 | 9,0 | 8,6 | 10,2 |
| T89-05             | 3,8           | 4,2 | 5,0 | 6,1 | 5,9 | 6,7  |
| T89-06             | 5,0           | 5,9 | 7,0 | 7,9 | 8,9 | 9,1  |
| T89-07             | 4,0           | 5,0 | 6,4 | 7,5 | 8,3 | 9,3  |
| T89-08             | 4,6           | 5,6 | 7,1 | 8,1 | 8,6 | 9,9  |
| T89-09             | 5,1           | 6,2 | 8,0 | 9,3 | 9,7 | 10,3 |
| T89-10             | 3,7           | 5,0 | 6,2 | 7,3 | 8,3 | 8,7  |
| T89-11             | 3,8           | 4,5 | 6,0 | 7,4 | 8,2 | 8,7  |
| T89-12             | 4,6           | 6,3 | 7,1 | 8,6 | 9,4 | 10,8 |
| T89-13             | 5,0           | 5,2 | 6,0 | 6,8 | 7,2 | 7,7  |
| T89-14             | 4,3           | 5,1 | 6,5 | 7,3 | 7,7 | 8,5  |
| T89-15             | 5,6           | 6,0 | 7,4 | 8,4 | 8,9 | 9,6  |
| T89-16             | 4,1           | 5,0 | 6,1 | 6,9 | 7,0 | 7,8  |

|        |     |     |     |     |      |      |
|--------|-----|-----|-----|-----|------|------|
| T89-17 | 5,5 | 6,2 | 7,2 | 7,9 | 8,7  | 9,0  |
| T89-18 | 4,6 | 4,9 | 6,0 | 7,2 | 7,9  | 8,7  |
| T89-19 | 4,0 | 5,2 | 6,5 | 7,7 | 7,0  | 8,4  |
| T89-20 | 4,6 | 6,0 | 7,5 | 9,8 | 10,3 | 8,8  |
| T89-21 | 4,5 | 4,7 | 5,6 | 6,8 | 5,8  | 7,8  |
| T89-22 | 4,7 | 5,4 | 6,1 | 6,9 | 6,9  | 8,1  |
| T89-23 | 4,0 | 5,0 | 6,2 | 7,7 | 8,5  | 9,0  |
| T89-24 | 4,4 | 5,0 | 5,5 | 6,8 | 6,9  | 7,9  |
| T89-25 | 4,4 | 5,5 | 6,1 | 7,8 | 8,2  | 7,3  |
| T89-26 | 4,4 | 4,8 | 6,2 | 7,6 | 6,3  | 8,5  |
| T89-27 | 4,4 | 5,1 | 5,8 | 7,1 | 9,0  | 7,2  |
| T89-28 | 4,0 | 5,0 | 6,3 | 7,4 | 8,1  | 8,9  |
| T89-29 | 4,7 | 6,0 | 7,1 | 8,3 | 7,8  | 9,3  |
| T89-30 | 4,3 | 4,8 | 5,5 | 6,0 | 6,6  | 7,1  |
| T89-31 | 4,6 | 5,5 | 6,4 | 7,8 | 9,0  | 9,3  |
| T89-32 | 4,5 | 5,2 | 6,1 | 7,0 | 7,9  | 8,7  |
| T89-33 | 3,9 | 4,4 | 5,6 | 6,5 | 5,7  | 7,7  |
| T89-34 | 4,5 | 5,7 | 6,6 | 8,3 | 9,0  | 9,5  |
| T89-35 | 4,2 | 5,4 | 7,1 | 8,5 | 9,3  | 10,0 |
| T89-36 | 5,0 | 5,6 | 7,0 | 8,3 | 7,1  | 8,9  |
| T89-37 | 5,1 | 6,0 | 6,9 | 8,1 | 9,1  | 9,6  |

Real-time RT-PCR was used to confirm over-expression of construct TF0002. Table 1.4c contains gene expression levels of construct gene relative to reference gene expression. All ratios between construct and reference gene expression levels shown are normalized to the average of wild type group ratios. All individuals of construction group TF0002 are over-expressed according to present RT-PCR data.

Table 1.4c Real-time RT-PCR data for TF0002

| Sample    | Relative gene expression level normalized to wild type average |
|-----------|----------------------------------------------------------------|
| TF0002-1B | 8,63                                                           |
| TF0002-2A | 7,88                                                           |
| TF0002-2B | 8,18                                                           |
| TF0002-3A | 5,88                                                           |
| TF0002-3B | 5,72                                                           |
| TF0002-4B | 8,89                                                           |
| T89-06    | 1,09                                                           |
| T89-26    | 1,47                                                           |
| T89-29    | 0,88                                                           |
| T89-31    | 0,84                                                           |
| T89-32    | 0,71                                                           |

Results from growth analysis are specified in the overview table 1.4d. The determined growth effects of specified construction group are presented as ratios between

construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and MDC.

Table 1.4d Overview table of growth effects of construct TF0002

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TF0002             | 1,12                 | 0,90                   | 1,31                               | 1,06                         | 1,04                 | 0,81                   | 1,13                                  | 0,85                         |

#### 5 Construction group TF0052

This construct induces increased growth. The final height is 24% higher comparing the largest individuals of the construction group and wild type control group. The TF0052 construction group meets the more stringent level of growth difference selection criterion (4) as shown in table 1.5c.

- 10 Tables 1.5a and 1.5b contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

#### 15 Table 1.5a Height growth data for TF0052

| Days in greenhouse | Height (cm) |     |     |     |     |     |     |     |     |     |
|--------------------|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                    | 19          | 28  | 34  | 40  | 44  | 47  | 51  | 54  | 61  | 65  |
| TF0052-1A          | 8           | 17  | 26  | 35  | 39  | 42  | 48  | 51  | 58  | 64  |
| TF0052-1B          | 18          | 32  | 50  | 65  | 79  | 89  | 99  | 107 | 125 | 135 |
| TF0052-2A          | 18          | 40  | 64  | 83  | 97  | 108 | 122 | 131 | 156 | 172 |
| TF0052-2B          | 13          | 29  | 47  | 59  | 72  | 80  | 90  | 99  | 120 | 132 |
| TF0052-3A          | 18          | 36  | 58  | 71  | 84  | 91  | 102 | 107 | 119 | 124 |
| TF0052-3B          | 15          | 33  | 54  | 69  | 82  | 90  | 100 | 107 | 124 | 135 |
| TF0052-4A          | 14          | 27  | 46  | 58  | 68  | 76  | 85  | 93  | 110 | 122 |
| TF0052-4B          | 19          | 36  | 55  | 68  | 79  | 87  | 96  | 98  | 113 | 121 |
| T89-01             | 18          | 30  | 46  | 58  | 69  | 77  | 87  | 96  | 113 | 122 |
| T89-02             | 18          | 30  | 49  | 62  | 72  | 77  | 84  | 90  | 102 | 109 |
| T89-03             | 15          | 27  | 41  | 54  | 65  | 73  | 82  | 91  | 112 | 123 |
| T89-10             | N/A         | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| T89-11             | 19          | 31  | 49  | 61  | 74  | 83  | 94  | 103 | 124 | 133 |
| T89-12             | 17          | 30  | 45  | 58  | 69  | 77  | 90  | 100 | 123 | 134 |
| T89-13             | 18          | 27  | 43  | 56  | 68  | 78  | 91  | 100 | 121 | 133 |
| T89-14             | 5           | 26  | 42  | 56  | 67  | 74  | 83  | 90  | 109 | 119 |
| T89-15             | 10          | 15  | 25  | 33  | 41  | 45  | 52  | 57  | 72  | 82  |

|        |    |    |    |    |    |    |    |     |     |     |
|--------|----|----|----|----|----|----|----|-----|-----|-----|
| T89-16 | 19 | 33 | 53 | 63 | 73 | 82 | 93 | 102 | 119 | 130 |
| T89-17 | 17 | 29 | 46 | 58 | 66 | 72 | 80 | 86  | 96  | 102 |
| T89-18 | 16 | 30 | 48 | 59 | 71 | 81 | 93 | 103 | 122 | 132 |
| T89-19 | 18 | 32 | 50 | 65 | 77 | 84 | 94 | 102 | 126 | 139 |
| T89-20 | 16 | 33 | 52 | 67 | 79 | 88 | 98 | 105 | 124 | 139 |
| T89-21 | 17 | 29 | 44 | 58 | 67 | 73 | 83 | 90  | 110 | 122 |
| T89-22 | 14 | 28 | 47 | 61 | 71 | 80 | 89 | 98  | 119 | 133 |
| T89-23 | 10 | 33 | 45 | 53 | 63 | 71 | 82 | 90  | 112 | 123 |
| T89-24 | 20 | 28 | 43 | 51 | 62 | 69 | 78 | 87  | 106 | 119 |
| T89-25 | 14 | 26 | 38 | 52 | 64 | 72 | 82 | 89  | 110 | 122 |
| T89-26 | 15 | 28 | 44 | 57 | 69 | 77 | 87 | 96  | 120 | 133 |
| T89-27 | 18 | 29 | 47 | 62 | 75 | 82 | 92 | 103 | 125 | 138 |
| T89-28 | 22 | 37 | 54 | 67 | 78 | 88 | 97 | 104 | 123 | 133 |
| T89-29 | 16 | 33 | 49 | 63 | 76 | 84 | 93 | 100 | 123 | 138 |
| T89-30 | 15 | 40 | 46 | 58 | 67 | 74 | 85 | 92  | 113 | 124 |

Table 1.5b Diameter growth data for TF0052

| Days in greenhouse | Diameter (mm) |     |     |     |     |     |      |      |      |
|--------------------|---------------|-----|-----|-----|-----|-----|------|------|------|
|                    | 28            | 34  | 40  | 44  | 47  | 51  | 54   | 61   | 65   |
| TF0052-1A          | 3,5           | 4,1 | 4,9 | 4,6 | 5,2 | 5,0 | 5,6  | 6,7  | 6,2  |
| TF0052-1B          | 3,1           | 4,4 | 6,0 | 6,6 | 6,9 | 8,0 | 8,2  | 9,3  | 9,4  |
| TF0052-2A          | 4,5           | 6,3 | 8,1 | 8,6 | 9,7 | 9,8 | 10,2 | 11,5 | 11,5 |
| TF0052-2B          | 3,5           | 5,2 | 6,1 | 7,5 | 7,8 | 8,8 | 9,5  | 10,9 | 11,0 |
| TF0052-3A          | 3,5           | 5,4 | 6,7 | 7,2 | 7,8 | 7,9 | 8,1  | 8,7  | 9,3  |
| TF0052-3B          | 3,8           | 5,5 | 7,1 | 7,2 | 8,2 | 8,4 | 9,0  | 9,1  | 9,6  |
| TF0052-4A          | 3,4           | 4,9 | 6,5 | 6,7 | 7,0 | 7,8 | 8,0  | 9,1  | 9,3  |
| TF0052-4B          | 3,5           | 4,9 | 6,0 | 7,0 | 7,2 | 7,6 | 7,8  | 8,1  | 8,7  |
| T89-01             | 3,2           | 4,6 | 5,4 | 6,2 | 6,8 | 7,9 | 8,3  | 9,5  | 9,3  |
| T89-02             | 3,4           | 4,7 | 5,5 | 7,3 | 6,3 | 6,6 | 6,9  | 8,3  | 7,5  |
| T89-03             | 3,9           | 4,4 | 5,2 | 6,2 | 6,4 | 7,8 | 7,6  | 9,7  | 9,4  |
| T89-10             | N/A           | N/A | N/A | N/A | N/A | N/A | N/A  | N/A  | N/A  |
| T89-11             | 3,4           | 5,1 | 6,2 | 7,6 | 6,8 | 6,9 | 7,7  | 10,1 | 9,5  |
| T89-12             | 2,9           | 4,7 | 5,8 | 6,6 | 7,8 | 8,0 | 8,7  | 9,1  | 9,2  |
| T89-13             | 3,0           | 4,3 | 5,4 | 5,8 | 6,4 | 7,6 | 7,8  | 8,2  | 8,8  |
| T89-14             | 3,0           | 4,5 | 5,7 | 6,3 | 6,7 | 7,9 | 7,8  | 9,0  | 8,9  |
| T89-15             | N/A           | 2,1 | 3,0 | 4,0 | 4,0 | 4,5 | 4,9  | 5,5  | 5,6  |
| T89-16             | 3,5           | 5,3 | 6,4 | 6,6 | 7,0 | 7,2 | 8,3  | 8,2  | 9,0  |
| T89-17             | 3,4           | 4,6 | 5,1 | 5,4 | 6,0 | 6,4 | 6,5  | 6,8  | 7,1  |
| T89-18             | 3,6           | 5,2 | 6,0 | 7,0 | 7,8 | 8,2 | 9,9  | 10,3 | 9,7  |
| T89-19             | 4,2           | 5,5 | 6,6 | 7,7 | 8,5 | 8,9 | 9,5  | 11,1 | 12,3 |
| T89-20             | 4,1           | 5,5 | 6,6 | 8,1 | 9,3 | 9,6 | 9,3  | 10,0 | 11,1 |
| T89-21             | 3,1           | 5,6 | 5,8 | 6,7 | 7,1 | 7,8 | 8,4  | 9,7  | 10,1 |
| T89-22             | 3,2           | 4,4 | 5,6 | 6,5 | 7,5 | 7,6 | 7,8  | 8,9  | 9,2  |
| T89-23             | 2,4           | 4,2 | 5,1 | 6,1 | 6,5 | 7,5 | 10,1 | 9,3  | 10,2 |
| T89-24             | 3,2           | 4,5 | 5,1 | 6,3 | 7,0 | 7,6 | 8,1  | 8,8  | 9,1  |
| T89-25             | 3,3           | 4,3 | 5,2 | 5,8 | 6,5 | 7,4 | 7,8  | 9,3  | 9,7  |
| T89-26             | 3,3           | 4,4 | 5,5 | 6,6 | 7,2 | 8,1 | 8,9  | 9,5  | 10,5 |
| T89-27             | 3,3           | 4,9 | 6,0 | 7,8 | 8,0 | 8,9 | 9,7  | 11,2 | 11,5 |
| T89-28             | 4,5           | 5,7 | 7,4 | 7,8 | 8,5 | 9,4 | 9,7  | 10,2 | 11,1 |
| T89-29             | 3,1           | 4,7 | 6,3 | 7,2 | 7,9 | 9,2 | 9,8  | 11,1 | 10,7 |

T89-30 | 3,0 5,8 6,2 7,7 7,9 8,6 8,2 10,1 10,3

Results from growth analysis are specified in the overview table 1.5c. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and 5 MDC.

Table 1.5c Overview table of growth effects of construct TF0052

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TF0052             | 1,00                 | 0,98                   | 0,95                               | 0,89                         | 1,24                 | 0,93                   | 1,08                                  | 0,91                         |

Construction group TF0065

10 This construct induces increased growth. The final height is 8% higher comparing the average of the construction group and wild type control group. The maximum height growth rate is 11% higher comparing the average of the construction group and wild type control group. The TF0065 construction group meets growth difference selection criterion (1) as shown in table 1.6c.

15

Tables 1.6a and 1.6b contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

20

Table 1.6a Height growth data for TF0065

| Days in greenhouse | Height (cm) |    |    |    |    |    |     |     |     |     |     |
|--------------------|-------------|----|----|----|----|----|-----|-----|-----|-----|-----|
|                    | 18          | 22 | 25 | 29 | 32 | 39 | 43  | 46  | 50  | 53  | 57  |
| TF0065-1AA         | 20          | 26 | 33 | 46 | 58 | 88 | 101 | 111 | 123 | 134 | 151 |
| TF0065-1AB         | 23          | 27 | 34 | 48 | 60 | 89 | 106 | 115 | 133 | 146 | 164 |
| TF0065-1BA         | 21          | 27 | 33 | 45 | 56 | 82 | 97  | 107 | 122 | 135 | 153 |
| TF0065-1BB         | 22          | 26 | 32 | 44 | 56 | 84 | 101 | 113 | 130 | 144 | 164 |
| TF0065-2B          | 24          | 29 | 37 | 51 | 64 | 96 | 115 | 127 | 145 | 162 | 181 |
| TF0065-3A          | 20          | 28 | 33 | 43 | 54 | 79 | 94  | 106 | 124 | 138 | 155 |

|           |     |     |     |     |     |     |     |     |     |     |     |
|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| TF0065-4B | 16  | 20  | 28  | 40  | 49  | 73  | 85  | 94  | 108 | 121 | 138 |
| T89-01    | 14  | 17  | 22  | 31  | 40  | 64  | 76  | 88  | 102 | 118 | 135 |
| T89-02    | 17  | 20  | 25  | 36  | 45  | 69  | 79  | 90  | 104 | 118 | 133 |
| T89-03    | 21  | 29  | 35  | 47  | 57  | 81  | 94  | 104 | 119 | 132 | 147 |
| T89-04    | 13  | 14  | 17  | 25  | 33  | 45  | 52  | 57  | 70  | 79  | 92  |
| T89-05    | 15  | 18  | 24  | 33  | 42  | 69  | 83  | 94  | 106 | 120 | 137 |
| T89-06    | 18  | 23  | 29  | 40  | 51  | 78  | 91  | 103 | 120 | 134 | 152 |
| T89-07    | 20  | 24  | 30  | 41  | 51  | 74  | 88  | 96  | 109 | 121 | 130 |
| T89-08    | 27  | 32  | 40  | 52  | 62  | 88  | 99  | 111 | 124 | 134 | 148 |
| T89-09    | 23  | 27  | 34  | 46  | 56  | 83  | 97  | 106 | 122 | 132 | 149 |
| T89-10    | 13  | 15  | 20  | 27  | 37  | 59  | 72  | 83  | 98  | 111 | 128 |
| T89-11    | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| T89-12    | 26  | 33  | 40  | 54  | 66  | 92  | 107 | 120 | 135 | 149 | 166 |
| T89-13    | 21  | 26  | 34  | 45  | 55  | 79  | 94  | 105 | 122 | 134 | 150 |
| T89-14    | 18  | 23  | 31  | 42  | 53  | 80  | 97  | 107 | 120 | 128 | 145 |
| T89-15    | 26  | 33  | 40  | 53  | 63  | 88  | 103 | 111 | 125 | 138 | 154 |
| T89-16    | 27  | 32  | 39  | 51  | 63  | 89  | 104 | 116 | 132 | 146 | 162 |
| T89-17    | 17  | 21  | 27  | 38  | 45  | 72  | 87  | 97  | 110 | 124 | 139 |
| T89-18    | 23  | 30  | 35  | 46  | 55  | 80  | 94  | 105 | 117 | 131 | 145 |
| T89-19    | 23  | 29  | 35  | 45  | 54  | 78  | 91  | 102 | 114 | 125 | 137 |
| T89-20    | 22  | 28  | 34  | 49  | 60  | 87  | 100 | 110 | 125 | 137 | 155 |
| T89-21    | 27  | 31  | 35  | 42  | 48  | 66  | 77  | 87  | 100 | 110 | 124 |
| T89-22    | 13  | 16  | 23  | 32  | 48  | 67  | 81  | 92  | 105 | 118 | 134 |
| T89-23    | 23  | 29  | 35  | 48  | 58  | 83  | 97  | 107 | 122 | 136 | 154 |
| T89-24    | 23  | 29  | 36  | 48  | 59  | 86  | 101 | 113 | 128 | 141 | 159 |
| T89-25    | 16  | 21  | 28  | 40  | 51  | 80  | 97  | 107 | 122 | 137 | 153 |
| T89-26    | 27  | 35  | 40  | 54  | 66  | 93  | 107 | 118 | 132 | 144 | 162 |
| T89-27    | 26  | 31  | 38  | 49  | 59  | 82  | 96  | 106 | 120 | 131 | 146 |
| T89-28    | 25  | 29  | 36  | 49  | 59  | 83  | 97  | 106 | 119 | 131 | 147 |
| T89-29    | 26  | 32  | 38  | 51  | 62  | 88  | 103 | 113 | 128 | 142 | 159 |
| T89-30    | 24  | 29  | 36  | 48  | 56  | 80  | 93  | 104 | 117 | 131 | 145 |
| T89-31    | 24  | 31  | 36  | 47  | 57  | 81  | 94  | 105 | 117 | 131 | 144 |
| T89-32    | 26  | 32  | 38  | 49  | 58  | 83  | 98  | 107 | 120 | 134 | 148 |
| T89-33    | 24  | 29  | 36  | 48  | 57  | 85  | 100 | 112 | 124 | 134 | 149 |
| T89-34    | 21  | 26  | 32  | 43  | 53  | 79  | 90  | 102 | 117 | 131 | 148 |
| T89-35    | 21  | 28  | 36  | 46  | 55  | 80  | 94  | 105 | 120 | 133 | 149 |
| T89-36    | 16  | 21  | 28  | 39  | 51  | 74  | 88  | 100 | 115 | 128 | 144 |
| T89-37    | 28  | 35  | 41  | 52  | 63  | 88  | 101 | 111 | 125 | 137 | 154 |
| T89-38    | 27  | 32  | 39  | 51  | 62  | 86  | 101 | 113 | 128 | 140 | 155 |
| T89-39    | 21  | 26  | 33  | 46  | 55  | 83  | 101 | 112 | 126 | 139 | 156 |
| T89-40    | 21  | 26  | 33  | 45  | 55  | 77  | 88  | 99  | 113 | 124 | 139 |
| T89-41    | 13  | 16  | 23  | 32  | 42  | 68  | 85  | 95  | 107 | 118 | 133 |
| T89-42    | 24  | 30  | 37  | 49  | 61  | 86  | 101 | 113 | 128 | 143 | 150 |
| T89-43    | 25  | 31  | 38  | 51  | 61  | 86  | 102 | 114 | 130 | 144 | 163 |
| T89-44    | 23  | 31  | 39  | 51  | 64  | 90  | 105 | 118 | 135 | 151 | 169 |
| T89-45    | 26  | 32  | 37  | 49  | 58  | 85  | 100 | 110 | 124 | 137 | 153 |
| T89-46    | 20  | 25  | 34  | 43  | 55  | 81  | 97  | 109 | 122 | 133 | 149 |

Table 1.6b Diameter growth data for TF0065

|  |               |
|--|---------------|
|  | Diameter (mm) |
|--|---------------|

| Days in greenhouse | 29  | 32  | 39  | 43  | 46  | 50  | 53   | 57   |
|--------------------|-----|-----|-----|-----|-----|-----|------|------|
| TF0065-1AA         | 3,9 | 5,0 | 6,2 | 6,7 | 6,9 | 7,3 | 8,5  | 8,3  |
| TF0065-1AB         | 4,0 | 5,1 | 6,9 | 8,4 | 8,0 | 9,5 | 9,5  | 10,6 |
| TF0065-1BA         | 4,3 | 4,9 | 5,9 | 6,3 | 6,8 | 7,5 | 7,8  | 8,4  |
| TF0065-1BB         | 3,8 | 4,8 | 6,0 | 7,1 | 7,4 | 8,4 | 9,3  | 10,1 |
| TF0065-2B          | 5,9 | 4,8 | 7,1 | 8,0 | 8,6 | 9,5 | 9,7  | 10,2 |
| TF0065-3A          | 4,2 | 4,9 | 6,0 | 6,9 | 7,1 | 7,6 | 8,4  | 9,2  |
| TF0065-4B          | 3,3 | 4,0 | 4,8 | 5,5 | 5,8 | N/A | 6,9  | 7,9  |
| T89-01             | 3,2 | 3,7 | 5,3 | 6,2 | 6,9 | 7,9 | 8,3  | 8,7  |
| T89-02             | 3,2 | 3,9 | 5,1 | 6,4 | 7,0 | 7,6 | 8,6  | 8,6  |
| T89-03             | 4,2 | 5,3 | 6,4 | 6,9 | 6,9 | N/A | 8,8  | 9,8  |
| T89-04             | 2,2 | 3,0 | 4,2 | 4,5 | 5,4 | 5,0 | 5,4  | 6,1  |
| T89-05             | 3,0 | 3,7 | 4,8 | 5,9 | 6,4 | 7,0 | 7,6  | 7,9  |
| T89-06             | 3,6 | 4,8 | 6,5 | 7,6 | 8,7 | 9,1 | 9,6  | 10,1 |
| T89-07             | 3,8 | 4,9 | 6,8 | 7,6 | 8,0 | 8,6 | 9,0  | 9,7  |
| T89-08             | 4,4 | 5,8 | 6,2 | 7,3 | 7,6 | 8,5 | 9,4  | 9,7  |
| T89-09             | 4,5 | 5,5 | 6,5 | 7,1 | 7,6 | 9,1 | 9,4  | 9,8  |
| T89-10             | 3,7 | 3,9 | 5,0 | 6,1 | 6,8 | 7,6 | 8,5  | 9,2  |
| T89-11             | N/A | N/A | N/A | N/A | N/A | N/A | N/A  | N/A  |
| T89-12             | 4,6 | 5,5 | 7,3 | 8,6 | 8,8 | 9,6 | 10,2 | 10,2 |
| T89-13             | 3,8 | 4,6 | 5,7 | 6,5 | 6,6 | 7,4 | 8,1  | 8,6  |
| T89-14             | 3,7 | 4,2 | 5,3 | 5,6 | 6,1 | 7,0 | 7,1  | 7,8  |
| T89-15             | 4,6 | 5,0 | 6,4 | 7,0 | 7,4 | 8,0 | 8,4  | 9,1  |
| T89-16             | 5,0 | 5,5 | 7,0 | 7,6 | 8,0 | 8,6 | 9,0  | 9,7  |
| T89-17             | 3,1 | 4,3 | 5,7 | 7,1 | 7,4 | 7,9 | 8,4  | 9,2  |
| T89-18             | 4,5 | 5,3 | 7,8 | 8,0 | 8,1 | 9,2 | 9,9  | 10,3 |
| T89-19             | 4,2 | 5,8 | 6,7 | 8,2 | 8,5 | 8,5 | 9,0  | 9,5  |
| T89-20             | 4,0 | 4,7 | 6,7 | 8,1 | 7,6 | 8,5 | 8,6  | 9,4  |
| T89-21             | 3,5 | 3,9 | 5,0 | 5,7 | 5,8 | 7,1 | 6,7  | 7,4  |
| T89-22             | 3,6 | 4,3 | 5,5 | 6,3 | 6,8 | 7,9 | 8,4  | 8,8  |
| T89-23             | 4,1 | 5,2 | 7,0 | 7,6 | 8,2 | 8,9 | 9,2  | 10,0 |
| T89-24             | 4,1 | 5,4 | 6,7 | 7,5 | 7,8 | 8,6 | 9,6  | 10,4 |
| T89-25             | 3,7 | 4,6 | 6,0 | 7,0 | 7,7 | 8,3 | 8,5  | 9,4  |
| T89-26             | 4,8 | 5,6 | 6,9 | 7,3 | 7,8 | 8,6 | 9,2  | 9,5  |
| T89-27             | 3,8 | 4,9 | 6,2 | 6,7 | 6,9 | 7,6 | 8,4  | 9,3  |
| T89-28             | 4,5 | 5,5 | 6,8 | 7,3 | 7,8 | 9,1 | 9,1  | 9,5  |
| T89-29             | 4,4 | 5,3 | 6,8 | 6,8 | 7,4 | 8,2 | 9,2  | 8,9  |
| T89-30             | 3,7 | 4,7 | 5,4 | 6,6 | 7,0 | 7,0 | 7,7  | 8,5  |
| T89-31             | 4,0 | 4,5 | 5,5 | 6,9 | 7,0 | 8,0 | 9,1  | 9,6  |
| T89-32             | 3,6 | 4,5 | 5,7 | 7,0 | 7,2 | 8,0 | 9,1  | 9,4  |
| T89-33             | 3,9 | 4,6 | 6,7 | 7,3 | 8,0 | 8,6 | 9,4  | 10,5 |
| T89-34             | 3,6 | 4,5 | 5,9 | 6,9 | 7,5 | 8,2 | 9,1  | 9,4  |
| T89-35             | 3,9 | 4,5 | 5,7 | 7,1 | 7,5 | 7,9 | 8,8  | 9,6  |
| T89-36             | 3,6 | 5,0 | 5,7 | 6,5 | 6,8 | 7,9 | 8,2  | 9,1  |
| T89-37             | 4,3 | 5,6 | 7,1 | 8,0 | 8,0 | 8,9 | 9,7  | 10,2 |
| T89-38             | 4,7 | 5,8 | 6,7 | 7,8 | 8,0 | 8,7 | 9,2  | 9,7  |
| T89-39             | 4,2 | 5,0 | 6,2 | 7,3 | 8,2 | 8,1 | 8,7  | 9,6  |
| T89-40             | 3,6 | 4,4 | 5,2 | 5,7 | 6,0 | 7,2 | 7,2  | 8,0  |
| T89-41             | 3,5 | 4,3 | 5,5 | 6,5 | 7,0 | 7,5 | 7,7  | 8,4  |
| T89-42             | 4,4 | 5,1 | 7,5 | 8,4 | 9,5 | 9,9 | 10,0 | 10,3 |
| T89-43             | 4,3 | 5,0 | 6,5 | 7,3 | 7,8 | 8,3 | 8,9  | 9,1  |
| T89-44             | 4,3 | 5,8 | 6,8 | 8,1 | 8,6 | 9,5 | 9,9  | 10,5 |

|        |     |     |     |     |     |     |     |     |
|--------|-----|-----|-----|-----|-----|-----|-----|-----|
| T89-45 | 4,2 | 4,9 | 6,8 | 7,5 | 7,6 | 8,5 | 9,4 | 9,7 |
| T89-46 | 3,5 | 4,4 | 5,7 | 7,0 | 7,5 | 8,6 | 9,4 | 9,8 |

Results from growth analysis are specified in the overview table 1.6c. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and 5 MDC.

Table 1.6c Overview table of growth effects of construct TF0065

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TF0065             | 1,08                 | 0,99                   | 1,11                               | 0,96                         | 1,07                 | 1,01                   | 1,06                                  | 0,97                         |

#### Construction group TF0076

- 10 This construct induces increased growth. The final height is 10% higher comparing the average of the construction group and wild type control group. The final height is 18% higher comparing the largest individuals of the construction group and wild type control group. The maximum height growth rate is 13% higher comparing the average of the construction group and wild type control group. The maximum height growth rate is 18% higher comparing the largest individuals of the construction group and wild type control group. The TF0076 construction group meets the more stringent level of growth difference selection criterion (1) and the less stringent level of growth difference selection criterion (4) as shown in table 1.7d.

Tables 1.7a and 1.7b contain growth data for specified construction group and 20 corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

Table 1.7a Height growth data for TF0076

| Days in greenhouse | Height (cm) |    |    |    |    |    |    |     |     |     |     |
|--------------------|-------------|----|----|----|----|----|----|-----|-----|-----|-----|
|                    | 18          | 22 | 25 | 29 | 32 | 39 | 43 | 46  | 50  | 53  | 57  |
| TF0076-2AA         | 18          | 24 | 30 | 42 | 52 | 76 | 92 | 103 | 118 | 133 | 150 |

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|            |     |     |     |     |     |     |     |     |     |     |     |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| TF0076-2AB | 18  | 25  | 33  | 44  | 55  | 81  | 94  | 104 | 117 | 128 | 143 |
| TF0076-3BA | 16  | 20  | 26  | 36  | 47  | 70  | 86  | 97  | 112 | 126 | 142 |
| TF0076-3BB | 23  | 28  | 35  | 49  | 61  | 90  | 104 | 115 | 130 | 143 | 155 |
| TF0076-4B  | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| TF0076-5BA | 20  | 25  | 33  | 45  | 55  | 87  | 106 | 121 | 140 | 157 | 177 |
| TF0076-5BB | 24  | 32  | 40  | 57  | 71  | 105 | 127 | 140 | 160 | 180 | 200 |
| T89-01     | 14  | 17  | 22  | 31  | 40  | 64  | 76  | 88  | 102 | 118 | 135 |
| T89-02     | 17  | 20  | 25  | 36  | 45  | 69  | 79  | 90  | 104 | 118 | 133 |
| T89-03     | 21  | 29  | 35  | 47  | 57  | 81  | 94  | 104 | 119 | 132 | 147 |
| T89-04     | 13  | 14  | 17  | 25  | 33  | 45  | 52  | 57  | 70  | 79  | 92  |
| T89-05     | 15  | 18  | 24  | 33  | 42  | 69  | 83  | 94  | 106 | 120 | 137 |
| T89-06     | 18  | 23  | 29  | 40  | 51  | 78  | 91  | 103 | 120 | 134 | 152 |
| T89-07     | 20  | 24  | 30  | 41  | 51  | 74  | 88  | 96  | 109 | 121 | 130 |
| T89-08     | 27  | 32  | 40  | 52  | 62  | 88  | 99  | 111 | 124 | 134 | 148 |
| T89-09     | 23  | 27  | 34  | 46  | 56  | 83  | 97  | 106 | 122 | 132 | 149 |
| T89-10     | 13  | 15  | 20  | 27  | 37  | 59  | 72  | 83  | 98  | 111 | 128 |
| T89-11     | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| T89-12     | 26  | 33  | 40  | 54  | 66  | 92  | 107 | 120 | 135 | 149 | 166 |
| T89-13     | 21  | 26  | 34  | 45  | 55  | 79  | 94  | 105 | 122 | 134 | 150 |
| T89-14     | 18  | 23  | 31  | 42  | 53  | 80  | 97  | 107 | 120 | 128 | 145 |
| T89-15     | 26  | 33  | 40  | 53  | 63  | 88  | 103 | 111 | 125 | 138 | 154 |
| T89-16     | 27  | 32  | 39  | 51  | 63  | 89  | 104 | 116 | 132 | 146 | 162 |
| T89-17     | 17  | 21  | 27  | 38  | 45  | 72  | 87  | 97  | 110 | 124 | 139 |
| T89-18     | 23  | 30  | 35  | 46  | 55  | 80  | 94  | 105 | 117 | 131 | 145 |
| T89-19     | 23  | 29  | 35  | 45  | 54  | 78  | 91  | 102 | 114 | 125 | 137 |
| T89-20     | 22  | 28  | 34  | 49  | 60  | 87  | 100 | 110 | 125 | 137 | 155 |
| T89-21     | 27  | 31  | 35  | 42  | 48  | 66  | 77  | 87  | 100 | 110 | 124 |
| T89-22     | 13  | 16  | 23  | 32  | 48  | 67  | 81  | 92  | 105 | 118 | 134 |
| T89-23     | 23  | 29  | 35  | 48  | 58  | 83  | 97  | 107 | 122 | 136 | 154 |
| T89-24     | 23  | 29  | 36  | 48  | 59  | 86  | 101 | 113 | 128 | 141 | 159 |
| T89-25     | 16  | 21  | 28  | 40  | 51  | 80  | 97  | 107 | 122 | 137 | 153 |
| T89-26     | 27  | 35  | 40  | 54  | 66  | 93  | 107 | 118 | 132 | 144 | 162 |
| T89-27     | 26  | 31  | 38  | 49  | 59  | 82  | 96  | 106 | 120 | 131 | 146 |
| T89-28     | 25  | 29  | 36  | 49  | 59  | 83  | 97  | 106 | 119 | 131 | 147 |
| T89-29     | 26  | 32  | 38  | 51  | 62  | 88  | 103 | 113 | 128 | 142 | 159 |
| T89-30     | 24  | 29  | 36  | 48  | 56  | 80  | 93  | 104 | 117 | 131 | 145 |
| T89-31     | 24  | 31  | 36  | 47  | 57  | 81  | 94  | 105 | 117 | 131 | 144 |
| T89-32     | 26  | 32  | 38  | 49  | 58  | 83  | 98  | 107 | 120 | 134 | 148 |
| T89-33     | 24  | 29  | 36  | 48  | 57  | 85  | 100 | 112 | 124 | 134 | 149 |
| T89-34     | 21  | 26  | 32  | 43  | 53  | 79  | 90  | 102 | 117 | 131 | 148 |
| T89-35     | 21  | 28  | 36  | 46  | 55  | 80  | 94  | 105 | 120 | 133 | 149 |
| T89-36     | 16  | 21  | 28  | 39  | 51  | 74  | 88  | 100 | 115 | 128 | 144 |
| T89-37     | 28  | 35  | 41  | 52  | 63  | 88  | 101 | 111 | 125 | 137 | 154 |
| T89-38     | 27  | 32  | 39  | 51  | 62  | 86  | 101 | 113 | 128 | 140 | 155 |
| T89-39     | 21  | 26  | 33  | 46  | 55  | 83  | 101 | 112 | 126 | 139 | 156 |
| T89-40     | 21  | 26  | 33  | 45  | 55  | 77  | 88  | 99  | 113 | 124 | 139 |
| T89-41     | 13  | 16  | 23  | 32  | 42  | 68  | 85  | 95  | 107 | 118 | 133 |
| T89-42     | 24  | 30  | 37  | 49  | 61  | 86  | 101 | 113 | 128 | 143 | 150 |
| T89-43     | 25  | 31  | 38  | 51  | 61  | 86  | 102 | 114 | 130 | 144 | 163 |
| T89-44     | 23  | 31  | 39  | 51  | 64  | 90  | 105 | 118 | 135 | 151 | 169 |
| T89-45     | 26  | 32  | 37  | 49  | 58  | 85  | 100 | 110 | 124 | 137 | 153 |
| T89-46     | 20  | 25  | 34  | 43  | 55  | 81  | 97  | 109 | 122 | 133 | 149 |

Table 1.7b Diameter growth data for TF0076

| Days in greenhouse | Diameter (mm) |     |     |     |     |     |      |      |
|--------------------|---------------|-----|-----|-----|-----|-----|------|------|
|                    | 29            | 32  | 39  | 43  | 46  | 50  | 53   | 57   |
| TF0076-2AA         | 3,8           | 4,5 | 6,6 | 7,5 | 8,0 | 9,1 | 9,9  | 10,4 |
| TF0076-2AB         | 4,8           | 5,0 | 5,6 | 6,3 | 6,8 | 7,3 | 7,9  | 8,1  |
| TF0076-3BA         | 3,1           | 3,8 | 5,5 | 6,6 | 7,5 | 7,6 | 8,8  | 8,9  |
| TF0076-3BB         | 3,8           | 4,7 | 6,2 | 7,4 | 8,5 | 8,7 | 9,4  | 10,0 |
| TF0076-4B          | N/A           | N/A | N/A | N/A | N/A | N/A | N/A  | N/A  |
| TF0076-5BA         | 3,7           | 4,9 | 6,1 | 7,0 | 7,8 | 9,1 | 9,7  | 9,8  |
| TF0076-5BB         | 4,2           | 6,0 | 7,2 | 8,9 | 8,9 | 9,8 | 10,1 | 10,6 |
| T89-01             | 3,2           | 3,7 | 5,3 | 6,2 | 6,9 | 7,9 | 8,3  | 8,7  |
| T89-02             | 3,2           | 3,9 | 5,1 | 6,4 | 7,0 | 7,6 | 8,6  | 8,6  |
| T89-03             | 4,2           | 5,3 | 6,4 | 6,9 | 6,9 | N/A | 8,8  | 9,8  |
| T89-04             | 2,2           | 3,0 | 4,2 | 4,5 | 5,4 | 5,0 | 5,4  | 6,1  |
| T89-05             | 3,0           | 3,7 | 4,8 | 5,9 | 6,4 | 7,0 | 7,6  | 7,9  |
| T89-06             | 3,6           | 4,8 | 6,5 | 7,6 | 8,7 | 9,1 | 9,6  | 10,1 |
| T89-07             | 3,8           | 4,9 | 6,8 | 7,6 | 8,0 | 8,6 | 9,0  | 9,7  |
| T89-08             | 4,4           | 5,8 | 6,2 | 7,3 | 7,6 | 8,5 | 9,4  | 9,7  |
| T89-09             | 4,5           | 5,5 | 6,5 | 7,1 | 7,6 | 9,1 | 9,4  | 9,8  |
| T89-10             | 3,7           | 3,9 | 5,0 | 6,1 | 6,8 | 7,6 | 8,5  | 9,2  |
| T89-11             | N/A           | N/A | N/A | N/A | N/A | N/A | N/A  | N/A  |
| T89-12             | 4,6           | 5,5 | 7,3 | 8,6 | 8,8 | 9,6 | 10,2 | 10,2 |
| T89-13             | 3,8           | 4,6 | 5,7 | 6,5 | 6,6 | 7,4 | 8,1  | 8,6  |
| T89-14             | 3,7           | 4,2 | 5,3 | 5,6 | 6,1 | 7,0 | 7,1  | 7,8  |
| T89-15             | 4,6           | 5,0 | 6,4 | 7,0 | 7,4 | 8,0 | 8,4  | 9,1  |
| T89-16             | 5,0           | 5,5 | 7,0 | 7,6 | 8,0 | 8,6 | 9,0  | 9,7  |
| T89-17             | 3,1           | 4,3 | 5,7 | 7,1 | 7,4 | 7,9 | 8,4  | 9,2  |
| T89-18             | 4,5           | 5,3 | 7,8 | 8,0 | 8,1 | 9,2 | 9,9  | 10,3 |
| T89-19             | 4,2           | 5,8 | 6,7 | 8,2 | 8,5 | 8,5 | 9,0  | 9,5  |
| T89-20             | 4,0           | 4,7 | 6,7 | 8,1 | 7,6 | 8,5 | 8,6  | 9,4  |
| T89-21             | 3,5           | 3,9 | 5,0 | 5,7 | 5,8 | 7,1 | 6,7  | 7,4  |
| T89-22             | 3,6           | 4,3 | 5,5 | 6,3 | 6,8 | 7,9 | 8,4  | 8,8  |
| T89-23             | 4,1           | 5,2 | 7,0 | 7,6 | 8,2 | 8,9 | 9,2  | 10,0 |
| T89-24             | 4,1           | 5,4 | 6,7 | 7,5 | 7,8 | 8,6 | 9,6  | 10,4 |
| T89-25             | 3,7           | 4,6 | 6,0 | 7,0 | 7,7 | 8,3 | 8,5  | 9,4  |
| T89-26             | 4,8           | 5,6 | 6,9 | 7,3 | 7,8 | 8,6 | 9,2  | 9,5  |
| T89-27             | 3,8           | 4,9 | 6,2 | 6,7 | 6,9 | 7,6 | 8,4  | 9,3  |
| T89-28             | 4,5           | 5,5 | 6,8 | 7,3 | 7,8 | 9,1 | 9,1  | 9,5  |
| T89-29             | 4,4           | 5,3 | 6,8 | 6,8 | 7,4 | 8,2 | 9,2  | 8,9  |
| T89-30             | 3,7           | 4,7 | 5,4 | 6,6 | 7,0 | 7,0 | 7,7  | 8,5  |
| T89-31             | 4,0           | 4,5 | 5,5 | 6,9 | 7,0 | 8,0 | 9,1  | 9,6  |
| T89-32             | 3,6           | 4,5 | 5,7 | 7,0 | 7,2 | 8,0 | 9,1  | 9,4  |
| T89-33             | 3,9           | 4,6 | 6,7 | 7,3 | 8,0 | 8,6 | 9,4  | 10,5 |
| T89-34             | 3,6           | 4,5 | 5,9 | 6,9 | 7,5 | 8,2 | 9,1  | 9,4  |
| T89-35             | 3,9           | 4,5 | 5,7 | 7,1 | 7,5 | 7,9 | 8,8  | 9,6  |
| T89-36             | 3,6           | 5,0 | 5,7 | 6,5 | 6,8 | 7,9 | 8,2  | 9,1  |
| T89-37             | 4,3           | 5,6 | 7,1 | 8,0 | 8,0 | 8,9 | 9,7  | 10,2 |
| T89-38             | 4,7           | 5,8 | 6,7 | 7,8 | 8,0 | 8,7 | 9,2  | 9,7  |
| T89-39             | 4,2           | 5,0 | 6,2 | 7,3 | 8,2 | 8,1 | 8,7  | 9,6  |

|        |     |     |     |     |     |     |      |      |
|--------|-----|-----|-----|-----|-----|-----|------|------|
| T89-40 | 3,6 | 4,4 | 5,2 | 5,7 | 6,0 | 7,2 | 7,2  | 8,0  |
| T89-41 | 3,5 | 4,3 | 5,5 | 6,5 | 7,0 | 7,5 | 7,7  | 8,4  |
| T89-42 | 4,4 | 5,1 | 7,5 | 8,4 | 9,5 | 9,9 | 10,0 | 10,3 |
| T89-43 | 4,3 | 5,0 | 6,5 | 7,3 | 7,8 | 8,3 | 8,9  | 9,1  |
| T89-44 | 4,3 | 5,8 | 6,8 | 8,1 | 8,6 | 9,5 | 9,9  | 10,5 |
| T89-45 | 4,2 | 4,9 | 6,8 | 7,5 | 7,6 | 8,5 | 9,4  | 9,7  |
| T89-46 | 3,5 | 4,4 | 5,7 | 7,0 | 7,5 | 8,6 | 9,4  | 9,8  |

Real-time RT-PCR was used to confirm over-expression of construct TF0076. Table 1.7c contains gene expression levels of construct gene relative to reference gene expression. All ratios between construct and reference gene expression levels shown are normalized to the average of wild type group ratios. 4 of 6 individuals of construction group TF0076 are over-expressed according to present RT-PCR data.

Table 1.7c Real-time RT-PCR data for TF0076

| Sample     | Relative gene expression level normalized to wild type average |
|------------|----------------------------------------------------------------|
| TF0076-2AA | 0,43                                                           |
| TF0076-2AB | 3,25                                                           |
| TF0076-3BA | 3,61                                                           |
| TF0076-3BB | 0,65                                                           |
| TF0076-5BA | 3,70                                                           |
| TF0076-5BB | 3,63                                                           |
| T89-03     | 1,46                                                           |
| T89-36     | 1,54                                                           |
| T89-37     | 0,52                                                           |
| T89-38     | 0,66                                                           |
| T89-39     | 0,82                                                           |

- 10 Results from growth analysis are specified in the overview table 1.7d. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and MDC.

Table 1.7d Overview table of growth effects of construct TF0076

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TF0076             | 1,10                 | 1,04                   | 1,13                               | 1,09                         | 1,18                 | 1,01                   | 1,18                                  | 1,02                         |

Construction group TF0089

This construct induces increased growth. The final height is 7% higher comparing the average of the construction group and wild type control group. The final height is 17% higher comparing the largest individuals of the construction group and wild type control group. The maximum height growth rate is 12% higher comparing the average of the construction group and wild type control group. The maximum height growth rate is 17% higher comparing the largest individuals of the construction group and wild type control group. The TF0089 construction group meets growth difference selection criterion (1) as shown in table 1.8c.

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Tables 1.8a and 1.8b contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

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Table 1.8a Height growth data for TF0089

| Days in greenhouse | Height (cm) |    |    |    |    |    |    |     |     |     |     |
|--------------------|-------------|----|----|----|----|----|----|-----|-----|-----|-----|
|                    | 18          | 21 | 26 | 32 | 35 | 39 | 43 | 46  | 53  | 60  | 64  |
| TF0089-1A          | 4           | 7  | 13 | 25 | 35 | 48 | 60 | 71  | 94  | 122 | 140 |
| TF0089-1BA         | 19          | 22 | 31 | 51 | 61 | 71 | 84 | 92  | 115 | 138 | 152 |
| TF0089-1BB         | 10          | 13 | 19 | 34 | 41 | 52 | 67 | 78  | 103 | 125 | 138 |
| TF0089-2AA         | 23          | 29 | 37 | 52 | 61 | 71 | 86 | 97  | 119 | 144 | 158 |
| TF0089-2AB         | 20          | 25 | 33 | 47 | 56 | 68 | 80 | 90  | 113 | 137 | 148 |
| TF0089-2B          | 24          | 30 | 32 | 60 | 70 | 80 | 98 | 111 | 140 | 168 | 184 |
| T89-01             | 20          | 27 | 35 | 54 | 61 | 72 | 84 | 93  | 112 | 130 | 141 |
| T89-02             | 19          | 25 | 31 | 48 | 56 | 67 | 79 | 90  | 113 | 137 | 149 |
| T89-03             | 21          | 26 | 33 | 48 | 55 | 64 | 75 | 83  | 100 | 117 | 128 |
| T89-04             | 21          | 26 | 33 | 52 | 59 | 69 | 83 | 96  | 120 | 140 | 152 |
| T89-05             | 20          | 25 | 34 | 52 | 59 | 70 | 84 |     | 120 | 144 | 156 |
| T89-06             | 20          | 26 | 35 | 52 | 61 | 73 | 87 | 98  | 121 | 143 | 156 |
| T89-07             | 17          | 21 | 27 | 45 | 53 | 63 | 74 | 85  | 107 | 129 | 140 |
| T89-08             | 18          | 24 | 31 | 48 | 56 | 64 | 75 | 86  | 106 | 128 | 141 |
| T89-09             | 24          | 28 | 34 | 48 | 55 | 65 | 78 | 91  | 112 | 136 | 153 |
| T89-10             | 18          | 24 | 30 | 44 | 52 | 62 | 75 | 87  | 107 | 129 | 142 |
| T89-11             | 11          | 14 | 20 | 32 | 41 | 52 | 62 | 72  | 95  | 118 | 132 |
| T89-12             | 17          | 24 | 30 | 44 | 52 | 62 | 74 | 85  | 106 | 129 | 141 |
| T89-13             | 21          | 28 | 35 | 48 | 56 | 67 | 78 | 85  | 103 | 122 | 134 |
| T89-14             | 20          | 25 | 34 | 51 | 60 | 69 | 80 | 90  | 110 | 135 | 148 |
| T89-15             | 19          | 24 | 32 | 45 | 52 | 62 | 74 | 84  | 106 | 129 | 142 |
| T89-16             | 20          | 24 | 30 | 45 | 53 | 63 | 75 | 86  | 108 | 131 | 141 |
| T89-17             | 18          | 23 | 28 | 42 | 50 | 61 | 74 | 82  | 104 | 129 | 143 |
| T89-18             | 17          | 22 | 28 | 44 | 53 | 62 | 75 | 85  | 108 | 130 | 144 |

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|        |    |    |    |    |    |    |    |    |     |     |     |
|--------|----|----|----|----|----|----|----|----|-----|-----|-----|
| T89-19 | 19 | 24 | 30 | 43 | 50 | 59 | 72 | 84 | 103 | 125 | 140 |
| T89-20 | 18 | 23 | 30 | 43 | 50 | 60 | 71 | 80 | 102 | 123 | 136 |
| T89-21 | 19 | 24 | 31 | 45 | 53 | 62 | 76 | 87 | 107 | 134 | 149 |
| T89-22 | 15 | 19 | 23 | 30 | 39 | 47 | 58 | 66 | 82  | 99  | 109 |
| T89-23 | 19 | 24 | 34 | 50 | 60 | 69 | 83 | 94 | 118 | 141 | 154 |
| T89-24 | 23 | 27 | 36 | 51 | 61 | 72 | 85 | 95 | 120 | 145 | 157 |
| T89-25 | 19 | 21 | 29 | 44 | 52 | 63 | 74 | 84 | 102 | 124 | 138 |
| T89-26 | 20 | 25 | 32 | 45 | 53 | 63 | 75 | 85 | 108 | 128 | 139 |
| T89-27 | 22 | 25 | 33 | 48 | 56 | 66 | 80 | 92 | 112 | 134 | 147 |
| T89-28 | 21 | 28 | 33 | 47 | 57 | 68 | 80 | 89 | 111 | 137 | 148 |
| T89-29 | 18 | 23 | 28 | 43 | 51 | 61 | 73 | 84 | 105 | 125 | 136 |
| T89-30 | 19 | 20 | 25 | 38 | 45 | 53 | 63 | 71 | 91  | 114 | 125 |
| T89-31 | 15 | 21 | 29 | 48 | 57 | 66 | 80 | 91 | 114 | 134 | 148 |
| T89-32 | 20 | 24 | 33 | 50 | 55 | 65 | 77 | 88 | 110 | 134 | 146 |
| T89-33 | 20 | 26 | 33 | 49 | 57 | 68 | 79 | 89 | 113 | 135 | 149 |
| T89-34 | 19 | 25 | 33 | 51 | 58 | 70 | 84 | 98 | 120 | 140 | 154 |
| T89-35 | 19 | 24 | 31 | 46 | 54 | 64 | 78 | 90 | 112 | 135 | 147 |
| T89-36 | 21 | 25 | 33 | 49 | 57 | 68 | 80 | 89 | 109 | 130 | 140 |
| T89-37 | 17 | 23 | 32 | 49 | 58 | 68 | 78 | 88 | 110 | 133 | 146 |
| T89-38 | 18 | 24 | 31 | 46 | 54 | 65 | 79 | 91 | 112 | 138 | 152 |
| T89-39 | 20 | 25 | 32 | 50 | 59 | 69 | 82 | 92 | 118 | 138 | 151 |
| T89-40 | 22 | 27 | 35 | 49 | 56 | 66 | 77 | 88 | 109 | 131 | 145 |
| T89-41 | 20 | 24 | 30 | 44 | 51 | 60 | 73 | 82 | 106 | 129 | 141 |
| T89-42 | 21 | 26 | 32 | 50 | 58 | 68 | 82 | 92 | 115 | 134 | 148 |
| T89-43 | 17 | 24 | 32 | 47 | 55 | 65 | 79 | 89 | 113 | 139 | 154 |
| T89-44 | 18 | 24 | 31 | 47 | 56 | 65 | 78 | 89 | 112 | 135 | 152 |
| T89-45 | 20 | 23 | 29 | 45 | 55 | 63 | 75 | 86 | 106 | 129 | 141 |
| T89-46 | 21 | 24 | 32 | 45 | 55 | 67 | 78 | 85 | 103 | 122 | 138 |
| T89-47 | 19 | 24 | 30 | 46 | 53 | 67 | 74 | 84 | 105 | 131 | 144 |

Table 1.8b Diameter growth data for TF0089

| Days in greenhouse | Diameter (mm) |     |     |     |     |      |      |      |
|--------------------|---------------|-----|-----|-----|-----|------|------|------|
|                    | 32            | 35  | 39  | 43  | 46  | 53   | 60   | 64   |
| TF0089-1A          | 3,0           | 3,3 | 4,2 | 5,1 | 6,0 | 7,5  | 8,3  | 8,2  |
| TF0089-1BA         | 4,9           | 6,0 | 6,5 | 7,8 | 8,1 | 9,1  | 9,5  | 10,1 |
| TF0089-1BB         | 4,0           | 4,2 | 5,3 | 6,1 | 6,8 | 7,6  | 8,7  | 9,2  |
| TF0089-2AA         | 5,7           | 6,3 | 7,3 | 8,6 | 8,1 | 9,6  | 10,9 | 11,5 |
| TF0089-2AB         | 4,8           | 6,0 | 6,5 | 7,5 | 8,1 | 8,8  | 10,4 | 10,4 |
| TF0089-2B          | 5,3           | 6,0 | 6,8 | 8,6 | 9,4 | 10,0 | 12,4 | 12,2 |
| T89-01             | 5,1           | 5,8 | 6,6 | 7,4 | 8,5 | 8,3  | 9,5  | 9,7  |
| T89-02             | 5,1           | 5,8 | 6,7 | 7,5 | 8,6 | 9,5  | 10,9 | 11,4 |
| T89-03             | 4,6           | 5,3 | 5,8 | 6,4 | 7,0 | 7,5  | 8,2  | 8,7  |
| T89-04             | 5,4           | 6,2 | 7,3 | 8,1 | 8,6 | 9,8  | 10,8 | 10,9 |
| T89-05             | 5,1           | 6,0 | 7,1 | 7,7 | 8,7 | 9,3  | 10,7 | 11,0 |
| T89-06             | 5,6           | 5,6 | 6,8 | 7,4 | 8,6 | 10,3 | 10,8 | 11,3 |
| T89-07             | 4,1           | 4,8 | 5,6 | 6,7 | 7,3 | 8,5  | 9,8  | 9,9  |
| T89-08             | 4,8           | 5,5 | 6,2 | 7,5 | 7,4 | 8,2  | 9,0  | 9,0  |
| T89-09             | 5,1           | 5,5 | 6,5 | 7,6 | 7,9 | 9,7  | 10,6 | 10,8 |
| T89-10             | 5,8           | 5,8 | 6,5 | 7,2 | 7,5 | 9,3  | 10,2 | 10,9 |
| T89-11             | 3,8           | 4,4 | 5,5 | 6,1 | 6,7 | 8,6  | 9,9  | 10,1 |

|        |     |     |     |     |     |      |      |      |
|--------|-----|-----|-----|-----|-----|------|------|------|
| T89-12 | 4,8 | 5,8 | 6,2 | 7,0 | 6,9 | 10,0 | 9,3  | 9,7  |
| T89-13 | 5,9 | 5,8 | 7,3 | 8,7 | 9,0 | 10,7 | 11,2 | 11,6 |
| T89-14 | 5,4 | 6,3 | 6,7 | 8,5 | 8,6 | 10,0 | 10,8 | 11,3 |
| T89-15 | 5,0 | 5,5 | 6,6 | 7,3 | 8,1 | 9,7  | 10,3 | 10,3 |
| T89-16 | 4,8 | 5,3 | 5,9 | 6,8 | 7,6 | 8,1  | 9,8  | 10,0 |
| T89-17 | 4,0 | 4,7 | 6,1 | 6,6 | 6,8 | 9,0  | 9,6  | 10,5 |
| T89-18 | 4,7 | 5,7 | 6,5 | 7,2 | 7,8 | 8,8  | 9,0  | 9,8  |
| T89-19 | 4,5 | 5,4 | 6,1 | 6,8 | 7,2 | 8,4  | 9,8  | 10,1 |
| T89-20 | 5,4 | 5,9 | 7,3 | 7,9 | 8,6 | 9,8  | 11,2 | 11,6 |
| T89-21 | 5,0 | 5,8 | 5,7 | 8,2 | 8,0 | 9,3  | 10,1 | 11,2 |
| T89-22 | 3,1 | 3,6 | 3,8 | 4,2 | 4,1 | 5,0  | 5,3  | 5,5  |
| T89-23 | 5,2 | 5,8 | 6,7 | 7,8 | 8,1 | 10,2 | 11,5 | 12,3 |
| T89-24 | 5,3 | 6,2 | 7,0 | 7,7 | 8,0 | 9,2  | 9,9  | 10,9 |
| T89-25 | 4,6 | 5,0 | 6,0 | 6,7 | 7,0 | 9,0  | 8,9  | 9,3  |
| T89-26 | 5,2 | 4,9 | 5,9 | 6,3 | 7,0 | 7,7  | 9,5  | 9,7  |
| T89-27 | 4,6 | 5,3 | 6,0 | 6,8 | 7,3 | 9,0  | 9,8  | 10,9 |
| T89-28 | 4,7 | 5,7 | 6,1 | 6,7 | 7,8 | 9,1  | 10,3 | 10,6 |
| T89-29 | 4,5 | 4,9 | 5,7 | 7,4 | 7,3 | 7,6  | 8,5  | 9,4  |
| T89-30 | 3,7 | 4,9 | 5,3 | 6,0 | 6,3 | 7,6  | 8,5  | 9,3  |
| T89-31 | 5,2 | 6,1 | 7,1 | 8,3 | 8,2 | 9,4  | 10,2 | 10,7 |
| T89-32 | 5,1 | 5,9 | 7,0 | 7,8 | 8,5 | 9,7  | 10,6 | 12,1 |
| T89-33 | 4,9 | 5,6 | 6,7 | 7,8 | 8,6 | 10,0 | 10,3 | 11,1 |
| T89-34 | 7,0 | 6,7 | 7,9 | 9,1 | 9,6 | 11,0 | 11,3 | 12,1 |
| T89-35 | 4,9 | 5,4 | 6,8 | 7,5 | 8,5 | 11,1 | 10,3 | 10,9 |
| T89-36 | 5,3 | 6,3 | 6,5 | 7,2 | 7,3 | 8,1  | 9,5  | 9,8  |
| T89-37 | 5,0 | 5,7 | 6,4 | 6,9 | 6,9 | 7,7  | 9,2  | 9,1  |
| T89-38 | 4,4 | 4,9 | 6,2 | 7,2 | 7,6 | 9,0  | 10,1 | 11,3 |
| T89-39 | 4,8 | 5,1 | 6,2 | 6,6 | 7,5 | 8,5  | 9,7  | 10,2 |
| T89-40 | 5,1 | 5,8 | 6,9 | 7,4 | 7,8 | 9,0  | 10,3 | 10,7 |
| T89-41 | 4,2 | 5,3 | 6,1 | 7,2 | 8,0 | 8,9  | 10,4 | 10,5 |
| T89-42 | 4,9 | 6,1 | 6,2 | 7,2 | 8,0 | 9,2  | 10,2 | 10,7 |
| T89-43 | 4,6 | 5,8 | 6,4 | 7,8 | 7,8 | 9,6  | 11,1 | 11,5 |
| T89-44 | 5,0 | 5,6 | 6,3 | 7,0 | 7,4 | 9,0  | 10,9 | 10,6 |
| T89-45 | 5,0 | 5,1 | 5,4 | 6,8 | 6,2 | 7,9  | 8,7  | 9,3  |
| T89-46 | 5,2 | 5,8 | 6,7 | 7,6 | 8,2 | 9,4  | 10,8 | 11,4 |
| T89-47 | 4,6 | 5,8 | 6,3 | 7,3 | 8,2 | 9,1  | 9,8  | 10,3 |

Results from growth analysis are specified in the overview table 1.8c. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and 5 MDC.

Table 1.8c Overview table of growth effects of construct TF0089

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|-------------------------------|------------------------------|----------------------|------------------------|---------------------------|------------------------------|
|--------------------|----------------------|------------------------|-------------------------------|------------------------------|----------------------|------------------------|---------------------------|------------------------------|

|        |      |      | Rate |      |      |      | Growth Rate |      |
|--------|------|------|------|------|------|------|-------------|------|
| TF0089 | 1,07 | 0,98 | 1,12 | 1,02 | 1,17 | 0,99 | 1,17        | 0,96 |

#### Construction group TF0109

This construct induces increased growth. The final height is 24% higher comparing the average of the construction group and wild type control group. The final height is 39% higher comparing the largest individuals of the construction group and wild type control group. The maximum height growth rate is 27% higher comparing the average of the construction group and wild type control group. The maximum height growth rate is 44% higher comparing the largest individuals of the construction group and wild type control group. The TF0109 construction group meets the more stringent level of growth difference selection criteria (1), (3) and (4) as shown in table 1.9d.

Tables 1.9a and 1.9b contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

Table 1.9a Height growth data for TF0109

| Days in greenhouse | Height (cm) |    |    |    |     |     |     |
|--------------------|-------------|----|----|----|-----|-----|-----|
|                    | 17          | 20 | 27 | 34 | 41  | 48  | 56  |
| TF0109-1B-1        | 17          | 20 | 34 | 56 | 81  | 108 | 138 |
| TF0109-1B-2        | 19          | 23 | 42 | 62 | 88  | 113 | 142 |
| TF0109-2A          | 16          | 21 | 39 | 59 | 87  | 118 | 150 |
| TF0109-2B          | 19          | 25 | 45 | 75 | 121 | 157 | 185 |
| TF0109-3B          | 19          | 25 | 46 | 70 | 96  | 123 | 159 |
| TF0109-4A          | 15          | 20 | 36 | 56 | 81  | 105 | 133 |
| TF0109-4B          | 20          | 28 | 51 | 84 | 122 | 162 | 210 |
| T89-01             | 18          | 20 | 29 | 46 | 65  | 87  | 111 |
| T89-02             | 20          | 23 | 38 | 54 | 75  | 98  | 122 |
| T89-03             | 16          | 19 | 32 | 49 | 72  | 95  | 124 |
| T89-04             | 19          | 24 | 40 | 57 | 81  | 103 | 133 |
| T89-05             | 18          | 22 | 35 | 52 | 71  | 95  | 124 |
| T89-06             | 16          | 21 | 33 | 53 | 77  | 100 | 132 |
| T89-07             | 18          | 22 | 37 | 57 | 82  | 107 | 138 |
| T89-08             | 12          | 14 | 25 | 42 | 64  | 87  | 117 |
| T89-09             | 12          | 16 | 33 | 52 | 75  | 101 | 128 |
| T89-10             | 16          | 20 | 31 | 51 | 75  | 100 | 133 |
| T89-11             | 12          | 17 | 31 | 52 | 75  | 98  | 122 |

|        |    |    |    |    |     |     |     |
|--------|----|----|----|----|-----|-----|-----|
| T89-12 | 17 | 22 | 39 | 43 | N/A | N/A | N/A |
| T89-13 | 18 | 23 | 39 | 59 | 83  | 110 | 145 |
| T89-14 | 19 | 23 | 40 | 61 | 81  | 100 | 127 |
| T89-15 | 19 | 21 | 33 | 51 | 77  | 99  | 127 |
| T89-16 | 21 | 24 | 40 | 57 | 82  | 107 | 140 |
| T89-17 | 20 | 24 | 37 | 56 | 77  | 103 | 136 |
| T89-18 | 19 | 24 | 39 | 58 | 83  | 110 | 140 |
| T89-19 | 20 | 24 | 35 | 51 | 76  | 102 | 132 |
| T89-20 | 19 | 23 | 39 | 59 | 82  | 111 | 146 |
| T89-21 | 21 | 24 | 37 | 57 | 81  | 107 | 136 |
| T89-22 | 20 | 24 | 39 | 61 | 85  | 110 | 142 |
| T89-23 | 19 | 22 | 37 | 54 | 77  | 102 | 128 |
| T89-24 | 17 | 22 | 35 | 55 | 80  | 107 | 140 |
| T89-25 | 19 | 23 | 38 | 57 | 78  | 101 | 131 |
| T89-26 | 18 | 20 | 35 | 53 | 71  | 99  | 128 |
| T89-27 | 23 | 27 | 42 | 59 | 85  | 106 | 129 |
| T89-28 | 19 | 25 | 37 | 55 | 76  | 96  | 126 |
| T89-29 | 12 | 13 | 19 | 29 | 46  | 66  | 91  |
| T89-30 | 19 | 23 | 36 | 58 | 81  | 107 | 136 |
| T89-31 | 19 | 21 | 33 | 48 | 71  | 95  | 124 |
| T89-32 | 16 | 20 | 31 | 48 | 71  | 97  | 126 |
| T89-33 | 19 | 22 | 36 | 56 | 78  | 103 | 132 |
| T89-34 | 18 | 21 | 36 | 52 | 74  | 97  | 120 |
| T89-35 | 20 | 22 | 36 | 54 | 76  | 97  | 125 |
| T89-36 | 21 | 28 | 43 | 65 | 87  | 115 | 151 |
| T89-37 | 16 | 19 | 32 | 50 | 73  | 97  | 126 |
| T89-38 | 17 | 21 | 35 | 52 | 74  | 92  | 113 |
| T89-39 | 17 | 19 | 28 | 45 | 60  | 89  | 116 |
| T89-40 | 21 | 26 | 38 | 55 | 79  | 104 | 130 |

Table 1.9b Diameter growth data for TF0109

| Days in greenhouse | Diameter (mm) |     |     |     |      |
|--------------------|---------------|-----|-----|-----|------|
|                    | 27            | 34  | 41  | 48  | 56   |
| TF0109-1B-1        | 3,9           | 5,2 | 6,9 | 9,0 | 10,5 |
| TF0109-1B-2        | 4,3           | 5,7 | 7,2 | 8,8 | 9,8  |
| TF0109-2A          | 4,1           | 5,8 | 7,9 | 9,9 | 11,1 |
| TF0109-2B          | 4,0           | 5,8 | 7,2 | 8,8 | 9,4  |
| TF0109-3B          | 4,4           | 6,0 | 7,9 | 9,6 | 10,2 |
| TF0109-4A          | 4,2           | 5,4 | 7,5 | 8,4 | 10,0 |
| TF0109-4B          | 4,2           | 5,5 | 7,1 | 8,6 | 10,0 |
| T89-01             | 3,5           | 4,3 | 5,4 | 7,0 | 8,1  |
| T89-02             | 4,2           | 6,0 | 7,6 | 8,0 | 9,7  |
| T89-03             | 3,6           | 5,9 | 7,0 | 8,0 | 9,9  |
| T89-04             | 4,0           | 6,0 | 7,7 | 8,9 | 10,7 |
| T89-05             | 4,0           | 5,6 | 7,4 | 9,0 | 10,4 |
| T89-06             | 4,7           | 6,2 | 7,8 | 9,9 | 11,2 |
| T89-07             | 5,3           | 5,8 | 7,0 | 8,4 | 10,0 |
| T89-08             | 4,0           | 4,6 | 6,4 | 7,8 | 9,4  |
| T89-09             | 4,2           | 4,9 | 7,0 | 9,4 | 10,5 |
| T89-10             | 3,9           | 5,0 | 7,0 | 9,0 | 9,7  |

|        |     |     |     |     |      |
|--------|-----|-----|-----|-----|------|
| T89-11 | 3,8 | 5,0 | 6,6 | 7,7 | 9,1  |
| T89-12 | 4,8 | N/A | N/A | N/A | N/A  |
| T89-13 | 4,0 | 5,5 | 7,2 | 8,9 | 10,1 |
| T89-14 | 4,4 | 5,8 | 6,9 | 8,2 | 8,0  |
| T89-15 | 3,6 | 4,6 | 6,5 | 7,4 | 8,7  |
| T89-16 | 4,0 | 5,3 | 6,4 | 8,8 | 9,3  |
| T89-17 | 3,8 | 6,4 | 6,7 | 8,5 | 9,6  |
| T89-18 | 4,3 | 5,8 | 6,9 | 8,1 | 9,7  |
| T89-19 | 3,7 | 5,0 | 6,9 | 7,9 | 9,3  |
| T89-20 | 3,9 | 5,2 | 7,1 | 8,4 | 9,8  |
| T89-21 | 4,3 | 5,4 | 7,0 | 8,5 | 11,0 |
| T89-22 | 4,3 | 5,6 | 7,0 | 9,0 | 10,0 |
| T89-23 | 4,0 | 5,2 | 7,3 | 8,6 | 10,8 |
| T89-24 | 4,6 | 5,8 | 7,5 | 8,5 | 10,0 |
| T89-25 | 4,0 | 5,9 | 6,7 | 7,3 | 8,8  |
| T89-26 | 4,2 | 5,4 | 6,4 | 8,0 | 8,4  |
| T89-27 | 4,2 | 5,1 | 6,5 | 7,5 | 7,7  |
| T89-28 | 3,6 | 4,5 | 6,4 | 7,5 | 8,9  |
| T89-29 | N/A | 2,5 | 3,4 | 4,9 | 5,9  |
| T89-30 | 4,2 | 5,2 | 6,6 | 8,0 | 9,4  |
| T89-31 | 3,8 | 4,9 | 6,5 | 8,3 | 9,7  |
| T89-32 | 3,9 | 4,8 | 6,0 | 7,5 | 9,2  |
| T89-33 | 3,7 | 5,0 | 7,7 | 7,8 | 9,4  |
| T89-34 | 3,9 | 5,1 | 6,2 | 7,5 | 7,5  |
| T89-35 | 3,6 | 5,5 | 6,7 | 7,6 | 8,9  |
| T89-36 | 4,1 | 5,6 | 7,3 | 8,8 | 10,4 |
| T89-37 | 3,8 | 4,9 | 6,9 | 7,8 | 9,5  |
| T89-38 | 3,4 | 4,6 | 5,4 | 5,9 | 6,5  |
| T89-39 | 2,8 | 4,0 | 5,4 | 6,2 | 7,2  |
| T89-40 | 3,7 | 5,8 | 6,4 | 8,3 | 9,2  |

Real-time RT-PCR was used to confirm over-expression of construct TF0109. Table 1.9c contains gene expression levels of construct gene relative to reference gene expression. All ratios between construct and reference gene expression levels shown are normalized to the average of wild type group ratios. 4 of 7 individuals of construction group TF0109 are over-expressed according to present RT-PCR data. 2 of 7 individuals of construction group TF0109 are down-regulated according to present RT-PCR data. Individuals having higher expression levels of construct TF0109 are correlatively tall and fast growing while individuals having lower expression levels of construct TF0109 are shorter.

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Table 1.9c Real-time RT-PCR data for TF0109

| Sample      | Relative gene expression level normalized to wild type average |
|-------------|----------------------------------------------------------------|
| TF0109-1B-1 | 0,39                                                           |
| TF0109-1B-2 | 0,55                                                           |

|           |      |
|-----------|------|
| TF0109-2A | 2,16 |
| TF0109-2B | 9,21 |
| TF0109-3B | 1,80 |
| TF0109-4A | 0,95 |
| TF0109-4B | 6,24 |
| T89-03    | 1,08 |
| T89-07    | 1,17 |
| T89-08    | 1,11 |
| T89-10    | 0,79 |
| T89-11    | 0,85 |

Results from growth analysis are specified in the overview table 1.9d. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and 5 MDC.

Table 1.9d Overview table of growth effects of construct TF0109

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TF0109             | 1,24                 | 1,09                   | 1,27                               | 1,12                         | 1,39                 | 1,00                   | 1,44                                  | 1,02                         |

#### Construction group TF0132

- 10 This construct induces increased growth. The final height is 13% higher comparing the average of the construction group and wild type control group. The final height is 26% higher comparing the largest individuals of the construction group and wild type control group. The maximum height growth rate is 18% higher comparing the average of the construction group and wild type control group. The maximum height growth rate is 18% higher comparing the largest individuals of the construction group and wild type control group. The TF0132 construction group meets the more stringent level of growth difference selection criteria (1) and (4) as shown in table 1.10c.

Tables 1.10a and 1.10b contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of 20 individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

Table 1.10a Height growth data for TF0132

| Days in greenhouse | Height (cm) |    |    |     |     |     |     |     |     |
|--------------------|-------------|----|----|-----|-----|-----|-----|-----|-----|
|                    | 20          | 28 | 34 | 37  | 41  | 48  | 51  | 55  | 59  |
| TF0132-3A-1        | 23          | 38 | 53 | 60  | 70  | 89  | 96  | 107 | 119 |
| TF0132-3A-2        | 15          | 28 | 42 | 49  | 58  | 75  | 81  | 93  | 100 |
| TF0132-3A-3        | 26          | 41 | 54 | 61  | 72  | 89  | 96  | 107 | 119 |
| TF0132-3B-1        | 27          | 47 | 63 | 73  | 84  | 113 | 125 | 142 | 156 |
| TF0132-3B-2        | 30          | 51 | 71 | 80  | 94  | N/A | 134 | 148 | 160 |
| TF0132-3BB         | 32          | 58 | 87 | 96  | 112 | 141 | 155 | 171 | 182 |
| TF0132-4AA         | 20          | 39 | 59 | 67  | 78  | 102 | 112 | 129 | 143 |
| TF0132-4AB         | 21          | 43 | 63 | 74  | 87  | 114 | 126 | 142 | 156 |
| TF0132-4AC         | 27          | 48 | 67 | 76  | 89  | 117 | 129 | 146 | 156 |
| T89-02             | 27          | 40 | 51 | 58  | 66  | 86  | 94  | 105 | 115 |
| T89-03             | 27          | 44 | 58 | 67  | 77  | 97  | 104 | 114 | 126 |
| T89-04             | 27          | 39 | 56 | 65  | 74  | 92  | 100 | 109 | 118 |
| T89-07             | 28          | 47 | 66 | 77  | 88  | 107 | 116 | 130 | 140 |
| T89-08             | 19          | 37 | 51 | 59  | 69  | 90  | 99  | 109 | 119 |
| T89-09             | 25          | 43 | 58 | 67  | 78  | 100 | 109 | 121 | 131 |
| T89-11             | 29          | 45 | 60 | 69  | 81  | 104 | 111 | 121 | 132 |
| T89-12             | 26          | 41 | 58 | 65  | 77  | 105 | 114 | 127 | 136 |
| T89-13             | 31          | 47 | 70 | 78  | 90  | 110 | 119 | 131 | 143 |
| T89-14             | 26          | 46 | 70 | 78  | 88  | 108 | 116 | 127 | 137 |
| T89-18             | 22          | 41 | 55 | 65  | 74  | 95  | 104 | 115 | 126 |
| T89-19             | 27          | 43 | 60 | 70  | 81  | 102 | 110 | 121 | 131 |
| T89-20             | 25          | 40 | 57 | N/A | 74  | 94  | 103 | 118 | 130 |
| T89-21             | 27          | 45 | 61 | 72  | 84  | 108 | 115 | 126 | 137 |
| T89-22             | 25          | 38 | 55 | 65  | 77  | 95  | 104 | 115 | 125 |
| T89-23             | 23          | 37 | 50 | 57  | 65  | 82  | 92  | 106 | 115 |
| T89-24             | 25          | 41 | 54 | 60  | 69  | 87  | 94  | 102 | 110 |
| T89-25             | 25          | 38 | 55 | 66  | 80  | 100 | 109 | 121 | 133 |
| T89-26             | 24          | 38 | 53 | 61  | 69  | 81  | 87  | 95  | 104 |
| T89-27             | 26          | 39 | 54 | 62  | 70  | 90  | 97  | 109 | 120 |
| T89-28             | 27          | 46 | 67 | 75  | 86  | 107 | 114 | 126 | 136 |
| T89-29             | 24          | 39 | 57 | 64  | 74  | 91  | 98  | 108 | 128 |
| T89-31             | 27          | 43 | 57 | 65  | 73  | 91  | 97  | 105 | 113 |
| T89-32             | 25          | 41 | 55 | 63  | 75  | 96  | 107 | 121 | 135 |
| T89-35             | 25          | 38 | 53 | 62  | 73  | 88  | 96  | 103 | 112 |
| T89-36             | 27          | 45 | 67 | 78  | 90  | 113 | 122 | 134 | 145 |
| T89-37             | 20          | 43 | 59 | 68  | 79  | 101 | 112 | 124 | 137 |
| T89-39             | 25          | 45 | 61 | 69  | 79  | 99  | 108 | 120 | 132 |
| T89-40             | 23          | 32 | 43 | 49  | 60  | 76  | 84  | 94  | 104 |
| T89-41             | 27          | 45 | 66 | 75  | 87  | 112 | 120 | 133 | 144 |
| T89-43             | 26          | 38 | 54 | 61  | 70  | 93  | 100 | 109 | 120 |
| T89-46             | 26          | 45 | 66 | 76  | 88  | 109 | 114 | 125 | 133 |

Table 1.10b Diameter growth data for TF0132

|  | Diameter (mm) |
|--|---------------|
|--|---------------|

| Days in greenhouse | 34  | 41  | 48  | 55   | 59   |
|--------------------|-----|-----|-----|------|------|
| TF0132-3A-1        | 6,1 | 7,3 | 7,8 | 9,0  | 8,9  |
| TF0132-3A-2        | 5,8 | 7,3 | 7,8 | 9,0  | 9,0  |
| TF0132-3A-3        | 6,6 | 8,5 | 8,6 | 9,2  | 9,7  |
| TF0132-3B-1        | 6,2 | 7,0 | 8,6 | 9,2  | 9,7  |
| TF0132-3B-2        | 5,7 | 7,3 | 8,8 | 9,8  | 9,2  |
| TF0132-3BB         | 6,4 | 7,3 | 8,0 | 9,1  | 9,2  |
| TF0132-4AA         | 5,3 | 6,0 | 7,4 | 8,8  | 9,1  |
| TF0132-4AB         | 5,6 | 7,0 | 7,0 | 8,4  | 8,4  |
| TF0132-4AC         | 6,2 | 7,2 | 9,1 | 9,6  | 10,0 |
| T89-02             | 5,6 | 6,4 | 7,8 | 9,0  | 8,4  |
| T89-03             | 6,6 | 7,7 | 8,5 | 8,9  | 9,6  |
| T89-04             | 7,2 | 7,8 | 9,1 | 9,8  | 9,7  |
| T89-07             | 7,3 | 7,9 | 9,5 | 9,9  | 10,1 |
| T89-08             | 5,5 | 7,8 | 8,3 | 10,0 | 9,8  |
| T89-09             | 6,7 | 7,8 | 9,3 | 9,7  | 9,8  |
| T89-11             | 6,4 | 8,1 | 9,2 | 9,4  | 9,7  |
| T89-12             | 7,0 | 8,0 | 9,0 | 10,1 | 9,9  |
| T89-13             | 6,8 | 8,5 | 9,1 | 10,7 | 10,8 |
| T89-14             | 6,1 | 6,9 | 7,7 | 8,4  | 8,8  |
| T89-18             | 5,5 | 6,5 | 7,9 | 9,5  | 9,4  |
| T89-19             | 7,5 | 8,3 | 9,0 | 9,5  | 10,4 |
| T89-20             | 7,3 | 7,1 | 8,7 | 9,3  | 9,7  |
| T89-21             | 7,0 | 8,6 | 9,3 | 10,3 | 10,3 |
| T89-22             | 7,0 | 7,8 | 8,4 | 10,0 | 9,5  |
| T89-23             | 5,8 | 6,8 | 7,9 | 9,9  | 9,7  |
| T89-24             | 6,1 | 6,8 | 8,1 | 9,0  | 9,4  |
| T89-25             | 6,5 | 8,8 | 9,5 | 10,0 | 10,9 |
| T89-26             | 5,8 | 6,7 | 7,0 | 7,5  | 7,7  |
| T89-27             | 6,3 | 7,4 | 8,6 | 9,0  | 9,5  |
| T89-28             | 7,0 | 8,1 | 8,8 | 9,7  | 10,5 |
| T89-29             | 7,5 | 7,4 | 8,5 | 10,7 | 10,0 |
| T89-31             | 5,6 | 6,3 | 7,2 | 7,6  | 8,6  |
| T89-32             | 6,0 | 7,0 | 8,2 | 8,7  | 9,3  |
| T89-35             | 5,4 | 6,4 | 6,8 | 7,9  | 8,0  |
| T89-36             | 6,7 | 8,2 | 8,9 | 9,6  | 9,4  |
| T89-37             | 7,4 | 8,5 | 8,6 | 9,3  | 10,8 |
| T89-39             | 7,1 | 7,9 | 9,6 | 10,2 | 10,2 |
| T89-40             | 3,9 | 5,2 | 5,7 | 6,8  | 6,6  |
| T89-41             | 7,2 | 8,7 | N/A | 9,7  | 10,3 |
| T89-43             | 6,9 | 7,5 | 8,6 | 9,7  | 10,4 |
| T89-46             | 6,4 | 7,2 | 8,2 | 8,7  | 9,7  |

Results from growth analysis are specified in the overview table 1.10c. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and

Table 1.10c Overview table of growth effects of construct TF0132

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TF0132             | 1,13                 | 0,97                   | 1,18                               | 1,04                         | 1,26                 | 0,92                   | 1,18                                  | 0,99                         |

Construction group TFSTT051

This construct induces increased growth. The final height is 7% higher comparing the average of the construction group and wild type control group. The final height is 11% higher comparing the largest individuals of the construction group and wild type control group. The maximum height growth rate is 5% higher comparing the average of the construction group and wild type control group. The maximum height growth rate is 10% higher comparing the largest individuals of the construction group and wild type control group. The TFSTT051 construction group meets growth difference selection criterion (1) as shown in table 1.11d.

Tables 1.11a and 1.11b contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

Table 1.11a Height growth data for TFSTT051

| Days in greenhouse | Height (cm) |     |     |     |     |     |     |     |     |     |
|--------------------|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                    | 19          | 28  | 34  | 40  | 44  | 47  | 51  | 54  | 61  | 65  |
| TFSTT051-1B        | 13          | 24  | 43  | 57  | 69  | 76  | 83  | 89  | 104 | 112 |
| TFSTT051-2A        | 18          | 33  | 48  | 61  | 72  | 81  | 93  | 103 | 120 | 131 |
| TFSTT051-2B        | 17          | 28  | 44  | 56  | 67  | 76  | 88  | 96  | 117 | 129 |
| TFSTT051-3A        | 19          | 31  | 46  | 59  | 70  | 77  | 87  | 96  | 120 | 130 |
| TFSTT051-3B        | 16          | 33  | 52  | 67  | 79  | 90  | 101 | 112 | 134 | 145 |
| TFSTT051-4A        | 18          | 36  | 57  | 71  | 86  | 98  | 111 | 119 | 140 | 154 |
| TFSTT051-4B-1      | 18          | 34  | 52  | 67  | 81  | 87  | 96  | 103 | 123 | 136 |
| TFSTT051-4B-2      | 17          | 31  | 51  | 66  | 78  | 85  | 95  | 105 | 124 | 135 |
| T89-01             | 18          | 30  | 46  | 58  | 69  | 77  | 87  | 96  | 113 | 122 |
| T89-02             | 18          | 30  | 49  | 62  | 72  | 77  | 84  | 90  | 102 | 109 |
| T89-03             | 15          | 27  | 41  | 54  | 65  | 73  | 82  | 91  | 112 | 123 |
| T89-10             | N/A         | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| T89-11             | 19          | 31  | 49  | 61  | 74  | 83  | 94  | 103 | 124 | 133 |
| T89-12             | 17          | 30  | 45  | 58  | 69  | 77  | 90  | 100 | 123 | 134 |
| T89-13             | 18          | 27  | 43  | 56  | 68  | 78  | 91  | 100 | 121 | 133 |

|        |    |    |    |    |    |    |    |     |     |     |
|--------|----|----|----|----|----|----|----|-----|-----|-----|
| T89-14 | 5  | 26 | 42 | 56 | 67 | 74 | 83 | 90  | 109 | 119 |
| T89-15 | 10 | 15 | 25 | 33 | 41 | 45 | 52 | 57  | 72  | 82  |
| T89-16 | 19 | 33 | 53 | 63 | 73 | 82 | 93 | 102 | 119 | 130 |
| T89-17 | 17 | 29 | 46 | 58 | 66 | 72 | 80 | 86  | 96  | 102 |
| T89-18 | 16 | 30 | 48 | 59 | 71 | 81 | 93 | 103 | 122 | 132 |
| T89-19 | 18 | 32 | 50 | 65 | 77 | 84 | 94 | 102 | 126 | 139 |
| T89-20 | 16 | 33 | 52 | 67 | 79 | 88 | 98 | 105 | 124 | 139 |
| T89-21 | 17 | 29 | 44 | 58 | 67 | 73 | 83 | 90  | 110 | 122 |
| T89-22 | 14 | 28 | 47 | 61 | 71 | 80 | 89 | 98  | 119 | 133 |
| T89-23 | 10 | 33 | 45 | 53 | 63 | 71 | 82 | 90  | 112 | 123 |
| T89-24 | 20 | 28 | 43 | 51 | 62 | 69 | 78 | 87  | 106 | 119 |
| T89-25 | 14 | 26 | 38 | 52 | 64 | 72 | 82 | 89  | 110 | 122 |
| T89-26 | 15 | 28 | 44 | 57 | 69 | 77 | 87 | 96  | 120 | 133 |
| T89-27 | 18 | 29 | 47 | 62 | 75 | 82 | 92 | 103 | 125 | 138 |
| T89-28 | 22 | 37 | 54 | 67 | 78 | 88 | 97 | 104 | 123 | 133 |
| T89-29 | 16 | 33 | 49 | 63 | 76 | 84 | 93 | 100 | 123 | 138 |
| T89-30 | 15 | 40 | 46 | 58 | 67 | 74 | 85 | 92  | 113 | 124 |

Table 1.11b Diameter growth data for TFSTT051

| Days in greenhouse | Diameter (mm) |     |     |     |     |     |      |      |      |
|--------------------|---------------|-----|-----|-----|-----|-----|------|------|------|
|                    | 28            | 34  | 40  | 44  | 47  | 51  | 54   | 61   | 65   |
| TFSTT051-1B        | 3,2           | 4,6 | 5,6 | 6,4 | 6,6 | 7,3 | 7,2  | 7,8  | 8,0  |
| TFSTT051-2A        | 3,2           | 4,5 | 5,7 | 6,7 | 7,4 | 8,6 | 9,3  | 8,8  | 8,9  |
| TFSTT051-2B        | 3,1           | 4,4 | 6,0 | 6,0 | 6,8 | 8,0 | 8,2  | 9,0  | 9,2  |
| TFSTT051-3A        | 3,5           | 5,0 | 6,1 | 6,6 | 7,1 | 8,2 | 8,7  | 9,8  | 10,5 |
| TFSTT051-3B        | 4,2           | 5,6 | 6,8 | 8,0 | 8,5 | 9,4 | 9,8  | 10,2 | 11,1 |
| TFSTT051-4A        | 4,5           | 5,9 | 7,1 | 8,8 | 8,7 | 9,4 | 10,1 | 11,1 | 11,1 |
| TFSTT051-4B-1      | 4,1           | 5,6 | 6,8 | 7,9 | 8,1 | 8,6 | 9,7  | 10,7 | 11,6 |
| TFSTT051-4B-2      | 3,9           | 5,5 | 6,3 | 7,6 | 8,2 | 9,4 | 8,8  | 9,6  | 10,3 |
| T89-01             | 3,2           | 4,6 | 5,4 | 6,2 | 6,8 | 7,9 | 8,3  | 9,5  | 9,3  |
| T89-02             | 3,4           | 4,7 | 5,5 | 7,3 | 6,3 | 6,6 | 6,9  | 8,3  | 7,5  |
| T89-03             | 3,9           | 4,4 | 5,2 | 6,2 | 6,4 | 7,8 | 7,6  | 9,7  | 9,4  |
| T89-10             | N/A           | N/A | N/A | N/A | N/A | N/A | N/A  | N/A  | N/A  |
| T89-11             | 3,4           | 5,1 | 6,2 | 7,6 | 6,8 | 6,9 | 7,7  | 10,1 | 9,5  |
| T89-12             | 2,9           | 4,7 | 5,8 | 6,6 | 7,8 | 8,0 | 8,7  | 9,1  | 9,2  |
| T89-13             | 3,0           | 4,3 | 5,4 | 5,8 | 6,4 | 7,6 | 7,8  | 8,2  | 8,8  |
| T89-14             | 3,0           | 4,5 | 5,7 | 6,3 | 6,7 | 7,9 | 7,8  | 9,0  | 8,9  |
| T89-15             | N/A           | 2,1 | 3,0 | 4,0 | 4,0 | 4,5 | 4,9  | 5,5  | 5,6  |
| T89-16             | 3,5           | 5,3 | 6,4 | 6,6 | 7,0 | 7,2 | 8,3  | 8,2  | 9,0  |
| T89-17             | 3,4           | 4,6 | 5,1 | 5,4 | 6,0 | 6,4 | 6,5  | 6,8  | 7,1  |
| T89-18             | 3,6           | 5,2 | 6,0 | 7,0 | 7,8 | 8,2 | 9,9  | 10,3 | 9,7  |
| T89-19             | 4,2           | 5,5 | 6,6 | 7,7 | 8,5 | 8,9 | 9,5  | 11,1 | 12,3 |
| T89-20             | 4,1           | 5,5 | 6,6 | 8,1 | 9,3 | 9,6 | 9,3  | 10,0 | 11,1 |
| T89-21             | 3,1           | 5,6 | 5,8 | 6,7 | 7,1 | 7,8 | 8,4  | 9,7  | 10,1 |
| T89-22             | 3,2           | 4,4 | 5,6 | 6,5 | 7,5 | 7,6 | 7,8  | 8,9  | 9,2  |
| T89-23             | 2,4           | 4,2 | 5,1 | 6,1 | 6,5 | 7,5 | 10,1 | 9,3  | 10,2 |
| T89-24             | 3,2           | 4,5 | 5,1 | 6,3 | 7,0 | 7,6 | 8,1  | 8,8  | 9,1  |
| T89-25             | 3,3           | 4,3 | 5,2 | 5,8 | 6,5 | 7,4 | 7,8  | 9,3  | 9,7  |
| T89-26             | 3,3           | 4,4 | 5,5 | 6,6 | 7,2 | 8,1 | 8,9  | 9,5  | 10,5 |
| T89-27             | 3,3           | 4,9 | 6,0 | 7,8 | 8,0 | 8,9 | 9,7  | 11,2 | 11,5 |

|        |     |     |     |     |     |     |     |      |      |
|--------|-----|-----|-----|-----|-----|-----|-----|------|------|
| T89-28 | 4,5 | 5,7 | 7,4 | 7,8 | 8,5 | 9,4 | 9,7 | 10,2 | 11,1 |
| T89-29 | 3,1 | 4,7 | 6,3 | 7,2 | 7,9 | 9,2 | 9,8 | 11,1 | 10,7 |
| T89-30 | 3,0 | 5,8 | 6,2 | 7,7 | 7,9 | 8,6 | 8,2 | 10,1 | 10,3 |

Real-time RT-PCR was used to confirm over-expression of construct TFSTT051. Table 1.11c contains gene expression levels of construct gene relative to reference gene expression. All ratios between construct and reference gene expression levels shown are normalized to the average of wild type group ratios. 1 of 8 individuals of construction group TFSTT051 are over-expressed according to present RT-PCR data.

Table 1.11c Real-time RT-PCR data for TFSTT051

| Sample        | Relative gene expression level normalized to wild type average |
|---------------|----------------------------------------------------------------|
| TFSTT051-1B   | 1,18                                                           |
| TFSTT051-2A   | 7,42                                                           |
| TFSTT051-2B   | 1,13                                                           |
| TFSTT051-3A   | 0,30                                                           |
| TFSTT051-3B   | 1,06                                                           |
| TFSTT051-4A   | 0,65                                                           |
| TFSTT051-4B-1 | 1,34                                                           |
| TFSTT051-4B-2 | 0,76                                                           |
| T89-11        | 0,42                                                           |
| T89-12        | 1,65                                                           |
| T89-24        | 1,27                                                           |
| T89-25        | 0,66                                                           |

10 Results from growth analysis are specified in the overview table 1.11d. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and MDC.

15 Table 1.11d Overview table of growth effects of construct TFSTT051

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TFSTT051           | 1,07                 | 1,06                   | 1,05                               | 1,01                         | 1,11                 | 0,94                   | 1,10                                  | 0,90                         |

Construction group TF0013

This construct induces increased growth. The final height is 12% higher comparing the average of the construction group and wild type control group. The final height is 6% higher comparing the largest individuals of the construction group and wild type control group. The maximum height growth rate is 20% higher comparing the average of the construction group and wild type control group. The maximum height growth rate is 33% higher comparing the largest individuals of the construction group and wild type control group. The TF0013 construction group meets the more stringent level of growth difference selection criterion (4) and the less stringent level of growth difference selection criterion (1) and (3) as shown in table 1.12d.

Tables 1.12a and 1.12b contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

Table 1.12a Height growth data for TF0013

| Days in greenhouse | Height (cm) |     |     |     |     |     |     |     |     |     |     |
|--------------------|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                    | 18          | 22  | 25  | 29  | 32  | 39  | 43  | 46  | 50  | 53  | 57  |
| TF0013-1A-1        | 19          | 24  | 31  | 43  | 53  | 81  | 98  | 111 | 128 | 144 | 161 |
| TF0013-1A-2        | 12          | 15  | 19  | 27  | 37  | 62  | 77  | 90  | 108 | 125 | 159 |
| TF0013-2A          | N/A         | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| TF0013-2B          | 20          | 25  | 32  | 45  | 57  | 85  | 102 | 112 | 128 | 142 | 157 |
| TF0013-3A          | 19          | 25  | 33  | 47  | 58  | 88  | 103 | 116 | 134 | 151 | 170 |
| TF0013-3BA         | 24          | 30  | 37  | 52  | 64  | 94  | 112 | 125 | 144 | 159 | 179 |
| TF0013-3BB         | 19          | 26  | 31  | 43  | 53  | 84  | 100 | 114 | 130 | 144 | 164 |
| TF0013-4BA         | 25          | 31  | 40  | 52  | 63  | 89  | 107 | 117 | 130 | 141 | 155 |
| TF0013-4BB         | 20          | 25  | 31  | 45  | 57  | 83  | 100 | 111 | 128 | 145 | 162 |
| T89-01             | 14          | 17  | 22  | 31  | 40  | 64  | 76  | 88  | 102 | 118 | 135 |
| T89-02             | 17          | 20  | 25  | 36  | 45  | 69  | 79  | 90  | 104 | 118 | 133 |
| T89-03             | 21          | 29  | 35  | 47  | 57  | 81  | 94  | 104 | 119 | 132 | 147 |
| T89-04             | 13          | 14  | 17  | 25  | 33  | 45  | 52  | 57  | 70  | 79  | 92  |
| T89-05             | 15          | 18  | 24  | 33  | 42  | 69  | 83  | 94  | 106 | 120 | 137 |
| T89-06             | 18          | 23  | 29  | 40  | 51  | 78  | 91  | 103 | 120 | 134 | 152 |
| T89-07             | 20          | 24  | 30  | 41  | 51  | 74  | 88  | 96  | 109 | 121 | 130 |
| T89-08             | 27          | 32  | 40  | 52  | 62  | 88  | 99  | 111 | 124 | 134 | 148 |
| T89-09             | 23          | 27  | 34  | 46  | 56  | 83  | 97  | 106 | 122 | 132 | 149 |
| T89-10             | 13          | 15  | 20  | 27  | 37  | 59  | 72  | 83  | 98  | 111 | 128 |
| T89-11             | N/A         | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| T89-12             | 26          | 33  | 40  | 54  | 66  | 92  | 107 | 120 | 135 | 149 | 166 |
| T89-13             | 21          | 26  | 34  | 45  | 55  | 79  | 94  | 105 | 122 | 134 | 150 |

|        |    |    |    |    |    |    |     |     |     |     |     |
|--------|----|----|----|----|----|----|-----|-----|-----|-----|-----|
| T89-14 | 18 | 23 | 31 | 42 | 53 | 80 | 97  | 107 | 120 | 128 | 145 |
| T89-15 | 26 | 33 | 40 | 53 | 63 | 88 | 103 | 111 | 125 | 138 | 154 |
| T89-16 | 27 | 32 | 39 | 51 | 63 | 89 | 104 | 116 | 132 | 146 | 162 |
| T89-17 | 17 | 21 | 27 | 38 | 45 | 72 | 87  | 97  | 110 | 124 | 139 |
| T89-18 | 23 | 30 | 35 | 46 | 55 | 80 | 94  | 105 | 117 | 131 | 145 |
| T89-19 | 23 | 29 | 35 | 45 | 54 | 78 | 91  | 102 | 114 | 125 | 137 |
| T89-20 | 22 | 28 | 34 | 49 | 60 | 87 | 100 | 110 | 125 | 137 | 155 |
| T89-21 | 27 | 31 | 35 | 42 | 48 | 66 | 77  | 87  | 100 | 110 | 124 |
| T89-22 | 13 | 16 | 23 | 32 | 48 | 67 | 81  | 92  | 105 | 118 | 134 |
| T89-23 | 23 | 29 | 35 | 48 | 58 | 83 | 97  | 107 | 122 | 136 | 154 |
| T89-24 | 23 | 29 | 36 | 48 | 59 | 86 | 101 | 113 | 128 | 141 | 159 |
| T89-25 | 16 | 21 | 28 | 40 | 51 | 80 | 97  | 107 | 122 | 137 | 153 |
| T89-26 | 27 | 35 | 40 | 54 | 66 | 93 | 107 | 118 | 132 | 144 | 162 |
| T89-27 | 26 | 31 | 38 | 49 | 59 | 82 | 96  | 106 | 120 | 131 | 146 |
| T89-28 | 25 | 29 | 36 | 49 | 59 | 83 | 97  | 106 | 119 | 131 | 147 |
| T89-29 | 26 | 32 | 38 | 51 | 62 | 88 | 103 | 113 | 128 | 142 | 159 |
| T89-30 | 24 | 29 | 36 | 48 | 56 | 80 | 93  | 104 | 117 | 131 | 145 |
| T89-31 | 24 | 31 | 36 | 47 | 57 | 81 | 94  | 105 | 117 | 131 | 144 |
| T89-32 | 26 | 32 | 38 | 49 | 58 | 83 | 98  | 107 | 120 | 134 | 148 |
| T89-33 | 24 | 29 | 36 | 48 | 57 | 85 | 100 | 112 | 124 | 134 | 149 |
| T89-34 | 21 | 26 | 32 | 43 | 53 | 79 | 90  | 102 | 117 | 131 | 148 |
| T89-35 | 21 | 28 | 36 | 46 | 55 | 80 | 94  | 105 | 120 | 133 | 149 |
| T89-36 | 16 | 21 | 28 | 39 | 51 | 74 | 88  | 100 | 115 | 128 | 144 |
| T89-37 | 28 | 35 | 41 | 52 | 63 | 88 | 101 | 111 | 125 | 137 | 154 |
| T89-38 | 27 | 32 | 39 | 51 | 62 | 86 | 101 | 113 | 128 | 140 | 155 |
| T89-39 | 21 | 26 | 33 | 46 | 55 | 83 | 101 | 112 | 126 | 139 | 156 |
| T89-40 | 21 | 26 | 33 | 45 | 55 | 77 | 88  | 99  | 113 | 124 | 139 |
| T89-41 | 13 | 16 | 23 | 32 | 42 | 68 | 85  | 95  | 107 | 118 | 133 |
| T89-42 | 24 | 30 | 37 | 49 | 61 | 86 | 101 | 113 | 128 | 143 | 150 |
| T89-43 | 25 | 31 | 38 | 51 | 61 | 86 | 102 | 114 | 130 | 144 | 163 |
| T89-44 | 23 | 31 | 39 | 51 | 64 | 90 | 105 | 118 | 135 | 151 | 169 |
| T89-45 | 26 | 32 | 37 | 49 | 58 | 85 | 100 | 110 | 124 | 137 | 153 |
| T89-46 | 20 | 25 | 34 | 43 | 55 | 81 | 97  | 109 | 122 | 133 | 149 |

Table 1.12b Diameter growth data for TF0013

| Days in greenhouse | Diameter (mm) |     |     |     |     |     |      |      |
|--------------------|---------------|-----|-----|-----|-----|-----|------|------|
|                    | 29            | 32  | 39  | 43  | 46  | 50  | 53   | 57   |
| TF0013-1A-1        | 3,9           | 5,1 | 6,6 | 7,6 | 8,6 | 9,8 | 9,9  | 10,5 |
| TF0013-1A-2        | 3,0           | 2,8 | 5,5 | 6,5 | 7,2 | 8,3 | 8,6  | 8,6  |
| TF0013-2A          | N/A           | N/A | N/A | N/A | N/A | N/A | N/A  | N/A  |
| TF0013-2B          | 4,3           | 5,0 | 6,4 | 7,4 | 8,0 | 8,5 | 9,2  | 10,2 |
| TF0013-3A          | 4,6           | 5,4 | 7,1 | 8,2 | 8,7 | 9,7 | 10,3 | 10,7 |
| TF0013-3BA         | 4,4           | 5,0 | 7,2 | 7,5 | 9,1 | 9,1 | 9,8  | 10,6 |
| TF0013-3BB         | 3,8           | 5,2 | 6,7 | 7,5 | 7,5 | 8,4 | 9,0  | 9,8  |
| TF0013-4BA         | 4,7           | 5,7 | 6,1 | 6,8 | 7,4 | 8,8 | 9,0  | 9,6  |
| TF0013-4BB         | 3,8           | 4,9 | N/A | 8,4 | 8,3 | 9,0 | 9,6  | 9,9  |
| T89-01             | 3,2           | 3,7 | 5,3 | 6,2 | 6,9 | 7,9 | 8,3  | 8,7  |
| T89-02             | 3,2           | 3,9 | 5,1 | 6,4 | 7,0 | 7,6 | 8,6  | 8,6  |
| T89-03             | 4,2           | 5,3 | 6,4 | 6,9 | 6,9 | N/A | 8,8  | 9,8  |
| T89-04             | 2,2           | 3,0 | 4,2 | 4,5 | 5,4 | 5,0 | 5,4  | 6,1  |

|        |     |     |     |     |     |     |      |      |
|--------|-----|-----|-----|-----|-----|-----|------|------|
| T89-05 | 3,0 | 3,7 | 4,8 | 5,9 | 6,4 | 7,0 | 7,6  | 7,9  |
| T89-06 | 3,6 | 4,8 | 6,5 | 7,6 | 8,7 | 9,1 | 9,6  | 10,1 |
| T89-07 | 3,8 | 4,9 | 6,8 | 7,6 | 8,0 | 8,6 | 9,0  | 9,7  |
| T89-08 | 4,4 | 5,8 | 6,2 | 7,3 | 7,6 | 8,5 | 9,4  | 9,7  |
| T89-09 | 4,5 | 5,5 | 6,5 | 7,1 | 7,6 | 9,1 | 9,4  | 9,8  |
| T89-10 | 3,7 | 3,9 | 5,0 | 6,1 | 6,8 | 7,6 | 8,5  | 9,2  |
| T89-11 | N/A | N/A | N/A | N/A | N/A | N/A | N/A  | N/A  |
| T89-12 | 4,6 | 5,5 | 7,3 | 8,6 | 8,8 | 9,6 | 10,2 | 10,2 |
| T89-13 | 3,8 | 4,6 | 5,7 | 6,5 | 6,6 | 7,4 | 8,1  | 8,6  |
| T89-14 | 3,7 | 4,2 | 5,3 | 5,6 | 6,1 | 7,0 | 7,1  | 7,8  |
| T89-15 | 4,6 | 5,0 | 6,4 | 7,0 | 7,4 | 8,0 | 8,4  | 9,1  |
| T89-16 | 5,0 | 5,5 | 7,0 | 7,6 | 8,0 | 8,6 | 9,0  | 9,7  |
| T89-17 | 3,1 | 4,3 | 5,7 | 7,1 | 7,4 | 7,9 | 8,4  | 9,2  |
| T89-18 | 4,5 | 5,3 | 7,8 | 8,0 | 8,1 | 9,2 | 9,9  | 10,3 |
| T89-19 | 4,2 | 5,8 | 6,7 | 8,2 | 8,5 | 8,5 | 9,0  | 9,5  |
| T89-20 | 4,0 | 4,7 | 6,7 | 8,1 | 7,6 | 8,5 | 8,6  | 9,4  |
| T89-21 | 3,5 | 3,9 | 5,0 | 5,7 | 5,8 | 7,1 | 6,7  | 7,4  |
| T89-22 | 3,6 | 4,3 | 5,5 | 6,3 | 6,8 | 7,9 | 8,4  | 8,8  |
| T89-23 | 4,1 | 5,2 | 7,0 | 7,6 | 8,2 | 8,9 | 9,2  | 10,0 |
| T89-24 | 4,1 | 5,4 | 6,7 | 7,5 | 7,8 | 8,6 | 9,6  | 10,4 |
| T89-25 | 3,7 | 4,6 | 6,0 | 7,0 | 7,7 | 8,3 | 8,5  | 9,4  |
| T89-26 | 4,8 | 5,6 | 6,9 | 7,3 | 7,8 | 8,6 | 9,2  | 9,5  |
| T89-27 | 3,8 | 4,9 | 6,2 | 6,7 | 6,9 | 7,6 | 8,4  | 9,3  |
| T89-28 | 4,5 | 5,5 | 6,8 | 7,3 | 7,8 | 9,1 | 9,1  | 9,5  |
| T89-29 | 4,4 | 5,3 | 6,8 | 6,8 | 7,4 | 8,2 | 9,2  | 8,9  |
| T89-30 | 3,7 | 4,7 | 5,4 | 6,6 | 7,0 | 7,0 | 7,7  | 8,5  |
| T89-31 | 4,0 | 4,5 | 5,5 | 6,9 | 7,0 | 8,0 | 9,1  | 9,6  |
| T89-32 | 3,6 | 4,5 | 5,7 | 7,0 | 7,2 | 8,0 | 9,1  | 9,4  |
| T89-33 | 3,9 | 4,6 | 6,7 | 7,3 | 8,0 | 8,6 | 9,4  | 10,5 |
| T89-34 | 3,6 | 4,5 | 5,9 | 6,9 | 7,5 | 8,2 | 9,1  | 9,4  |
| T89-35 | 3,9 | 4,5 | 5,7 | 7,1 | 7,5 | 7,9 | 8,8  | 9,6  |
| T89-36 | 3,6 | 5,0 | 5,7 | 6,5 | 6,8 | 7,9 | 8,2  | 9,1  |
| T89-37 | 4,3 | 5,6 | 7,1 | 8,0 | 8,0 | 8,9 | 9,7  | 10,2 |
| T89-38 | 4,7 | 5,8 | 6,7 | 7,8 | 8,0 | 8,7 | 9,2  | 9,7  |
| T89-39 | 4,2 | 5,0 | 6,2 | 7,3 | 8,2 | 8,1 | 8,7  | 9,6  |
| T89-40 | 3,6 | 4,4 | 5,2 | 5,7 | 6,0 | 7,2 | 7,2  | 8,0  |
| T89-41 | 3,5 | 4,3 | 5,5 | 6,5 | 7,0 | 7,5 | 7,7  | 8,4  |
| T89-42 | 4,4 | 5,1 | 7,5 | 8,4 | 9,5 | 9,9 | 10,0 | 10,3 |
| T89-43 | 4,3 | 5,0 | 6,5 | 7,3 | 7,8 | 8,3 | 8,9  | 9,1  |
| T89-44 | 4,3 | 5,8 | 6,8 | 8,1 | 8,6 | 9,5 | 9,9  | 10,5 |
| T89-45 | 4,2 | 4,9 | 6,8 | 7,5 | 7,6 | 8,5 | 9,4  | 9,7  |
| T89-46 | 3,5 | 4,4 | 5,7 | 7   | 7,5 | 8,6 | 9,4  | 9,8  |

Real-time RT-PCR was used to confirm over-expression of construct TF0013. Table 1.12c contains gene expression levels of construct gene relative to reference gene expression. All ratios between construct and reference gene expression levels shown are normalized to the average of wild type group ratios. 3 of 8 individuals of construction group TF0013 are over-expressed according to present RT-PCR data.

Table 1.12c Real-time RT-PCR data for TF0013

| Sample      | Relative gene expression level<br>normalized to wild type average |
|-------------|-------------------------------------------------------------------|
| TF0013-1A-1 | 0,59                                                              |
| TF0013-1A-2 | 1,02                                                              |
| TF0013-2B   | 2,32                                                              |
| TF0013-3A   | 0,90                                                              |
| TF0013-3BA  | 0,86                                                              |
| TF0013-3BB  | 0,80                                                              |
| TF0013-4BA  | 1,38                                                              |
| TF0013-4BB  | 1,65                                                              |
| T89-03      | 1,22                                                              |
| T89-36      | 1,04                                                              |
| T89-37      | 0,90                                                              |
| T89-38      | 0,85                                                              |

Results from growth analysis are specified in the overview table 1.12d. The determined  
5 growth effects of specified construction group are presented as ratios between  
construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and  
MDC.

Table 1.12d Overview table of growth effects of construct TF0013

| Construction<br>group | Average<br>Final<br>Height | Average<br>Final<br>Diameter | Average<br>Maximum<br>Height<br>Growth<br>Rate | Average<br>Diameter<br>Growth<br>Rate | Maximum<br>Final<br>Height | Maximum<br>Final<br>Diameter | Maximum<br>of<br>Maximum<br>Height<br>Growth<br>Rate | Maximum<br>Diameter<br>Growth<br>Rate |
|-----------------------|----------------------------|------------------------------|------------------------------------------------|---------------------------------------|----------------------------|------------------------------|------------------------------------------------------|---------------------------------------|
| TF0013                | 1,12                       | 1,07                         | 1,20                                           | 1,12                                  | 1,06                       | 1,02                         | 1,33                                                 | 1,01                                  |

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### 1.3.10 Construction group TF0097

This construct induces increased growth. The final height is 10% higher comparing the  
average of the construction group and wild type control group. The final height is 16%  
higher comparing the largest individuals of the construction group and wild type control  
15 group. The maximum height growth rate is 15% higher comparing the average of the  
construction group and wild type control group. The maximum height growth rate is 15%  
higher comparing the largest individuals of the construction group and wild type control  
group. The diameter growth rate is 7% higher comparing the average of the construction

group and wild type control group. The diameter growth rate is 21% higher comparing the largest individuals of the construction group and wild type control group. The TF0097 construction group meets the more stringent level of growth difference selection criterion (1) and the less stringent level of growth difference selection criterion (4) as shown in 5 table 1.13d.

Tables 1.13a and 1.13b contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

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Table 1.13a Height growth data for TF0097

| Days in greenhouse | Height (cm) |    |    |     |     |     |
|--------------------|-------------|----|----|-----|-----|-----|
|                    | 16          | 20 | 29 | 34  | 41  | 48  |
| TF0097-1A          | 28          | 35 | 71 | 93  | 133 | 176 |
| TF0097-1B          | 26          | 36 | 72 | 100 | 137 | 171 |
| TF0097-2A          | 19          | 22 | 42 | 57  | 79  | 101 |
| TF0097-2B          | 31          | 40 | 79 | 105 | 138 | 175 |
| TF0097-3A-1        | 28          | 36 | 73 | 96  | 130 | 166 |
| TF0097-3A-2        | 30          | 38 | 72 | 100 | 141 | 178 |
| TF0097-4A-1        | 27          | 32 | 48 | 68  | 103 | 140 |
| TF0097-4A-2        | 28          | 34 | 65 | 85  | 118 | 141 |
| TF0097-4B          | 25          | 10 | 23 | 37  | 65  | 92  |
| T89-01             | 28          | 35 | 66 | 89  | 122 | 150 |
| T89-02             | 25          | 35 | 62 | 80  | 103 | 128 |
| T89-03             | 24          | 33 | 61 | 83  | 113 | 142 |
| T89-04             | 27          | 34 | 65 | 87  | 120 | 152 |
| T89-05             | 27          | 32 | 59 | 80  | 107 | 138 |
| T89-06             | 25          | 32 | 61 | 77  | 106 | 135 |
| T89-07             | 22          | 28 | 50 | 67  | 92  | 120 |
| T89-08             | 24          | 29 | 56 | 75  | 103 | 122 |
| T89-09             | 20          | 24 | 45 | 61  | 91  | 115 |
| T89-10             | 22          | 28 | 52 | 70  | 99  | 124 |
| T89-11             | 26          | 32 | 63 | 80  | 110 | 142 |
| T89-12             | 27          | 32 | 60 | 80  | 109 | 132 |
| T89-13             | 23          | 30 | 59 | 79  | 107 | 133 |
| T89-14             | 26          | 31 | 60 | 79  | 106 | 131 |
| T89-15             | 26          | 32 | 58 | 79  | 110 | 133 |
| T89-16             | 29          | 32 | 65 | 87  | 121 | 151 |
| T89-17             | 25          | 32 | 59 | 79  | 105 | 133 |
| T89-18             | 29          | 37 | 67 | 86  | 114 | 136 |
| T89-19             | 29          | 35 | 66 | 84  | 111 | 129 |
| T89-20             | 27          | 38 | 64 | 83  | 112 | 122 |
| T89-21             | 28          | 33 | 58 | 79  | 108 | 132 |
| T89-22             | 25          | 33 | 54 | 83  | 113 | 140 |
| T89-23             | 24          | 31 | 56 | 75  | 104 | 134 |

|        |    |    |    |    |     |     |
|--------|----|----|----|----|-----|-----|
| T89-24 | 25 | 33 | 58 | 78 | 106 | 136 |
| T89-25 | 26 | 33 | 62 | 80 | 111 | 142 |
| T89-26 | 28 | 35 | 64 | 81 | 113 | 146 |
| T89-27 | 26 | 31 | 60 | 75 | 107 | 140 |
| T89-28 | 28 | 34 | 61 | 83 | 116 | 147 |
| T89-29 | 19 | 24 | 49 | 70 | 101 | 132 |
| T89-30 | 26 | 33 | 57 | 77 | 110 | 140 |
| T89-31 | 25 | 35 | 63 | 81 | 115 | 140 |
| T89-32 | 28 | 36 | 67 | 89 | 121 | 151 |
| T89-33 | 26 | 33 | 63 | 85 | 110 | 126 |
| T89-34 | 28 | 35 | 59 | 77 | 107 | 135 |
| T89-35 | 26 | 34 | 59 | 77 | 107 | 132 |
| T89-36 | 26 | 32 | 61 | 79 | 107 | 136 |
| T89-37 | 22 | 23 | 39 | 54 | 78  | 106 |
| T89-38 | 27 | 35 | 58 | 74 | 98  | 124 |
| T89-39 | 24 | 29 | 53 | 73 | 103 | 128 |
| T89-40 | 22 | 27 | 52 | 70 | 101 | 121 |
| T89-41 | 27 | 34 | 64 | 81 | 111 | 143 |
| T89-42 | 25 | 33 | 63 | 79 | 111 | 142 |
| T89-43 | 26 | 33 | 62 | 84 | 117 | 148 |
| T89-44 | 26 | 32 | 64 | 82 | 115 | 149 |
| T89-45 | 24 | 33 | 60 | 79 | 107 | 134 |
| T89-46 | 27 | 34 | 64 | 88 | 121 | 147 |
| T89-47 | 24 | 32 | 61 | 78 | 101 | 121 |
| T89-48 | 24 | 31 | 62 | 79 | 108 | 140 |
| T89-49 | 27 | 35 | 63 | 80 | 109 | 138 |
| T89-50 | 26 | 33 | 61 | 80 | 108 | 135 |
| T89-51 | 20 | 25 | 52 | 70 | 98  | 116 |
| T89-52 | 24 | 28 | 53 | 73 | 99  | 128 |
| T89-53 | 21 | 31 | 58 | 75 | 100 | 115 |
| T89-54 | 22 | 30 | 54 | 72 | 105 | 133 |
| T89-55 | 21 | 27 | 53 | 73 | 105 | 129 |
| T89-56 | 29 | 36 | 67 | 84 | 115 | 147 |
| T89-57 | 27 | 32 | 60 | 80 | 111 | 139 |
| T89-58 | 29 | 38 | 67 | 86 | 119 | 150 |
| T89-59 | 25 | 32 | 63 | 86 | 120 | 149 |
| T89-60 | 27 | 33 | 62 | 84 | 119 | 154 |
| T89-61 | 26 | 35 | 65 | 89 | 124 | 152 |
| T89-62 | 24 | 30 | 57 | 79 | 107 | 134 |
| T89-63 | 25 | 33 | 62 | 81 | 111 | 134 |
| T89-64 | 21 | 29 | 58 | 79 | 110 | 139 |
| T89-65 | 23 | 31 | 55 | 70 | 96  | 122 |
| T89-66 | 25 | 32 | 61 | 82 | 113 | 142 |
| T89-67 | 25 | 30 | 50 | 75 | 105 | 131 |
| T89-68 | 22 | 31 | 61 | 80 | 110 | 138 |
| T89-69 | 25 | 33 | 56 | 74 | 101 | 128 |
| T89-70 | 21 | 28 | 59 | 77 | 105 | 135 |
| T89-71 | 20 | 26 | 57 | 73 | 101 | 129 |
| T89-72 | 26 | 33 | 62 | 82 | 115 | 144 |

Table 1.13b Diameter growth data for TF0097

| Days in greenhouse | Diameter (mm) |     |     |     |
|--------------------|---------------|-----|-----|-----|
|                    | 29            | 34  | 41  | 48  |
| TF0097-1A          | 4,7           | 5,0 | 6,9 | 8,2 |
| TF0097-1B          | 4,2           | 5,1 | 6,9 | 8,2 |
| TF0097-2A          | 3,0           | 3,6 | 4,1 | 7,9 |
| TF0097-2B          | 5,9           | 6,6 | 7,1 | 8,6 |
| TF0097-3A-1        | 4,9           | 5,9 | 7,0 | 8,1 |
| TF0097-3A-2        | 5,2           | 6,4 | 8,1 | 9,3 |
| TF0097-4A-1        | 3,9           | 5,7 | 5,0 | 6,2 |
| TF0097-4A-2        | 4,7           | 4,8 | 5,6 | 6,4 |
| TF0097-4B          | 2,5           | 2,9 | 4,0 | 4,8 |
| T89-01             | 5,3           | 6,3 | 8,0 | 8,8 |
| T89-02             | 4,8           | 5,3 | 6,7 | 7,1 |
| T89-03             | 5,3           | 6,4 | 8,2 | 8,7 |
| T89-04             | 5,3           | 6,5 | 7,9 | 9,3 |
| T89-05             | 5,4           | 6,5 | 7,6 | 8,1 |
| T89-06             | 5,3           | 6,0 | 7,2 | 8,4 |
| T89-07             | 4,0           | 4,8 | 7,2 | 7,7 |
| T89-08             | 4,5           | 5,4 | 6,3 | 7,1 |
| T89-09             | 3,7           | 4,7 | 6,1 | 7,5 |
| T89-10             | 4,4           | 5,5 | 6,9 | 7,6 |
| T89-11             | 5,4           | 6,4 | 7,1 | 8,0 |
| T89-12             | 5,5           | 5,7 | 6,8 | 8,1 |
| T89-13             | 5,2           | 6,0 | 6,7 | 7,4 |
| T89-14             | 5,3           | 6,4 | 6,7 | 7,9 |
| T89-15             | 5,1           | 6,4 | 6,9 | 7,8 |
| T89-16             | 5,2           | 6,4 | 7,6 | 9,2 |
| T89-17             | 5,0           | 5,7 | 6,5 | 7,9 |
| T89-18             | 5,8           | 6,4 | 7,1 | 7,7 |
| T89-19             | 5,4           | 6,4 | 7,5 | 8,0 |
| T89-20             | 5,6           | 6,6 | 8,3 | 8,6 |
| T89-21             | 5,0           | 5,8 | 6,9 | 7,8 |
| T89-22             | 5,4           | 6,5 | 8,2 | 8,9 |
| T89-23             | 4,7           | 5,3 | 7,1 | 8,0 |
| T89-24             | 4,8           | 6,3 | 6,9 | 8,4 |
| T89-25             | 5,0           | 6,3 | 6,9 | 7,8 |
| T89-26             | 5,6           | 6,6 | 7,5 | 8,5 |
| T89-27             | 5,5           | 6,0 | 7,5 | 8,8 |
| T89-28             | 6,0           | 7,1 | 7,7 | 8,8 |
| T89-29             | 4,2           | 5,3 | 6,8 | 8,5 |
| T89-30             | 5,5           | 6,4 | 8,0 | 9,3 |
| T89-31             | 5,7           | 5,7 | 8,4 | 8,9 |
| T89-32             | 5,4           | 6,5 | 7,8 | 9,0 |
| T89-33             | 5,6           | 6,3 | 6,8 | 7,4 |
| T89-34             | 5,1           | 6,1 | 7,2 | 8,1 |
| T89-35             | 5,6           | 6,7 | 7,7 | 8,2 |
| T89-36             | 5,4           | 6,2 | 7,7 | 9,4 |
| T89-37             | 2,8           | 3,3 | 4,7 | 5,5 |
| T89-38             | 5,1           | 5,5 | 7,1 | 8,4 |
| T89-39             | 4,9           | 5,5 | 6,5 | 7,4 |
| T89-40             | 4,9           | 6,4 | 7,6 | 7,6 |
| T89-41             | 5,6           | 7   | 7,3 | 9,1 |

|        |     |     |     |     |
|--------|-----|-----|-----|-----|
| T89-42 | 5,9 | 6,4 | 7,7 | 8,4 |
| T89-43 | 5,4 | 6,7 | 8,2 | 9,1 |
| T89-44 | 6,4 | 6,4 | 8,1 | 9,3 |
| T89-45 | 5,6 | 6,4 | 7,8 | 8,0 |
| T89-46 | 6,1 | 6,4 | 7,9 | 9,5 |
| T89-47 | 5,2 | 5,9 | 6,5 | 6,9 |
| T89-48 | 5,1 | 6,1 | 7,3 | 8,8 |
| T89-49 | 5,3 | 5,9 | 7,3 | 7,7 |
| T89-50 | 5,3 | 6,8 | 7,7 | 8,2 |
| T89-51 | 4,7 | 5,7 | 7   | 7,5 |
| T89-52 | 4,9 | 5,5 | 6,9 | 8,2 |
| T89-53 | 5,1 | 6,1 | 6,8 | 7,5 |
| T89-54 | 4,7 | 5,9 | 6,7 | 7,7 |
| T89-55 | 4,8 | 5,9 | 7,1 | 7,9 |
| T89-56 | 5,4 | 6,9 | 7,7 | 9,1 |
| T89-57 | 5,3 | 6,5 | 7,5 | 9,2 |
| T89-58 | 5,5 | 6,5 | 8   | 8,8 |
| T89-59 | 5,8 | 6,4 | 7,7 | 8,4 |
| T89-60 | 5,6 | 6,2 | 7,9 | 9,6 |
| T89-61 | 5,6 | 7   | 8,3 | 9,4 |
| T89-62 | 5,1 | 6,3 | 7,2 | 7,7 |
| T89-63 | 5,5 | 7,1 | 8   | 8,4 |
| T89-64 | 4,7 | 6,2 | 8,4 | 8,1 |
| T89-65 | 5,3 | 6,1 | 6,9 | 8,2 |
| T89-66 | 5,2 | 6   | 7,2 | 8,4 |
| T89-67 | 5,8 | 6,5 | 7,7 | 8,9 |
| T89-68 | 5   | 6,1 | 7,5 | 8,2 |
| T89-69 | 5,1 | 6,4 | 7,2 | 9,0 |
| T89-70 | 5   | 6,1 | 6,6 | 7,4 |
| T89-71 | 4,9 | 6,4 | 7,2 | 8,7 |
| T89-72 | 5,8 | 6,8 | 7,9 | 9,1 |

Real-time RT-PCR was used to confirm over-expression of construct TF0097. Table 1.13c contains gene expression levels of construct gene relative to reference gene expression. All ratios between construct and reference gene expression levels shown are normalized to the average of wild type group ratios. 2 of 9 individuals of construction group TF0097 are over-expressed according to present RT-PCR data.

Table 1.13c Real-time RT-PCR data for TF0097

| Sample      | Relative gene expression level normalized to wild type average |
|-------------|----------------------------------------------------------------|
| TF0097-1A   | 1,85                                                           |
| TF0097-1B   | 1,66                                                           |
| TF0097-2A   | 1,45                                                           |
| TF0097-2B   | 1,57                                                           |
| TF0097-3A-1 | 1,09                                                           |

|             |      |
|-------------|------|
| TF0097-3A-2 | 1,71 |
| TF0097-4A-1 | 0,79 |
| TF0097-4A-2 | 4,64 |
| TF0097-4B   | 3,20 |
| T89-03      | 1,98 |
| T89-17      | 0,38 |
| T89-19      | 0,64 |

Results from growth analysis are specified in the overview table 1.13d. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and 5 MDC.

Table 1.13d Overview table of growth effects of construct TF0097

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TF0097             | 1,10                 | 0,91                   | 1,15                               | 1,07                         | 1,16                 | 0,97                   | 1,15                                  | 1,21                         |

#### 1.3.11 Construction group TFSTT019

- 10 This construct induces increased growth. The final diameter is 11% higher comparing the average of the construction group and wild type control group. The final diameter is 8% higher comparing the largest individuals of the construction group and wild type control group. The diameter growth rate is 18% higher comparing the average of the construction group and wild type control group. The diameter growth rate is 9% higher comparing the 15 largest individuals of the construction group and wild type control group. The TFSTT019 construction group meets growth difference selection criterion (2) as shown in table 1.14c.

Tables 1.14a and 1.14b contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of 20 individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

Table 1.14a Height growth data for TFSTT019

| Days in greenhouse | Height (cm) |     |     |     |     |     |     |     |     |     |     |
|--------------------|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                    | 18          | 22  | 25  | 29  | 32  | 39  | 43  | 46  | 50  | 53  | 57  |
| TFSTT019-1A        | N/A         | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| TFSTT019-1BA       | 18          | 22  | 29  | 39  | 49  | 73  | 84  | 91  | 103 | 115 | 129 |
| TFSTT019-1BB       | 21          | 26  | 34  | 46  | 55  | 82  | 99  | 107 | 120 | 132 | 145 |
| TFSTT019-2A        | 24          | 30  | 37  | 51  | 61  | 88  | 104 | 114 | 128 | 140 | 157 |
| TFSTT019-2B        | 11          | 14  | 18  | 28  | 37  | 60  | 73  | 86  | 102 | 115 | 132 |
| TFSTT019-3A        | 23          | 31  | 37  | 50  | 57  | 81  | 94  | 106 | 119 | 129 | 144 |
| TFSTT019-4BA       | 27          | 32  | 39  | 49  | 58  | 84  | 99  | 110 | 124 | 137 | 152 |
| TFSTT019-4BB       | 21          | 27  | 35  | 47  | 57  | 84  | 99  | 110 | 124 | 137 | 151 |
| T89-01             | 14          | 17  | 22  | 31  | 40  | 64  | 76  | 88  | 102 | 118 | 135 |
| T89-02             | 17          | 20  | 25  | 36  | 45  | 69  | 79  | 90  | 104 | 118 | 133 |
| T89-03             | 21          | 29  | 35  | 47  | 57  | 81  | 94  | 104 | 119 | 132 | 147 |
| T89-04             | 13          | 14  | 17  | 25  | 33  | 45  | 52  | 57  | 70  | 79  | 92  |
| T89-05             | 15          | 18  | 24  | 33  | 42  | 69  | 83  | 94  | 106 | 120 | 137 |
| T89-06             | 18          | 23  | 29  | 40  | 51  | 78  | 91  | 103 | 120 | 134 | 152 |
| T89-07             | 20          | 24  | 30  | 41  | 51  | 74  | 88  | 96  | 109 | 121 | 130 |
| T89-08             | 27          | 32  | 40  | 52  | 62  | 88  | 99  | 111 | 124 | 134 | 148 |
| T89-09             | 23          | 27  | 34  | 46  | 56  | 83  | 97  | 106 | 122 | 132 | 149 |
| T89-10             | 13          | 15  | 20  | 27  | 37  | 59  | 72  | 83  | 98  | 111 | 128 |
| T89-11             | N/A         | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| T89-12             | 26          | 33  | 40  | 54  | 66  | 92  | 107 | 120 | 135 | 149 | 166 |
| T89-13             | 21          | 26  | 34  | 45  | 55  | 79  | 94  | 105 | 122 | 134 | 150 |
| T89-14             | 18          | 23  | 31  | 42  | 53  | 80  | 97  | 107 | 120 | 128 | 145 |
| T89-15             | 26          | 33  | 40  | 53  | 63  | 88  | 103 | 111 | 125 | 138 | 154 |
| T89-16             | 27          | 32  | 39  | 51  | 63  | 89  | 104 | 116 | 132 | 146 | 162 |
| T89-17             | 17          | 21  | 27  | 38  | 45  | 72  | 87  | 97  | 110 | 124 | 139 |
| T89-18             | 23          | 30  | 35  | 46  | 55  | 80  | 94  | 105 | 117 | 131 | 145 |
| T89-19             | 23          | 29  | 35  | 45  | 54  | 78  | 91  | 102 | 114 | 125 | 137 |
| T89-20             | 22          | 28  | 34  | 49  | 60  | 87  | 100 | 110 | 125 | 137 | 155 |
| T89-21             | 27          | 31  | 35  | 42  | 48  | 66  | 77  | 87  | 100 | 110 | 124 |
| T89-22             | 13          | 16  | 23  | 32  | 48  | 67  | 81  | 92  | 105 | 118 | 134 |
| T89-23             | 23          | 29  | 35  | 48  | 58  | 83  | 97  | 107 | 122 | 136 | 154 |
| T89-24             | 23          | 29  | 36  | 48  | 59  | 86  | 101 | 113 | 128 | 141 | 159 |
| T89-25             | 16          | 21  | 28  | 40  | 51  | 80  | 97  | 107 | 122 | 137 | 153 |
| T89-26             | 27          | 35  | 40  | 54  | 66  | 93  | 107 | 118 | 132 | 144 | 162 |
| T89-27             | 26          | 31  | 38  | 49  | 59  | 82  | 96  | 106 | 120 | 131 | 146 |
| T89-28             | 25          | 29  | 36  | 49  | 59  | 83  | 97  | 106 | 119 | 131 | 147 |
| T89-29             | 26          | 32  | 38  | 51  | 62  | 88  | 103 | 113 | 128 | 142 | 159 |
| T89-30             | 24          | 29  | 36  | 48  | 56  | 80  | 93  | 104 | 117 | 131 | 145 |
| T89-31             | 24          | 31  | 36  | 47  | 57  | 81  | 94  | 105 | 117 | 131 | 144 |
| T89-32             | 26          | 32  | 38  | 49  | 58  | 83  | 98  | 107 | 120 | 134 | 148 |
| T89-33             | 24          | 29  | 36  | 48  | 57  | 85  | 100 | 112 | 124 | 134 | 149 |
| T89-34             | 21          | 26  | 32  | 43  | 53  | 79  | 90  | 102 | 117 | 131 | 148 |
| T89-35             | 21          | 28  | 36  | 46  | 55  | 80  | 94  | 105 | 120 | 133 | 149 |
| T89-36             | 16          | 21  | 28  | 39  | 51  | 74  | 88  | 100 | 115 | 128 | 144 |
| T89-37             | 28          | 35  | 41  | 52  | 63  | 88  | 101 | 111 | 125 | 137 | 154 |
| T89-38             | 27          | 32  | 39  | 51  | 62  | 86  | 101 | 113 | 128 | 140 | 155 |
| T89-39             | 21          | 26  | 33  | 46  | 55  | 83  | 101 | 112 | 126 | 139 | 156 |
| T89-40             | 21          | 26  | 33  | 45  | 55  | 77  | 88  | 99  | 113 | 124 | 139 |

|        |    |    |    |    |    |    |     |     |     |     |     |
|--------|----|----|----|----|----|----|-----|-----|-----|-----|-----|
| T89-41 | 13 | 16 | 23 | 32 | 42 | 68 | 85  | 95  | 107 | 118 | 133 |
| T89-42 | 24 | 30 | 37 | 49 | 61 | 86 | 101 | 113 | 128 | 143 | 150 |
| T89-43 | 25 | 31 | 38 | 51 | 61 | 86 | 102 | 114 | 130 | 144 | 163 |
| T89-44 | 23 | 31 | 39 | 51 | 64 | 90 | 105 | 118 | 135 | 151 | 169 |
| T89-45 | 26 | 32 | 37 | 49 | 58 | 85 | 100 | 110 | 124 | 137 | 153 |
| T89-46 | 20 | 25 | 34 | 43 | 55 | 81 | 97  | 109 | 122 | 133 | 149 |

Table 1.14b Diameter growth data for TFSTT019

| Days in greenhouse | Diameter (mm) |     |     |     |     |      |      |      |
|--------------------|---------------|-----|-----|-----|-----|------|------|------|
|                    | 29            | 32  | 39  | 43  | 46  | 50   | 53   | 57   |
| TFSTT019-1A        | N/A           | N/A | N/A | N/A | N/A | N/A  | N/A  | N/A  |
| TFSTT019-1BA       | 3,7           | 5,0 | 7,1 | 7,9 | 8,4 | 8,6  | 9,7  | 10,2 |
| TFSTT019-1BB       | 4,0           | 4,7 | 6,4 | 7,3 | 8,0 | 8,7  | 9,2  | 9,4  |
| TFSTT019-2A        | 4,5           | 5,1 | 7,2 | 7,8 | 9,0 | 9,8  | 10,2 | 10,7 |
| TFSTT019-2B        | 3,5           | 4,2 | 6,0 | 7,1 | 7,6 | 8,5  | 9,0  | 9,1  |
| TFSTT019-3A        | 4,1           | 5,1 | 6,9 | 8,4 | 9,0 | 10,5 | 10,8 | 11,1 |
| TFSTT019-4BA       | 4,4           | 5,5 | 7,3 | 8,4 | 9,2 | 9,5  | 10,1 | 11,3 |
| TFSTT019-4BB       | 4,5           | 5,7 | 7,1 | 8,1 | 8,4 | 9,5  | 10,2 | 10,6 |
| T89-01             | 3,2           | 3,7 | 5,3 | 6,2 | 6,9 | 7,9  | 8,3  | 8,7  |
| T89-02             | 3,2           | 3,9 | 5,1 | 6,4 | 7,0 | 7,6  | 8,6  | 8,6  |
| T89-03             | 4,2           | 5,3 | 6,4 | 6,9 | 6,9 | N/A  | 8,8  | 9,8  |
| T89-04             | 2,2           | 3,0 | 4,2 | 4,5 | 5,4 | 5,0  | 5,4  | 6,1  |
| T89-05             | 3,0           | 3,7 | 4,8 | 5,9 | 6,4 | 7,0  | 7,6  | 7,9  |
| T89-06             | 3,6           | 4,8 | 6,5 | 7,6 | 8,7 | 9,1  | 9,6  | 10,1 |
| T89-07             | 3,8           | 4,9 | 6,8 | 7,6 | 8,0 | 8,6  | 9,0  | 9,7  |
| T89-08             | 4,4           | 5,8 | 6,2 | 7,3 | 7,6 | 8,5  | 9,4  | 9,7  |
| T89-09             | 4,5           | 5,5 | 6,5 | 7,1 | 7,6 | 9,1  | 9,4  | 9,8  |
| T89-10             | 3,7           | 3,9 | 5,0 | 6,1 | 6,8 | 7,6  | 8,5  | 9,2  |
| T89-11             | N/A           | N/A | N/A | N/A | N/A | N/A  | N/A  | N/A  |
| T89-12             | 4,6           | 5,5 | 7,3 | 8,6 | 8,8 | 9,6  | 10,2 | 10,2 |
| T89-13             | 3,8           | 4,6 | 5,7 | 6,5 | 6,6 | 7,4  | 8,1  | 8,6  |
| T89-14             | 3,7           | 4,2 | 5,3 | 5,6 | 6,1 | 7,0  | 7,1  | 7,8  |
| T89-15             | 4,6           | 5,0 | 6,4 | 7,0 | 7,4 | 8,0  | 8,4  | 9,1  |
| T89-16             | 5,0           | 5,5 | 7,0 | 7,6 | 8,0 | 8,6  | 9,0  | 9,7  |
| T89-17             | 3,1           | 4,3 | 5,7 | 7,1 | 7,4 | 7,9  | 8,4  | 9,2  |
| T89-18             | 4,5           | 5,3 | 7,8 | 8,0 | 8,1 | 9,2  | 9,9  | 10,3 |
| T89-19             | 4,2           | 5,8 | 6,7 | 8,2 | 8,5 | 8,5  | 9,0  | 9,5  |
| T89-20             | 4,0           | 4,7 | 6,7 | 8,1 | 7,6 | 8,5  | 8,6  | 9,4  |
| T89-21             | 3,5           | 3,9 | 5,0 | 5,7 | 5,8 | 7,1  | 6,7  | 7,4  |
| T89-22             | 3,6           | 4,3 | 5,5 | 6,3 | 6,8 | 7,9  | 8,4  | 8,8  |
| T89-23             | 4,1           | 5,2 | 7,0 | 7,6 | 8,2 | 8,9  | 9,2  | 10,0 |
| T89-24             | 4,1           | 5,4 | 6,7 | 7,5 | 7,8 | 8,6  | 9,6  | 10,4 |
| T89-25             | 3,7           | 4,6 | 6,0 | 7,0 | 7,7 | 8,3  | 8,5  | 9,4  |
| T89-26             | 4,8           | 5,6 | 6,9 | 7,3 | 7,8 | 8,6  | 9,2  | 9,5  |
| T89-27             | 3,8           | 4,9 | 6,2 | 6,7 | 6,9 | 7,6  | 8,4  | 9,3  |
| T89-28             | 4,5           | 5,5 | 6,8 | 7,3 | 7,8 | 9,1  | 9,1  | 9,5  |
| T89-29             | 4,4           | 5,3 | 6,8 | 6,8 | 7,4 | 8,2  | 9,2  | 8,9  |
| T89-30             | 3,7           | 4,7 | 5,4 | 6,6 | 7,0 | 7,0  | 7,7  | 8,5  |
| T89-31             | 4,0           | 4,5 | 5,5 | 6,9 | 7,0 | 8,0  | 9,1  | 9,6  |
| T89-32             | 3,6           | 4,5 | 5,7 | 7,0 | 7,2 | 8,0  | 9,1  | 9,4  |

|        |     |     |     |     |     |     |      |      |
|--------|-----|-----|-----|-----|-----|-----|------|------|
| T89-33 | 3,9 | 4,6 | 6,7 | 7,3 | 8,0 | 8,6 | 9,4  | 10,5 |
| T89-34 | 3,6 | 4,5 | 5,9 | 6,9 | 7,5 | 8,2 | 9,1  | 9,4  |
| T89-35 | 3,9 | 4,5 | 5,7 | 7,1 | 7,5 | 7,9 | 8,8  | 9,6  |
| T89-36 | 3,6 | 5,0 | 5,7 | 6,5 | 6,8 | 7,9 | 8,2  | 9,1  |
| T89-37 | 4,3 | 5,6 | 7,1 | 8,0 | 8,0 | 8,9 | 9,7  | 10,2 |
| T89-38 | 4,7 | 5,8 | 6,7 | 7,8 | 8,0 | 8,7 | 9,2  | 9,7  |
| T89-39 | 4,2 | 5,0 | 6,2 | 7,3 | 8,2 | 8,1 | 8,7  | 9,6  |
| T89-40 | 3,6 | 4,4 | 5,2 | 5,7 | 6,0 | 7,2 | 7,2  | 8,0  |
| T89-41 | 3,5 | 4,3 | 5,5 | 6,5 | 7,0 | 7,5 | 7,7  | 8,4  |
| T89-42 | 4,4 | 5,1 | 7,5 | 8,4 | 9,5 | 9,9 | 10,0 | 10,3 |
| T89-43 | 4,3 | 5,0 | 6,5 | 7,3 | 7,8 | 8,3 | 8,9  | 9,1  |
| T89-44 | 4,3 | 5,8 | 6,8 | 8,1 | 8,6 | 9,5 | 9,9  | 10,5 |
| T89-45 | 4,2 | 4,9 | 6,8 | 7,5 | 7,6 | 8,5 | 9,4  | 9,7  |
| T89-46 | 3,5 | 4,4 | 5,7 | 7   | 7,5 | 8,6 | 9,4  | 9,8  |

Results from growth analysis are specified in the overview table 1.14c. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and 5 MDC.

Table 1.14c Overview table of growth effects of construct TFSTT019

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TFSTT019           | 0,99                 | 1,11                   | 0,96                               | 1,18                         | 0,93                 | 1,08                   | 0,89                                  | 1,09                         |

### 1.3.12 Construction group TFSTT035

- 10 This construct induces increased growth. The final diameter is 8% higher comparing the average of the construction group and wild type control group. The final diameter is 11% higher comparing the largest individuals of the construction group and wild type control group. The diameter growth rate is 12% higher comparing the average of the construction group and wild type control group. The diameter growth rate is 8% higher comparing the
- 15 largest individuals of the construction group and wild type control group. The TFSTT035 construction group meets growth difference selection criterion (2) as shown in table 1.15c.

Tables 1.15a and 1.15b contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of

individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

Table 1.15a Height growth data for TFSTT035

| Days in greenhouse | Height (cm) |     |     |     |     |     |     |     |     |     |     |
|--------------------|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                    | 18          | 22  | 25  | 29  | 32  | 39  | 43  | 46  | 50  | 53  | 57  |
| TFSTT035-1A        | 23          | 30  | 36  | 49  | 60  | 88  | 101 | 112 | 127 | 141 | 158 |
| TFSTT035-1BA       | 21          | 27  | 34  | 47  | 58  | 83  | 97  | 109 | 125 | 138 | 150 |
| TFSTT035-1BB       | 23          | 28  | 35  | 47  | 56  | 80  | 94  | 105 | 118 | 129 | 143 |
| TFSTT035-2AA       | 22          | 28  | 36  | 49  | 59  | 84  | 98  | 107 | 122 | 135 | 150 |
| TFSTT035-2AB       | 20          | 25  | 31  | 41  | 49  | 70  | 83  | 95  | 109 | 121 | 137 |
| TFSTT035-2B        | 18          | 23  | 29  | 40  | 51  | 75  | 90  | 100 | 112 | 125 | 138 |
| TFSTT035-3B        | 20          | 26  | 31  | 42  | 52  | 77  | 93  | 103 | 116 | 129 | 145 |
| TFSTT035-4B        | 14          | 19  | 25  | 35  | 44  | 73  | 88  | 98  | 113 | 127 | 141 |
| T89-01             | 14          | 17  | 22  | 31  | 40  | 64  | 76  | 88  | 102 | 118 | 135 |
| T89-02             | 17          | 20  | 25  | 36  | 45  | 69  | 79  | 90  | 104 | 118 | 133 |
| T89-03             | 21          | 29  | 35  | 47  | 57  | 81  | 94  | 104 | 119 | 132 | 147 |
| T89-04             | 13          | 14  | 17  | 25  | 33  | 45  | 52  | 57  | 70  | 79  | 92  |
| T89-05             | 15          | 18  | 24  | 33  | 42  | 69  | 83  | 94  | 106 | 120 | 137 |
| T89-06             | 18          | 23  | 29  | 40  | 51  | 78  | 91  | 103 | 120 | 134 | 152 |
| T89-07             | 20          | 24  | 30  | 41  | 51  | 74  | 88  | 96  | 109 | 121 | 130 |
| T89-08             | 27          | 32  | 40  | 52  | 62  | 88  | 99  | 111 | 124 | 134 | 148 |
| T89-09             | 23          | 27  | 34  | 46  | 56  | 83  | 97  | 106 | 122 | 132 | 149 |
| T89-10             | 13          | 15  | 20  | 27  | 37  | 59  | 72  | 83  | 98  | 111 | 128 |
| T89-11             | N/A         | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| T89-12             | 26          | 33  | 40  | 54  | 66  | 92  | 107 | 120 | 135 | 149 | 166 |
| T89-13             | 21          | 26  | 34  | 45  | 55  | 79  | 94  | 105 | 122 | 134 | 150 |
| T89-14             | 18          | 23  | 31  | 42  | 53  | 80  | 97  | 107 | 120 | 128 | 145 |
| T89-15             | 26          | 33  | 40  | 53  | 63  | 88  | 103 | 111 | 125 | 138 | 154 |
| T89-16             | 27          | 32  | 39  | 51  | 63  | 89  | 104 | 116 | 132 | 146 | 162 |
| T89-17             | 17          | 21  | 27  | 38  | 45  | 72  | 87  | 97  | 110 | 124 | 139 |
| T89-18             | 23          | 30  | 35  | 46  | 55  | 80  | 94  | 105 | 117 | 131 | 145 |
| T89-19             | 23          | 29  | 35  | 45  | 54  | 78  | 91  | 102 | 114 | 125 | 137 |
| T89-20             | 22          | 28  | 34  | 49  | 60  | 87  | 100 | 110 | 125 | 137 | 155 |
| T89-21             | 27          | 31  | 35  | 42  | 48  | 66  | 77  | 87  | 100 | 110 | 124 |
| T89-22             | 13          | 16  | 23  | 32  | 48  | 67  | 81  | 92  | 105 | 118 | 134 |
| T89-23             | 23          | 29  | 35  | 48  | 58  | 83  | 97  | 107 | 122 | 136 | 154 |
| T89-24             | 23          | 29  | 36  | 48  | 59  | 86  | 101 | 113 | 128 | 141 | 159 |
| T89-25             | 16          | 21  | 28  | 40  | 51  | 80  | 97  | 107 | 122 | 137 | 153 |
| T89-26             | 27          | 35  | 40  | 54  | 66  | 93  | 107 | 118 | 132 | 144 | 162 |
| T89-27             | 26          | 31  | 38  | 49  | 59  | 82  | 96  | 106 | 120 | 131 | 146 |
| T89-28             | 25          | 29  | 36  | 49  | 59  | 83  | 97  | 106 | 119 | 131 | 147 |
| T89-29             | 26          | 32  | 38  | 51  | 62  | 88  | 103 | 113 | 128 | 142 | 159 |
| T89-30             | 24          | 29  | 36  | 48  | 56  | 80  | 93  | 104 | 117 | 131 | 145 |
| T89-31             | 24          | 31  | 36  | 47  | 57  | 81  | 94  | 105 | 117 | 131 | 144 |
| T89-32             | 26          | 32  | 38  | 49  | 58  | 83  | 98  | 107 | 120 | 134 | 148 |
| T89-33             | 24          | 29  | 36  | 48  | 57  | 85  | 100 | 112 | 124 | 134 | 149 |
| T89-34             | 21          | 26  | 32  | 43  | 53  | 79  | 90  | 102 | 117 | 131 | 148 |
| T89-35             | 21          | 28  | 36  | 46  | 55  | 80  | 94  | 105 | 120 | 133 | 149 |

|        |    |    |    |    |    |    |     |     |     |     |     |
|--------|----|----|----|----|----|----|-----|-----|-----|-----|-----|
| T89-36 | 16 | 21 | 28 | 39 | 51 | 74 | 88  | 100 | 115 | 128 | 144 |
| T89-37 | 28 | 35 | 41 | 52 | 63 | 88 | 101 | 111 | 125 | 137 | 154 |
| T89-38 | 27 | 32 | 39 | 51 | 62 | 86 | 101 | 113 | 128 | 140 | 155 |
| T89-39 | 21 | 26 | 33 | 46 | 55 | 83 | 101 | 112 | 126 | 139 | 156 |
| T89-40 | 21 | 26 | 33 | 45 | 55 | 77 | 88  | 99  | 113 | 124 | 139 |
| T89-41 | 13 | 16 | 23 | 32 | 42 | 68 | 85  | 95  | 107 | 118 | 133 |
| T89-42 | 24 | 30 | 37 | 49 | 61 | 86 | 101 | 113 | 128 | 143 | 150 |
| T89-43 | 25 | 31 | 38 | 51 | 61 | 86 | 102 | 114 | 130 | 144 | 163 |
| T89-44 | 23 | 31 | 39 | 51 | 64 | 90 | 105 | 118 | 135 | 151 | 169 |
| T89-45 | 26 | 32 | 37 | 49 | 58 | 85 | 100 | 110 | 124 | 137 | 153 |
| T89-46 | 20 | 25 | 34 | 43 | 55 | 81 | 97  | 109 | 122 | 133 | 149 |

Table 1.15b Diameter growth data for TFSTT035

| Days in greenhouse | Diameter (mm) |     |     |     |     |      |      |      |
|--------------------|---------------|-----|-----|-----|-----|------|------|------|
|                    | 29            | 32  | 39  | 43  | 46  | 50   | 53   | 57   |
| TFSTT035-1A        | 4,6           | 5,6 | 7,0 | 8,3 | 8,7 | 8,8  | 9,1  | 10,4 |
| TFSTT035-1BA       | 4,5           | 5,7 | 7,3 | 8,8 | 9,0 | 10,0 | 11,0 | 11,7 |
| TFSTT035-1BB       | 4,1           | 5,3 | 6,5 | 7,1 | 7,5 | 8,3  | 9,0  | 9,5  |
| TFSTT035-2AA       | 4,1           | 5,0 | 7,0 | 8,0 | 8,7 | 9,2  | 10,0 | 10,3 |
| TFSTT035-2AB       | 4,0           | 4,9 | 6,5 | 7,5 | 8,0 | 8,6  | 9,2  | 9,8  |
| TFSTT035-2B        | 3,6           | 5,0 | 6,6 | 7,3 | 8,0 | 8,3  | 8,9  | 9,5  |
| TFSTT035-3B        | 3,5           | 4,2 | 5,8 | 6,8 | 7,2 | 8,0  | 8,9  | 9,5  |
| TFSTT035-4B        | 3,4           | 4,5 | 5,5 | 7,0 | 7,4 | 7,7  | 9,0  | 9,5  |
| T89-01             | 3,2           | 3,7 | 5,3 | 6,2 | 6,9 | 7,9  | 8,3  | 8,7  |
| T89-02             | 3,2           | 3,9 | 5,1 | 6,4 | 7,0 | 7,6  | 8,6  | 8,6  |
| T89-03             | 4,2           | 5,3 | 6,4 | 6,9 | 6,9 | N/A  | 8,8  | 9,8  |
| T89-04             | 2,2           | 3,0 | 4,2 | 4,5 | 5,4 | 5,0  | 5,4  | 6,1  |
| T89-05             | 3,0           | 3,7 | 4,8 | 5,9 | 6,4 | 7,0  | 7,6  | 7,9  |
| T89-06             | 3,6           | 4,8 | 6,5 | 7,6 | 8,7 | 9,1  | 9,6  | 10,1 |
| T89-07             | 3,8           | 4,9 | 6,8 | 7,6 | 8,0 | 8,6  | 9,0  | 9,7  |
| T89-08             | 4,4           | 5,8 | 6,2 | 7,3 | 7,6 | 8,5  | 9,4  | 9,7  |
| T89-09             | 4,5           | 5,5 | 6,5 | 7,1 | 7,6 | 9,1  | 9,4  | 9,8  |
| T89-10             | 3,7           | 3,9 | 5,0 | 6,1 | 6,8 | 7,6  | 8,5  | 9,2  |
| T89-11             | N/A           | N/A | N/A | N/A | N/A | N/A  | N/A  | N/A  |
| T89-12             | 4,6           | 5,5 | 7,3 | 8,6 | 8,8 | 9,6  | 10,2 | 10,2 |
| T89-13             | 3,8           | 4,6 | 5,7 | 6,5 | 6,6 | 7,4  | 8,1  | 8,6  |
| T89-14             | 3,7           | 4,2 | 5,3 | 5,6 | 6,1 | 7,0  | 7,1  | 7,8  |
| T89-15             | 4,6           | 5,0 | 6,4 | 7,0 | 7,4 | 8,0  | 8,4  | 9,1  |
| T89-16             | 5,0           | 5,5 | 7,0 | 7,6 | 8,0 | 8,6  | 9,0  | 9,7  |
| T89-17             | 3,1           | 4,3 | 5,7 | 7,1 | 7,4 | 7,9  | 8,4  | 9,2  |
| T89-18             | 4,5           | 5,3 | 7,8 | 8,0 | 8,1 | 9,2  | 9,9  | 10,3 |
| T89-19             | 4,2           | 5,8 | 6,7 | 8,2 | 8,5 | 8,5  | 9,0  | 9,5  |
| T89-20             | 4,0           | 4,7 | 6,7 | 8,1 | 7,6 | 8,5  | 8,6  | 9,4  |
| T89-21             | 3,5           | 3,9 | 5,0 | 5,7 | 5,8 | 7,1  | 6,7  | 7,4  |
| T89-22             | 3,6           | 4,3 | 5,5 | 6,3 | 6,8 | 7,9  | 8,4  | 8,8  |
| T89-23             | 4,1           | 5,2 | 7,0 | 7,6 | 8,2 | 8,9  | 9,2  | 10,0 |
| T89-24             | 4,1           | 5,4 | 6,7 | 7,5 | 7,8 | 8,6  | 9,6  | 10,4 |
| T89-25             | 3,7           | 4,6 | 6,0 | 7,0 | 7,7 | 8,3  | 8,5  | 9,4  |
| T89-26             | 4,8           | 5,6 | 6,9 | 7,3 | 7,8 | 8,6  | 9,2  | 9,5  |
| T89-27             | 3,8           | 4,9 | 6,2 | 6,7 | 6,9 | 7,6  | 8,4  | 9,3  |

|        |     |     |     |     |     |     |      |      |
|--------|-----|-----|-----|-----|-----|-----|------|------|
| T89-28 | 4,5 | 5,5 | 6,8 | 7,3 | 7,8 | 9,1 | 9,1  | 9,5  |
| T89-29 | 4,4 | 5,3 | 6,8 | 6,8 | 7,4 | 8,2 | 9,2  | 8,9  |
| T89-30 | 3,7 | 4,7 | 5,4 | 6,6 | 7,0 | 7,0 | 7,7  | 8,5  |
| T89-31 | 4,0 | 4,5 | 5,5 | 6,9 | 7,0 | 8,0 | 9,1  | 9,6  |
| T89-32 | 3,6 | 4,5 | 5,7 | 7,0 | 7,2 | 8,0 | 9,1  | 9,4  |
| T89-33 | 3,9 | 4,6 | 6,7 | 7,3 | 8,0 | 8,6 | 9,4  | 10,5 |
| T89-34 | 3,6 | 4,5 | 5,9 | 6,9 | 7,5 | 8,2 | 9,1  | 9,4  |
| T89-35 | 3,9 | 4,5 | 5,7 | 7,1 | 7,5 | 7,9 | 8,8  | 9,6  |
| T89-36 | 3,6 | 5,0 | 5,7 | 6,5 | 6,8 | 7,9 | 8,2  | 9,1  |
| T89-37 | 4,3 | 5,6 | 7,1 | 8,0 | 8,0 | 8,9 | 9,7  | 10,2 |
| T89-38 | 4,7 | 5,8 | 6,7 | 7,8 | 8,0 | 8,7 | 9,2  | 9,7  |
| T89-39 | 4,2 | 5,0 | 6,2 | 7,3 | 8,2 | 8,1 | 8,7  | 9,6  |
| T89-40 | 3,6 | 4,4 | 5,2 | 5,7 | 6,0 | 7,2 | 7,2  | 8,0  |
| T89-41 | 3,5 | 4,3 | 5,5 | 6,5 | 7,0 | 7,5 | 7,7  | 8,4  |
| T89-42 | 4,4 | 5,1 | 7,5 | 8,4 | 9,5 | 9,9 | 10,0 | 10,3 |
| T89-43 | 4,3 | 5,0 | 6,5 | 7,3 | 7,8 | 8,3 | 8,9  | 9,1  |
| T89-44 | 4,3 | 5,8 | 6,8 | 8,1 | 8,6 | 9,5 | 9,9  | 10,5 |
| T89-45 | 4,2 | 4,9 | 6,8 | 7,5 | 7,6 | 8,5 | 9,4  | 9,7  |
| T89-46 | 3,5 | 4,4 | 5,7 | 7   | 7,5 | 8,6 | 9,4  | 9,8  |

Results from growth analysis are specified in the overview table 1.15c. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and 5 MDC.

Table 1.15c Overview table of growth effects of construct TFSTT035

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TFSTT035           | 0,99                 | 1,08                   | 0,98                               | 1,12                         | 0,93                 | 1,11                   | 0,90                                  | 1,08                         |

### 1.3.13 Construction group TFSTT047

- 10 This construct induces increased growth. The final diameter is 8% higher comparing the average of the construction group and wild type control group. The final diameter is 11% higher comparing the largest individuals of the construction group and wild type control group. The diameter growth rate is 12% higher comparing the average of the construction group and wild type control group. The diameter growth rate is 8% higher comparing the
- 15 largest individuals of the construction group and wild type control group. The TFSTT047 construction group meets growth difference selection criterion (3) as shown in table 1.16c.

Tables 1.16a and 1.16b contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

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Table 1.16a Height growth data for TFSTT047

| Days in greenhouse | Height (cm) |    |    |     |    |     |     |     |     |
|--------------------|-------------|----|----|-----|----|-----|-----|-----|-----|
|                    | 20          | 28 | 34 | 37  | 41 | 48  | 51  | 55  | 59  |
| TFSTT047-1B        | 29          | 44 | 56 | 64  | 73 | 91  | 99  | 111 | 121 |
| TFSTT047-2A        | 29          | 47 | 67 | 76  | 87 | 114 | 122 | 135 | 147 |
| TFSTT047-2B        | 26          | 44 | 67 | 76  | 90 | 116 | 125 | 139 | 150 |
| TFSTT047-3B        | 25          | 43 | 65 | 74  | 87 | 109 | 118 | 131 | 143 |
| TFSTT047-4A        | 25          | 45 | 68 | 75  | 87 | 108 | 115 | 128 | 138 |
| T89-02             | 27          | 40 | 51 | 58  | 66 | 86  | 94  | 105 | 115 |
| T89-03             | 27          | 44 | 58 | 67  | 77 | 97  | 104 | 114 | 126 |
| T89-04             | 27          | 39 | 56 | 65  | 74 | 92  | 100 | 109 | 118 |
| T89-07             | 28          | 47 | 66 | 77  | 88 | 107 | 116 | 130 | 140 |
| T89-08             | 19          | 37 | 51 | 59  | 69 | 90  | 99  | 109 | 119 |
| T89-09             | 25          | 43 | 58 | 67  | 78 | 100 | 109 | 121 | 131 |
| T89-11             | 29          | 45 | 60 | 69  | 81 | 104 | 111 | 121 | 132 |
| T89-12             | 26          | 41 | 58 | 65  | 77 | 105 | 114 | 127 | 136 |
| T89-13             | 31          | 47 | 70 | 78  | 90 | 110 | 119 | 131 | 143 |
| T89-14             | 26          | 46 | 70 | 78  | 88 | 108 | 116 | 127 | 137 |
| T89-18             | 22          | 41 | 55 | 65  | 74 | 95  | 104 | 115 | 126 |
| T89-19             | 27          | 43 | 60 | 70  | 81 | 102 | 110 | 121 | 131 |
| T89-20             | 25          | 40 | 57 | N/A | 74 | 94  | 103 | 118 | 130 |
| T89-21             | 27          | 45 | 61 | 72  | 84 | 108 | 115 | 126 | 137 |
| T89-22             | 25          | 38 | 55 | 65  | 77 | 95  | 104 | 115 | 125 |
| T89-23             | 23          | 37 | 50 | 57  | 65 | 82  | 92  | 106 | 115 |
| T89-24             | 25          | 41 | 54 | 60  | 69 | 87  | 94  | 102 | 110 |
| T89-25             | 25          | 38 | 55 | 66  | 80 | 100 | 109 | 121 | 133 |
| T89-26             | 24          | 38 | 53 | 61  | 69 | 81  | 87  | 95  | 104 |
| T89-27             | 26          | 39 | 54 | 62  | 70 | 90  | 97  | 109 | 120 |
| T89-28             | 27          | 46 | 67 | 75  | 86 | 107 | 114 | 126 | 136 |
| T89-29             | 24          | 39 | 57 | 64  | 74 | 91  | 98  | 108 | 128 |
| T89-31             | 27          | 43 | 57 | 65  | 73 | 91  | 97  | 105 | 113 |
| T89-32             | 25          | 41 | 55 | 63  | 75 | 96  | 107 | 121 | 135 |
| T89-35             | 25          | 38 | 53 | 62  | 73 | 88  | 96  | 103 | 112 |
| T89-36             | 27          | 45 | 67 | 78  | 90 | 113 | 122 | 134 | 145 |
| T89-37             | 20          | 43 | 59 | 68  | 79 | 101 | 112 | 124 | 137 |
| T89-39             | 25          | 45 | 61 | 69  | 79 | 99  | 108 | 120 | 132 |
| T89-40             | 23          | 32 | 43 | 49  | 60 | 76  | 84  | 94  | 104 |
| T89-41             | 27          | 45 | 66 | 75  | 87 | 112 | 120 | 133 | 144 |
| T89-43             | 26          | 38 | 54 | 61  | 70 | 93  | 100 | 109 | 120 |
| T89-46             | 26          | 45 | 66 | 76  | 88 | 109 | 114 | 125 | 133 |

Table 1.16b Diameter growth data for TFSTT047

| Days in greenhouse | Diameter (mm) |     |     |      |      |
|--------------------|---------------|-----|-----|------|------|
|                    | 34            | 41  | 48  | 55   | 59   |
| TFSTT047-1B        | 6,1           | 7,0 | 8,3 | 9,3  | 9,4  |
| TFSTT047-2A        | 6,7           | 7,6 | 8,7 | 10,0 | 10,4 |
| TFSTT047-2B        | 6,9           | 7,5 | N/A | 9,5  | 10,6 |
| TFSTT047-3B        | 6,8           | 7,8 | 8,9 | 9,9  | 10,1 |
| TFSTT047-4A        | 5,7           | 6,9 | 8,2 | 9,1  | 9,8  |
| T89-02             | 5,6           | 6,4 | 7,8 | 9,0  | 8,4  |
| T89-03             | 6,6           | 7,7 | 8,5 | 8,9  | 9,6  |
| T89-04             | 7,2           | 7,8 | 9,1 | 9,8  | 9,7  |
| T89-07             | 7,3           | 7,9 | 9,5 | 9,9  | 10,1 |
| T89-08             | 5,5           | 7,8 | 8,3 | 10,0 | 9,8  |
| T89-09             | 6,7           | 7,8 | 9,3 | 9,7  | 9,8  |
| T89-11             | 6,4           | 8,1 | 9,2 | 9,4  | 9,7  |
| T89-12             | 7,0           | 8,0 | 9,0 | 10,1 | 9,9  |
| T89-13             | 6,8           | 8,5 | 9,1 | 10,7 | 10,8 |
| T89-14             | 6,1           | 6,9 | 7,7 | 8,4  | 8,8  |
| T89-18             | 5,5           | 6,5 | 7,9 | 9,5  | 9,4  |
| T89-19             | 7,5           | 8,3 | 9,0 | 9,5  | 10,4 |
| T89-20             | 7,3           | 7,1 | 8,7 | 9,3  | 9,7  |
| T89-21             | 7,0           | 8,6 | 9,3 | 10,3 | 10,3 |
| T89-22             | 7,0           | 7,8 | 8,4 | 10,0 | 9,5  |
| T89-23             | 5,8           | 6,8 | 7,9 | 9,9  | 9,7  |
| T89-24             | 6,1           | 6,8 | 8,1 | 9,0  | 9,4  |
| T89-25             | 6,5           | 8,8 | 9,5 | 10,0 | 10,9 |
| T89-26             | 5,8           | 6,7 | 7,0 | 7,5  | 7,7  |
| T89-27             | 6,3           | 7,4 | 8,6 | 9,0  | 9,5  |
| T89-28             | 7,0           | 8,1 | 8,8 | 9,7  | 10,5 |
| T89-29             | 7,5           | 7,4 | 8,5 | 10,7 | 10,0 |
| T89-31             | 5,6           | 6,3 | 7,2 | 7,6  | 8,6  |
| T89-32             | 6,0           | 7,0 | 8,2 | 8,7  | 9,3  |
| T89-35             | 5,4           | 6,4 | 6,8 | 7,9  | 8,0  |
| T89-36             | 6,7           | 8,2 | 8,9 | 9,6  | 9,4  |
| T89-37             | 7,4           | 8,5 | 8,6 | 9,3  | 10,8 |
| T89-39             | 7,1           | 7,9 | 9,6 | 10,2 | 10,2 |
| T89-40             | 3,9           | 5,2 | 5,7 | 6,8  | 6,6  |
| T89-41             | 7,2           | 8,7 | N/A | 9,7  | 10,3 |
| T89-43             | 6,9           | 7,5 | 8,6 | 9,7  | 10,4 |
| T89-46             | 6,4           | 7,2 | 8,2 | 8,7  | 9,7  |

Results from growth analysis are specified in the overview table 1.16c. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and 5 MDC.

Table 1.16c Overview table of growth effects of construct TFSTT047

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TFSTT047           | 1,10                 | 1,05                   | 1,08                               | 1,20                         | 1,03                 | 0,97                   | 0,99                                  | 1,00                         |

**Example 2**Construction group TF0002Rp2

This construct induces increased growth. The final height is 29% higher comparing the average of the construction group and wild type control group. The final height is 27% higher comparing the largest individuals of the construction group and wild type control group. The maximum height growth rate is 36% higher comparing the average of the construction group and wild type control group. The maximum height growth rate is 38% higher comparing the largest individuals of the construction group and wild type control group. The diameter growth rate is 10% higher comparing the average of the construction group and wild type control group. The diameter growth rate is 9% higher comparing the largest individuals of the construction group and wild type control group. The TF0002Rp2 construction group meets the more stringent level of growth difference selection criteria (1), (3) and (4) as shown in table 2.3.

Tables 2.1 and 2.2 contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

Table 2.1 Height growth data for TF0002Rp2

| Days in greenhouse | Height (cm) |    |    |    |    |     |     |     |     |     |
|--------------------|-------------|----|----|----|----|-----|-----|-----|-----|-----|
|                    | 20          | 25 | 29 | 35 | 41 | 46  | 50  | 53  | 57  | 60  |
| TF0002rp2-1B-1     | 18          | 25 | 33 | 50 | 72 | 91  | 106 | 120 | 132 | 143 |
| TF0002rp2-1B-2     | 21          | 31 | 42 | 62 | 85 | 106 | 120 | 132 | 146 | 155 |
| TF0002rp2-1B-3     | 19          | 26 | 36 | 54 | 77 | 100 | 113 | 125 | 140 | 153 |
| TF0002rp2-2A-1     | 19          | 28 | 38 | 52 | 72 | 91  | 103 | 115 | 127 | 138 |
| TF0002rp2-2A-2     | 20          | 23 | 28 | 36 | 53 | 73  | 83  | 94  | 106 | 116 |
| TF0002rp2-2A-3     | 22          | 31 | 40 | 57 | 73 | 94  | 101 | 109 | 116 | 124 |
| TF0002rp2-3B-1     | 17          | 18 | 23 | 36 | 52 | 70  | 81  | 92  | 106 | 118 |
| TF0002rp2-3B-2     | 19          | 28 | 37 | 56 | 78 | 103 | 115 | 125 | 139 | 150 |
| TF0002rp2-3B-3     | 19          | 29 | 41 | 60 | 85 | 111 | 126 | 137 | 150 | 161 |
| T89-01             | 17          | 26 | 31 | 45 | 61 | 76  | 87  | 95  | 107 | 116 |
| T89-02             | 16          | 21 | 26 | 38 | 53 | 67  | 76  | 83  | N/A | N/A |
| T89-03             | 18          | 24 | 32 | 47 | 64 | 78  | 87  | 96  | 106 | 115 |
| T89-04             | 18          | 26 | 35 | 50 | 66 | 80  | 87  | 96  | 107 | 115 |
| T89-05             | 17          | 26 | 33 | 44 | 57 | 73  | 81  | 91  | 100 | 107 |
| T89-06             | 16          | 21 | 28 | 40 | 55 | 74  | 79  | 89  | 99  | 106 |
| T89-07             | 17          | 23 | 31 | 43 | 57 | 71  | 80  | 88  | 98  | 107 |
| T89-08             | 15          | 20 | 26 | 37 | 51 | 65  | 75  | 84  | 94  | 100 |
| T89-09             | 18          | 25 | 32 | 46 | 61 | 74  | 85  | 93  | 103 | 112 |
| T89-10             | 19          | 25 | 32 | 46 | 60 | 75  | 86  | 95  | 104 | 112 |

|        |    |    |    |    |    |    |    |     |     |     |
|--------|----|----|----|----|----|----|----|-----|-----|-----|
| T89-11 | 20 | 27 | 36 | 51 | 68 | 86 | 98 | 107 | 120 | 127 |
| T89-12 | 19 | 27 | 36 | 50 | 67 | 80 | 89 | 97  | 108 | 118 |
| T89-13 | 18 | 25 | 32 | 45 | 59 | 75 | 83 | 92  | 101 | 108 |
| T89-14 | 18 | 23 | 26 | 36 | 51 | 65 | 72 | 79  | 89  | 96  |
| T89-15 | 17 | 21 | 28 | 39 | 53 | 70 | 78 | 87  | 97  | 105 |
| T89-16 | 19 | 25 | 32 | 43 | 57 | 71 | 81 | 90  | 101 | 109 |
| T89-17 | 16 | 20 | 29 | 41 | 54 | 68 | 78 | 84  | 93  | 101 |
| T89-18 | 16 | 23 | 30 | 45 | 63 | 78 | 87 | 94  | 103 | 110 |
| T89-19 | 16 | 22 | 28 | 42 | 56 | 69 | 79 | 89  | 100 | 107 |
| T89-20 | 18 | 25 | 32 | 47 | 63 | 78 | 89 | 99  | 109 | 115 |
| T89-21 | 19 | 27 | 34 | 50 | 67 | 82 | 92 | 102 | 111 | 120 |
| T89-22 | 19 | 25 | 32 | 44 | 58 | 76 | 84 | 93  | 102 | 109 |
| T89-23 | 18 | 26 | 33 | 47 | 63 | 79 | 88 | 99  | 108 | 116 |
| T89-24 | 16 | 24 | 28 | 42 | 53 | 70 | 78 | 85  | 94  | 103 |
| T89-25 | 16 | 25 | 32 | 45 | 61 | 76 | 85 | 95  | 107 | 114 |
| T89-26 | 16 | 20 | 26 | 38 | 52 | 68 | 78 | 86  | 97  | 103 |
| T89-27 | 16 | 21 | 25 | 35 | 48 | 61 | 70 | 78  | N/A | 98  |
| T89-28 | 14 | 18 | 25 | 38 | 51 | 64 | 73 | 81  | 90  | 96  |
| T89-29 | 7  | 13 | 18 | 30 | 45 | 60 | 69 | 77  | 90  | 98  |
| T89-30 | 15 | 22 | 29 | 42 | 55 | 69 | 80 | 88  | 97  | 106 |
| T89-31 | 21 | 29 | 37 | 50 | 65 | 80 | 88 | 98  | 108 | 116 |
| T89-32 | 19 | 24 | 32 | 42 | 55 | 70 | 78 | 87  | 96  | 105 |

Table 2.2 Diameter growth data for TF0002Rp2

| Days in<br>greenhouse | Diameter (mm) |     |     |     |     | Days in<br>greenhouse | Diameter (mm) |     |     |     |     |
|-----------------------|---------------|-----|-----|-----|-----|-----------------------|---------------|-----|-----|-----|-----|
|                       | 35            | 41  | 46  | 53  | 60  |                       | 35            | 41  | 46  | 53  | 60  |
| TF0002rp2-1B-1        | 4,6           | 5,4 | 6,3 | 8,0 | 8,2 | T89-12                | 4,7           | 5,9 | 7,3 | 7,4 | 7,6 |
| TF0002rp2-1B-2        | 4,5           | 5,4 | 6,5 | 7,7 | 8,7 | T89-13                | 5,9           | 5,9 | 6,7 | 7,5 | 8,3 |
| TF0002rp2-1B-3        | 4,9           | 5,9 | 6,4 | 7,2 | 8,0 | T89-14                | 4,5           | 5,2 | 5,8 | 6,1 | 7,0 |
| TF0002rp2-2A-1        | 4,3           | 4,9 | 6,0 | 7,4 | 8,0 | T89-15                | 4,7           | NA  | 6,0 | 6,4 | 7,3 |
| TF0002rp2-2A-2        | 4,1           | 5,3 | 6,3 | 6,5 | 7,6 | T89-16                | 4,5           | 5,6 | 7,7 | 7,5 | 8,6 |
| TF0002rp2-2A-3        | 4,7           | 6,3 | 6,2 | 7,7 | 9,8 | T89-17                | 4,1           | 5,4 | 6,0 | 6,8 | 7,5 |
| TF0002rp2-3B-1        | 3,4           | 4,4 | 5,1 | 6,9 | 7,1 | T89-18                | 4,4           | 5,8 | 6,0 | 7,7 | 8,3 |
| TF0002rp2-3B-2        | 4,9           | 6,5 | 6,8 | 8,5 | 9,3 | T89-19                | 4,7           | 5,8 | 7,1 | 8,5 | 9,4 |
| TF0002rp2-3B-3        | 4,7           | 6,3 | 6,9 | 8,5 | 8,7 | T89-20                | 4,7           | 5,8 | 6,6 | 7,4 | 8,3 |
| T89-01                | 4,7           | 6,0 | 6,5 | 6,9 | 8,3 | T89-21                | 4,7           | 6,2 | 6,3 | 7,7 | 8,5 |
| T89-02                | 4,4           | 5,7 | 6,6 | 7,6 | 7,8 | T89-22                | 4,2           | 5,1 | 6,3 | 6,9 | 8,0 |
| T89-03                | 4,7           | 6,3 | 6,7 | 7,7 | 8,4 | T89-23                | 4,6           | 5,8 | 7,1 | 7,5 | 8,3 |
| T89-04                | 4,7           | 6,0 | 7,1 | 8,0 | 8,5 | T89-24                | 4,4           | 5,8 | 6,9 | 7,7 | 8,8 |
| T89-05                | 4,0           | 5,3 | 6,3 | 7,8 | 8,1 | T89-25                | 4,5           | 5,4 | 6,2 | 8,0 | 8,7 |
| T89-06                | 4,6           | 5,9 | 6,3 | 7,7 | 8,2 | T89-26                | 4,1           | 5,4 | 6,0 | 7,2 | 8,0 |
| T89-07                | 4,6           | 6,1 | 6,5 | 7,9 | 8,5 | T89-27                | 4,5           | 5,7 | 6,5 | 7,9 | 9,2 |
| T89-08                | 4,0           | 5,2 | 5,8 | 6,9 | 7,1 | T89-28                | 4,3           | 5,1 | 6,0 | 6,6 | 7,7 |
| T89-09                | 4,4           | 5,8 | 6,4 | 7,6 | 8,2 | T89-29                | 3,5           | 4,7 | 5,5 | 6,3 | 7,1 |
| T89-09                | 4,4           | 5,8 | 6,4 | 7,6 | 8,2 | T89-30                | 4,1           | 5,4 | 5,8 | 7,2 | 7,8 |
| T89-10                | 4,9           | 6,0 | 6,6 | 7,4 | 8,5 | T89-31                | 5,0           | 5,8 | 6,8 | 7,3 | 8,2 |
| T89-11                | 4,7           | 5,8 | 6,4 | 7,9 | 8,3 | T89-32                | 4,4           | 6,4 | 6,6 | 8,0 | 8,4 |

Results from growth analysis are specified in the overview table 2.3. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and MDC.

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Table 2.3 Overview table of growth effects of construct TF0002Rp2

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TF0002Rp2          | 1,29                 | 1,03                   | 1,36                               | 1,10                         | 1,27                 | 1,05                   | 1,38                                  | 1,09                         |

Construction group TF0003

Tables 2.4 and 2.5 contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

Table 2.4 Height growth data for TF0003

| Days in greenhouse | Height (cm) |    |     |     |     |     |     |
|--------------------|-------------|----|-----|-----|-----|-----|-----|
|                    | 18          | 25 | 35  | 39  | 46  | 49  | 53  |
| TF0003-1A          | 32          | 55 | 94  | 113 | 145 | 156 | 168 |
| TF0003-1B          | 37          | 58 | 104 | 120 | 143 | 155 | 170 |
| TF0003-2A          | 30          | 49 | 86  | 107 | 142 | 159 | 178 |
| TF0003-3A          | 38          | 59 | 100 | 114 | 142 | 152 | 167 |
| TF0003-3B          | 29          | 51 | 98  | 117 | 147 | 162 | 183 |
| TF0003-4A          | 30          | 52 | 97  | 116 | 149 | 162 | 176 |
| TF0003-4B          | 32          | 52 | 91  | 112 | 146 | 162 | 179 |
| T89-01             | 33          | 57 | 108 | 128 | 161 | 173 | 192 |
| T89-02             | 32          | 55 | 94  | 112 | 145 | 160 | 180 |
| T89-03             | 31          | 53 | 95  | 114 | 147 | 160 | 173 |
| T89-04             | 27          | 48 | 91  | 110 | 143 | 157 | 179 |
| T89-05             | 26          | 43 | 86  | 107 | 141 | 155 | 171 |
| T89-06             | 28          | 47 | 86  | 106 | 142 | 157 | 175 |
| T89-07             | 34          | 56 | 101 | 120 | 153 | 168 | 184 |
| T89-08             | 26          | 44 | 83  | 101 | 133 | 148 | 166 |
| T89-09             | 29          | 51 | 88  | 106 | 141 | 154 | 171 |
| T89-10             | 25          | 45 | 90  | 108 | 141 | 156 | 178 |
| T89-11             | 26          | 46 | 80  | 96  | 128 | 143 | 166 |
| T89-12             | 27          | 45 | 84  | 102 | 132 | 143 | 156 |
| T89-13             | 29          | 50 | 96  | 115 | 149 | 163 | 185 |
| T89-14             | 28          | 49 | 89  | 109 | 147 | 163 | 185 |
| T89-15             | 25          | 43 | 81  | 99  | 134 | 146 | 161 |
| T89-16             | 27          | 46 | 88  | 106 | 146 | 162 | 185 |
| T89-17             | 31          | 52 | 90  | 107 | 142 | 158 | 179 |
| T89-18             | 28          | 45 | 82  | 101 | 140 | 158 | 180 |
| T89-19             | 27          | 42 | 82  | 101 | 132 | 146 | 163 |
| T89-20             | 28          | 42 | 81  | 101 | 135 | 150 | 169 |
| T89-21             | 26          | 36 | 67  | 76  | 100 | 113 | 128 |
| T89-22             | 31          | 51 | 97  | 115 | 150 | 165 | 181 |
| T89-23             | 29          | 49 | 83  | 101 | 132 | 144 | 163 |
| T89-24             | 30          | 48 | 89  | 107 | 144 | 159 | 177 |
| T89-25             | 26          | 45 | 89  | 103 | 136 | 152 | 175 |
| T89-26             | 28          | 48 | 87  | 105 | 140 | 156 | 177 |
| T89-27             | 28          | 46 | 86  | 103 | 138 | 153 | 170 |
| T89-28             | 29          | 47 | 86  | 103 | 135 | 152 | 173 |
| T89-29             | 26          | 43 | 81  | 101 | 139 | 156 | 179 |
| T89-30             | 32          | 53 | 94  | 114 | 150 | 166 | 187 |
| T89-31             | 30          | 48 | 85  | 103 | 134 | 148 | 169 |
| T89-32             | 31          | 51 | 91  | 109 | 140 | 154 | 173 |

|        |    |    |     |     |     |     |     |
|--------|----|----|-----|-----|-----|-----|-----|
| T89-33 | 31 | 52 | 94  | 113 | 151 | 167 | 186 |
| T89-34 | 23 | 40 | 84  | 105 | 140 | 153 | 171 |
| T89-35 | 29 | 48 | 88  | 106 | 137 | 150 | 165 |
| T89-36 | 29 | 49 | 88  | 107 | 143 | 159 | 176 |
| T89-37 | 32 | 49 | 91  | 105 | 141 | 154 | 168 |
| T89-38 | 29 | 50 | 88  | 106 | 144 | 158 | 172 |
| T89-39 | 31 | 48 | 89  | 106 | 139 | 152 | 172 |
| T89-40 | 32 | 49 | 97  | 117 | 149 | 163 | 185 |
| T89-41 | 24 | 46 | 86  | 104 | 138 | 155 | 176 |
| T89-42 | 26 | 41 | 80  | 98  | 133 | 151 | 172 |
| T89-43 | 29 | 48 | 92  | 110 | 145 | 163 | 188 |
| T89-44 | 28 | 49 | 89  | 109 | 146 | 163 | 186 |
| T89-45 | 28 | 48 | 83  | 97  | 119 | 129 | 145 |
| T89-46 | 32 | 52 | 95  | 115 | 149 | 165 | 185 |
| T89-47 | 26 | 42 | 83  | 101 | 133 | 147 | 166 |
| T89-48 | 26 | 41 | 82  | 101 | 135 | 152 | 173 |
| T89-49 | 33 | 52 | 103 | 123 | 153 | 166 | 180 |

Table 2.5 Diameter growth data for TF0003

| Days in greenhouse | Diameter (mm) |     |     |      |
|--------------------|---------------|-----|-----|------|
|                    | 35            | 39  | 46  | 53   |
| TF0003-1A          | 5,3           | 6,7 | 7,5 | 8,8  |
| TF0003-1B          | 6,0           | 6,6 | 7,3 | 7,7  |
| TF0003-2A          | 6,3           | 6,9 | 8,8 | 9,7  |
| TF0003-3A          | 6,3           | 7,1 | 7,9 | 9,3  |
| TF0003-3B          | 6,0           | 6,9 | 8,5 | 9,2  |
| TF0003-4A          | 6,6           | 7,5 | 7,9 | 9,0  |
| TF0003-4B          | 6,0           | 7,0 | 8,6 | 10,4 |
| T89-01             | 7,2           | 8,0 | 9,6 | 10,7 |
| T89-02             | 6,2           | 7,1 | 8,0 | 9,1  |
| T89-03             | 6,3           | 7,3 | 8,3 | 9,3  |
| T89-04             | 5,5           | 6,7 | 8,0 | 9,0  |
| T89-05             | 5,3           | 6,5 | 7,4 | 8,3  |
| T89-06             | 5,8           | 6,8 | 8,0 | 9,1  |
| T89-07             | 6,3           | 7,3 | 9,1 | 10,9 |
| T89-08             | 5,7           | 6,3 | 7,1 | 7,6  |
| T89-09             | 6,0           | 6,6 | 8,1 | 9,1  |
| T89-10             | 5,6           | 6,5 | 7,7 | 9,1  |
| T89-11             | 5,8           | 6,6 | 7,7 | 8,6  |
| T89-12             | 6,2           | 6,8 | 7,3 | 8,1  |
| T89-13             | 5,7           | 6,6 | 7,7 | 8,8  |
| T89-14             | 6,3           | 7,0 | 8,5 | 10,0 |
| T89-15             | 5,2           | 6,0 | 6,9 | 7,6  |
| T89-16             | 6,3           | 7,2 | 8,4 | 9,3  |
| T89-17             | 5,9           | 6,8 | 8,0 | 9,1  |
| T89-18             | 6,2           | 6,8 | 8,2 | 9,6  |
| T89-19             | 6,1           | 6,8 | 7,9 | 9,1  |
| T89-20             | 5,3           | 6,3 | 7,4 | 9,0  |
| T89-21             | 3,5           | 4,2 | 5,0 | 9,2  |
| T89-22             | 5,9           | 6,6 | 7,7 | 8,4  |
| T89-23             | 6,1           | 7,0 | 8,4 | 9,7  |

|        |     |     |     |      |
|--------|-----|-----|-----|------|
| T89-24 | 5,7 | 6,7 | 8,0 | 9,4  |
| T89-25 | 5,9 | 6,8 | 8,1 | 8,7  |
| T89-26 | 6,4 | 7,2 | 8,4 | 9,7  |
| T89-27 | 5,7 | 6,9 | 8,8 | 10,1 |
| T89-28 | 5,7 | 6,6 | 7,7 | 8,7  |
| T89-29 | 5,1 | 6,4 | 7,7 | 9,1  |
| T89-30 | 6,0 | 6,9 | 8,1 | 10,1 |
| T89-31 | 5,8 | 6,7 | 8,2 | 9,3  |
| T89-32 | 6,2 | 6,9 | 7,8 | 8,8  |
| T89-33 | 6,3 | 7,1 | 8,5 | 10,2 |
| T89-34 | 5,8 | 6,8 | 8,1 | 9,8  |
| T89-35 | 6,1 | 7,2 | 7,7 | 8,9  |
| T89-36 | 6,3 | 6,9 | 8,7 | 10,0 |
| T89-37 | 5,9 | 7,0 | 8,4 | 9,2  |
| T89-38 | 6,0 | 6,6 | 7,5 | 8,2  |
| T89-39 | 7,1 | 7,6 | 8,4 | 9,7  |
| T89-40 | 6,1 | 7,0 | 8,3 | 9,7  |
| T89-41 | 5,5 | 6,4 | 6,9 | 7,9  |
| T89-42 | 5,4 | 6,2 | 7,8 | 9,1  |
| T89-43 | 6,0 | 6,9 | 8,3 | 9,5  |
| T89-44 | 5,9 | 7,2 | 9,0 | 10,5 |
| T89-45 | 5,0 | 5,7 | 6,2 | 7,8  |
| T89-46 | 6,2 | 7,5 | 8,6 | 9,8  |
| T89-47 | 5,3 | 6,1 | 7,8 | 8,8  |
| T89-48 | 5,4 | 6,2 | 7,6 | 8,2  |
| T89-49 | 7,0 | 8,2 | 9,4 | 10,3 |

Results from growth analysis are specified in the overview table 2.6. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and 5 MDC.

Table 2.6 Overview table of growth effects of construct TF0003

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TF0003             | 1,00                 | 1,00                   | 0,93                               | 0,93                         | 0,95                 | 0,96                   | 0,91                                  | 0,73                         |

Construction group TF0011

Tables 2.7 and 2.8 contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

Table 2.7 Height growth data for TF0011

| Days in greenhouse | Height (cm) |    |    |    |     |     |     |
|--------------------|-------------|----|----|----|-----|-----|-----|
|                    | 19          | 25 | 32 | 39 | 48  | 54  | 56  |
| TF0011-1A-1        | 17          | 28 | 48 | 73 | 107 | 133 | 141 |
| TF0011-1A-2        | 23          | 35 | 58 | 80 | 101 | 114 | 118 |
| TF0011-1B          | 17          | 27 | 45 | 66 | 94  | 111 | 117 |
| TF0011-2A-1        | 23          | 32 | 56 | 81 | 110 | 125 | 131 |
| TF0011-2A-2        | 18          | 33 | 55 | 76 | 105 | 127 | 134 |
| TF0011-3A-1        | 19          | 31 | 53 | 75 | 105 | 125 | 131 |
| TF0011-3A-2        | 17          | 27 | 47 | 67 | 95  | 116 | 121 |
| TF0011-3B-1        | 17          | 29 | 47 | 72 | 100 | 121 | 127 |
| TF0011-3B-2        | 14          | 24 | 45 | 67 | 101 | 123 | 130 |
| TF0011-4A          | 19          | 33 | 57 | 81 | 114 | 135 | 143 |
| T89-01             | 18          | 28 | 49 | 70 | 100 | 126 | 133 |
| T89-02             | 19          | 29 | 51 | 76 | 105 | 128 | 136 |
| T89-03             | 11          | 18 | 36 | 47 | 76  | 93  | 98  |
| T89-04             | 16          | 25 | 48 | 74 | 102 | 126 | 133 |
| T89-05             | 17          | 29 | 49 | 73 | 106 | 128 | 135 |
| T89-06             | 16          | 28 | 51 | 74 | 105 | 127 | 132 |
| T89-07             | 19          | 28 | 51 | 73 | 104 | 125 | 136 |
| T89-08             | 19          | 31 | 52 | 77 | 110 | 130 | 137 |
| T89-09             | 17          | 26 | 44 | 67 | 93  | 114 | 122 |
| T89-10             | 16          | 25 | 44 | 63 | 89  | 108 | 115 |
| T89-11             | 20          | 31 | 47 | 68 | 87  | 114 | 118 |
| T89-12             | 17          | 28 | 48 | 70 | 101 | 117 | 124 |
| T89-13             | 18          | 30 | 52 | 73 | 105 | 125 | 130 |
| T89-14             | 19          | 29 | 44 | 67 | 96  | 116 | 123 |
| T89-15             | 17          | 29 | 49 | 72 | 102 | 124 | 131 |
| T89-16             | 18          | 29 | 50 | 74 | 108 | 129 | 135 |
| T89-17             | 14          | 23 | 43 | 65 | 93  | 116 | 123 |
| T89-18             | 15          | 26 | 48 | 72 | 103 | 128 | 136 |
| T89-19             | 11          | 19 | 38 | 63 | 93  | 115 | 122 |
| T89-20             | 19          | 30 | 52 | 75 | 104 | 126 | 133 |
| T89-21             | 17          | 28 | 48 | 72 | 104 | 128 | 135 |
| T89-22             | 19          | 29 | 49 | 73 | 105 | 123 | 129 |
| T89-23             | 21          | 30 | 54 | 79 | 112 | 135 | 138 |
| T89-24             | 19          | 24 | 37 | 54 | 77  | 100 | 103 |
| T89-25             | 15          | 27 | 46 | 69 | 98  | 117 | 123 |
| T89-26             | 19          | 29 | 50 | 73 | 103 | 127 | 135 |
| T89-27             | 15          | 27 | 47 | 70 | 106 | 129 | 135 |
| T89-28             | 20          | 33 | 55 | 80 | 109 | 130 | 137 |
| T89-29             | 24          | 38 | 62 | 88 | 122 | 143 | 151 |

|        |    |    |    |    |     |     |     |
|--------|----|----|----|----|-----|-----|-----|
| T89-30 | 21 | 33 | 56 | 78 | 113 | 132 | 138 |
| T89-31 | 21 | 31 | 52 | 76 | 105 | 126 | 133 |
| T89-32 | 18 | 29 | 50 | 73 | 105 | 129 | 138 |
| T89-33 | 23 | 37 | 61 | 89 | 121 | 143 | 150 |
| T89-34 | 19 | 30 | 52 | 78 | 108 | 130 | 138 |
| T89-35 | 19 | 31 | 55 | 79 | 111 | 134 | 142 |
| T89-36 | 18 | 29 | 52 | 75 | 105 | 127 | 134 |
| T89-37 | 22 | 32 | 52 | 73 | 103 | 124 | 130 |
| T89-38 | 18 | 29 | 51 | 74 | 105 | 128 | 134 |
| T89-39 | 21 | 31 | 51 | 72 | 102 | 119 | 124 |
| T89-40 | 20 | 32 | 51 | 74 | 99  | 121 | 128 |
| T89-41 | 19 | 29 | 50 | 73 | 108 | 130 | 135 |
| T89-42 | 15 | 26 | 46 | 68 | 95  | 113 | 119 |
| T89-43 | 16 | 28 | 48 | 67 | 93  | 113 | 119 |
| T89-44 | 21 | 31 | 50 | 70 | 97  | 116 | 122 |
| T89-45 | 16 | 26 | 48 | 72 | 101 | 123 | 131 |
| T89-46 | 21 | 29 | 50 | 75 | 106 | 129 | 138 |
| T89-47 | 9  | 16 | 34 | 55 | 82  | 106 | 114 |
| T89-48 | 5  | 8  | 17 | 24 | 42  | 52  | 56  |
| T89-49 | 20 | 30 | 50 | 71 | 96  | 117 | 125 |
| T89-50 | 16 | 28 | 50 | 74 | 105 | 128 | 136 |
| T89-51 | 19 | 29 | 51 | 75 | 107 | 128 | 136 |
| T89-52 | 20 | 29 | 50 | 75 | 104 | 124 | 131 |
| T89-53 | 21 | 32 | 50 | 72 | 101 | 118 | 125 |
| T89-54 | 21 | 32 | 55 | 81 | 112 | 133 | 142 |
| T89-55 | 21 | 32 | 56 | 83 | 112 | 133 | 141 |

Table 2.8 Diameter growth data for TF0011

| Days in<br>greenhouse | Diameter (mm) |     |      |      | Days in<br>greenhouse | Diameter (mm) |     |      |      |
|-----------------------|---------------|-----|------|------|-----------------------|---------------|-----|------|------|
|                       | 39            | 48  | 54   | 56   |                       | 39            | 48  | 54   | 56   |
| TF0011-1A-1           | 5,7           | 6,9 | 7,6  | 7,9  | T89-24                | 3,1           | 4,6 | 5,0  | 4,5  |
| TF0011-1A-2           | 5,0           | 5,6 | 5,6  | 6,0  | T89-25                | 5,9           | 7,7 | 8,5  | 8,9  |
| TF0011-1B             | 5,2           | 7,1 | 7,7  | 7,6  | T89-26                | 6,2           | 7,8 | 8,6  | 9,5  |
| TF0011-2A-1           | 5,8           | 7,9 | 8,1  | 8,0  | T89-27                | 6,1           | 7,6 | 8,2  | 8,6  |
| TF0011-2A-2           | 6,2           | 7,9 | 9,2  | 9,3  | T89-28                | 6,9           | 9,0 | 10,7 | 10,5 |
| TF0011-3A-1           | 6,0           | 8,4 | 8,4  | 8,8  | T89-29                | 7,8           | 8,4 | 10,3 | 10,2 |
| TF0011-3A-2           | 6,0           | 7,5 | 8,0  | 8,5  | T89-30                | 6,4           | 8,5 | 9,4  | 9,9  |
| TF0011-3B-1           | 6,3           | 8,5 | 9,5  | 9,7  | T89-31                | 6,8           | 8,6 | 8,8  | 9,5  |
| TF0011-3B-2           | 7,7           | 8,4 | 9,3  | 9,5  | T89-32                | 6,7           | 8,4 | 10,2 | 10,9 |
| TF0011-4A             | 6,7           | 8,1 | 9,2  | 9,6  | T89-33                | 7,1           | 8,7 | 9,4  | 11,4 |
| T89-01                | 6,6           | 8,4 | 8,5  | 9,2  | T89-34                | 7,1           | 8,5 | 11,1 | 10,9 |
| T89-02                | 6,8           | 8,3 | 9,4  | 10,1 | T89-35                | 6,7           | 9,0 | 8,9  | 11,4 |
| T89-03                | 4,6           | 4,9 | 6,1  | 6,1  | T89-36                | 6,2           | 8,0 | 8,5  | 8,5  |
| T89-04                | 6,9           | 8,7 | 10,0 | 9,4  | T89-37                | 5,6           | 7,1 | 7,8  | 8,7  |
| T89-05                | 5,6           | 7,6 | 8,2  | 8,8  | T89-38                | 5,8           | 7,8 | 8,8  | 8,7  |
| T89-06                | 6,9           | 8,2 | 9,6  | 9,3  | T89-39                | 6,2           | 8,1 | 9,2  | 9,3  |
| T89-07                | 6,6           | 7,9 | 9,5  | 9,5  | T89-40                | 6,2           | 7,9 | 9,6  | 9,5  |
| T89-08                | 6,9           | 8,9 | 9,6  | 9,8  | T89-41                | 5,9           | 8,2 | 8,9  | 9,5  |
| T89-09                | 6,1           | 7,6 | 8,6  | 8,7  | T89-42                | 6,8           | 8,4 | 9,1  | 10,4 |
| T89-10                | 5,5           | 7,5 | 8,6  | 8,6  | T89-43                | 6,7           | 8,5 | 9,7  | 9,3  |

|        |     |     |      |      |        |     |     |      |      |
|--------|-----|-----|------|------|--------|-----|-----|------|------|
| T89-11 | 7,4 | 8,4 | 9,3  | 8,7  | T89-44 | 7,1 | 9,1 | 9,2  | 9,4  |
| T89-12 | 5,9 | 7,4 | 8,7  | 9,5  | T89-45 | 6,6 | 7,8 | 9,2  | 9,2  |
| T89-13 | 6,2 | 7,7 | 9,2  | 9,5  | T89-46 | 6,8 | 9,3 | 10,2 | 10,0 |
| T89-14 | 5,9 | 7,8 | 9,2  | 8,7  | T89-47 | 5,3 | 7,0 | 7,9  | 8,4  |
| T89-15 | 6,8 | 8,1 | 9,4  | 9,7  | T89-48 | 2,3 | 3,0 | 3,2  | 3,5  |
| T89-16 | 7,3 | 9,2 | 10,6 | 10,3 | T89-49 | 7,5 | 8,7 | 9,1  | 9,8  |
| T89-17 | 6,4 | 8,0 | 8,9  | 9,1  | T89-50 | 6,8 | 8,6 | 9,3  | 8,9  |
| T89-18 | 7,0 | 7,5 | 8,1  | 8,8  | T89-51 | 7,2 | 8,3 | 9,2  | 9,1  |
| T89-19 | 5,6 | 7,4 | 8,6  | 8,9  | T89-52 | 7,5 | 8,8 | 9,4  | 9,7  |
| T89-20 | 6,5 | 8,3 | 8,6  | 9,5  | T89-53 | 7,3 | 9,3 | 9,5  | 10,2 |
| T89-21 | 6,2 | 8,1 | 8,0  | 8,7  | T89-54 | 7,0 | 9,0 | 9,2  | 9,6  |
| T89-22 | 6,2 | 8,5 | 9,3  | 10,1 | T89-55 | 7,0 | 8,9 | 9,2  | 9,8  |
| T89-23 | 6,2 | 8,1 | 9,2  | 9,5  |        |     |     |      |      |

Results from growth analysis are specified in the overview table 2.9. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and 5 MDC.

Table 2.9 Overview table of growth effects of construct TF0011

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TF0011             | 1,00                 | 0,92                   | 1,00                               | 0,83                         | 0,95                 | 0,85                   | 1,04                                  | 0,77                         |

Construction group TF0013rp2

Tables 2.10 and 2.11 contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

Table 2.10 Height growth data for TF0013rp2

| Days in greenhouse | Height (cm) |    |    |    |    |    |     |     |     |
|--------------------|-------------|----|----|----|----|----|-----|-----|-----|
|                    | 15          | 19 | 26 | 33 | 37 | 40 | 47  | 51  | 54  |
| TF0013rp2-1A-1     | 20          | 25 | 39 | 48 | 59 | 68 | 89  | 100 | 111 |
| TF0013rp2-1A-2     | 18          | 22 | 34 | 52 | 64 | 74 | 101 | 115 | 131 |
| TF0013rp2-1A-3     | 21          | 25 | 38 | 54 | 67 | 75 | 104 | 116 | 133 |
| TF0013rp2-3BA-1    | 21          | 26 | 39 | 57 | 73 | 84 | 113 | 125 | 137 |
| TF0013rp2-3BA-2    | 20          | 23 | 34 | 52 | 65 | 75 | 101 | 113 | 128 |
| TF0013rp2-3BA-3    | 20          | 24 | 36 | 55 | 71 | 83 | 115 | 131 | 145 |
| T89-20             | 21          | 26 | 39 | 58 | 73 | 82 | 111 | 130 | 134 |
| T89-21             | 21          | 24 | 34 | 51 | 64 | 72 | 97  | 103 | 125 |
| T89-22             | 19          | 23 | 32 | 48 | 60 | 70 | 96  | 111 | 123 |
| T89-23             | 21          | 24 | 34 | 51 | 63 | 70 | 94  | 112 | 122 |
| T89-24             | 19          | 22 | 30 | 46 | 59 | 68 | 90  | 103 | 115 |
| T89-25             | 22          | 30 | 39 | 57 | 72 | 81 | 106 | 112 | 130 |
| T89-26             | 21          | 24 | 35 | 48 | 60 | 70 | 98  | 111 | 130 |
| T89-27             | 21          | 24 | 34 | 48 | 60 | 70 | 93  | 106 | 120 |
| T89-28             | 20          | 22 | 32 | 48 | 60 | 70 | 93  | 105 | 116 |

Table 2.11 Diameter growth data for TF0013rp2

| Days in greenhouse | Diameter (mm) |     |     |     | Days in greenhouse | Diameter (mm) |     |     |     |
|--------------------|---------------|-----|-----|-----|--------------------|---------------|-----|-----|-----|
|                    | 33            | 40  | 47  | 54  |                    | 33            | 40  | 47  | 54  |
| TF0013rp2-1A-1     | 3,8           | 5,0 | 6,3 | 6,8 | T89-21             | 3,8           | 5,5 | 6,0 | 6,9 |
| TF0013rp2-1A-2     | 5,4           | 5,7 | 7,3 | 8,1 | T89-22             | 4,5           | 6,2 | 6,6 | 7,5 |
| TF0013rp2-1A-3     | 4,4           | 5,4 | 6,6 | 7,6 | T89-23             | 3,8           | 4,8 | 5,6 | 6,2 |
| TF0013rp2-3BA-1    | 5,0           | 6,3 | 7,1 | 8,5 | T89-24             | 3,8           | 4,9 | 5,8 | 7,2 |
| TF0013rp2-3BA-2    | 4,2           | 5,4 | 7,0 | 8,5 | T89-25             | 4,8           | 5,9 | 7,4 | 8,9 |
| TF0013rp2-3BA-3    | 5,0           | 6,5 | 7,3 | 8,1 | T89-26             | 4,4           | 6,2 | 7,0 | 7,8 |
| T89-20             | 4,8           | 6,2 | 6,3 | 6,9 | T89-27             | 4,9           | 6,4 | 7,3 | 8,3 |
| T89-21             | 3,8           | 5,5 | 6,0 | 6,9 | T89-28             | 4,5           | 4,8 | 5,8 | 7,2 |
| T89-22             | 4,5           | 6,2 | 6,6 | 7,5 |                    |               |     |     |     |

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Results from growth analysis are specified in the overview table 2.12. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and MDC.

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Table 2.12 Overview table of growth effects of construct TF0013rp2

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TF0013rp2          | 1,04                 | 1,03                   | 1,08                               | 1,06                         | 1,08                 | 0,91                   | 1,06                                  | 0,96                         |

Construction group TF0045

This construct induces increased growth. The final height is 6% higher comparing the average of the construction group and wild type control group. The final height is 11% higher comparing the largest individuals of the construction group and wild type control group. The maximum height growth rate is 9% higher comparing the average of the construction group and wild type control group. The maximum height growth rate is 12% higher comparing the largest individuals of the construction group and wild type control group. The final diameter is 10% higher comparing the average of the construction group and wild type control group. The final diameter is 9% higher comparing the largest individuals of the construction group and wild type control group. The TF0045 construction group meets growth difference selection criterion (1) as shown in table 2.15.

Tables 2.13 and 2.14 contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

Table 2.13 Height growth data for TF0045

| Days in greenhouse | Height (cm) |    |    |     |    |    |     |     |     |
|--------------------|-------------|----|----|-----|----|----|-----|-----|-----|
|                    | 18          | 25 | 28 | 32  | 36 | 39 | 46  | 53  | 55  |
| TF0045-1A-1        | 25          | 39 | 53 | 66  | 79 | 87 | 106 | 125 | 128 |
| TF0045-1A-2        | 15          | 25 | 34 | 44  | 57 | 66 | 89  | 114 | 121 |
| TF0045-1A-3        | 18          | 34 | 45 | 55  | 68 | 79 | 104 | 133 | 141 |
| TF0045-1B-1        | 24          | 43 | 57 | 68  | 84 | 95 | 126 | 150 | 156 |
| TF0045-1B-2        | 24          | 43 | 57 | 70  | 85 | 95 | 120 | 147 | 154 |
| TF0045-1B-3        | 25          | 30 | 34 | 43  | 54 | 64 | 84  | 107 | 115 |
| TF0045-2B-1        | 21          | 33 | 45 | 53  | 64 | 76 | 103 | 128 | 136 |
| TF0045-2B-3        | 19          | 32 | 42 | 51  | 64 | 72 | 96  | 120 | 128 |
| T89-01             | 18          | 32 | 43 | 54  | 66 | 76 | 98  | 124 | 133 |
| T89-02             | 20          | 33 | 43 | 53  | 67 | 76 | 101 | 124 | 129 |
| T89-03             | 17          | 31 | 43 | 53  | 68 | 76 | 102 | 128 | 135 |
| T89-04             | 19          | 33 | 44 | 54  | 67 | 74 | 97  | 122 | 129 |
| T89-05             | 20          | 33 | 44 | 54  | 67 | 76 | 100 | 121 | 129 |
| T89-06             | 18          | 31 | 42 | 53  | 67 | 76 | 97  | 121 | 128 |
| T89-07             | 16          | 28 | 41 | 53  | 65 | 74 | 96  | 121 | 129 |
| T89-08             | 19          | 34 | 43 | 53  | 65 | 75 | 98  | 123 | 131 |
| T89-09             | 20          | 30 | 40 | 52  | 64 | 73 | 97  | 119 | 125 |
| T89-10             | 21          | 33 | 41 | 49  | 61 | 70 | 92  | 114 | 121 |
| T89-11             | 18          | 31 | 40 | 49  | 61 | 71 | 94  | 117 | 123 |
| T89-12             | 18          | 31 | 40 | N/A | 60 | 68 | 90  | 107 | 115 |
| T89-13             | 19          | 35 | 47 | 58  | 70 | 78 | 103 | 128 | 135 |
| T89-14             | 19          | 31 | 40 | 50  | 61 | 72 | 93  | 118 | 124 |
| T89-15             | 20          | 32 | 41 | 50  | 62 | 70 | 91  | 114 | 120 |

|        |    |    |    |    |    |    |     |     |     |
|--------|----|----|----|----|----|----|-----|-----|-----|
| T89-16 | 18 | 30 | 39 | 49 | 62 | 71 | 92  | 114 | 122 |
| T89-17 | 17 | 33 | 45 | 55 | 70 | 78 | 104 | 129 | 136 |
| T89-18 | 19 | 32 | 44 | 56 | 71 | 82 | 106 | 130 | 137 |
| T89-19 | 16 | 26 | 36 | 46 | 51 | 69 | 89  | 112 | 119 |
| T89-20 | 16 | 31 | 41 | 49 | 60 | 71 | 91  | 111 | 118 |
| T89-21 | 20 | 31 | 44 | 54 | 68 | 76 | 99  | 122 | 127 |
| T89-22 | 14 | 26 | 37 | 46 | 61 | 72 | 96  | 120 | 127 |
| T89-23 | 19 | 32 | 40 | 50 | 63 | 73 | 100 | 121 | 127 |
| T89-24 | 20 | 31 | 41 | 47 | 58 | 68 | 90  | 111 | 117 |
| T89-25 | 20 | 36 | 45 | 57 | 69 | 78 | 101 | 127 | 134 |
| T89-26 | 20 | 37 | 49 | 58 | 71 | 80 | 107 | 131 | 140 |
| T89-27 | 19 | 34 | 44 | 55 | 71 | 81 | 107 | 131 | 138 |
| T89-28 | 17 | 35 | 44 | 56 | 68 | 76 | 99  | 126 | 132 |
| T89-29 | 17 | 32 | 45 | 55 | 68 | 78 | 101 | 125 | 132 |
| T89-30 | 18 | 31 | 41 | 50 | 63 | 72 | 95  | 119 | 125 |
| T89-31 | 17 | 27 | 35 | 45 | 58 | 67 | 87  | 108 | 116 |
| T89-32 | 19 | 32 | 44 | 52 | 65 | 74 | 98  | 121 | 127 |
| T89-33 | 20 | 33 | 43 | 53 | 64 | 74 | 96  | 119 | 126 |
| T89-34 | 19 | 34 | 44 | 55 | 68 | 78 | 100 | 124 | 130 |
| T89-35 | 17 | 30 | 40 | 51 | 64 | 74 | 95  | 116 | 122 |
| T89-36 | 18 | 30 | 40 | 49 | 62 | 71 | 91  | 114 | 121 |
| T89-82 | 21 | 33 | 43 | 54 | 65 | 75 | 98  | 118 | 125 |
| T89-83 | 22 | 35 | 47 | 55 | 71 | 80 | 105 | 130 | 137 |
| T89-85 | 21 | 36 | 46 | 56 | 67 | 76 | 98  | 123 | 131 |

Table 2.14 Diameter growth data for TF0045

| Days in greenhouse | Diameter (mm) |     |     |      |      |
|--------------------|---------------|-----|-----|------|------|
|                    | 32            | 39  | 46  | 53   | 55   |
| TF0045-1A-1        | 5,8           | 6,5 | 6,9 | 7,5  | 7,6  |
| TF0045-1A-2        | 4,3           | 6,8 | 8,4 | 8,7  | 9,2  |
| TF0045-1A-3        | 5,6           | 6,7 | 7,9 | 9,2  | 9,2  |
| TF0045-1B-1        | 5,9           | 7,1 | 8,8 | 9,7  | 10,0 |
| TF0045-1B-2        | 6,8           | 7,8 | 8,4 | 10,1 | 9,9  |
| TF0045-1B-3        | 4,3           | 4,4 | 4,6 | 5,9  | 5,9  |
| TF0045-2B-1        | 5,3           | 7,1 | 7,4 | 8,5  | 8,8  |
| TF0045-2B-3        | 5,4           | 6,2 | 8,0 | 8,9  | 8,8  |
| T89-01             | 5,2           | 6,0 | 6,8 | 8,2  | 7,6  |
| T89-02             | 4,5           | 5,8 | 7,1 | 8,6  | 8,3  |
| T89-03             | 4,4           | 5,7 | 6,8 | 7,9  | 8,1  |
| T89-04             | 4,4           | 6,0 | 6,9 | 8,6  | 8,5  |
| T89-05             | 4,6           | 5,8 | 6,7 | 7,9  | 8,0  |
| T89-06             | 4,7           | 5,9 | 7,2 | 8,1  | 9,2  |
| T89-07             | 4,8           | 5,5 | 6,2 | 6,9  | 7,1  |
| T89-08             | 4,5           | 5,4 | 6,0 | 6,9  | 7,1  |
| T89-09             | 4,7           | 5,6 | 6,7 | 8,8  | 8,0  |
| T89-10             | 4,1           | 4,9 | 5,6 | 7,1  | 7,0  |
| T89-11             | 3,8           | 5,3 | 7,3 | 8,0  | 7,6  |
| T89-12             | N/A           | 5,1 | 6,2 | 7,3  | 6,9  |
| T89-13             | 4,8           | 5,7 | 6,5 | 7,6  | 7,6  |
| T89-14             | 4,2           | 5,5 | 6,6 | 7,6  | 6,5  |
| T89-15             | 5,0           | 6,1 | 7,2 | 7,9  | 8,3  |

|        |     |     |     |     |     |
|--------|-----|-----|-----|-----|-----|
| T89-16 | 4,4 | 5,6 | 6,2 | 7,3 | 7,9 |
| T89-17 | 4,8 | 6,7 | 7,0 | 8,3 | 8,4 |
| T89-18 | 4,2 | 5,5 | 6,7 | 7,3 | 7,4 |
| T89-19 | 4,7 | 5,5 | 6,8 | 7,2 | 7,8 |
| T89-20 | 4,5 | 5,6 | 6,5 | 7,0 | 7,3 |
| T89-21 | 4,9 | 5,6 | 6,4 | 7,4 | 7,6 |
| T89-22 | 4,3 | 5,4 | 6,5 | 7,3 | 7,6 |
| T89-23 | 3,9 | 5,5 | 6,7 | 7,7 | 7,0 |
| T89-24 | 4,3 | 5,9 | 6,8 | 8,1 | 7,9 |
| T89-25 | 4,7 | 6,5 | 7,5 | 9,2 | 9,1 |
| T89-26 | 5,4 | 5,9 | 7,7 | 8,6 | 8,8 |
| T89-27 | 4,7 | 5,6 | 7,4 | 7,9 | 8,0 |
| T89-28 | 4,7 | 5,7 | 6,3 | 7,2 | 7,4 |
| T89-29 | 4,8 | 5,6 | 6,6 | 7,7 | 8,1 |
| T89-30 | 4,6 | 5,5 | 6,7 | 7,3 | 7,3 |
| T89-31 | 4,3 | 5,8 | 6,3 | 7,5 | 7,6 |
| T89-32 | 4,6 | 5,9 | 7,6 | 9,3 | 9,1 |
| T89-33 | 4,4 | 5,3 | 6,2 | 7,1 | 7,1 |
| T89-34 | 4,6 | 5,6 | 6,8 | 8,1 | 8,7 |
| T89-35 | 5,3 | 6,0 | 7,5 | 8,8 | 8,9 |
| T89-36 | 4,4 | 6,1 | 6,9 | 8,1 | 8,6 |
| T89-82 | 4,7 | 5,3 | 6,5 | 7,5 | 7,4 |
| T89-83 | 4,7 | 6,1 | 7,1 | 8,3 | 8,3 |
| T89-85 | 5,1 | 6,3 | 7,3 | 7,7 | 8,2 |

Results from growth analysis are specified in the overview table 2.15. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and 5 MDC.

Table 2.15 Overview table of growth effects of construct TF0045

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TF0045             | 1,06                 | 1,10                   | 1,09                               | 0,98                         | 1,11                 | 1,09                   | 1,12                                  | 0,94                         |

Construction group TF0052Rp1

Tables 2.16 and 2.17 contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

Table 2.16 Height growth data for TF0052Rp1

| Days in greenhouse | Height (cm) |    |    |    |    |    |     |     |     |     |
|--------------------|-------------|----|----|----|----|----|-----|-----|-----|-----|
|                    | 20          | 25 | 29 | 35 | 41 | 46 | 50  | 53  | 57  | 60  |
| TF0052rp1-2A-1     | 21          | 29 | 38 | 53 | 74 | 90 | 103 | 115 | 127 | 138 |
| TF0052rp1-2A-2     | 19          | 28 | 37 | 52 | 68 | 83 | 97  | 105 | 116 | 126 |
| TF0052rp1-2A-3     | 15          | 23 | 33 | 50 | 69 | 85 | 97  | 108 | 117 | 129 |
| TF0052rp1-2B-1     | 18          | 26 | 32 | 47 | 59 | 75 | 82  | 91  | 100 | 109 |
| TF0052rp1-2B-2     | 18          | 23 | 27 | 35 | 49 | 67 | 75  | 84  | 94  | 101 |
| TF0052rp1-2B-3     | 18          | 21 | 28 | 38 | 50 | 63 | 68  | 75  | 83  | 89  |
| T89-01             | 17          | 26 | 31 | 45 | 61 | 76 | 87  | 95  | 107 | 116 |
| T89-02             | 16          | 21 | 26 | 38 | 53 | 67 | 76  | 83  | N/A | N/A |
| T89-03             | 18          | 24 | 32 | 47 | 64 | 78 | 87  | 96  | 106 | 115 |
| T89-04             | 18          | 26 | 35 | 50 | 66 | 80 | 87  | 96  | 107 | 115 |
| T89-05             | 17          | 26 | 33 | 44 | 57 | 73 | 81  | 91  | 100 | 107 |
| T89-06             | 16          | 21 | 28 | 40 | 55 | 74 | 79  | 89  | 99  | 106 |
| T89-07             | 17          | 23 | 31 | 43 | 57 | 71 | 80  | 88  | 98  | 107 |
| T89-08             | 15          | 20 | 26 | 37 | 51 | 65 | 75  | 84  | 94  | 100 |
| T89-09             | 18          | 25 | 32 | 46 | 61 | 74 | 85  | 93  | 103 | 112 |
| T89-10             | 19          | 25 | 32 | 46 | 60 | 75 | 86  | 95  | 104 | 112 |
| T89-11             | 20          | 27 | 36 | 51 | 68 | 86 | 98  | 107 | 120 | 127 |
| T89-12             | 19          | 27 | 36 | 50 | 67 | 80 | 89  | 97  | 108 | 118 |
| T89-13             | 18          | 25 | 32 | 45 | 59 | 75 | 83  | 92  | 101 | 108 |
| T89-14             | 18          | 23 | 26 | 36 | 51 | 65 | 72  | 79  | 89  | 96  |
| T89-15             | 17          | 21 | 28 | 39 | 53 | 70 | 78  | 87  | 97  | 105 |
| T89-16             | 19          | 25 | 32 | 43 | 57 | 71 | 81  | 90  | 101 | 109 |
| T89-17             | 16          | 20 | 29 | 41 | 54 | 68 | 78  | 84  | 93  | 101 |
| T89-18             | 16          | 23 | 30 | 45 | 63 | 78 | 87  | 94  | 103 | 110 |
| T89-19             | 16          | 22 | 28 | 42 | 56 | 69 | 79  | 89  | 100 | 107 |
| T89-20             | 18          | 25 | 32 | 47 | 63 | 78 | 89  | 99  | 109 | 115 |
| T89-21             | 19          | 27 | 34 | 50 | 67 | 82 | 92  | 102 | 111 | 120 |
| T89-22             | 19          | 25 | 32 | 44 | 58 | 76 | 84  | 93  | 102 | 109 |
| T89-23             | 18          | 26 | 33 | 47 | 63 | 79 | 88  | 99  | 108 | 116 |
| T89-24             | 16          | 24 | 28 | 42 | 53 | 70 | 78  | 85  | 94  | 103 |
| T89-25             | 16          | 25 | 32 | 45 | 61 | 76 | 85  | 95  | 107 | 114 |
| T89-26             | 16          | 20 | 26 | 38 | 52 | 68 | 78  | 86  | 97  | 103 |
| T89-27             | 16          | 21 | 25 | 35 | 48 | 61 | 70  | 78  | N/A | 98  |
| T89-28             | 14          | 18 | 25 | 38 | 51 | 64 | 73  | 81  | 90  | 96  |
| T89-29             | 7           | 13 | 18 | 30 | 45 | 60 | 69  | 77  | 90  | 98  |
| T89-30             | 15          | 22 | 29 | 42 | 55 | 69 | 80  | 88  | 97  | 106 |
| T89-31             | 21          | 29 | 37 | 50 | 65 | 80 | 88  | 98  | 108 | 116 |
| T89-32             | 19          | 24 | 32 | 42 | 55 | 70 | 78  | 87  | 96  | 105 |

Table 2.17 Diameter growth data for TF0052Rp1

| Days in<br>greenhouse | Diameter (mm) |     |     |     |     | Days in<br>greenhouse | Diameter (mm) |     |     |     |     |
|-----------------------|---------------|-----|-----|-----|-----|-----------------------|---------------|-----|-----|-----|-----|
|                       | 35            | 41  | 46  | 53  | 60  |                       | 35            | 41  | 46  | 53  | 60  |
| TF0052rp1-2A-1        | 5,4           | 6,5 | 7,2 | 8,6 | 9,4 | T89-14                | 4,5           | 5,2 | 5,8 | 6,1 | 7,0 |
| TF0052rp1-2A-2        | 4,9           | 6,6 | 6,9 | 7,3 | 8,3 | T89-15                | 4,7           | N/A | 6,0 | 6,4 | 7,3 |
| TF0052rp1-2A-3        | 5,3           | 6,7 | 7,5 | 8,4 | 9,5 | T89-16                | 4,5           | 5,6 | 7,7 | 7,5 | 8,6 |
| TF0052rp1-2B-1        | 5,0           | 6,2 | 6,9 | 9,0 | 8,0 | T89-17                | 4,1           | 5,4 | 6,0 | 6,8 | 7,5 |
| TF0052rp1-2B-2        | 4,9           | 5,9 | 6,6 | 6,8 | 8,1 | T89-18                | 4,4           | 5,8 | 6,0 | 7,7 | 8,3 |
| TF0052rp1-2B-3        | 3,3           | 4,2 | 4,4 | 5,1 | 5,7 | T89-19                | 4,7           | 5,8 | 7,1 | 8,5 | 9,4 |
| T89-01                | 4,7           | 6,0 | 6,5 | 6,9 | 8,3 | T89-20                | 4,7           | 5,8 | 6,6 | 7,4 | 8,3 |
| T89-02                | 4,4           | 5,7 | 6,6 | 7,6 | 7,8 | T89-21                | 4,7           | 6,2 | 6,3 | 7,7 | 8,5 |
| T89-03                | 4,7           | 6,3 | 6,7 | 7,7 | 8,4 | T89-22                | 4,2           | 5,1 | 6,3 | 6,9 | 8,0 |
| T89-04                | 4,7           | 6,0 | 7,1 | 8,0 | 8,5 | T89-23                | 4,6           | 5,8 | 7,1 | 7,5 | 8,3 |
| T89-05                | 4,0           | 5,3 | 6,3 | 7,8 | 8,1 | T89-24                | 4,4           | 5,8 | 6,9 | 7,7 | 8,8 |
| T89-06                | 4,6           | 5,9 | 6,3 | 7,7 | 8,2 | T89-25                | 4,5           | 5,4 | 6,2 | 8,0 | 8,7 |
| T89-07                | 4,6           | 6,1 | 6,5 | 7,9 | 8,5 | T89-26                | 4,1           | 5,4 | 6,0 | 7,2 | 8,0 |
| T89-08                | 4,0           | 5,2 | 5,8 | 6,9 | 7,1 | T89-27                | 4,5           | 5,7 | 6,5 | 7,9 | 9,2 |
| T89-09                | 4,4           | 5,8 | 6,4 | 7,6 | 8,2 | T89-28                | 4,3           | 5,1 | 6,0 | 6,6 | 7,7 |
| T89-10                | 4,9           | 6,0 | 6,6 | 7,4 | 8,5 | T89-29                | 3,5           | 4,7 | 5,5 | 6,3 | 7,1 |
| T89-11                | 4,7           | 5,8 | 6,4 | 7,9 | 8,3 | T89-30                | 4,1           | 5,4 | 5,8 | 7,2 | 7,8 |
| T89-12                | 4,7           | 5,9 | 7,3 | 7,4 | 7,6 | T89-31                | 5,0           | 5,8 | 6,8 | 7,3 | 8,2 |
| T89-13                | 5,9           | 5,9 | 6,7 | 7,5 | 8,3 | T89-32                | 4,4           | 6,4 | 6,6 | 8,0 | 8,4 |

- 5 Results from growth analysis are specified in the overview table 2.18. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and MDC.

10 Table 2.18 Overview table of growth effects of construct TF0052Rp1

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TF0052Rp1          | 1,06                 | 1,00                   | 1,04                               | 0,91                         | 1,09                 | 1,02                   | 1,06                                  | 0,86                         |

Construction group TF0076Rp2

This construct induces increased growth. The final height is 13% higher comparing the average of the construction group and wild type control group. The final height is 13% higher comparing the largest individuals of the construction group and wild type control group. The maximum height growth rate is 13% higher comparing the average of the construction group and wild type control group. The maximum height growth rate is 18% higher comparing the largest individuals of the construction group and wild type control group. The TF0076Rp2 construction group meets the more stringent level of growth difference selection criterion (1) as shown in table 2.21.

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Tables 2.19 and 2.20 contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

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Table 2.19 Height growth data for TF0076Rp2

| Days in greenhouse | Height (cm) |    |    |    |    |     |     |     |     |     |
|--------------------|-------------|----|----|----|----|-----|-----|-----|-----|-----|
|                    | 20          | 25 | 29 | 35 | 41 | 46  | 50  | 53  | 57  | 60  |
| TF0076rp2-3BB-1    | 15          | 22 | 29 | 43 | 59 | 72  | 84  | 93  | 103 | 111 |
| TF0076rp2-3BB-2    | 20          | 28 | 39 | 53 | 70 | 85  | 95  | 104 | 115 | 120 |
| TF0076rp2-3BB-3    | 17          | 25 | 33 | 48 | 67 | 81  | 92  | 101 | 112 | 122 |
| TF0076rp2-4B-1     | 15          | 26 | 35 | 55 | 76 | 97  | 111 | 122 | 134 | 143 |
| TF0076rp2-4B-2     | 19          | 28 | 37 | 53 | 72 | 89  | 103 | 111 | 124 | 135 |
| TF0076rp2-4B-3     | 20          | 28 | 40 | 53 | 74 | 93  | 104 | 114 | 124 | 134 |
| TF0076rp2-5BA-1    | 18          | 24 | 30 | 39 | 49 | 65  | 74  | 84  | 96  | 103 |
| TF0076rp2-5BA-2    | 17          | 26 | 36 | 49 | 63 | 82  | 92  | 100 | 112 | 121 |
| TF0076rp2-5BA-3    | 16          | 24 | 31 | 46 | 65 | 84  | 93  | 103 | 116 | 126 |
| TF0076rp2-5BB-1    | 17          | 24 | 30 | 45 | 61 | 76  | 86  | 97  | 109 | 119 |
| TF0076rp2-5BB-2    | 15          | 22 | 29 | 42 | 58 | 73  | 86  | 95  | 106 | 118 |
| TF0076rp2-5BB-3    | 20          | 27 | 36 | 50 | 69 | N/A | 94  | 100 | 109 | 118 |
| T89-01             | 17          | 26 | 31 | 45 | 61 | 76  | 87  | 95  | 107 | 116 |
| T89-02             | 16          | 21 | 26 | 38 | 53 | 67  | 76  | 83  | N/A | N/A |
| T89-03             | 18          | 24 | 32 | 47 | 64 | 78  | 87  | 96  | 106 | 115 |
| T89-04             | 18          | 26 | 35 | 50 | 66 | 80  | 87  | 96  | 107 | 115 |
| T89-05             | 17          | 26 | 33 | 44 | 57 | 73  | 81  | 91  | 100 | 107 |
| T89-06             | 16          | 21 | 28 | 40 | 55 | 74  | 79  | 89  | 99  | 106 |
| T89-07             | 17          | 23 | 31 | 43 | 57 | 71  | 80  | 88  | 98  | 107 |
| T89-08             | 15          | 20 | 26 | 37 | 51 | 65  | 75  | 84  | 94  | 100 |
| T89-09             | 18          | 25 | 32 | 46 | 61 | 74  | 85  | 93  | 103 | 112 |
| T89-10             | 19          | 25 | 32 | 46 | 60 | 75  | 86  | 95  | 104 | 112 |
| T89-11             | 20          | 27 | 36 | 51 | 68 | 86  | 98  | 107 | 120 | 127 |
| T89-12             | 19          | 27 | 36 | 50 | 67 | 80  | 89  | 97  | 108 | 118 |
| T89-13             | 18          | 25 | 32 | 45 | 59 | 75  | 83  | 92  | 101 | 108 |
| T89-14             | 18          | 23 | 26 | 36 | 51 | 65  | 72  | 79  | 89  | 96  |

|        |    |    |    |    |    |    |    |     |     |     |
|--------|----|----|----|----|----|----|----|-----|-----|-----|
| T89-15 | 17 | 21 | 28 | 39 | 53 | 70 | 78 | 87  | 97  | 105 |
| T89-16 | 19 | 25 | 32 | 43 | 57 | 71 | 81 | 90  | 101 | 109 |
| T89-17 | 16 | 20 | 29 | 41 | 54 | 68 | 78 | 84  | 93  | 101 |
| T89-18 | 16 | 23 | 30 | 45 | 63 | 78 | 87 | 94  | 103 | 110 |
| T89-19 | 16 | 22 | 28 | 42 | 56 | 69 | 79 | 89  | 100 | 107 |
| T89-20 | 18 | 25 | 32 | 47 | 63 | 78 | 89 | 99  | 109 | 115 |
| T89-21 | 19 | 27 | 34 | 50 | 67 | 82 | 92 | 102 | 111 | 120 |
| T89-22 | 19 | 25 | 32 | 44 | 58 | 76 | 84 | 93  | 102 | 109 |
| T89-23 | 18 | 26 | 33 | 47 | 63 | 79 | 88 | 99  | 108 | 116 |
| T89-24 | 16 | 24 | 28 | 42 | 53 | 70 | 78 | 85  | 94  | 103 |
| T89-25 | 16 | 25 | 32 | 45 | 61 | 76 | 85 | 95  | 107 | 114 |
| T89-26 | 16 | 20 | 26 | 38 | 52 | 68 | 78 | 86  | 97  | 103 |
| T89-27 | 16 | 21 | 25 | 35 | 48 | 61 | 70 | 78  | N/A | 98  |
| T89-28 | 14 | 18 | 25 | 38 | 51 | 64 | 73 | 81  | 90  | 96  |
| T89-29 | 7  | 13 | 18 | 30 | 45 | 60 | 69 | 77  | 90  | 98  |
| T89-30 | 15 | 22 | 29 | 42 | 55 | 69 | 80 | 88  | 97  | 106 |
| T89-31 | 21 | 29 | 37 | 50 | 65 | 80 | 88 | 98  | 108 | 116 |
| T89-32 | 19 | 24 | 32 | 42 | 55 | 70 | 78 | 87  | 96  | 105 |

Table 2.20 Diameter growth data for TF0076Rp2

| Days in<br>greenhouse | Diameter (mm) |     |     |     |     | Days in<br>greenhouse | Diameter (mm) |     |     |     |     |
|-----------------------|---------------|-----|-----|-----|-----|-----------------------|---------------|-----|-----|-----|-----|
|                       | 35            | 41  | 46  | 53  | 60  |                       | 35            | 41  | 46  | 53  | 60  |
| TF0076rp2-3BB-1       | 4,1           | 5,3 | 6,4 | 8,3 | 8,2 | T89-11                | 4,7           | 5,8 | 6,4 | 7,9 | 8,3 |
| TF0076rp2-3BB-2       | 4,6           | 5,5 | 6,9 | 7,4 | 8,4 | T89-12                | 4,7           | 5,9 | 7,3 | 7,4 | 7,6 |
| TF0076rp2-3BB-3       | 5,3           | 6,6 | 7,3 | 8,5 | 9,1 | T89-13                | 5,9           | 5,9 | 6,7 | 7,5 | 8,3 |
| TF0076rp2-4B-1        | 4,4           | 5,8 | 6,8 | 7,5 | 8,0 | T89-14                | 4,5           | 5,2 | 5,8 | 6,1 | 7,0 |
| TF0076rp2-4B-2        | 4,4           | 5,7 | 6,5 | 7,0 | 7,9 | T89-15                | 4,7           | N/A | 6,0 | 6,4 | 7,3 |
| TF0076rp2-4B-3        | 4,9           | 6,2 | 7,5 | 8,2 | 9,1 | T89-16                | 4,5           | 5,6 | 7,7 | 7,5 | 8,6 |
| TF0076rp2-5BA-1       | 4,7           | 5,5 | 6,5 | 6,8 | 7,3 | T89-17                | 4,1           | 5,4 | 6,0 | 6,8 | 7,5 |
| TF0076rp2-5BA-2       | 4,4           | 6,2 | 6,4 | 7,4 | 8,1 | T89-18                | 4,4           | 5,8 | 6,0 | 7,7 | 8,3 |
| TF0076rp2-5BA-3       | 4,4           | 5,5 | 6,8 | 7,8 | 8,6 | T89-19                | 4,7           | 5,8 | 7,1 | 8,5 | 9,4 |
| TF0076rp2-5BB-1       | 4,5           | 5,8 | 6,1 | 7,3 | 8,0 | T89-20                | 4,7           | 5,8 | 6,6 | 7,4 | 8,3 |
| TF0076rp2-5BB-2       | 4,1           | 5,9 | 6,5 | 7,1 | 8,2 | T89-21                | 4,7           | 6,2 | 6,3 | 7,7 | 8,5 |
| TF0076rp2-5BB-3       | 4,1           | 6,1 | 6,1 | 6,4 | 8,1 | T89-22                | 4,2           | 5,1 | 6,3 | 6,9 | 8,0 |
| T89-01                | 4,7           | 6,0 | 6,5 | 6,9 | 8,3 | T89-23                | 4,6           | 5,8 | 7,1 | 7,5 | 8,3 |
| T89-02                | 4,4           | 5,7 | 6,6 | 7,6 | 7,8 | T89-24                | 4,4           | 5,8 | 6,9 | 7,7 | 8,8 |
| T89-03                | 4,7           | 6,3 | 6,7 | 7,7 | 8,4 | T89-25                | 4,5           | 5,4 | 6,2 | 8,0 | 8,7 |
| T89-04                | 4,7           | 6,0 | 7,1 | 8,0 | 8,5 | T89-26                | 4,1           | 5,4 | 6,0 | 7,2 | 8,0 |
| T89-05                | 4,0           | 5,3 | 6,3 | 7,8 | 8,1 | T89-27                | 4,5           | 5,7 | 6,5 | 7,9 | 9,2 |
| T89-06                | 4,6           | 5,9 | 6,3 | 7,7 | 8,2 | T89-28                | 4,3           | 5,1 | 6,0 | 6,6 | 7,7 |
| T89-07                | 4,6           | 6,1 | 6,5 | 7,9 | 8,5 | T89-29                | 3,5           | 4,7 | 5,5 | 6,3 | 7,1 |
| T89-08                | 4,0           | 5,2 | 5,8 | 6,9 | 7,1 | T89-30                | 4,1           | 5,4 | 5,8 | 7,2 | 7,8 |
| T89-09                | 4,4           | 5,8 | 6,4 | 7,6 | 8,2 | T89-31                | 5,0           | 5,8 | 6,8 | 7,3 | 8,2 |
| T89-10                | 4,9           | 6,0 | 6,6 | 7,4 | 8,5 | T89-32                | 4,4           | 6,4 | 6,6 | 8,0 | 8,4 |

Results from growth analysis are specified in the overview table 2.21. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and MDC.

5 Table 2.21 Overview table of growth effects of construct TF0076Rp2

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TF0076Rp2          | 1,13                 | 1,01                   | 1,13                               | 1,01                         | 1,13                 | 0,97                   | 1,18                                  | 0,87                         |

Construction group TF0096

This construct induces increased growth. The final height is 11% higher comparing the average of the construction group and wild type control group. The final height is 8% higher comparing the largest individuals of the construction group and wild type control group. The maximum height growth rate is 18% higher comparing the average of the construction group and wild type control group. The maximum height growth rate is 14% higher comparing the largest individuals of the construction group and wild type control group. The final diameter is 15% higher comparing the average of the construction group and wild type control group. The final diameter is 8% higher comparing the largest individuals of the construction group and wild type control group. The diameter growth rate is 27% higher comparing the average of the construction group and wild type control group. The diameter growth rate is 14% higher comparing the largest individuals of the construction group and wild type control group. The TF0096 construction group meets the more stringent level of growth difference selection criterion (3) and the less stringent level of growth difference selection criteria (1) and (2) as shown in table 2.24.

Tables 2.22 and 2.23 contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

Table 2.22 Height growth data for TF0096

| Days in greenhouse | Height (cm) |    |    |     |    |    |     |     |     |
|--------------------|-------------|----|----|-----|----|----|-----|-----|-----|
|                    | 18          | 25 | 28 | 32  | 36 | 39 | 46  | 53  | 55  |
| TF0096-2A          | 14          | 27 | 41 | 51  | 68 | 80 | 109 | 138 | 148 |
| TF0096-2B          | 13          | 24 | 36 | 47  | 62 | 72 | 101 | 126 | 131 |
| TF0096-3A          | 12          | 26 | 38 | 50  | 65 | 77 | 106 | 133 | 141 |
| TF0096-3B          | 16          | 29 | 39 | 50  | 62 | 72 | 101 | 127 | 134 |
| TF0096-4A          | 24          | 42 | 54 | 67  | 82 | 93 | 120 | N/A | 151 |
| T89-01             | 18          | 32 | 43 | 54  | 66 | 76 | 98  | 124 | 133 |
| T89-02             | 20          | 33 | 43 | 53  | 67 | 76 | 101 | 124 | 129 |
| T89-03             | 17          | 31 | 43 | 53  | 68 | 76 | 102 | 128 | 135 |
| T89-04             | 19          | 33 | 44 | 54  | 67 | 74 | 97  | 122 | 129 |
| T89-05             | 20          | 33 | 44 | 54  | 67 | 76 | 100 | 121 | 129 |
| T89-06             | 18          | 31 | 42 | 53  | 67 | 76 | 97  | 121 | 128 |
| T89-07             | 16          | 28 | 41 | 53  | 65 | 74 | 96  | 121 | 129 |
| T89-08             | 19          | 34 | 43 | 53  | 65 | 75 | 98  | 123 | 131 |
| T89-09             | 20          | 30 | 40 | 52  | 64 | 73 | 97  | 119 | 125 |
| T89-10             | 21          | 33 | 41 | 49  | 61 | 70 | 92  | 114 | 121 |
| T89-11             | 18          | 31 | 40 | 49  | 61 | 71 | 94  | 117 | 123 |
| T89-12             | 18          | 31 | 40 | N/A | 60 | 68 | 90  | 107 | 115 |

|        |    |    |    |    |    |    |     |     |     |
|--------|----|----|----|----|----|----|-----|-----|-----|
| T89-13 | 19 | 35 | 47 | 58 | 70 | 78 | 103 | 128 | 135 |
| T89-14 | 19 | 31 | 40 | 50 | 61 | 72 | 93  | 118 | 124 |
| T89-15 | 20 | 32 | 41 | 50 | 62 | 70 | 91  | 114 | 120 |
| T89-16 | 18 | 30 | 39 | 49 | 62 | 71 | 92  | 114 | 122 |
| T89-17 | 17 | 33 | 45 | 55 | 70 | 78 | 104 | 129 | 136 |
| T89-18 | 19 | 32 | 44 | 56 | 71 | 82 | 106 | 130 | 137 |
| T89-19 | 16 | 26 | 36 | 46 | 51 | 69 | 89  | 112 | 119 |
| T89-20 | 16 | 31 | 41 | 49 | 60 | 71 | 91  | 111 | 118 |
| T89-21 | 20 | 31 | 44 | 54 | 68 | 76 | 99  | 122 | 127 |
| T89-22 | 14 | 26 | 37 | 46 | 61 | 72 | 96  | 120 | 127 |
| T89-23 | 19 | 32 | 40 | 50 | 63 | 73 | 100 | 121 | 127 |
| T89-24 | 20 | 31 | 41 | 47 | 58 | 68 | 90  | 111 | 117 |
| T89-25 | 20 | 36 | 45 | 57 | 69 | 78 | 101 | 127 | 134 |
| T89-26 | 20 | 37 | 49 | 58 | 71 | 80 | 107 | 131 | 140 |
| T89-27 | 19 | 34 | 44 | 55 | 71 | 81 | 107 | 131 | 138 |
| T89-28 | 17 | 35 | 44 | 56 | 68 | 76 | 99  | 126 | 132 |
| T89-29 | 17 | 32 | 45 | 55 | 68 | 78 | 101 | 125 | 132 |
| T89-30 | 18 | 31 | 41 | 50 | 63 | 72 | 95  | 119 | 125 |
| T89-31 | 17 | 27 | 35 | 45 | 58 | 67 | 87  | 108 | 116 |
| T89-32 | 19 | 32 | 44 | 52 | 65 | 74 | 98  | 121 | 127 |
| T89-33 | 20 | 33 | 43 | 53 | 64 | 74 | 96  | 119 | 126 |
| T89-34 | 19 | 34 | 44 | 55 | 68 | 78 | 100 | 124 | 130 |
| T89-35 | 17 | 30 | 40 | 51 | 64 | 74 | 95  | 116 | 122 |
| T89-36 | 18 | 30 | 40 | 49 | 62 | 71 | 91  | 114 | 121 |
| T89-82 | 21 | 33 | 43 | 54 | 65 | 75 | 98  | 118 | 125 |
| T89-83 | 22 | 35 | 47 | 55 | 71 | 80 | 105 | 130 | 137 |
| T89-85 | 21 | 36 | 46 | 56 | 67 | 76 | 98  | 123 | 131 |

Table 2.23 Diameter growth data for TF0096

| Days in greenhouse | Diameter (mm) |     |     |     |     |
|--------------------|---------------|-----|-----|-----|-----|
|                    | 32            | 39  | 46  | 53  | 55  |
| TF0096-2A          | 4,8           | 6,0 | 7,3 | 8,4 | 8,6 |
| TF0096-2B          | 4,4           | 6,2 | 8,2 | 9,2 | 9,9 |
| TF0096-3A          | 5,5           | 6,8 | 7,4 | 9,2 | 9,2 |
| TF0096-3B          | 3,9           | 5,5 | 7,3 | 8,2 | 8,4 |
| TF0096-4A          | 5,5           | 6,9 | 7,6 | 9,2 | 9,1 |
| T89-01             | 5,2           | 6,0 | 6,8 | 8,2 | 7,6 |
| T89-02             | 4,5           | 5,8 | 7,1 | 8,6 | 8,3 |
| T89-03             | 4,4           | 5,7 | 6,8 | 7,9 | 8,1 |
| T89-04             | 4,4           | 6,0 | 6,9 | 8,6 | 8,5 |
| T89-05             | 4,6           | 5,8 | 6,7 | 7,9 | 8,0 |
| T89-06             | 4,7           | 5,9 | 7,2 | 8,1 | 9,2 |
| T89-07             | 4,8           | 5,5 | 6,2 | 6,9 | 7,1 |
| T89-08             | 4,5           | 5,4 | 6,0 | 6,9 | 7,1 |
| T89-09             | 4,7           | 5,6 | 6,7 | 8,8 | 8,0 |
| T89-10             | 4,1           | 4,9 | 5,6 | 7,1 | 7,0 |
| T89-11             | 3,8           | 5,3 | 7,3 | 8,0 | 7,6 |
| T89-12             | N/A           | 5,1 | 6,2 | 7,3 | 6,9 |
| T89-13             | 4,8           | 5,7 | 6,5 | 7,6 | 7,6 |
| T89-14             | 4,2           | 5,5 | 6,6 | 7,6 | 6,5 |
| T89-15             | 5,0           | 6,1 | 7,2 | 7,9 | 8,3 |

|        |     |     |     |     |     |
|--------|-----|-----|-----|-----|-----|
| T89-16 | 4,4 | 5,6 | 6,2 | 7,3 | 7,9 |
| T89-17 | 4,8 | 6,7 | 7,0 | 8,3 | 8,4 |
| T89-18 | 4,2 | 5,5 | 6,7 | 7,3 | 7,4 |
| T89-19 | 4,7 | 5,5 | 6,8 | 7,2 | 7,8 |
| T89-20 | 4,5 | 5,6 | 6,5 | 7,0 | 7,3 |
| T89-21 | 4,9 | 5,6 | 6,4 | 7,4 | 7,6 |
| T89-22 | 4,3 | 5,4 | 6,5 | 7,3 | 7,6 |
| T89-23 | 3,9 | 5,5 | 6,7 | 7,7 | 7,0 |
| T89-24 | 4,3 | 5,9 | 6,8 | 8,1 | 7,9 |
| T89-25 | 4,7 | 6,5 | 7,5 | 9,2 | 9,1 |
| T89-26 | 5,4 | 5,9 | 7,7 | 8,6 | 8,8 |
| T89-27 | 4,7 | 5,6 | 7,4 | 7,9 | 8,0 |
| T89-28 | 4,7 | 5,7 | 6,3 | 7,2 | 7,4 |
| T89-29 | 4,8 | 5,6 | 6,6 | 7,7 | 8,1 |
| T89-30 | 4,6 | 5,5 | 6,7 | 7,3 | 7,3 |
| T89-31 | 4,3 | 5,8 | 6,3 | 7,5 | 7,6 |
| T89-32 | 4,6 | 5,9 | 7,6 | 9,3 | 9,1 |
| T89-33 | 4,4 | 5,3 | 6,2 | 7,1 | 7,1 |
| T89-34 | 4,6 | 5,6 | 6,8 | 8,1 | 8,7 |
| T89-35 | 5,3 | 6,0 | 7,5 | 8,8 | 8,9 |
| T89-36 | 4,4 | 6,1 | 6,9 | 8,1 | 8,6 |
| T89-82 | 4,7 | 5,3 | 6,5 | 7,5 | 7,4 |
| T89-83 | 4,7 | 6,1 | 7,1 | 8,3 | 8,3 |
| T89-85 | 5,1 | 6,3 | 7,3 | 7,7 | 8,2 |

Results from growth analysis are specified in the overview table 2.24. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and 5 MDC.

Table 2.24 Overview table of growth effects of construct TF0096

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TF0096             | 1,11                 | 1,15                   | 1,18                               | 1,27                         | 1,08                 | 1,08                   | 1,14                                  | 1,14                         |

Construction group TF0097Rp1

This construct induces increased growth. The final height is 33% higher comparing the average of the construction group and wild type control group. The final height is 43% higher comparing the largest individuals of the construction group and wild type control group. The maximum height growth rate is 32% higher comparing the average of the construction group and wild type control group. The maximum height growth rate is 41% higher comparing the largest individuals of the construction group and wild type control group. The final diameter is 11% higher comparing the average of the construction group and wild type control group. The final diameter is 13% higher comparing the largest individuals of the construction group and wild type control group. The diameter growth rate is 20% higher comparing the average of the construction group and wild type control group. The diameter growth rate is 26% higher comparing the largest individuals of the construction group and wild type control group. The TF0097Rp1 construction group meets the more stringent level of growth difference selection criteria (1), (2), (3) and (4) as shown in table 2.27.

Tables 2.25 and 2.26 contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

Table 2.25 Height growth data for TF0097Rp1

| Days in greenhouse | Height (cm) |    |    |    |    |     |     |     |     |     |
|--------------------|-------------|----|----|----|----|-----|-----|-----|-----|-----|
|                    | 20          | 25 | 29 | 35 | 41 | 46  | 50  | 53  | 57  | 60  |
| TF0097rp1-1A-1     | 25          | 32 | 41 | 61 | 86 | 107 | 123 | 137 | 153 | 166 |
| TF0097rp1-1A-2     | 29          | 40 | 52 | 69 | 91 | 113 | 129 | 140 | 155 | 170 |
| TF0097rp1-1A-3     | 27          | 35 | 40 | 57 | 81 | 99  | 115 | 126 | 140 | 151 |
| TF0097rp1-2A-1     | 23          | 32 | 43 | 61 | 75 | 92  | 102 | 111 | 123 | 132 |
| TF0097rp1-2A-2     | 19          | 31 | 41 | 57 | 75 | 92  | 102 | 111 | 122 | 132 |
| TF0097rp1-2A-3     | 19          | 29 | 38 | 52 | 68 | 86  | 94  | 103 | 112 | 121 |
| TF0097rp1-2B-1     | 26          | 33 | 43 | 61 | 80 | 93  | 102 | 110 | 118 | 124 |
| TF0097rp1-2B-2     | 26          | 34 | 45 | 62 | 83 | 102 | 114 | 125 | 138 | 147 |
| TF0097rp1-2B-3     | 22          | 32 | 44 | 63 | 86 | 101 | 117 | 127 | 144 | 155 |
| TF0097rp1-3A-1     | 27          | 40 | 49 | 72 | 96 | 115 | 137 | 150 | 165 | 181 |
| TF0097rp1-3A-2     | 13          | 23 | 34 | 50 | 73 | 93  | 108 | 119 | 132 | 143 |
| TF0097rp1-3A-3     | 19          | 31 | 44 | 63 | 88 | 109 | 125 | 137 | 151 | 162 |
| TF0097rp1-4A-1     | 24          | 35 | 42 | 48 | 62 | 81  | 91  | 99  | 108 | 116 |
| TF0097rp1-4A-2     | 14          | 22 | 28 | 39 | 55 | 80  | 90  | 103 | 115 | 126 |
| TF0097rp1-4A-3     | 19          | 25 | 29 | 46 | 67 | 80  | 99  | 109 | 125 | 136 |
| T89-01             | 17          | 26 | 31 | 45 | 61 | 76  | 87  | 95  | 107 | 116 |
| T89-02             | 16          | 21 | 26 | 38 | 53 | 67  | 76  | 83  | N/A | N/A |

|        |    |    |    |    |    |    |    |     |     |     |
|--------|----|----|----|----|----|----|----|-----|-----|-----|
| T89-03 | 18 | 24 | 32 | 47 | 64 | 78 | 87 | 96  | 106 | 115 |
| T89-04 | 18 | 26 | 35 | 50 | 66 | 80 | 87 | 96  | 107 | 115 |
| T89-05 | 17 | 26 | 33 | 44 | 57 | 73 | 81 | 91  | 100 | 107 |
| T89-06 | 16 | 21 | 28 | 40 | 55 | 74 | 79 | 89  | 99  | 106 |
| T89-07 | 17 | 23 | 31 | 43 | 57 | 71 | 80 | 88  | 98  | 107 |
| T89-08 | 15 | 20 | 26 | 37 | 51 | 65 | 75 | 84  | 94  | 100 |
| T89-09 | 18 | 25 | 32 | 46 | 61 | 74 | 85 | 93  | 103 | 112 |
| T89-10 | 19 | 25 | 32 | 46 | 60 | 75 | 86 | 95  | 104 | 112 |
| T89-11 | 20 | 27 | 36 | 51 | 68 | 86 | 98 | 107 | 120 | 127 |
| T89-12 | 19 | 27 | 36 | 50 | 67 | 80 | 89 | 97  | 108 | 118 |
| T89-13 | 18 | 25 | 32 | 45 | 59 | 75 | 83 | 92  | 101 | 108 |
| T89-14 | 18 | 23 | 26 | 36 | 51 | 65 | 72 | 79  | 89  | 96  |
| T89-15 | 17 | 21 | 28 | 39 | 53 | 70 | 78 | 87  | 97  | 105 |
| T89-16 | 19 | 25 | 32 | 43 | 57 | 71 | 81 | 90  | 101 | 109 |
| T89-17 | 16 | 20 | 29 | 41 | 54 | 68 | 78 | 84  | 93  | 101 |
| T89-18 | 16 | 23 | 30 | 45 | 63 | 78 | 87 | 94  | 103 | 110 |
| T89-19 | 16 | 22 | 28 | 42 | 56 | 69 | 79 | 89  | 100 | 107 |
| T89-20 | 18 | 25 | 32 | 47 | 63 | 78 | 89 | 99  | 109 | 115 |
| T89-21 | 19 | 27 | 34 | 50 | 67 | 82 | 92 | 102 | 111 | 120 |
| T89-22 | 19 | 25 | 32 | 44 | 58 | 76 | 84 | 93  | 102 | 109 |
| T89-23 | 18 | 26 | 33 | 47 | 63 | 79 | 88 | 99  | 108 | 116 |
| T89-24 | 16 | 24 | 28 | 42 | 53 | 70 | 78 | 85  | 94  | 103 |
| T89-25 | 16 | 25 | 32 | 45 | 61 | 76 | 85 | 95  | 107 | 114 |
| T89-26 | 16 | 20 | 26 | 38 | 52 | 68 | 78 | 86  | 97  | 103 |
| T89-27 | 16 | 21 | 25 | 35 | 48 | 61 | 70 | 78  | N/A | 98  |
| T89-28 | 14 | 18 | 25 | 38 | 51 | 64 | 73 | 81  | 90  | 96  |
| T89-29 | 7  | 13 | 18 | 30 | 45 | 60 | 69 | 77  | 90  | 98  |
| T89-30 | 15 | 22 | 29 | 42 | 55 | 69 | 80 | 88  | 97  | 106 |
| T89-31 | 21 | 29 | 37 | 50 | 65 | 80 | 88 | 98  | 108 | 116 |
| T89-32 | 19 | 24 | 32 | 42 | 55 | 70 | 78 | 87  | 96  | 105 |

Table 2.26 Diameter growth data for TF0097Rp1

| Days in greenhouse | Diameter (mm) |     |     |     |      |
|--------------------|---------------|-----|-----|-----|------|
|                    | 35            | 41  | 46  | 53  | 60   |
| TF0097rp1-1A-1     | 4,3           | 5,3 | 6,2 | 8,0 | 9,5  |
| TF0097rp1-1A-2     | 4,5           | 5,3 | 6,0 | 7,4 | 8,8  |
| TF0097rp1-1A-3     | 4,4           | 5,2 | 5,3 | 6,4 | 8,1  |
| TF0097rp1-2A-1     | 5,7           | 6,9 | 7,8 | 9,6 | 9,9  |
| TF0097rp1-2A-2     | 5,3           | 6,7 | 7,5 | 7,9 | 9,3  |
| TF0097rp1-2A-3     | 5,1           | 6,5 | 7,5 | 7,8 | 9,2  |
| TF0097rp1-2B-1     | 4,6           | 5,5 | 6,2 | 6,8 | 7,5  |
| TF0097rp1-2B-2     | 4,9           | 6,0 | 7,1 | 7,6 | 10,2 |
| TF0097rp1-2B-3     | 5,3           | 7,7 | 8,2 | 9,9 | 10,6 |
| TF0097rp1-3A-1     | 5,7           | 7,0 | 7,7 | 9,4 | 9,8  |
| TF0097rp1-3A-2     | 4,7           | 6,2 | 7,0 | 7,3 | 9,5  |
| TF0097rp1-3A-3     | 5,0           | 6,5 | 7,1 | 9,0 | 10,2 |
| TF0097rp1-4A-1     | 4,4           | 5,0 | 6,0 | 7,3 | 6,7  |
| TF0097rp1-4A-2     | 4,1           | 5,4 | 5,9 | 6,3 | 7,2  |
| TF0097rp1-4A-3     | 3,7           | 4,9 | 6,0 | 8,6 | 9,4  |
| T89-01             | 4,7           | 6,0 | 6,5 | 6,9 | 8,3  |
| T89-02             | 4,4           | 5,7 | 6,6 | 7,6 | 7,8  |

|        |     |     |     |     |     |
|--------|-----|-----|-----|-----|-----|
| T89-03 | 4,7 | 6,3 | 6,7 | 7,7 | 8,4 |
| T89-04 | 4,7 | 6,0 | 7,1 | 8,0 | 8,5 |
| T89-05 | 4,0 | 5,3 | 6,3 | 7,8 | 8,1 |
| T89-06 | 4,6 | 5,9 | 6,3 | 7,7 | 8,2 |
| T89-07 | 4,6 | 6,1 | 6,5 | 7,9 | 8,5 |
| T89-08 | 4,0 | 5,2 | 5,8 | 6,9 | 7,1 |
| T89-09 | 4,4 | 5,8 | 6,4 | 7,6 | 8,2 |
| T89-10 | 4,9 | 6,0 | 6,6 | 7,4 | 8,5 |
| T89-11 | 4,7 | 5,8 | 6,4 | 7,9 | 8,3 |
| T89-12 | 4,7 | 5,9 | 7,3 | 7,4 | 7,6 |
| T89-13 | 5,9 | 5,9 | 6,7 | 7,5 | 8,3 |
| T89-14 | 4,5 | 5,2 | 5,8 | 6,1 | 7,0 |
| T89-15 | 4,7 | N/A | 6,0 | 6,4 | 7,3 |
| T89-16 | 4,5 | 5,6 | 7,7 | 7,5 | 8,6 |
| T89-17 | 4,1 | 5,4 | 6,0 | 6,8 | 7,5 |
| T89-18 | 4,4 | 5,8 | 6,0 | 7,7 | 8,3 |
| T89-19 | 4,7 | 5,8 | 7,1 | 8,5 | 9,4 |
| T89-20 | 4,7 | 5,8 | 6,6 | 7,4 | 8,3 |
| T89-21 | 4,7 | 6,2 | 6,3 | 7,7 | 8,5 |
| T89-22 | 4,2 | 5,1 | 6,3 | 6,9 | 8,0 |
| T89-23 | 4,6 | 5,8 | 7,1 | 7,5 | 8,3 |
| T89-24 | 4,4 | 5,8 | 6,9 | 7,7 | 8,8 |
| T89-25 | 4,5 | 5,4 | 6,2 | 8,0 | 8,7 |
| T89-26 | 4,1 | 5,4 | 6,0 | 7,2 | 8,0 |
| T89-27 | 4,5 | 5,7 | 6,5 | 7,9 | 9,2 |
| T89-28 | 4,3 | 5,1 | 6,0 | 6,6 | 7,7 |
| T89-29 | 3,5 | 4,7 | 5,5 | 6,3 | 7,1 |
| T89-30 | 4,1 | 5,4 | 5,8 | 7,2 | 7,8 |
| T89-31 | 5,0 | 5,8 | 6,8 | 7,3 | 8,2 |
| T89-32 | 4,4 | 6,4 | 6,6 | 8,0 | 8,4 |

Results from growth analysis are specified in the overview table 2.27. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and 5 MDC.

Table 2.27 Overview table of growth effects of construct TF0097Rp1

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TF0097Rp1          | 1,33                 | 1,11                   | 1,32                               | 1,20                         | 1,43                 | 1,13                   | 1,41                                  | 1,26                         |

Construction group TF0104

This construct induces increased growth. The final height is 15% higher comparing the average of the construction group and wild type control group. The final height is 12% higher comparing the largest individuals of the construction group and wild type control group. The maximum height growth rate is 16% higher comparing the average of the construction group and wild type control group. The maximum height growth rate is 14% higher comparing the largest individuals of the construction group and wild type control group. The final diameter is 23% higher comparing the average of the construction group and wild type control group. The final diameter is 20% higher comparing the largest individuals of the construction group and wild type control group. The diameter growth rate is 20% higher comparing the average of the construction group and wild type control group. The diameter growth rate is 10% higher comparing the largest individuals of the construction group and wild type control group. The TF0104 construction group meets the more stringent level of growth difference selection criteria (1), (2) and (3) and the less stringent level of growth difference selection criterion (4) as shown in table 2.30.

Tables 2.28 and 2.29 contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

Table 2.28 Height growth data for TF0104

| Days in greenhouse | Height (cm) |    |    |     |    |    |     |     |     |
|--------------------|-------------|----|----|-----|----|----|-----|-----|-----|
|                    | 18          | 25 | 28 | 32  | 36 | 39 | 46  | 53  | 55  |
| TF0104-1A          | 20          | 35 | 48 | 60  | 77 | 90 | 117 | 149 | 157 |
| TF0104-1B          | 23          | 37 | 50 | 63  | 78 | 90 | 120 | 148 | 155 |
| TF0104-2A          | 21          | 37 | 50 | 62  | 75 | 85 | 114 | 140 | 147 |
| TF0104-3A          | 20          | 37 | 50 | 61  | 74 | 85 | 102 | 115 | 119 |
| TF0104-3B          | 20          | 35 | 50 | 62  | 78 | 89 | 118 | 145 | 152 |
| T89-01             | 18          | 32 | 43 | 54  | 66 | 76 | 98  | 124 | 133 |
| T89-02             | 20          | 33 | 43 | 53  | 67 | 76 | 101 | 124 | 129 |
| T89-03             | 17          | 31 | 43 | 53  | 68 | 76 | 102 | 128 | 135 |
| T89-04             | 19          | 33 | 44 | 54  | 67 | 74 | 97  | 122 | 129 |
| T89-05             | 20          | 33 | 44 | 54  | 67 | 76 | 100 | 121 | 129 |
| T89-06             | 18          | 31 | 42 | 53  | 67 | 76 | 97  | 121 | 128 |
| T89-07             | 16          | 28 | 41 | 53  | 65 | 74 | 96  | 121 | 129 |
| T89-08             | 19          | 34 | 43 | 53  | 65 | 75 | 98  | 123 | 131 |
| T89-09             | 20          | 30 | 40 | 52  | 64 | 73 | 97  | 119 | 125 |
| T89-10             | 21          | 33 | 41 | 49  | 61 | 70 | 92  | 114 | 121 |
| T89-11             | 18          | 31 | 40 | 49  | 61 | 71 | 94  | 117 | 123 |
| T89-12             | 18          | 31 | 40 | N/A | 60 | 68 | 90  | 107 | 115 |

|        |    |    |    |    |    |    |     |     |     |
|--------|----|----|----|----|----|----|-----|-----|-----|
| T89-13 | 19 | 35 | 47 | 58 | 70 | 78 | 103 | 128 | 135 |
| T89-14 | 19 | 31 | 40 | 50 | 61 | 72 | 93  | 118 | 124 |
| T89-15 | 20 | 32 | 41 | 50 | 62 | 70 | 91  | 114 | 120 |
| T89-16 | 18 | 30 | 39 | 49 | 62 | 71 | 92  | 114 | 122 |
| T89-17 | 17 | 33 | 45 | 55 | 70 | 78 | 104 | 129 | 136 |
| T89-18 | 19 | 32 | 44 | 56 | 71 | 82 | 106 | 130 | 137 |
| T89-19 | 16 | 26 | 36 | 46 | 51 | 69 | 89  | 112 | 119 |
| T89-20 | 16 | 31 | 41 | 49 | 60 | 71 | 91  | 111 | 118 |
| T89-21 | 20 | 31 | 44 | 54 | 68 | 76 | 99  | 122 | 127 |
| T89-22 | 14 | 26 | 37 | 46 | 61 | 72 | 96  | 120 | 127 |
| T89-23 | 19 | 32 | 40 | 50 | 63 | 73 | 100 | 121 | 127 |
| T89-24 | 20 | 31 | 41 | 47 | 58 | 68 | 90  | 111 | 117 |
| T89-25 | 20 | 36 | 45 | 57 | 69 | 78 | 101 | 127 | 134 |
| T89-26 | 20 | 37 | 49 | 58 | 71 | 80 | 107 | 131 | 140 |
| T89-27 | 19 | 34 | 44 | 55 | 71 | 81 | 107 | 131 | 138 |
| T89-28 | 17 | 35 | 44 | 56 | 68 | 76 | 99  | 126 | 132 |
| T89-29 | 17 | 32 | 45 | 55 | 68 | 78 | 101 | 125 | 132 |
| T89-30 | 18 | 31 | 41 | 50 | 63 | 72 | 95  | 119 | 125 |
| T89-31 | 17 | 27 | 35 | 45 | 58 | 67 | 87  | 108 | 116 |
| T89-32 | 19 | 32 | 44 | 52 | 65 | 74 | 98  | 121 | 127 |
| T89-33 | 20 | 33 | 43 | 53 | 64 | 74 | 96  | 119 | 126 |
| T89-34 | 19 | 34 | 44 | 55 | 68 | 78 | 100 | 124 | 130 |
| T89-35 | 17 | 30 | 40 | 51 | 64 | 74 | 95  | 116 | 122 |
| T89-36 | 18 | 30 | 40 | 49 | 62 | 71 | 91  | 114 | 121 |
| T89-82 | 21 | 33 | 43 | 54 | 65 | 75 | 98  | 118 | 125 |
| T89-83 | 22 | 35 | 47 | 55 | 71 | 80 | 105 | 130 | 137 |
| T89-85 | 21 | 36 | 46 | 56 | 67 | 76 | 98  | 123 | 131 |

Table 2.29 Diameter growth data for TF0104

| Days in greenhouse | Diameter (mm) |     |     |      |      |
|--------------------|---------------|-----|-----|------|------|
|                    | 32            | 39  | 46  | 53   | 55   |
| TF0104-1A          | 6,0           | 7,2 | 8,7 | 10,4 | 11,0 |
| TF0104-1B          | 5,7           | 7,9 | 8,8 | 10,0 | 10,6 |
| TF0104-2A          | 5,7           | 8,0 | 9,0 | 10,4 | 10,2 |
| TF0104-3A          | 5,3           | 6,3 | 6,7 | 7,5  | 7,1  |
| TF0104-3B          | 5,7           | 6,9 | 8,2 | 9,8  | 9,5  |
| T89-01             | 5,2           | 6,0 | 6,8 | 8,2  | 7,6  |
| T89-02             | 4,5           | 5,8 | 7,1 | 8,6  | 8,3  |
| T89-03             | 4,4           | 5,7 | 6,8 | 7,9  | 8,1  |
| T89-04             | 4,4           | 6,0 | 6,9 | 8,6  | 8,5  |
| T89-05             | 4,6           | 5,8 | 6,7 | 7,9  | 8,0  |
| T89-06             | 4,7           | 5,9 | 7,2 | 8,1  | 9,2  |
| T89-07             | 4,8           | 5,5 | 6,2 | 6,9  | 7,1  |
| T89-08             | 4,5           | 5,4 | 6,0 | 6,9  | 7,1  |
| T89-09             | 4,7           | 5,6 | 6,7 | 8,8  | 8,0  |
| T89-10             | 4,1           | 4,9 | 5,6 | 7,1  | 7,0  |
| T89-11             | 3,8           | 5,3 | 7,3 | 8,0  | 7,6  |
| T89-12             | N/A           | 5,1 | 6,2 | 7,3  | 6,9  |
| T89-13             | 4,8           | 5,7 | 6,5 | 7,6  | 7,6  |
| T89-14             | 4,2           | 5,5 | 6,6 | 7,6  | 6,5  |
| T89-15             | 5,0           | 6,1 | 7,2 | 7,9  | 8,3  |

|        |     |     |     |     |     |
|--------|-----|-----|-----|-----|-----|
| T89-16 | 4,4 | 5,6 | 6,2 | 7,3 | 7,9 |
| T89-17 | 4,8 | 6,7 | 7,0 | 8,3 | 8,4 |
| T89-18 | 4,2 | 5,5 | 6,7 | 7,3 | 7,4 |
| T89-19 | 4,7 | 5,5 | 6,8 | 7,2 | 7,8 |
| T89-20 | 4,5 | 5,6 | 6,5 | 7,0 | 7,3 |
| T89-21 | 4,9 | 5,6 | 6,4 | 7,4 | 7,6 |
| T89-22 | 4,3 | 5,4 | 6,5 | 7,3 | 7,6 |
| T89-23 | 3,9 | 5,5 | 6,7 | 7,7 | 7,0 |
| T89-24 | 4,3 | 5,9 | 6,8 | 8,1 | 7,9 |
| T89-25 | 4,7 | 6,5 | 7,5 | 9,2 | 9,1 |
| T89-26 | 5,4 | 5,9 | 7,7 | 8,6 | 8,8 |
| T89-27 | 4,7 | 5,6 | 7,4 | 7,9 | 8,0 |
| T89-28 | 4,7 | 5,7 | 6,3 | 7,2 | 7,4 |
| T89-29 | 4,8 | 5,6 | 6,6 | 7,7 | 8,1 |
| T89-30 | 4,6 | 5,5 | 6,7 | 7,3 | 7,3 |
| T89-31 | 4,3 | 5,8 | 6,3 | 7,5 | 7,6 |
| T89-32 | 4,6 | 5,9 | 7,6 | 9,3 | 9,1 |
| T89-33 | 4,4 | 5,3 | 6,2 | 7,1 | 7,1 |
| T89-34 | 4,6 | 5,6 | 6,8 | 8,1 | 8,7 |
| T89-35 | 5,3 | 6,0 | 7,5 | 8,8 | 8,9 |
| T89-36 | 4,4 | 6,1 | 6,9 | 8,1 | 8,6 |
| T89-82 | 4,7 | 5,3 | 6,5 | 7,5 | 7,4 |
| T89-83 | 4,7 | 6,1 | 7,1 | 8,3 | 8,3 |
| T89-85 | 5,1 | 6,3 | 7,3 | 7,7 | 8,2 |

Results from growth analysis are specified in the overview table 2.30. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and 5 MDC.

Table 2.30 Overview table of growth effects of construct TF0104

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TF0104             | 1,15                 | 1,23                   | 1,16                               | 1,20                         | 1,12                 | 1,20                   | 1,14                                  | 1,10                         |

Construction group TF0109Rp1

This construct induces increased growth. The final height is 22% higher comparing the average of the construction group and wild type control group. The final height is 32% higher comparing the largest individuals of the construction group and wild type control group. The maximum height growth rate is 26% higher comparing the average of the construction group and wild type control group. The maximum height growth rate is 40% higher comparing the largest individuals of the construction group and wild type control group. The final diameter is 15% higher comparing the average of the construction group and wild type control group. The final diameter is 14% higher comparing the largest individuals of the construction group and wild type control group. The diameter growth rate is 25% higher comparing the average of the construction group and wild type control group. The diameter growth rate is 27% higher comparing the largest individuals of the construction group and wild type control group. The TF0109Rp1 construction group meets the more stringent level of growth difference selection criteria (1), (2), (3) and (4) as shown in table 2.33.

Tables 2.31 and 2.32 contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

Table 2.31 Height growth data for TF0109Rp1

| Days in greenhouse | Height (cm) |    |    |    |    |     |     |     |     |     |
|--------------------|-------------|----|----|----|----|-----|-----|-----|-----|-----|
|                    | 20          | 25 | 29 | 35 | 41 | 46  | 50  | 53  | 57  | 60  |
| TF0109rp1-2A-1     | 21          | 31 | 39 | 55 | 73 | 89  | 100 | 109 | 122 | 130 |
| TF0109rp1-2A-2     | 18          | 25 | 33 | 47 | 65 | 79  | 91  | 101 | 111 | 120 |
| TF0109rp1-2A-3     | 17          | 23 | 31 | 47 | 63 | 77  | 87  | 96  | 109 | 118 |
| TF0109rp1-2B-1     | 19          | 26 | 35 | 54 | 78 | 103 | 117 | 129 | 141 | 149 |
| TF0109rp1-2B-2     | 21          | 31 | 39 | 57 | 82 | 105 | 124 | 136 | 151 | 168 |
| TF0109rp1-2B-3     | 16          | 27 | 40 | 51 | 80 | 102 | 117 | 122 | 137 | 150 |
| TF0109rp1-3B-1     | 18          | 29 | 39 | 59 | 77 | 94  | 104 | 114 | 126 | 136 |
| TF0109rp1-3B-2     | 18          | 28 | 37 | 54 | 70 | 88  | 98  | 108 | 118 | 125 |
| TF0109rp1-3B-3     | 17          | 28 | 37 | 51 | 65 | 87  | 94  | 103 | 115 | 120 |
| TF0109rp1-4A-1     | 16          | 25 | 32 | 46 | 64 | 79  | 94  | 104 | 116 | 126 |
| TF0109rp1-4A-2     | 17          | 24 | 32 | 46 | 65 | 83  | 94  | 106 | 118 | 126 |
| TF0109rp1-4A-3     | 17          | 19 | 26 | 38 | 57 | 73  | 85  | 96  | 110 | 121 |
| T89-01             | 17          | 26 | 31 | 45 | 61 | 76  | 87  | 95  | 107 | 116 |
| T89-02             | 16          | 21 | 26 | 38 | 53 | 67  | 76  | 83  | N/A | N/A |
| T89-03             | 18          | 24 | 32 | 47 | 64 | 78  | 87  | 96  | 106 | 115 |
| T89-04             | 18          | 26 | 35 | 50 | 66 | 80  | 87  | 96  | 107 | 115 |
| T89-05             | 17          | 26 | 33 | 44 | 57 | 73  | 81  | 91  | 100 | 107 |

|        |    |    |    |    |    |    |    |     |     |     |
|--------|----|----|----|----|----|----|----|-----|-----|-----|
| T89-06 | 16 | 21 | 28 | 40 | 55 | 74 | 79 | 89  | 99  | 106 |
| T89-07 | 17 | 23 | 31 | 43 | 57 | 71 | 80 | 88  | 98  | 107 |
| T89-08 | 15 | 20 | 26 | 37 | 51 | 65 | 75 | 84  | 94  | 100 |
| T89-09 | 18 | 25 | 32 | 46 | 61 | 74 | 85 | 93  | 103 | 112 |
| T89-10 | 19 | 25 | 32 | 46 | 60 | 75 | 86 | 95  | 104 | 112 |
| T89-11 | 20 | 27 | 36 | 51 | 68 | 86 | 98 | 107 | 120 | 127 |
| T89-12 | 19 | 27 | 36 | 50 | 67 | 80 | 89 | 97  | 108 | 118 |
| T89-13 | 18 | 25 | 32 | 45 | 59 | 75 | 83 | 92  | 101 | 108 |
| T89-14 | 18 | 23 | 26 | 36 | 51 | 65 | 72 | 79  | 89  | 96  |
| T89-15 | 17 | 21 | 28 | 39 | 53 | 70 | 78 | 87  | 97  | 105 |
| T89-16 | 19 | 25 | 32 | 43 | 57 | 71 | 81 | 90  | 101 | 109 |
| T89-17 | 16 | 20 | 29 | 41 | 54 | 68 | 78 | 84  | 93  | 101 |
| T89-18 | 16 | 23 | 30 | 45 | 63 | 78 | 87 | 94  | 103 | 110 |
| T89-19 | 16 | 22 | 28 | 42 | 56 | 69 | 79 | 89  | 100 | 107 |
| T89-20 | 18 | 25 | 32 | 47 | 63 | 78 | 89 | 99  | 109 | 115 |
| T89-21 | 19 | 27 | 34 | 50 | 67 | 82 | 92 | 102 | 111 | 120 |
| T89-22 | 19 | 25 | 32 | 44 | 58 | 76 | 84 | 93  | 102 | 109 |
| T89-23 | 18 | 26 | 33 | 47 | 63 | 79 | 88 | 99  | 108 | 116 |
| T89-24 | 16 | 24 | 28 | 42 | 53 | 70 | 78 | 85  | 94  | 103 |
| T89-25 | 16 | 25 | 32 | 45 | 61 | 76 | 85 | 95  | 107 | 114 |
| T89-26 | 16 | 20 | 26 | 38 | 52 | 68 | 78 | 86  | 97  | 103 |
| T89-27 | 16 | 21 | 25 | 35 | 48 | 61 | 70 | 78  | N/A | 98  |
| T89-28 | 14 | 18 | 25 | 38 | 51 | 64 | 73 | 81  | 90  | 96  |
| T89-29 | 7  | 13 | 18 | 30 | 45 | 60 | 69 | 77  | 90  | 98  |
| T89-30 | 15 | 22 | 29 | 42 | 55 | 69 | 80 | 88  | 97  | 106 |
| T89-31 | 21 | 29 | 37 | 50 | 65 | 80 | 88 | 98  | 108 | 116 |
| T89-32 | 19 | 24 | 32 | 42 | 55 | 70 | 78 | 87  | 96  | 105 |

Table 2.32 Diameter growth data for TF0109Rp1

| Days in greenhouse | Diameter (mm) |     |     |     |      |
|--------------------|---------------|-----|-----|-----|------|
|                    | 35            | 41  | 46  | 53  | 60   |
| TF0109rp1-2A-1     | 5,7           | 7,3 | 8,1 | 9,1 | 9,9  |
| TF0109rp1-2A-2     | 4,7           | 5,7 | 6,7 | 7,8 | 8,8  |
| TF0109rp1-2A-3     | 4,6           | 6,2 | 6,5 | 8,1 | 9,3  |
| TF0109rp1-2B-1     | 3,8           | 5,2 | 5,6 | 6,7 | 8,0  |
| TF0109rp1-2B-2     | 4,3           | 5,4 | 6,3 | 6,9 | 7,9  |
| TF0109rp1-2B-3     | 5,1           | 6,2 | 7,3 | 8,2 | 9,3  |
| TF0109rp1-3B-1     | 5,1           | 7,0 | 7,3 | 7,7 | 9,1  |
| TF0109rp1-3B-2     | 5,3           | 6,1 | 7,5 | 7,7 | 8,7  |
| TF0109rp1-3B-3     | 4,9           | 5,3 | 6,7 | 8,1 | 9,3  |
| TF0109rp1-4A-1     | 5,2           | 6,5 | 7,5 | 8,7 | 10,5 |
| TF0109rp1-4A-2     | 5,4           | 6,5 | 7,8 | 9,2 | 10,7 |
| TF0109rp1-4A-3     | 4,8           | 6,2 | 7,3 | 9,1 | 10,7 |
| T89-01             | 4,7           | 6,0 | 6,5 | 6,9 | 8,3  |
| T89-02             | 4,4           | 5,7 | 6,6 | 7,6 | 7,8  |
| T89-03             | 4,7           | 6,3 | 6,7 | 7,7 | 8,4  |
| T89-04             | 4,7           | 6,0 | 7,1 | 8,0 | 8,5  |
| T89-05             | 4,0           | 5,3 | 6,3 | 7,8 | 8,1  |
| T89-06             | 4,6           | 5,9 | 6,3 | 7,7 | 8,2  |
| T89-07             | 4,6           | 6,1 | 6,5 | 7,9 | 8,5  |
| T89-08             | 4,0           | 5,2 | 5,8 | 6,9 | 7,1  |

|        |     |     |     |     |     |
|--------|-----|-----|-----|-----|-----|
| T89-09 | 4,4 | 5,8 | 6,4 | 7,6 | 8,2 |
| T89-10 | 4,9 | 6,0 | 6,6 | 7,4 | 8,5 |
| T89-11 | 4,7 | 5,8 | 6,4 | 7,9 | 8,3 |
| T89-12 | 4,7 | 5,9 | 7,3 | 7,4 | 7,6 |
| T89-13 | 5,9 | 5,9 | 6,7 | 7,5 | 8,3 |
| T89-14 | 4,5 | 5,2 | 5,8 | 6,1 | 7,0 |
| T89-15 | 4,7 | N/A | 6,0 | 6,4 | 7,3 |
| T89-16 | 4,5 | 5,6 | 7,7 | 7,5 | 8,6 |
| T89-17 | 4,1 | 5,4 | 6,0 | 6,8 | 7,5 |
| T89-18 | 4,4 | 5,8 | 6,0 | 7,7 | 8,3 |
| T89-19 | 4,7 | 5,8 | 7,1 | 8,5 | 9,4 |
| T89-20 | 4,7 | 5,8 | 6,6 | 7,4 | 8,3 |
| T89-21 | 4,7 | 6,2 | 6,3 | 7,7 | 8,5 |
| T89-22 | 4,2 | 5,1 | 6,3 | 6,9 | 8,0 |
| T89-23 | 4,6 | 5,8 | 7,1 | 7,5 | 8,3 |
| T89-24 | 4,4 | 5,8 | 6,9 | 7,7 | 8,8 |
| T89-25 | 4,5 | 5,4 | 6,2 | 8,0 | 8,7 |
| T89-26 | 4,1 | 5,4 | 6,0 | 7,2 | 8,0 |
| T89-27 | 4,5 | 5,7 | 6,5 | 7,9 | 9,2 |
| T89-28 | 4,3 | 5,1 | 6,0 | 6,6 | 7,7 |
| T89-29 | 3,5 | 4,7 | 5,5 | 6,3 | 7,1 |
| T89-30 | 4,1 | 5,4 | 5,8 | 7,2 | 7,8 |
| T89-31 | 5,0 | 5,8 | 6,8 | 7,3 | 8,2 |
| T89-32 | 4,4 | 6,4 | 6,6 | 8,0 | 8,4 |

Results from growth analysis are specified in the overview table 2.33. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and 5 MDC.

Table 2.33 Overview table of growth effects of construct TF0109Rp1

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TF0109Rp1          | 1,22                 | 1,15                   | 1,26                               | 1,25                         | 1,32                 | 1,14                   | 1,40                                  | 1,27                         |

Construction group TF0116

Tables 2.34 and 2.35 contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

Table 2.34 Height growth data for TF0116

| Days in greenhouse | Height (cm) |     |     |     |     |     |     |     |     |     |
|--------------------|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                    | 19          | 28  | 34  | 40  | 44  | 47  | 51  | 54  | 61  | 65  |
| TF0116-1B          | N/A         | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| TF0116-2A          | 18          | 37  | 51  | 67  | 77  | 86  | 98  | 106 | 123 | 133 |
| TF0116-2B-1        | 18          | 34  | 50  | 65  | 76  | 84  | 98  | 106 | 126 | 139 |
| TF0116-2B-2        | 17          | 31  | 48  | 61  | 75  | 82  | 93  | 101 | 120 | 133 |
| TF0116-4A          | 16          | 33  | 53  | 68  | 81  | 91  | 103 | 113 | 133 | 142 |
| TF0116-5B          | 21          | 40  | 56  | 70  | 78  | 88  | 98  | 105 | 124 | 136 |
| TF0116-6A          | 21          | 36  | 55  | 71  | 83  | 90  | 101 | 110 | 131 | 143 |
| TF0116-6B          | 17          | 29  | 45  | 59  | 70  | 80  | 92  | 102 | 125 | 138 |
| T89-01             | 18          | 30  | 46  | 58  | 69  | 77  | 87  | 96  | 113 | 122 |
| T89-02             | 18          | 30  | 49  | 62  | 72  | 77  | 84  | 90  | 102 | 109 |
| T89-03             | 15          | 27  | 41  | 54  | 65  | 73  | 82  | 91  | 112 | 123 |
| T89-10             | N/A         | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| T89-11             | 19          | 31  | 49  | 61  | 74  | 83  | 94  | 103 | 124 | 133 |
| T89-12             | 17          | 30  | 45  | 58  | 69  | 77  | 90  | 100 | 123 | 134 |
| T89-13             | 18          | 27  | 43  | 56  | 68  | 78  | 91  | 100 | 121 | 133 |
| T89-14             | 5           | 26  | 42  | 56  | 67  | 74  | 83  | 90  | 109 | 119 |
| T89-15             | 10          | 15  | 25  | 33  | 41  | 45  | 52  | 57  | 72  | 82  |
| T89-16             | 19          | 33  | 53  | 63  | 73  | 82  | 93  | 102 | 119 | 130 |
| T89-17             | 17          | 29  | 46  | 58  | 66  | 72  | 80  | 86  | 96  | 102 |
| T89-18             | 16          | 30  | 48  | 59  | 71  | 81  | 93  | 103 | 122 | 132 |
| T89-19             | 18          | 32  | 50  | 65  | 77  | 84  | 94  | 102 | 126 | 139 |
| T89-20             | 16          | 33  | 52  | 67  | 79  | 88  | 98  | 105 | 124 | 139 |
| T89-21             | 17          | 29  | 44  | 58  | 67  | 73  | 83  | 90  | 110 | 122 |
| T89-22             | 14          | 28  | 47  | 61  | 71  | 80  | 89  | 98  | 119 | 133 |
| T89-23             | 10          | 33  | 45  | 53  | 63  | 71  | 82  | 90  | 112 | 123 |
| T89-24             | 20          | 28  | 43  | 51  | 62  | 69  | 78  | 87  | 106 | 119 |
| T89-25             | 14          | 26  | 38  | 52  | 64  | 72  | 82  | 89  | 110 | 122 |
| T89-26             | 15          | 28  | 44  | 57  | 69  | 77  | 87  | 96  | 120 | 133 |
| T89-27             | 18          | 29  | 47  | 62  | 75  | 82  | 92  | 103 | 125 | 138 |
| T89-28             | 22          | 37  | 54  | 67  | 78  | 88  | 97  | 104 | 123 | 133 |
| T89-29             | 16          | 33  | 49  | 63  | 76  | 84  | 93  | 100 | 123 | 138 |
| T89-30             | 15          | 40  | 46  | 58  | 67  | 74  | 85  | 92  | 113 | 124 |

Table 2.35 Diameter growth data for TF0116

| Days in greenhouse | Diameter (mm) |     |     |     |     |     |      |      |      |
|--------------------|---------------|-----|-----|-----|-----|-----|------|------|------|
|                    | 28            | 34  | 40  | 44  | 47  | 51  | 54   | 61   | 65   |
| TF0116-1B          | N/A           | N/A | N/A | N/A | N/A | N/A | N/A  | N/A  | N/A  |
| TF0116-2A          | 3,7           | 5,9 | 7,3 | 8,2 | 8,6 | 9,2 | 10,0 | 10,5 | 10,9 |
| TF0116-2B-1        | 3,5           | 5,3 | 6,2 | 6,9 | 8,0 | 8,4 | 9,0  | 10,0 | 10,2 |

|             |     |     |     |     |     |     |      |      |      |
|-------------|-----|-----|-----|-----|-----|-----|------|------|------|
| TF0116-2B-2 | 3,4 | 5,0 | 5,8 | 6,6 | 7,3 | 8,4 | 8,4  | 10,7 | 10,3 |
| TF0116-4A   | 3,8 | 5,8 | 6,5 | 7,2 | 8,0 | 8,7 | 9,4  | 10,2 | 10,9 |
| TF0116-5B   | 3,9 | 5,0 | 6,3 | 6,9 | 7,6 | 8,2 | 8,4  | 10,3 | 10,4 |
| TF0116-6A   | 3,9 | 4,9 | 6,7 | 7,5 | 7,9 | 9,0 | 9,4  | 10,7 | 11,1 |
| TF0116-6B   | 3,7 | 4,7 | 5,9 | 7,2 | 7,7 | 9,2 | 9,7  | 10,5 | 10,8 |
| T89-01      | 3,2 | 4,6 | 5,4 | 6,2 | 6,8 | 7,9 | 8,3  | 9,5  | 9,3  |
| T89-02      | 3,4 | 4,7 | 5,5 | 7,3 | 6,3 | 6,6 | 6,9  | 8,3  | 7,5  |
| T89-03      | 3,9 | 4,4 | 5,2 | 6,2 | 6,4 | 7,8 | 7,6  | 9,7  | 9,4  |
| T89-10      | N/A | N/A | N/A | N/A | N/A | N/A | N/A  | N/A  | N/A  |
| T89-11      | 3,4 | 5,1 | 6,2 | 7,6 | 6,8 | 6,9 | 7,7  | 10,1 | 9,5  |
| T89-12      | 2,9 | 4,7 | 5,8 | 6,6 | 7,8 | 8,0 | 8,7  | 9,1  | 9,2  |
| T89-13      | 3,0 | 4,3 | 5,4 | 5,8 | 6,4 | 7,6 | 7,8  | 8,2  | 8,8  |
| T89-14      | 3,0 | 4,5 | 5,7 | 6,3 | 6,7 | 7,9 | 7,8  | 9,0  | 8,9  |
| T89-15      | N/A | 2,1 | 3,0 | 4,0 | 4,0 | 4,5 | 4,9  | 5,5  | 5,6  |
| T89-16      | 3,5 | 5,3 | 6,4 | 6,6 | 7,0 | 7,2 | 8,3  | 8,2  | 9,0  |
| T89-17      | 3,4 | 4,6 | 5,1 | 5,4 | 6,0 | 6,4 | 6,5  | 6,8  | 7,1  |
| T89-18      | 3,6 | 5,2 | 6,0 | 7,0 | 7,8 | 8,2 | 9,9  | 10,3 | 9,7  |
| T89-19      | 4,2 | 5,5 | 6,6 | 7,7 | 8,5 | 8,9 | 9,5  | 11,1 | 12,3 |
| T89-20      | 4,1 | 5,5 | 6,6 | 8,1 | 9,3 | 9,6 | 9,3  | 10,0 | 11,1 |
| T89-21      | 3,1 | 5,6 | 5,8 | 6,7 | 7,1 | 7,8 | 8,4  | 9,7  | 10,1 |
| T89-22      | 3,2 | 4,4 | 5,6 | 6,5 | 7,5 | 7,6 | 7,8  | 8,9  | 9,2  |
| T89-23      | 2,4 | 4,2 | 5,1 | 6,1 | 6,5 | 7,5 | 10,1 | 9,3  | 10,2 |
| T89-24      | 3,2 | 4,5 | 5,1 | 6,3 | 7,0 | 7,6 | 8,1  | 8,8  | 9,1  |
| T89-25      | 3,3 | 4,3 | 5,2 | 5,8 | 6,5 | 7,4 | 7,8  | 9,3  | 9,7  |
| T89-26      | 3,3 | 4,4 | 5,5 | 6,6 | 7,2 | 8,1 | 8,9  | 9,5  | 10,5 |
| T89-27      | 3,3 | 4,9 | 6,0 | 7,8 | 8,0 | 8,9 | 9,7  | 11,2 | 11,5 |
| T89-28      | 4,5 | 5,7 | 7,4 | 7,8 | 8,5 | 9,4 | 9,7  | 10,2 | 11,1 |
| T89-29      | 3,1 | 4,7 | 6,3 | 7,2 | 7,9 | 9,2 | 9,8  | 11,1 | 10,7 |
| T89-30      | 3,0 | 5,8 | 6,2 | 7,7 | 7,9 | 8,6 | 8,2  | 10,1 | 10,3 |

Results from growth analysis are specified in the overview table 2.36. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and 5 MDC.

Table 2.36 Overview table of growth effects of construct TF0116

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TF0116             | 1,10                 | 1,12                   | 1,03                               | 1,13                         | 1,03                 | 0,90                   | 0,99                                  | 0,90                         |

Construction group TF0132.2nd

This construct induces increased growth. The final height is 27% higher comparing the average of the construction group and wild type control group. The final height is 32% higher comparing the largest individuals of the construction group and wild type control group. The maximum height growth rate is 38% higher comparing the average of the construction group and wild type control group. The maximum height growth rate is 41% higher comparing the largest individuals of the construction group and wild type control group. The final diameter is 12% higher comparing the average of the construction group and wild type control group. The final diameter is 9% higher comparing the largest individuals of the construction group and wild type control group. The diameter growth rate is 15% higher comparing the average of the construction group and wild type control group. The diameter growth rate is 8% higher comparing the largest individuals of the construction group and wild type control group. The TF0132.2nd construction group meets the more stringent level of growth difference selection criteria (1), (3) and (4) and the less stringent level of growth difference selection criterion (2) as shown in table 2.39.

Tables 2.37 and 2.38 contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

Table 2.37 Height growth data for TF0132.2nd

| Days in greenhouse | Height (cm) |    |    |    |    |     |     |     |     |
|--------------------|-------------|----|----|----|----|-----|-----|-----|-----|
|                    | 18          | 25 | 28 | 32 | 36 | 39  | 46  | 53  | 55  |
| TF0132.2nd-1A      | 17          | 30 | 40 | 51 | 66 | 78  | 103 | 132 | 139 |
| TF0132.2nd-1B      | 19          | 34 | 48 | 63 | 82 | 96  | 132 | 168 | 178 |
| TF0132.2nd-2A      | 19          | 32 | 40 | 52 | 67 | 77  | 93  | 108 | 112 |
| TF0132.2nd-4B      | 22          | 41 | 57 | 73 | 93 | 106 | 138 | 175 | 185 |
| TF0132.2nd-5A      | 19          | 33 | 47 | 62 | 73 | 84  | 110 | 143 | 153 |
| TF0132.2nd-5B      | 19          | 35 | 49 | 63 | 84 | 101 | 136 | 168 | 177 |
| TF0132.2nd-6B      | 21          | 37 | 51 | 64 | 83 | 98  | 133 | 170 | 180 |
| TF0132.2nd-7A      | 20          | 34 | 47 | 59 | 77 | 92  | 125 | 160 | 175 |
| T89-01             | 18          | 32 | 43 | 54 | 66 | 76  | 98  | 124 | 133 |
| T89-02             | 20          | 33 | 43 | 53 | 67 | 76  | 101 | 124 | 129 |
| T89-03             | 17          | 31 | 43 | 53 | 68 | 76  | 102 | 128 | 135 |
| T89-04             | 19          | 33 | 44 | 54 | 67 | 74  | 97  | 122 | 129 |
| T89-05             | 20          | 33 | 44 | 54 | 67 | 76  | 100 | 121 | 129 |
| T89-06             | 18          | 31 | 42 | 53 | 67 | 76  | 97  | 121 | 128 |
| T89-07             | 16          | 28 | 41 | 53 | 65 | 74  | 96  | 121 | 129 |
| T89-08             | 19          | 34 | 43 | 53 | 65 | 75  | 98  | 123 | 131 |
| T89-09             | 20          | 30 | 40 | 52 | 64 | 73  | 97  | 119 | 125 |

123

|        |    |    |    |     |    |    |     |     |     |
|--------|----|----|----|-----|----|----|-----|-----|-----|
| T89-10 | 21 | 33 | 41 | 49  | 61 | 70 | 92  | 114 | 121 |
| T89-11 | 18 | 31 | 40 | 49  | 61 | 71 | 94  | 117 | 123 |
| T89-12 | 18 | 31 | 40 | N/A | 60 | 68 | 90  | 107 | 115 |
| T89-13 | 19 | 35 | 47 | 58  | 70 | 78 | 103 | 128 | 135 |
| T89-14 | 19 | 31 | 40 | 50  | 61 | 72 | 93  | 118 | 124 |
| T89-15 | 20 | 32 | 41 | 50  | 62 | 70 | 91  | 114 | 120 |
| T89-16 | 18 | 30 | 39 | 49  | 62 | 71 | 92  | 114 | 122 |
| T89-17 | 17 | 33 | 45 | 55  | 70 | 78 | 104 | 129 | 136 |
| T89-18 | 19 | 32 | 44 | 56  | 71 | 82 | 106 | 130 | 137 |
| T89-19 | 16 | 26 | 36 | 46  | 51 | 69 | 89  | 112 | 119 |
| T89-20 | 16 | 31 | 41 | 49  | 60 | 71 | 91  | 111 | 118 |
| T89-21 | 20 | 31 | 44 | 54  | 68 | 76 | 99  | 122 | 127 |
| T89-22 | 14 | 26 | 37 | 46  | 61 | 72 | 96  | 120 | 127 |
| T89-23 | 19 | 32 | 40 | 50  | 63 | 73 | 100 | 121 | 127 |
| T89-24 | 20 | 31 | 41 | 47  | 58 | 68 | 90  | 111 | 117 |
| T89-25 | 20 | 36 | 45 | 57  | 69 | 78 | 101 | 127 | 134 |
| T89-26 | 20 | 37 | 49 | 58  | 71 | 80 | 107 | 131 | 140 |
| T89-27 | 19 | 34 | 44 | 55  | 71 | 81 | 107 | 131 | 138 |
| T89-28 | 17 | 35 | 44 | 56  | 68 | 76 | 99  | 126 | 132 |
| T89-29 | 17 | 32 | 45 | 55  | 68 | 78 | 101 | 125 | 132 |
| T89-30 | 18 | 31 | 41 | 50  | 63 | 72 | 95  | 119 | 125 |
| T89-31 | 17 | 27 | 35 | 45  | 58 | 67 | 87  | 108 | 116 |
| T89-32 | 19 | 32 | 44 | 52  | 65 | 74 | 98  | 121 | 127 |
| T89-33 | 20 | 33 | 43 | 53  | 64 | 74 | 96  | 119 | 126 |
| T89-34 | 19 | 34 | 44 | 55  | 68 | 78 | 100 | 124 | 130 |
| T89-35 | 17 | 30 | 40 | 51  | 64 | 74 | 95  | 116 | 122 |
| T89-36 | 18 | 30 | 40 | 49  | 62 | 71 | 91  | 114 | 121 |
| T89-82 | 21 | 33 | 43 | 54  | 65 | 75 | 98  | 118 | 125 |
| T89-83 | 22 | 35 | 47 | 55  | 71 | 80 | 105 | 130 | 137 |
| T89-85 | 21 | 36 | 46 | 56  | 67 | 76 | 98  | 123 | 131 |

Table 2.38 Diameter growth data for TF0132.2nd

| Days in greenhouse | Diameter (mm) |     |     |      |      |
|--------------------|---------------|-----|-----|------|------|
|                    | 32            | 39  | 46  | 53   | 55   |
| TF0132.2nd-1A      | 4,7           | 6,1 | 7,5 | 8,8  | 9,3  |
| TF0132.2nd-1B      | 5,3           | 6,3 | 7,6 | 10,2 | 10,0 |
| TF0132.2nd-2A      | 5,0           | 6,0 | 6,5 | 7,2  | 6,7  |
| TF0132.2nd-4B      | 5,8           | 6,5 | 7,5 | 9,6  | 9,6  |
| TF0132.2nd-5A      | 5,1           | 6,0 | 6,4 | 7,7  | 8,0  |
| TF0132.2nd-5B      | 5,2           | 6,4 | 7,2 | 8,4  | 8,3  |
| TF0132.2nd-6B      | 4,9           | 6,3 | 7,6 | 9,1  | 9,3  |
| TF0132.2nd-7A      | 4,9           | 6,7 | 8,0 | 9,1  | 9,5  |
| T89-01             | 5,2           | 6,0 | 6,8 | 8,2  | 7,6  |
| T89-02             | 4,5           | 5,8 | 7,1 | 8,6  | 8,3  |
| T89-03             | 4,4           | 5,7 | 6,8 | 7,9  | 8,1  |
| T89-04             | 4,4           | 6,0 | 6,9 | 8,6  | 8,5  |
| T89-05             | 4,6           | 5,8 | 6,7 | 7,9  | 8,0  |
| T89-06             | 4,7           | 5,9 | 7,2 | 8,1  | 9,2  |
| T89-07             | 4,8           | 5,5 | 6,2 | 6,9  | 7,1  |
| T89-08             | 4,5           | 5,4 | 6,0 | 6,9  | 7,1  |
| T89-09             | 4,7           | 5,6 | 6,7 | 8,8  | 8,0  |

|        |     |     |     |     |     |
|--------|-----|-----|-----|-----|-----|
| T89-10 | 4,1 | 4,9 | 5,6 | 7,1 | 7,0 |
| T89-11 | 3,8 | 5,3 | 7,3 | 8,0 | 7,6 |
| T89-12 | N/A | 5,1 | 6,2 | 7,3 | 6,9 |
| T89-13 | 4,8 | 5,7 | 6,5 | 7,6 | 7,6 |
| T89-14 | 4,2 | 5,5 | 6,6 | 7,6 | 6,5 |
| T89-15 | 5,0 | 6,1 | 7,2 | 7,9 | 8,3 |
| T89-16 | 4,4 | 5,6 | 6,2 | 7,3 | 7,9 |
| T89-17 | 4,8 | 6,7 | 7,0 | 8,3 | 8,4 |
| T89-18 | 4,2 | 5,5 | 6,7 | 7,3 | 7,4 |
| T89-19 | 4,7 | 5,5 | 6,8 | 7,2 | 7,8 |
| T89-20 | 4,5 | 5,6 | 6,5 | 7,0 | 7,3 |
| T89-21 | 4,9 | 5,6 | 6,4 | 7,4 | 7,6 |
| T89-22 | 4,3 | 5,4 | 6,5 | 7,3 | 7,6 |
| T89-23 | 3,9 | 5,5 | 6,7 | 7,7 | 7,0 |
| T89-24 | 4,3 | 5,9 | 6,8 | 8,1 | 7,9 |
| T89-25 | 4,7 | 6,5 | 7,5 | 9,2 | 9,1 |
| T89-26 | 5,4 | 5,9 | 7,7 | 8,6 | 8,8 |
| T89-27 | 4,7 | 5,6 | 7,4 | 7,9 | 8,0 |
| T89-28 | 4,7 | 5,7 | 6,3 | 7,2 | 7,4 |
| T89-29 | 4,8 | 5,6 | 6,6 | 7,7 | 8,1 |
| T89-30 | 4,6 | 5,5 | 6,7 | 7,3 | 7,3 |
| T89-31 | 4,3 | 5,8 | 6,3 | 7,5 | 7,6 |
| T89-32 | 4,6 | 5,9 | 7,6 | 9,3 | 9,1 |
| T89-33 | 4,4 | 5,3 | 6,2 | 7,1 | 7,1 |
| T89-34 | 4,6 | 5,6 | 6,8 | 8,1 | 8,7 |
| T89-35 | 5,3 | 6,0 | 7,5 | 8,8 | 8,9 |
| T89-36 | 4,4 | 6,1 | 6,9 | 8,1 | 8,6 |
| T89-82 | 4,7 | 5,3 | 6,5 | 7,5 | 7,4 |
| T89-83 | 4,7 | 6,1 | 7,1 | 8,3 | 8,3 |
| T89-85 | 5,1 | 6,3 | 7,3 | 7,7 | 8,2 |

Results from growth analysis are specified in the overview table 2.39. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and 5 MDC.

Table 2.39 Overview table of growth effects of construct TF0132.2nd

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TF0132.2nd         | 1,27                 | 1,12                   | 1,38                               | 1,15                         | 1,32                 | 1,09                   | 1,41                                  | 1,08                         |

Construction group TF0132rp1

This construct induces increased growth. The final height is 29% higher comparing the average of the construction group and wild type control group. The final height is 28% higher comparing the largest individuals of the construction group and wild type control group. The maximum height growth rate is 31% higher comparing the average of the construction group and wild type control group. The maximum height growth rate is 23% higher comparing the largest individuals of the construction group and wild type control group.

The TF0132rp1 construction group meets the more stringent level of growth difference selection criteria (1), (3) and (4) as shown in table 2.42.

Tables 2.40 and 2.41 contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

Table 2.40 Height growth data for TF0132rp1

| Days in greenhouse | Height (cm) |    |    |    |    |     |     |     |     |
|--------------------|-------------|----|----|----|----|-----|-----|-----|-----|
|                    | 15          | 19 | 26 | 33 | 37 | 40  | 47  | 51  | 54  |
| TF0132rp1-1B-1     | 25          | 30 | 48 | 70 | 88 | 103 | 137 | 153 | 170 |
| TF0132rp1-1B-2     | 23          | 26 | 38 | 63 | 80 | 96  | 133 | 151 | 168 |
| TF0132rp1-1B-3     | 23          | 27 | 42 | 66 | 86 | 98  | 131 | 151 | 167 |
| TF0132rp1-3BB-1    | 21          | 25 | 36 | 58 | 76 | 90  | 124 | 140 | 157 |
| TF0132rp1-3BB-2    | 21          | 28 | 46 | 68 | 88 | 101 | 135 | 147 | 171 |
| TF0132rp1-3BB-3    | 18          | 22 | 38 | 66 | 81 | 94  | 129 | 144 | 161 |
| TF0132rp1-4AC-1    | 22          | 27 | 42 | 65 | 83 | 95  | 127 | 142 | 159 |
| TF0132rp1-4AC-2    | 20          | 25 | 41 | 65 | 81 | 94  | 125 | 140 | 156 |
| TF0132rp1-4AC-3    | 21          | 24 | 38 | 61 | 77 | 88  | 122 | 139 | 154 |
| TF0132rp1-4B-1     | 26          | 30 | 45 | 70 | 87 | 100 | 133 | 144 | 162 |
| TF0132rp1-4B-2     | 20          | 26 | 43 | 64 | 77 | 90  | 121 | 135 | 152 |
| TF0132rp1-4B-3     | 20          | 24 | 41 | 67 | 85 | 100 | 132 | 147 | 163 |
| TF0132rp1-6B-1     | 23          | 26 | 41 | 65 | 83 | 95  | 127 | 141 | 157 |
| TF0132rp1-6B-2     | 23          | 28 | 41 | 64 | 82 | 96  | 132 | 152 | 165 |
| TF0132rp1-6B-3     | 20          | 26 | 45 | 73 | 93 | 107 | 140 | 156 | 169 |
| T89-20             | 21          | 26 | 39 | 58 | 73 | 82  | 111 | 130 | 134 |
| T89-21             | 21          | 24 | 34 | 51 | 64 | 72  | 97  | 103 | 125 |
| T89-22             | 19          | 23 | 32 | 48 | 60 | 70  | 96  | 111 | 123 |
| T89-23             | 21          | 24 | 34 | 51 | 63 | 70  | 94  | 112 | 122 |
| T89-24             | 19          | 22 | 30 | 46 | 59 | 68  | 90  | 103 | 115 |
| T89-25             | 22          | 30 | 39 | 57 | 72 | 81  | 106 | 112 | 130 |
| T89-26             | 21          | 24 | 35 | 48 | 60 | 70  | 98  | 111 | 130 |
| T89-27             | 21          | 24 | 34 | 48 | 60 | 70  | 93  | 106 | 120 |
| T89-28             | 20          | 22 | 32 | 48 | 60 | 70  | 93  | 105 | 116 |

Table 2.41 Diameter growth data for TF0132rp1

| Days in greenhouse | Diameter (mm) |     |     |     |
|--------------------|---------------|-----|-----|-----|
|                    | 33            | 40  | 47  | 54  |
| TF0132rp1-1B-1     | 5,1           | 6,3 | 7,4 | 9,1 |
| TF0132rp1-1B-2     | 4,8           | 5,8 | 6,9 | 8,1 |
| TF0132rp1-1B-3     | 4,2           | 5,8 | 7,0 | 7,6 |
| TF0132rp1-3BB-1    | 4,0           | 5,5 | 6,7 | 7,4 |
| TF0132rp1-3BB-2    | 5,1           | 6,1 | 6,8 | 8,2 |
| TF0132rp1-3BB-3    | 4,9           | 5,7 | 6,8 | 8,4 |
| TF0132rp1-4AC-1    | 4,3           | 6,2 | 8,0 | 9,1 |
| TF0132rp1-4AC-2    | 5,0           | 6,6 | 8,5 | 9,4 |
| TF0132rp1-4AC-3    | 4,8           | 6,5 | 7,5 | 8,5 |
| TF0132rp1-4B-1     | 4,8           | 5,1 | 6,5 | 7,9 |
| TF0132rp1-4B-2     | 4,8           | 5,3 | 6,3 | 7,2 |
| TF0132rp1-4B-3     | 4,5           | 5,6 | 7,7 | 8,4 |
| TF0132rp1-6B-1     | 4,2           | 5,3 | 6,6 | 6,9 |
| TF0132rp1-6B-2     | 4,5           | 5,8 | 7,6 | 8,2 |
| TF0132rp1-6B-3     | 6,5           | 6,7 | 7,3 | 8,4 |
| T89-20             | 4,8           | 6,2 | 6,3 | 6,9 |
| T89-21             | 3,8           | 5,5 | 6,0 | 6,9 |
| T89-22             | 4,5           | 6,2 | 6,6 | 7,5 |
| T89-23             | 3,8           | 4,8 | 5,6 | 6,2 |
| T89-24             | 3,8           | 4,9 | 5,8 | 7,2 |
| T89-25             | 4,8           | 5,9 | 7,4 | 8,9 |
| T89-26             | 4,4           | 6,2 | 7,0 | 7,8 |
| T89-27             | 4,9           | 6,4 | 7,3 | 8,3 |
| T89-28             | 4,5           | 4,8 | 5,8 | 7,2 |

- 5 Results from growth analysis are specified in the overview table 2.42. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and MDC.

10 Table 2.42 Overview table of growth effects of construct TF0132rp1

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TF0132rp1          | 1,29                 | 1,07                   | 1,31                               | 1,10                         | 1,28                 | 1,01                   | 1,23                                  | 1,02                         |

Construction group TF0146

This construct induces increased growth. The final height is 13% higher comparing the average of the construction group and wild type control group. The final height is 16% higher comparing the largest individuals of the construction group and wild type control group. The maximum height growth rate is 18% higher comparing the average of the construction group and wild type control group. The maximum height growth rate is 25% higher comparing the largest individuals of the construction group and wild type control group. The final diameter is 8% higher comparing the average of the construction group and wild type control group. The final diameter is 8% higher comparing the largest individuals of the construction group and wild type control group. The TF0146 construction group meets the more stringent level of growth difference selection criteria (1) and (4) as shown in table 2.45.

Tables 2.43 and 2.44 contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

Table 2.43 Height growth data for TF0146

| Days in greenhouse | Height (cm) |    |    |     |    |    |     |     |     |
|--------------------|-------------|----|----|-----|----|----|-----|-----|-----|
|                    | 18          | 25 | 28 | 32  | 36 | 39 | 46  | 53  | 55  |
| TF0146-1A          | 25          | 43 | 51 | 60  | 80 | 94 | 125 | 152 | 158 |
| TF0146-1B          | 16          | 32 | 42 | 55  | 68 | 82 | 113 | 140 | 148 |
| TF0146-2A          | 18          | 31 | 41 | 51  | 64 | 74 | 98  | 124 | 132 |
| TF0146-2B          | 22          | 42 | 55 | 64  | 81 | 95 | 125 | 156 | 162 |
| TF0146-3A          | 24          | 38 | 51 | 63  | 77 | 89 | 116 | 139 | 144 |
| TF0146-3B          | 18          | 30 | 38 | 49  | 64 | 74 | 95  | 114 | 122 |
| TF0146-4A          | 20          | 34 | 47 | 58  | 72 | 84 | 107 | 124 | 132 |
| TF0146-4B          | 24          | 39 | 52 | 63  | 79 | 91 | 120 | 149 | 158 |
| T89-01             | 18          | 32 | 43 | 54  | 66 | 76 | 98  | 124 | 133 |
| T89-02             | 20          | 33 | 43 | 53  | 67 | 76 | 101 | 124 | 129 |
| T89-03             | 17          | 31 | 43 | 53  | 68 | 76 | 102 | 128 | 135 |
| T89-04             | 19          | 33 | 44 | 54  | 67 | 74 | 97  | 122 | 129 |
| T89-05             | 20          | 33 | 44 | 54  | 67 | 76 | 100 | 121 | 129 |
| T89-06             | 18          | 31 | 42 | 53  | 67 | 76 | 97  | 121 | 128 |
| T89-07             | 16          | 28 | 41 | 53  | 65 | 74 | 96  | 121 | 129 |
| T89-08             | 19          | 34 | 43 | 53  | 65 | 75 | 98  | 123 | 131 |
| T89-09             | 20          | 30 | 40 | 52  | 64 | 73 | 97  | 119 | 125 |
| T89-10             | 21          | 33 | 41 | 49  | 61 | 70 | 92  | 114 | 121 |
| T89-11             | 18          | 31 | 40 | 49  | 61 | 71 | 94  | 117 | 123 |
| T89-12             | 18          | 31 | 40 | N/A | 60 | 68 | 90  | 107 | 115 |
| T89-13             | 19          | 35 | 47 | 58  | 70 | 78 | 103 | 128 | 135 |
| T89-14             | 19          | 31 | 40 | 50  | 61 | 72 | 93  | 118 | 124 |

128

|        |    |    |    |    |    |    |     |     |     |
|--------|----|----|----|----|----|----|-----|-----|-----|
| T89-15 | 20 | 32 | 41 | 50 | 62 | 70 | 91  | 114 | 120 |
| T89-16 | 18 | 30 | 39 | 49 | 62 | 71 | 92  | 114 | 122 |
| T89-17 | 17 | 33 | 45 | 55 | 70 | 78 | 104 | 129 | 136 |
| T89-18 | 19 | 32 | 44 | 56 | 71 | 82 | 106 | 130 | 137 |
| T89-19 | 16 | 26 | 36 | 46 | 51 | 69 | 89  | 112 | 119 |
| T89-20 | 16 | 31 | 41 | 49 | 60 | 71 | 91  | 111 | 118 |
| T89-21 | 20 | 31 | 44 | 54 | 68 | 76 | 99  | 122 | 127 |
| T89-22 | 14 | 26 | 37 | 46 | 61 | 72 | 96  | 120 | 127 |
| T89-23 | 19 | 32 | 40 | 50 | 63 | 73 | 100 | 121 | 127 |
| T89-24 | 20 | 31 | 41 | 47 | 58 | 68 | 90  | 111 | 117 |
| T89-25 | 20 | 36 | 45 | 57 | 69 | 78 | 101 | 127 | 134 |
| T89-26 | 20 | 37 | 49 | 58 | 71 | 80 | 107 | 131 | 140 |
| T89-27 | 19 | 34 | 44 | 55 | 71 | 81 | 107 | 131 | 138 |
| T89-28 | 17 | 35 | 44 | 56 | 68 | 76 | 99  | 126 | 132 |
| T89-29 | 17 | 32 | 45 | 55 | 68 | 78 | 101 | 125 | 132 |
| T89-30 | 18 | 31 | 41 | 50 | 63 | 72 | 95  | 119 | 125 |
| T89-31 | 17 | 27 | 35 | 45 | 58 | 67 | 87  | 108 | 116 |
| T89-32 | 19 | 32 | 44 | 52 | 65 | 74 | 98  | 121 | 127 |
| T89-33 | 20 | 33 | 43 | 53 | 64 | 74 | 96  | 119 | 126 |
| T89-34 | 19 | 34 | 44 | 55 | 68 | 78 | 100 | 124 | 130 |
| T89-35 | 17 | 30 | 40 | 51 | 64 | 74 | 95  | 116 | 122 |
| T89-36 | 18 | 30 | 40 | 49 | 62 | 71 | 91  | 114 | 121 |
| T89-82 | 21 | 33 | 43 | 54 | 65 | 75 | 98  | 118 | 125 |
| T89-83 | 22 | 35 | 47 | 55 | 71 | 80 | 105 | 130 | 137 |
| T89-85 | 21 | 36 | 46 | 56 | 67 | 76 | 98  | 123 | 131 |

Table 2.44 Diameter growth data for TF0146

| Days in greenhouse | Diameter (mm) |     |     |      |     |
|--------------------|---------------|-----|-----|------|-----|
|                    | 32            | 39  | 46  | 53   | 55  |
| TF0146-1A          | 5,4           | 6,2 | 7,2 | 6,9  | 7,5 |
| TF0146-1B          | 4,2           | 5,7 | 7,0 | 8,3  | 8,6 |
| TF0146-2A          | 6,1           | 6,4 | 7,4 | 8,7  | 9,4 |
| TF0146-2B          | 5,5           | 7,0 | 8,5 | 9,9  | 9,9 |
| TF0146-3A          | 6,0           | 7,1 | 8,1 | 8,3  | 8,3 |
| TF0146-3B          | 4,2           | 5,6 | 6,8 | 8,5  | 8,4 |
| TF0146-4A          | 4,8           | 5,1 | 6,9 | 7,2  | 7,2 |
| TF0146-4B          | 5,5           | 8,8 | 8,5 | 10,0 | 9,1 |
| T89-01             | 5,2           | 6,0 | 6,8 | 8,2  | 7,6 |
| T89-02             | 4,5           | 5,8 | 7,1 | 8,6  | 8,3 |
| T89-03             | 4,4           | 5,7 | 6,8 | 7,9  | 8,1 |
| T89-04             | 4,4           | 6,0 | 6,9 | 8,6  | 8,5 |
| T89-05             | 4,6           | 5,8 | 6,7 | 7,9  | 8,0 |
| T89-06             | 4,7           | 5,9 | 7,2 | 8,1  | 9,2 |
| T89-07             | 4,8           | 5,5 | 6,2 | 6,9  | 7,1 |
| T89-08             | 4,5           | 5,4 | 6,0 | 6,9  | 7,1 |
| T89-09             | 4,7           | 5,6 | 6,7 | 8,8  | 8,0 |
| T89-10             | 4,1           | 4,9 | 5,6 | 7,1  | 7,0 |
| T89-11             | 3,8           | 5,3 | 7,3 | 8,0  | 7,6 |
| T89-12             | N/A           | 5,1 | 6,2 | 7,3  | 6,9 |
| T89-13             | 4,8           | 5,7 | 6,5 | 7,6  | 7,6 |
| T89-14             | 4,2           | 5,5 | 6,6 | 7,6  | 6,5 |

|        |     |     |     |     |     |
|--------|-----|-----|-----|-----|-----|
| T89-15 | 5,0 | 6,1 | 7,2 | 7,9 | 8,3 |
| T89-16 | 4,4 | 5,6 | 6,2 | 7,3 | 7,9 |
| T89-17 | 4,8 | 6,7 | 7,0 | 8,3 | 8,4 |
| T89-18 | 4,2 | 5,5 | 6,7 | 7,3 | 7,4 |
| T89-19 | 4,7 | 5,5 | 6,8 | 7,2 | 7,8 |
| T89-20 | 4,5 | 5,6 | 6,5 | 7,0 | 7,3 |
| T89-21 | 4,9 | 5,6 | 6,4 | 7,4 | 7,6 |
| T89-22 | 4,3 | 5,4 | 6,5 | 7,3 | 7,6 |
| T89-23 | 3,9 | 5,5 | 6,7 | 7,7 | 7,0 |
| T89-24 | 4,3 | 5,9 | 6,8 | 8,1 | 7,9 |
| T89-25 | 4,7 | 6,5 | 7,5 | 9,2 | 9,1 |
| T89-26 | 5,4 | 5,9 | 7,7 | 8,6 | 8,8 |
| T89-27 | 4,7 | 5,6 | 7,4 | 7,9 | 8,0 |
| T89-28 | 4,7 | 5,7 | 6,3 | 7,2 | 7,4 |
| T89-29 | 4,8 | 5,6 | 6,6 | 7,7 | 8,1 |
| T89-30 | 4,6 | 5,5 | 6,7 | 7,3 | 7,3 |
| T89-31 | 4,3 | 5,8 | 6,3 | 7,5 | 7,6 |
| T89-32 | 4,6 | 5,9 | 7,6 | 9,3 | 9,1 |
| T89-33 | 4,4 | 5,3 | 6,2 | 7,1 | 7,1 |
| T89-34 | 4,6 | 5,6 | 6,8 | 8,1 | 8,7 |
| T89-35 | 5,3 | 6,0 | 7,5 | 8,8 | 8,9 |
| T89-36 | 4,4 | 6,1 | 6,9 | 8,1 | 8,6 |
| T89-82 | 4,7 | 5,3 | 6,5 | 7,5 | 7,4 |
| T89-83 | 4,7 | 6,1 | 7,1 | 8,3 | 8,3 |
| T89-85 | 5,1 | 6,3 | 7,3 | 7,7 | 8,2 |

Results from growth analysis are specified in the overview table 2.45. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and 5 MDC.

Table 2.45 Overview table of growth effects of construct TF0146

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TF0146             | 1,13                 | 1,08                   | 1,18                               | 0,99                         | 1,16                 | 1,08                   | 1,25                                  | 0,95                         |

Construction group TF0173

This construct induces increased growth. The diameter growth rate is 19% higher comparing the average of the construction group and wild type control group. The TF0173 construction group meets growth difference selection criterion (3) as shown in table 2.48.

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Tables 2.46 and 2.47 contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

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Table 2.46 Height growth data for TF0173

| Days in greenhouse | Height (cm) |    |    |    |    |    |     |     |     |     |
|--------------------|-------------|----|----|----|----|----|-----|-----|-----|-----|
|                    | 22          | 27 | 31 | 34 | 38 | 41 | 45  | 48  | 52  | 56  |
| TF0173-3A-1        | 28          | 39 | 51 | 60 | 73 | 81 | 93  | 104 | 120 | 134 |
| TF0173-3A-2        | 24          | 34 | 44 | 53 | 65 | 74 | 87  | 98  | 111 | 123 |
| TF0173-3B-1        | 30          | 42 | 57 | 67 | 81 | 94 | 108 | 120 | 136 | 155 |
| TF0173-3B-2        | 26          | 37 | 50 | 62 | 76 | 88 | 103 | 114 | 131 | 147 |
| TF0173-4A-1        | 26          | 37 | 51 | 60 | 76 | 87 | 101 | 112 | 125 | 141 |
| TF0173-4A-2        | 28          | 40 | 54 | 64 | 77 | 88 | 102 | 111 | 125 | 142 |
| TF0173-4B-1        | 30          | 41 | 57 | 65 | 80 | 91 | 105 | 115 | N/A | 136 |
| TF0173-4B-2        | 30          | 38 | 49 | 58 | 71 | 82 | 95  | 105 | 116 | 140 |
| T89-01             | 27          | 37 | 47 | 58 | 69 | 79 | 93  | 100 | 114 | 129 |
| T89-02             | 28          | 38 | 48 | 57 | 69 | 75 | 84  | 91  | 97  | 104 |
| T89-03             | 26          | 38 | 49 | 59 | 69 | 82 | 94  | 106 | 122 | 139 |
| T89-04             | 27          | 37 | 49 | 58 | 70 | 82 | 99  | 110 | 124 | 140 |
| T89-05             | 29          | 40 | 52 | 60 | 74 | 83 | 96  | 106 | 120 | 134 |
| T89-06             | 29          | 39 | 51 | 59 | 70 | 85 | 97  | 105 | 118 | 133 |
| T89-07             | 24          | 32 | 43 | 52 | 61 | 71 | 81  | 90  | 96  | 102 |
| T89-08             | 27          | 35 | 45 | 54 | 67 | 76 | 88  | 99  | 114 | 129 |
| T89-09             | 30          | 40 | 53 | 64 | 75 | 86 | 99  | 110 | 123 | 136 |
| T89-10             | 26          | 37 | 48 | 59 | 73 | 80 | 92  | 101 | 115 | 129 |
| T89-12             | 32          | 43 | 56 | 68 | 80 | 93 | 108 | 117 | 131 | 144 |
| T89-13             | 29          | 41 | 50 | 61 | 72 | 82 | 93  | 104 | 118 | 136 |
| T89-14             | 28          | 36 | 47 | 58 | 69 | 77 | 89  | 100 | 115 | 132 |
| T89-15             | 24          | 38 | 48 | 57 | 68 | 78 | 93  | 106 | 120 | 135 |
| T89-16             | 29          | 40 | 53 | 63 | 74 | 85 | N/A | 109 | 122 | 137 |
| T89-18             | 30          | 40 | 52 | 61 | 73 | 81 | 93  | 104 | 115 | 124 |
| T89-19             | 30          | 43 | 56 | 67 | 80 | 92 | 108 | 117 | 132 | 149 |
| T89-20             | 31          | 42 | 56 | 65 | 78 | 89 | 102 | 113 | 129 | 145 |
| T89-21             | 31          | 42 | 55 | 64 | 78 | 89 | 102 | 116 | 132 | 147 |
| T89-23             | 32          | 41 | 52 | 62 | 74 | 85 | 97  | 107 | 120 | 135 |
| T89-24             | 25          | 36 | 47 | 55 | 69 | 78 | 92  | 101 | 113 | 128 |
| T89-25             | 30          | 40 | 52 | 61 | 73 | 84 | 101 | 112 | 125 | 139 |
| T89-26             | 28          | 40 | 50 | 60 | 72 | 85 | 97  | 109 | 122 | 136 |
| T89-27             | 27          | 36 | 46 | 53 | 65 | 74 | 85  | 96  | 109 | 123 |
| T89-31             | 30          | 41 | 51 | 61 | 73 | 84 | 98  | 109 | 123 | 138 |
| T89-32             | 28          | 38 | 52 | 62 | 75 | 85 | 98  | 107 | 121 | 135 |

|        |    |    |    |    |    |    |     |     |     |     |
|--------|----|----|----|----|----|----|-----|-----|-----|-----|
| T89-35 | 29 | 40 | 54 | 64 | 76 | 88 | 101 | 110 | 124 | 139 |
| T89-36 | 24 | 34 | 43 | 52 | 63 | 72 | 84  | 95  | 108 | 120 |
| T89-37 | 27 | 40 | 52 | 63 | 73 | 84 | 97  | 105 | 122 | 137 |
| T89-38 | 13 | 14 | 18 | 22 | 39 | 46 | 55  | 62  | 72  | 81  |
| T89-39 | 28 | 39 | 51 | 60 | 73 | 85 | 98  | 106 | 120 | 134 |
| T89-40 | 23 | 42 | 45 | 54 | 68 | 75 | 86  | 97  | 108 | 122 |
| T89-41 | 29 | 40 | 53 | 63 | 75 | 85 | 99  | 107 | 117 | 131 |
| T89-42 | 33 | 43 | 58 | 69 | 83 | 97 | 111 | 121 | 136 | 150 |
| T89-45 | 23 | 36 | 48 | 58 | 69 | 78 | 93  | 103 | 119 | N/A |
| T89-46 | 25 | 34 | 44 | 51 | 60 | 68 | 77  | 87  | 99  | 113 |
| T89-69 | 28 | 38 | 49 | 61 | 75 | 86 | 100 | 110 | 126 | 142 |

Table 2.47 Diameter growth data for TF0173

| Days in<br>greenhouse | Diameter (mm) |     |      |      | Days in<br>greenhouse | Diameter (mm) |     |     |      |
|-----------------------|---------------|-----|------|------|-----------------------|---------------|-----|-----|------|
|                       | 34            | 45  | 48   | 56   |                       | 34            | 45  | 48  | 56   |
| TF0173-3A-1           | 5,6           | 6,4 | 7,3  | 8,0  | T89-18                | 7,2           | 7,7 | 8,4 | 8,3  |
| TF0173-3A-2           | 6,5           | 6,8 | 7,3  | 9,2  | T89-19                | 6,1           | 8,1 | 8,7 | 9,4  |
| TF0173-3B-1           | 6,0           | 8,9 | 9,0  | 9,8  | T89-20                | 6,8           | 8,0 | 8,2 | 9,7  |
| TF0173-3B-2           | 5,7           | 8,2 | 8,7  | 9,5  | T89-21                | 6,3           | 7,3 | 8,3 | 9,6  |
| TF0173-4A-1           | 6,0           | 7,9 | 8,5  | 10,1 | T89-23                | 5,7           | 7,9 | 7,8 | 9,6  |
| TF0173-4A-2           | 5,6           | 8,0 | 8,5  | 10,7 | T89-24                | 5,7           | 6,9 | 7,1 | 8,4  |
| TF0173-4B-1           | 6,3           | 8,1 | 9,0  | 11,5 | T89-25                | 5,7           | 8,0 | 9,2 | 10,3 |
| TF0173-4B-2           | 5,2           | 6,8 | 8,7  | 9,3  | T89-26                | 6,5           | 8,7 | 9,5 | 10,3 |
| T89-01                | 7,0           | N/A | 9,0  | 10,2 | T89-27                | 6,4           | 7,7 | 8,6 | 10,1 |
| T89-02                | 5,9           | 6,0 | 6,4  | 6,8  | T89-31                | 5,6           | 8,6 | 7,7 | 9,2  |
| T89-03                | 6,2           | 7,9 | 10,3 | 9,8  | T89-32                | 7,2           | 9,0 | 9,2 | 10,6 |
| T89-04                | 6,2           | 9,0 | 8,2  | 9,5  | T89-35                | 6,9           | 8,1 | 8,6 | 9,6  |
| T89-05                | 6,2           | 8,0 | 8,4  | 9,8  | T89-36                | 5,3           | 7,4 | 8,2 | 9,7  |
| T89-06                | 6,6           | 8,9 | 9,7  | 9,9  | T89-37                | 5,5           | 8,0 | 8,7 | 9,2  |
| T89-07                | 5,2           | 6,3 | 6,7  | 7,0  | T89-38                | 5,4           | N/A | 6,1 | 7,0  |
| T89-08                | 5,7           | 6,9 | 7,9  | 9,1  | T89-39                | 6,0           | 8,3 | 8,8 | 10,4 |
| T89-09                | 4,1           | 7,6 | 9,0  | 9,8  | T89-40                | 5,3           | 7,0 | 7,7 | 8,7  |
| T89-10                | 6,3           | 8,5 | 8,4  | 9,9  | T89-41                | 5,4           | 7,4 | 7,8 | 9,3  |
| T89-12                | 5,8           | 7,8 | 8,3  | 9,7  | T89-42                | 6,2           | 8,5 | 9,1 | 10,5 |
| T89-13                | 5,7           | 7,8 | 8,0  | 9,3  | T89-45                | 5,4           | 8,5 | 8,7 | 9,9  |
| T89-14                | 6,5           | 6,8 | 7,1  | 8,8  | T89-46                | 7,3           | 7,4 | 8,0 | 9,6  |
| T89-15                | 6,0           | 7,6 | 8,3  | 9,5  | T89-69                | 5,7           | 8,0 | 8,7 | 8,9  |
| T89-16                | 6,3           | 8,6 | 7,8  | 9,3  |                       |               |     |     |      |

Results from growth analysis are specified in the overview table 2.48. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and MDC.

Table 2.48 Overview table of growth effects of construct TF0173

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TF0173             | 1,06                 | 1,04                   | 1,07                               | 1,19                         | 1,03                 | 1,09                   | 1,04                                  | 0,99                         |

Construction group TF0247

This construct induces increased growth. The final height is 7% higher comparing the average of the construction group and wild type control group. The final height is 10% higher comparing the largest individuals of the construction group and wild type control group. The maximum height growth rate is 5% higher comparing the average of the construction group and wild type control group. The maximum height growth rate is 7% higher comparing the largest individuals of the construction group and wild type control group. The final diameter is 18% higher comparing the average of the construction group and wild type control group. The final diameter is 9% higher comparing the largest individuals of the construction group and wild type control group. The diameter growth rate is 22% higher comparing the average of the construction group and wild type control group. The diameter growth rate is 18% higher comparing the largest individuals of the construction group and wild type control group. The TF0247 construction group meets the more stringent level of growth difference selection criterion (2) and the less stringent level of growth difference selection criteria (1), (3) and (4) as shown in table 2.51.

Tables 2.49 and 2.50 contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

Table 2.49 Height growth data for TF0247

| Days in greenhouse | Height (cm) |    |    |     |    |    |     |     |     |
|--------------------|-------------|----|----|-----|----|----|-----|-----|-----|
|                    | 18          | 25 | 28 | 32  | 36 | 39 | 46  | 53  | 55  |
| TF0247-1A          | 18          | 29 | 40 | 52  | 67 | 76 | 98  | 123 | 131 |
| TF0247-3A          | 22          | 38 | 51 | 63  | 78 | 90 | 118 | 145 | 154 |
| TF0247-3B          | 23          | 37 | 50 | 61  | 76 | 87 | 114 | 139 | 145 |
| TF0247-4A          | 17          | 30 | 41 | 53  | 68 | 77 | 103 | 127 | 134 |
| TF0247-6B          | 25          | 40 | 52 | 63  | 73 | 83 | 97  | 111 | 116 |
| T89-01             | 18          | 32 | 43 | 54  | 66 | 76 | 98  | 124 | 133 |
| T89-02             | 20          | 33 | 43 | 53  | 67 | 76 | 101 | 124 | 129 |
| T89-03             | 17          | 31 | 43 | 53  | 68 | 76 | 102 | 128 | 135 |
| T89-04             | 19          | 33 | 44 | 54  | 67 | 74 | 97  | 122 | 129 |
| T89-05             | 20          | 33 | 44 | 54  | 67 | 76 | 100 | 121 | 129 |
| T89-06             | 18          | 31 | 42 | 53  | 67 | 76 | 97  | 121 | 128 |
| T89-07             | 16          | 28 | 41 | 53  | 65 | 74 | 96  | 121 | 129 |
| T89-08             | 19          | 34 | 43 | 53  | 65 | 75 | 98  | 123 | 131 |
| T89-09             | 20          | 30 | 40 | 52  | 64 | 73 | 97  | 119 | 125 |
| T89-10             | 21          | 33 | 41 | 49  | 61 | 70 | 92  | 114 | 121 |
| T89-11             | 18          | 31 | 40 | 49  | 61 | 71 | 94  | 117 | 123 |
| T89-12             | 18          | 31 | 40 | N/A | 60 | 68 | 90  | 107 | 115 |

|        |    |    |    |    |    |    |     |     |     |
|--------|----|----|----|----|----|----|-----|-----|-----|
| T89-13 | 19 | 35 | 47 | 58 | 70 | 78 | 103 | 128 | 135 |
| T89-14 | 19 | 31 | 40 | 50 | 61 | 72 | 93  | 118 | 124 |
| T89-15 | 20 | 32 | 41 | 50 | 62 | 70 | 91  | 114 | 120 |
| T89-16 | 18 | 30 | 39 | 49 | 62 | 71 | 92  | 114 | 122 |
| T89-17 | 17 | 33 | 45 | 55 | 70 | 78 | 104 | 129 | 136 |
| T89-18 | 19 | 32 | 44 | 56 | 71 | 82 | 106 | 130 | 137 |
| T89-19 | 16 | 26 | 36 | 46 | 51 | 69 | 89  | 112 | 119 |
| T89-20 | 16 | 31 | 41 | 49 | 60 | 71 | 91  | 111 | 118 |
| T89-21 | 20 | 31 | 44 | 54 | 68 | 76 | 99  | 122 | 127 |
| T89-22 | 14 | 26 | 37 | 46 | 61 | 72 | 96  | 120 | 127 |
| T89-23 | 19 | 32 | 40 | 50 | 63 | 73 | 100 | 121 | 127 |
| T89-24 | 20 | 31 | 41 | 47 | 58 | 68 | 90  | 111 | 117 |
| T89-25 | 20 | 36 | 45 | 57 | 69 | 78 | 101 | 127 | 134 |
| T89-26 | 20 | 37 | 49 | 58 | 71 | 80 | 107 | 131 | 140 |
| T89-27 | 19 | 34 | 44 | 55 | 71 | 81 | 107 | 131 | 138 |
| T89-28 | 17 | 35 | 44 | 56 | 68 | 76 | 99  | 126 | 132 |
| T89-29 | 17 | 32 | 45 | 55 | 68 | 78 | 101 | 125 | 132 |
| T89-30 | 18 | 31 | 41 | 50 | 63 | 72 | 95  | 119 | 125 |
| T89-31 | 17 | 27 | 35 | 45 | 58 | 67 | 87  | 108 | 116 |
| T89-32 | 19 | 32 | 44 | 52 | 65 | 74 | 98  | 121 | 127 |
| T89-33 | 20 | 33 | 43 | 53 | 64 | 74 | 96  | 119 | 126 |
| T89-34 | 19 | 34 | 44 | 55 | 68 | 78 | 100 | 124 | 130 |
| T89-35 | 17 | 30 | 40 | 51 | 64 | 74 | 95  | 116 | 122 |
| T89-36 | 18 | 30 | 40 | 49 | 62 | 71 | 91  | 114 | 121 |
| T89-82 | 21 | 33 | 43 | 54 | 65 | 75 | 98  | 118 | 125 |
| T89-83 | 22 | 35 | 47 | 55 | 71 | 80 | 105 | 130 | 137 |
| T89-85 | 21 | 36 | 46 | 56 | 67 | 76 | 98  | 123 | 131 |

Table 2.50 Diameter growth data for TF0247

| Days in greenhouse | Diameter (mm) |     |     |      |      |
|--------------------|---------------|-----|-----|------|------|
|                    | 32            | 39  | 46  | 53   | 55   |
| TF0247-1A          | 4,9           | 6,0 | 7,4 | 8,5  | 9,7  |
| TF0247-3A          | 5,8           | 6,8 | 7,6 | 8,7  | 9,1  |
| TF0247-3B          | 5,4           | 7,0 | 8,1 | 9,5  | 10,0 |
| TF0247-4A          | 4,6           | 5,7 | 7,4 | 10,3 | 9,7  |
| TF0247-6B          | 6,0           | 6,8 | 7,0 | 7,3  | 7,9  |
| T89-01             | 5,2           | 6,0 | 6,8 | 8,2  | 7,6  |
| T89-02             | 4,5           | 5,8 | 7,1 | 8,6  | 8,3  |
| T89-03             | 4,4           | 5,7 | 6,8 | 7,9  | 8,1  |
| T89-04             | 4,4           | 6,0 | 6,9 | 8,6  | 8,5  |
| T89-05             | 4,6           | 5,8 | 6,7 | 7,9  | 8,0  |
| T89-06             | 4,7           | 5,9 | 7,2 | 8,1  | 9,2  |
| T89-07             | 4,8           | 5,5 | 6,2 | 6,9  | 7,1  |
| T89-08             | 4,5           | 5,4 | 6,0 | 6,9  | 7,1  |
| T89-09             | 4,7           | 5,6 | 6,7 | 8,8  | 8,0  |
| T89-10             | 4,1           | 4,9 | 5,6 | 7,1  | 7,0  |
| T89-11             | 3,8           | 5,3 | 7,3 | 8,0  | 7,6  |
| T89-12             | N/A           | 5,1 | 6,2 | 7,3  | 6,9  |
| T89-13             | 4,8           | 5,7 | 6,5 | 7,6  | 7,6  |
| T89-14             | 4,2           | 5,5 | 6,6 | 7,6  | 6,5  |
| T89-15             | 5,0           | 6,1 | 7,2 | 7,9  | 8,3  |

|        |     |     |     |     |     |
|--------|-----|-----|-----|-----|-----|
| T89-16 | 4,4 | 5,6 | 6,2 | 7,3 | 7,9 |
| T89-17 | 4,8 | 6,7 | 7,0 | 8,3 | 8,4 |
| T89-18 | 4,2 | 5,5 | 6,7 | 7,3 | 7,4 |
| T89-19 | 4,7 | 5,5 | 6,8 | 7,2 | 7,8 |
| T89-20 | 4,5 | 5,6 | 6,5 | 7,0 | 7,3 |
| T89-21 | 4,9 | 5,6 | 6,4 | 7,4 | 7,6 |
| T89-22 | 4,3 | 5,4 | 6,5 | 7,3 | 7,6 |
| T89-23 | 3,9 | 5,5 | 6,7 | 7,7 | 7,0 |
| T89-24 | 4,3 | 5,9 | 6,8 | 8,1 | 7,9 |
| T89-25 | 4,7 | 6,5 | 7,5 | 9,2 | 9,1 |
| T89-26 | 5,4 | 5,9 | 7,7 | 8,6 | 8,8 |
| T89-27 | 4,7 | 5,6 | 7,4 | 7,9 | 8,0 |
| T89-28 | 4,7 | 5,7 | 6,3 | 7,2 | 7,4 |
| T89-29 | 4,8 | 5,6 | 6,6 | 7,7 | 8,1 |
| T89-30 | 4,6 | 5,5 | 6,7 | 7,3 | 7,3 |
| T89-31 | 4,3 | 5,8 | 6,3 | 7,5 | 7,6 |
| T89-32 | 4,6 | 5,9 | 7,6 | 9,3 | 9,1 |
| T89-33 | 4,4 | 5,3 | 6,2 | 7,1 | 7,1 |
| T89-34 | 4,6 | 5,6 | 6,8 | 8,1 | 8,7 |
| T89-35 | 5,3 | 6,0 | 7,5 | 8,8 | 8,9 |
| T89-36 | 4,4 | 6,1 | 6,9 | 8,1 | 8,6 |
| T89-82 | 4,7 | 5,3 | 6,5 | 7,5 | 7,4 |
| T89-83 | 4,7 | 6,1 | 7,1 | 8,3 | 8,3 |
| T89-85 | 5,1 | 6,3 | 7,3 | 7,7 | 8,2 |

Results from growth analysis are specified in the overview table 2.51. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and 5 MDC.

Table 2.51 Overview table of growth effects of construct TF0247

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TF0247             | 1,07                 | 1,18                   | 1,05                               | 1,22                         | 1,10                 | 1,09                   | 1,07                                  | 1,18                         |

Construction group TF0405

This construct induces increased growth. The final height is 10% higher comparing the average of the construction group and wild type control group. The final height is 9% higher comparing the largest individuals of the construction group and wild type control group. The maximum height growth rate is 13% higher comparing the average of the construction group and wild type control group. The maximum height growth rate is 15% higher comparing the largest individuals of the construction group and wild type control group. The final diameter is 15% higher comparing the average of the construction group and wild type control group. The final diameter is 10% higher comparing the largest individuals of the construction group and wild type control group. The diameter growth rate is 22% higher comparing the average of the construction group and wild type control group. The diameter growth rate is 19% higher comparing the largest individuals of the construction group and wild type control group. The TF0405 construction group meets the more stringent level of growth difference selection criteria (1) and (2) and the less stringent level of growth difference selection criteria (3) and (4) as shown in table 2.54.

Tables 2.52 and 2.53 contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

Table 2.52 Height growth data for TF0405

| Days in greenhouse | Height (cm) |    |    |    |    |    |     |     |     |
|--------------------|-------------|----|----|----|----|----|-----|-----|-----|
|                    | 18          | 25 | 28 | 32 | 36 | 39 | 46  | 53  | 55  |
| TF0405-2A-1        | 7           | 17 | 25 | 36 | 46 | 57 | 83  | 109 | 117 |
| TF0405-2A-2        | 21          | 36 | 50 | 60 | 74 | 87 | 118 | 146 | 153 |
| TF0405-2B-2        | 19          | 34 | 47 | 58 | 73 | 84 | 108 | 130 | 136 |
| TF0405-3A-1        | 24          | 41 | 54 | 63 | 77 | 88 | 117 | 144 | 150 |
| TF0405-3A-2        | 25          | 38 | 52 | 64 | 79 | 91 | 117 | 142 | 150 |
| TF0405-3B-1        | 19          | 33 | 44 | 54 | 65 | 75 | 98  | 123 | 130 |
| TF0405-3B-2        | 22          | 36 | 49 | 59 | 72 | 86 | 112 | 136 | 145 |
| T89-01             | 18          | 32 | 43 | 54 | 66 | 76 | 98  | 124 | 133 |
| T89-02             | 20          | 33 | 43 | 53 | 67 | 76 | 101 | 124 | 129 |
| T89-03             | 17          | 31 | 43 | 53 | 68 | 76 | 102 | 128 | 135 |
| T89-04             | 19          | 33 | 44 | 54 | 67 | 74 | 97  | 122 | 129 |
| T89-05             | 20          | 33 | 44 | 54 | 67 | 76 | 100 | 121 | 129 |
| T89-06             | 18          | 31 | 42 | 53 | 67 | 76 | 97  | 121 | 128 |
| T89-07             | 16          | 28 | 41 | 53 | 65 | 74 | 96  | 121 | 129 |
| T89-08             | 19          | 34 | 43 | 53 | 65 | 75 | 98  | 123 | 131 |
| T89-09             | 20          | 30 | 40 | 52 | 64 | 73 | 97  | 119 | 125 |

|        |    |    |    |     |    |    |     |     |     |
|--------|----|----|----|-----|----|----|-----|-----|-----|
| T89-10 | 21 | 33 | 41 | 49  | 61 | 70 | 92  | 114 | 121 |
| T89-11 | 18 | 31 | 40 | 49  | 61 | 71 | 94  | 117 | 123 |
| T89-12 | 18 | 31 | 40 | N/A | 60 | 68 | 90  | 107 | 115 |
| T89-13 | 19 | 35 | 47 | 58  | 70 | 78 | 103 | 128 | 135 |
| T89-14 | 19 | 31 | 40 | 50  | 61 | 72 | 93  | 118 | 124 |
| T89-15 | 20 | 32 | 41 | 50  | 62 | 70 | 91  | 114 | 120 |
| T89-16 | 18 | 30 | 39 | 49  | 62 | 71 | 92  | 114 | 122 |
| T89-17 | 17 | 33 | 45 | 55  | 70 | 78 | 104 | 129 | 136 |
| T89-18 | 19 | 32 | 44 | 56  | 71 | 82 | 106 | 130 | 137 |
| T89-19 | 16 | 26 | 36 | 46  | 51 | 69 | 89  | 112 | 119 |
| T89-20 | 16 | 31 | 41 | 49  | 60 | 71 | 91  | 111 | 118 |
| T89-21 | 20 | 31 | 44 | 54  | 68 | 76 | 99  | 122 | 127 |
| T89-22 | 14 | 26 | 37 | 46  | 61 | 72 | 96  | 120 | 127 |
| T89-23 | 19 | 32 | 40 | 50  | 63 | 73 | 100 | 121 | 127 |
| T89-24 | 20 | 31 | 41 | 47  | 58 | 68 | 90  | 111 | 117 |
| T89-25 | 20 | 36 | 45 | 57  | 69 | 78 | 101 | 127 | 134 |
| T89-26 | 20 | 37 | 49 | 58  | 71 | 80 | 107 | 131 | 140 |
| T89-27 | 19 | 34 | 44 | 55  | 71 | 81 | 107 | 131 | 138 |
| T89-28 | 17 | 35 | 44 | 56  | 68 | 76 | 99  | 126 | 132 |
| T89-29 | 17 | 32 | 45 | 55  | 68 | 78 | 101 | 125 | 132 |
| T89-30 | 18 | 31 | 41 | 50  | 63 | 72 | 95  | 119 | 125 |
| T89-31 | 17 | 27 | 35 | 45  | 58 | 67 | 87  | 108 | 116 |
| T89-32 | 19 | 32 | 44 | 52  | 65 | 74 | 98  | 121 | 127 |
| T89-33 | 20 | 33 | 43 | 53  | 64 | 74 | 96  | 119 | 126 |
| T89-34 | 19 | 34 | 44 | 55  | 68 | 78 | 100 | 124 | 130 |
| T89-35 | 17 | 30 | 40 | 51  | 64 | 74 | 95  | 116 | 122 |
| T89-36 | 18 | 30 | 40 | 49  | 62 | 71 | 91  | 114 | 121 |
| T89-82 | 21 | 33 | 43 | 54  | 65 | 75 | 98  | 118 | 125 |
| T89-83 | 22 | 35 | 47 | 55  | 71 | 80 | 105 | 130 | 137 |
| T89-85 | 21 | 36 | 46 | 56  | 67 | 76 | 98  | 123 | 131 |

Table 2.53 Diameter growth data for TF0405

| Days in greenhouse | Diameter (mm) |     |     |      |      |
|--------------------|---------------|-----|-----|------|------|
|                    | 32            | 39  | 46  | 53   | 55   |
| TF0405-2A-1        | 4,0           | 5,1 | 6,8 | 9,1  | 9,2  |
| TF0405-2A-2        | 5,3           | 6,9 | 8,3 | 10,2 | 10,1 |
| TF0405-2B-2        | 5,3           | 7,0 | 7,7 | 8,9  | 9,0  |
| TF0405-3A-1        | 5,2           | 6,9 | 8,1 | 9,1  | 8,9  |
| TF0405-3A-2        | 5,4           | 6,7 | 8,0 | 9,2  | 9,0  |
| TF0405-3B-1        | 5,1           | 5,8 | 7,3 | 7,8  | 7,9  |
| TF0405-3B-2        | 5,3           | 6,3 | 7,8 | 9,2  | 9,1  |
| T89-01             | 5,2           | 6,0 | 6,8 | 8,2  | 7,6  |
| T89-02             | 4,5           | 5,8 | 7,1 | 8,6  | 8,3  |
| T89-03             | 4,4           | 5,7 | 6,8 | 7,9  | 8,1  |
| T89-04             | 4,4           | 6,0 | 6,9 | 8,6  | 8,5  |
| T89-05             | 4,6           | 5,8 | 6,7 | 7,9  | 8,0  |
| T89-06             | 4,7           | 5,9 | 7,2 | 8,1  | 9,2  |
| T89-07             | 4,8           | 5,5 | 6,2 | 6,9  | 7,1  |
| T89-08             | 4,5           | 5,4 | 6,0 | 6,9  | 7,1  |
| T89-09             | 4,7           | 5,6 | 6,7 | 8,8  | 8,0  |
| T89-10             | 4,1           | 4,9 | 5,6 | 7,1  | 7,0  |

|        |     |     |     |     |     |
|--------|-----|-----|-----|-----|-----|
| T89-11 | 3,8 | 5,3 | 7,3 | 8,0 | 7,6 |
| T89-12 | N/A | 5,1 | 6,2 | 7,3 | 6,9 |
| T89-13 | 4,8 | 5,7 | 6,5 | 7,6 | 7,6 |
| T89-14 | 4,2 | 5,5 | 6,6 | 7,6 | 6,5 |
| T89-15 | 5,0 | 6,1 | 7,2 | 7,9 | 8,3 |
| T89-16 | 4,4 | 5,6 | 6,2 | 7,3 | 7,9 |
| T89-17 | 4,8 | 6,7 | 7,0 | 8,3 | 8,4 |
| T89-18 | 4,2 | 5,5 | 6,7 | 7,3 | 7,4 |
| T89-19 | 4,7 | 5,5 | 6,8 | 7,2 | 7,8 |
| T89-20 | 4,5 | 5,6 | 6,5 | 7,0 | 7,3 |
| T89-21 | 4,9 | 5,6 | 6,4 | 7,4 | 7,6 |
| T89-22 | 4,3 | 5,4 | 6,5 | 7,3 | 7,6 |
| T89-23 | 3,9 | 5,5 | 6,7 | 7,7 | 7,0 |
| T89-24 | 4,3 | 5,9 | 6,8 | 8,1 | 7,9 |
| T89-25 | 4,7 | 6,5 | 7,5 | 9,2 | 9,1 |
| T89-26 | 5,4 | 5,9 | 7,7 | 8,6 | 8,8 |
| T89-27 | 4,7 | 5,6 | 7,4 | 7,9 | 8,0 |
| T89-28 | 4,7 | 5,7 | 6,3 | 7,2 | 7,4 |
| T89-29 | 4,8 | 5,6 | 6,6 | 7,7 | 8,1 |
| T89-30 | 4,6 | 5,5 | 6,7 | 7,3 | 7,3 |
| T89-31 | 4,3 | 5,8 | 6,3 | 7,5 | 7,6 |
| T89-32 | 4,6 | 5,9 | 7,6 | 9,3 | 9,1 |
| T89-33 | 4,4 | 5,3 | 6,2 | 7,1 | 7,1 |
| T89-34 | 4,6 | 5,6 | 6,8 | 8,1 | 8,7 |
| T89-35 | 5,3 | 6,0 | 7,5 | 8,8 | 8,9 |
| T89-36 | 4,4 | 6,1 | 6,9 | 8,1 | 8,6 |
| T89-82 | 4,7 | 5,3 | 6,5 | 7,5 | 7,4 |
| T89-83 | 4,7 | 6,1 | 7,1 | 8,3 | 8,3 |
| T89-85 | 5,1 | 6,3 | 7,3 | 7,7 | 8,2 |

Results from growth analysis are specified in the overview table 2.54. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and 5 MDC.

Table 2.54 Overview table of growth effects of construct TF0405

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TF0405             | 1,10                 | 1,15                   | 1,13                               | 1,22                         | 1,09                 | 1,10                   | 1,15                                  | 1,19                         |

Construction group TFSTT004

Tables 2.55 and 2.56 contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

Table 2.55 Height growth data for TFSTT004

| Days in greenhouse | Height (cm) |     |     |     |     |     |     |     |     |     |
|--------------------|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                    | 19          | 28  | 34  | 40  | 44  | 47  | 51  | 54  | 61  | 65  |
| TFSTT004-1A        | 18          | 35  | 55  | 71  | 84  | 95  | 105 | 114 | 135 | 145 |
| TFSTT004-2A-1      | 16          | 33  | 54  | 67  | 82  | 89  | 100 | 108 | 130 | 141 |
| TFSTT004-2A-2      | 19          | 39  | 57  | 71  | 84  | 94  | 106 | 112 | 130 | 140 |
| TFSTT004-2B-1      | 20          | 41  | 61  | 78  | 90  | 99  | 110 | 119 | 139 | 150 |
| TFSTT004-2B-2      | 20          | 38  | 59  | 74  | 85  | 93  | 103 | 113 | 135 | 146 |
| TFSTT004-3B        | 19          | 35  | 53  | 66  | 77  | 87  | 98  | 107 | 124 | 134 |
| TFSTT004-4B-1      | 18          | 33  | 51  | 63  | 76  | 86  | 98  | 108 | 129 | 142 |
| TFSTT004-4B-2      | 18          | 35  | 57  | 74  | 86  | 96  | 108 | 116 | 141 | 152 |
| T89-01             | 18          | 30  | 46  | 58  | 69  | 77  | 87  | 96  | 113 | 122 |
| T89-02             | 18          | 30  | 49  | 62  | 72  | 77  | 84  | 90  | 102 | 109 |
| T89-03             | 15          | 27  | 41  | 54  | 65  | 73  | 82  | 91  | 112 | 123 |
| T89-10             | N/A         | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| T89-11             | 19          | 31  | 49  | 61  | 74  | 83  | 94  | 103 | 124 | 133 |
| T89-12             | 17          | 30  | 45  | 58  | 69  | 77  | 90  | 100 | 123 | 134 |
| T89-13             | 18          | 27  | 43  | 56  | 68  | 78  | 91  | 100 | 121 | 133 |
| T89-14             | 5           | 26  | 42  | 56  | 67  | 74  | 83  | 90  | 109 | 119 |
| T89-15             | 10          | 15  | 25  | 33  | 41  | 45  | 52  | 57  | 72  | 82  |
| T89-16             | 19          | 33  | 53  | 63  | 73  | 82  | 93  | 102 | 119 | 130 |
| T89-17             | 17          | 29  | 46  | 58  | 66  | 72  | 80  | 86  | 96  | 102 |
| T89-18             | 16          | 30  | 48  | 59  | 71  | 81  | 93  | 103 | 122 | 132 |
| T89-19             | 18          | 32  | 50  | 65  | 77  | 84  | 94  | 102 | 126 | 139 |
| T89-20             | 16          | 33  | 52  | 67  | 79  | 88  | 98  | 105 | 124 | 139 |
| T89-21             | 17          | 29  | 44  | 58  | 67  | 73  | 83  | 90  | 110 | 122 |
| T89-22             | 14          | 28  | 47  | 61  | 71  | 80  | 89  | 98  | 119 | 133 |
| T89-23             | 10          | 33  | 45  | 53  | 63  | 71  | 82  | 90  | 112 | 123 |
| T89-24             | 20          | 28  | 43  | 51  | 62  | 69  | 78  | 87  | 106 | 119 |
| T89-25             | 14          | 26  | 38  | 52  | 64  | 72  | 82  | 89  | 110 | 122 |
| T89-26             | 15          | 28  | 44  | 57  | 69  | 77  | 87  | 96  | 120 | 133 |
| T89-27             | 18          | 29  | 47  | 62  | 75  | 82  | 92  | 103 | 125 | 138 |
| T89-28             | 22          | 37  | 54  | 67  | 78  | 88  | 97  | 104 | 123 | 133 |
| T89-29             | 16          | 33  | 49  | 63  | 76  | 84  | 93  | 100 | 123 | 138 |
| T89-30             | 15          | 40  | 46  | 58  | 67  | 74  | 85  | 92  | 113 | 124 |

Table 2.56 Diameter growth data for TFSTT004

| Days in greenhouse | Diameter (mm) |     |     |     |     |     |      |      |      |
|--------------------|---------------|-----|-----|-----|-----|-----|------|------|------|
|                    | 28            | 34  | 40  | 44  | 47  | 51  | 54   | 61   | 65   |
| TFSTT004-1A        | 4,6           | 6,0 | 8,5 | 7,9 | 8,6 | 9,0 | 10,3 | 11,2 | 11,3 |
| TFSTT004-2A-1      | 4,6           | 5,7 | 6,5 | 7,4 | 8,8 | 9,1 | 9,8  | 10,6 | 10,7 |

|               |     |     |     |     |     |      |      |      |      |
|---------------|-----|-----|-----|-----|-----|------|------|------|------|
| TFSTT004-2A-2 | 4,2 | 5,9 | 6,9 | 7,5 | 8,5 | 8,9  | 9,6  | 10,2 | 10,3 |
| TFSTT004-2B-1 | 5,0 | 6,5 | 7,8 | 8,9 | 9,6 | 10,9 | 10,9 | 12,1 | 12,6 |
| TFSTT004-2B-2 | 4,5 | 6,2 | 7,3 | 8,3 | 8,3 | 9,3  | 8,9  | 10,7 | 11,0 |
| TFSTT004-3B   | 4,1 | 5,6 | 6,8 | 7,5 | 8,2 | 9,0  | 9,9  | 10,6 | 10,7 |
| TFSTT004-4B-1 | 3,6 | 5,0 | 6,0 | 7,0 | 7,5 | 9,3  | 9,2  | 10,6 | 11,0 |
| TFSTT004-4B-2 | 4,2 | 5,7 | 7,5 | 8,6 | 9,2 | 9,5  | 10,4 | 11,1 | 11,7 |
| T89-01        | 3,2 | 4,6 | 5,4 | 6,2 | 6,8 | 7,9  | 8,3  | 9,5  | 9,3  |
| T89-02        | 3,4 | 4,7 | 5,5 | 7,3 | 6,3 | 6,6  | 6,9  | 8,3  | 7,5  |
| T89-03        | 3,9 | 4,4 | 5,2 | 6,2 | 6,4 | 7,8  | 7,6  | 9,7  | 9,4  |
| T89-10        | N/A | N/A | N/A | N/A | N/A | N/A  | N/A  | N/A  | N/A  |
| T89-11        | 3,4 | 5,1 | 6,2 | 7,6 | 6,8 | 6,9  | 7,7  | 10,1 | 9,5  |
| T89-12        | 2,9 | 4,7 | 5,8 | 6,6 | 7,8 | 8,0  | 8,7  | 9,1  | 9,2  |
| T89-13        | 3,0 | 4,3 | 5,4 | 5,8 | 6,4 | 7,6  | 7,8  | 8,2  | 8,8  |
| T89-14        | 3,0 | 4,5 | 5,7 | 6,3 | 6,7 | 7,9  | 7,8  | 9,0  | 8,9  |
| T89-15        | N/A | 2,1 | 3,0 | 4,0 | 4,0 | 4,5  | 4,9  | 5,5  | 5,6  |
| T89-16        | 3,5 | 5,3 | 6,4 | 6,6 | 7,0 | 7,2  | 8,3  | 8,2  | 9,0  |
| T89-17        | 3,4 | 4,6 | 5,1 | 5,4 | 6,0 | 6,4  | 6,5  | 6,8  | 7,1  |
| T89-18        | 3,6 | 5,2 | 6,0 | 7,0 | 7,8 | 8,2  | 9,9  | 10,3 | 9,7  |
| T89-19        | 4,2 | 5,5 | 6,6 | 7,7 | 8,5 | 8,9  | 9,5  | 11,1 | 12,3 |
| T89-20        | 4,1 | 5,5 | 6,6 | 8,1 | 9,3 | 9,6  | 9,3  | 10,0 | 11,1 |
| T89-21        | 3,1 | 5,6 | 5,8 | 6,7 | 7,1 | 7,8  | 8,4  | 9,7  | 10,1 |
| T89-22        | 3,2 | 4,4 | 5,6 | 6,5 | 7,5 | 7,6  | 7,8  | 8,9  | 9,2  |
| T89-23        | 2,4 | 4,2 | 5,1 | 6,1 | 6,5 | 7,5  | 10,1 | 9,3  | 10,2 |
| T89-24        | 3,2 | 4,5 | 5,1 | 6,3 | 7,0 | 7,6  | 8,1  | 8,8  | 9,1  |
| T89-25        | 3,3 | 4,3 | 5,2 | 5,8 | 6,5 | 7,4  | 7,8  | 9,3  | 9,7  |
| T89-26        | 3,3 | 4,4 | 5,5 | 6,6 | 7,2 | 8,1  | 8,9  | 9,5  | 10,5 |
| T89-27        | 3,3 | 4,9 | 6,0 | 7,8 | 8,0 | 8,9  | 9,7  | 11,2 | 11,5 |
| T89-28        | 4,5 | 5,7 | 7,4 | 7,8 | 8,5 | 9,4  | 9,7  | 10,2 | 11,1 |
| T89-29        | 3,1 | 4,7 | 6,3 | 7,2 | 7,9 | 9,2  | 9,8  | 11,1 | 10,7 |
| T89-30        | 3,0 | 5,8 | 6,2 | 7,7 | 7,9 | 8,6  | 8,2  | 10,1 | 10,3 |

Results from growth analysis are specified in the overview table 2.57. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and 5 MDC.

Table 2.57 Overview table of growth effects of construct TFSTT004

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TFSTT004           | 1,15                 | 1,17                   | 1,06                               | 1,09                         | 1,09                 | 1,02                   | 0,97                                  | 0,91                         |

Construction group TFSTT013

The gene over-expressed with construct TFSTT013 generates the same top hits as the gene over-expressed with construct TFSTT038, when using BLAST search against the *P. trichocarpa* Jamboree Gene Model database at the Joint Genome Institute web page

- 5 ([http://genome.jgi-psf.org/cgi-bin/runAlignment?db=Poptr1\\_1](http://genome.jgi-psf.org/cgi-bin/runAlignment?db=Poptr1_1)), indicating high homology between the two genes.

Tables 2.58 and 2.59 contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of  
 10 individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

Table 2.58 Height growth data for TFSTT013

| Days in greenhouse | Height (cm) |    |    |    |     |     |     |
|--------------------|-------------|----|----|----|-----|-----|-----|
|                    | 19          | 25 | 32 | 39 | 48  | 54  | 56  |
| TFSTT013-1A        | 18          | 30 | 54 | 81 | 113 | 137 | 140 |
| TFSTT013-1B        | 19          | 31 | 54 | 75 | 108 | 124 | 127 |
| TFSTT013-2B        | 16          | 28 | 48 | 67 | 98  | 115 | 121 |
| TFSTT013-3A        | 17          | 29 | 48 | 70 | 89  | 103 | 110 |
| TFSTT013-3B        | 20          | 32 | 53 | 75 | 106 | 128 | 136 |
| TFSTT013-4A        | 23          | 37 | 59 | 83 | 116 | 141 | 149 |
| TFSTT013-4B        | 21          | 33 | 57 | 85 | 120 | 140 | 147 |
| TFSTT013-5B        | 18          | 30 | 52 | 77 | 109 | 126 | 133 |
| T89-01             | 18          | 28 | 49 | 70 | 100 | 126 | 133 |
| T89-02             | 19          | 29 | 51 | 76 | 105 | 128 | 136 |
| T89-03             | 11          | 18 | 36 | 47 | 76  | 93  | 98  |
| T89-04             | 16          | 25 | 48 | 74 | 102 | 126 | 133 |
| T89-05             | 17          | 29 | 49 | 73 | 106 | 128 | 135 |
| T89-06             | 16          | 28 | 51 | 74 | 105 | 127 | 132 |
| T89-07             | 19          | 28 | 51 | 73 | 104 | 125 | 136 |
| T89-08             | 19          | 31 | 52 | 77 | 110 | 130 | 137 |
| T89-09             | 17          | 26 | 44 | 67 | 93  | 114 | 122 |
| T89-10             | 16          | 25 | 44 | 63 | 89  | 108 | 115 |
| T89-11             | 20          | 31 | 47 | 68 | 87  | 114 | 118 |
| T89-12             | 17          | 28 | 48 | 70 | 101 | 117 | 124 |
| T89-13             | 18          | 30 | 52 | 73 | 105 | 125 | 130 |
| T89-14             | 19          | 29 | 44 | 67 | 96  | 116 | 123 |
| T89-15             | 17          | 29 | 49 | 72 | 102 | 124 | 131 |
| T89-16             | 18          | 29 | 50 | 74 | 108 | 129 | 135 |
| T89-17             | 14          | 23 | 43 | 65 | 93  | 116 | 123 |
| T89-18             | 15          | 26 | 48 | 72 | 103 | 128 | 136 |
| T89-19             | 11          | 19 | 38 | 63 | 93  | 115 | 122 |
| T89-20             | 19          | 30 | 52 | 75 | 104 | 126 | 133 |
| T89-21             | 17          | 28 | 48 | 72 | 104 | 128 | 135 |
| T89-22             | 19          | 29 | 49 | 73 | 105 | 123 | 129 |

|        |    |    |    |    |     |     |     |
|--------|----|----|----|----|-----|-----|-----|
| T89-23 | 21 | 30 | 54 | 79 | 112 | 135 | 138 |
| T89-24 | 19 | 24 | 37 | 54 | 77  | 100 | 103 |
| T89-25 | 15 | 27 | 46 | 69 | 98  | 117 | 123 |
| T89-26 | 19 | 29 | 50 | 73 | 103 | 127 | 135 |
| T89-27 | 15 | 27 | 47 | 70 | 106 | 129 | 135 |
| T89-28 | 20 | 33 | 55 | 80 | 109 | 130 | 137 |
| T89-29 | 24 | 38 | 62 | 88 | 122 | 143 | 151 |
| T89-30 | 21 | 33 | 56 | 78 | 113 | 132 | 138 |
| T89-31 | 21 | 31 | 52 | 76 | 105 | 126 | 133 |
| T89-32 | 18 | 29 | 50 | 73 | 105 | 129 | 138 |
| T89-33 | 23 | 37 | 61 | 89 | 121 | 143 | 150 |
| T89-34 | 19 | 30 | 52 | 78 | 108 | 130 | 138 |
| T89-35 | 19 | 31 | 55 | 79 | 111 | 134 | 142 |
| T89-36 | 18 | 29 | 52 | 75 | 105 | 127 | 134 |
| T89-37 | 22 | 32 | 52 | 73 | 103 | 124 | 130 |
| T89-38 | 18 | 29 | 51 | 74 | 105 | 128 | 134 |
| T89-39 | 21 | 31 | 51 | 72 | 102 | 119 | 124 |
| T89-40 | 20 | 32 | 51 | 74 | 99  | 121 | 128 |
| T89-41 | 19 | 29 | 50 | 73 | 108 | 130 | 135 |
| T89-42 | 15 | 26 | 46 | 68 | 95  | 113 | 119 |
| T89-43 | 16 | 28 | 48 | 67 | 93  | 113 | 119 |
| T89-44 | 21 | 31 | 50 | 70 | 97  | 116 | 122 |
| T89-45 | 16 | 26 | 48 | 72 | 101 | 123 | 131 |
| T89-46 | 21 | 29 | 50 | 75 | 106 | 129 | 138 |
| T89-47 | 9  | 16 | 34 | 55 | 82  | 106 | 114 |
| T89-48 | 5  | 8  | 17 | 24 | 42  | 52  | 56  |
| T89-49 | 20 | 30 | 50 | 71 | 96  | 117 | 125 |
| T89-50 | 16 | 28 | 50 | 74 | 105 | 128 | 136 |
| T89-51 | 19 | 29 | 51 | 75 | 107 | 128 | 136 |
| T89-52 | 20 | 29 | 50 | 75 | 104 | 124 | 131 |
| T89-53 | 21 | 32 | 50 | 72 | 101 | 118 | 125 |
| T89-54 | 21 | 32 | 55 | 81 | 112 | 133 | 142 |
| T89-55 | 21 | 32 | 56 | 83 | 112 | 133 | 141 |

Table 2.59 Diameter growth data for TFSTT013

| Days in<br>greenhouse | Diameter (mm) |     |      |      | Days in<br>greenhouse | Diameter (mm) |     |      |      |
|-----------------------|---------------|-----|------|------|-----------------------|---------------|-----|------|------|
|                       | 39            | 48  | 54   | 56   |                       | 39            | 48  | 54   | 56   |
| TFSTT013-1A           | 5,9           | 7,9 | 8,6  | 9,4  | T89-24                | 3,1           | 4,6 | 5,0  | 4,5  |
| TFSTT013-1B           | 5,9           | 8,4 | 8,5  | 8,6  | T89-25                | 5,9           | 7,7 | 8,5  | 8,9  |
| TFSTT013-2B           | 5,7           | 5,6 | 7,8  | 8,1  | T89-26                | 6,2           | 7,8 | 8,6  | 9,5  |
| TFSTT013-3A           | 6,4           | 6,9 | 7,5  | 7,8  | T89-27                | 6,1           | 7,6 | 8,2  | 8,6  |
| TFSTT013-3B           | 5,9           | 7,9 | 8,8  | 9,8  | T89-28                | 6,9           | 9,0 | 10,7 | 10,5 |
| TFSTT013-4A           | 6,8           | 8,3 | 9,0  | 9,9  | T89-29                | 7,8           | 8,4 | 10,3 | 10,2 |
| TFSTT013-4B           | 7,2           | 9,1 | 10,4 | 10,1 | T89-30                | 6,4           | 8,5 | 9,4  | 9,9  |
| TFSTT013-5B           | 7,5           | 9,0 | 10,3 | 9,5  | T89-31                | 6,8           | 8,6 | 8,8  | 9,5  |
| T89-01                | 6,6           | 8,4 | 8,5  | 9,2  | T89-32                | 6,7           | 8,4 | 10,2 | 10,9 |
| T89-02                | 6,8           | 8,3 | 9,4  | 10,1 | T89-33                | 7,1           | 8,7 | 9,4  | 11,4 |
| T89-03                | 4,6           | 4,9 | 6,1  | 6,1  | T89-34                | 7,1           | 8,5 | 11,1 | 10,9 |
| T89-04                | 6,9           | 8,7 | 10,0 | 9,4  | T89-35                | 6,7           | 9,0 | 8,9  | 11,4 |
| T89-05                | 5,6           | 7,6 | 8,2  | 8,8  | T89-36                | 6,2           | 8,0 | 8,5  | 8,5  |

|        |     |     |      |      |        |     |     |      |      |
|--------|-----|-----|------|------|--------|-----|-----|------|------|
| T89-06 | 6,9 | 8,2 | 9,6  | 9,3  | T89-37 | 5,6 | 7,1 | 7,8  | 8,7  |
| T89-07 | 6,6 | 7,9 | 9,5  | 9,5  | T89-38 | 5,8 | 7,8 | 8,8  | 8,7  |
| T89-08 | 6,9 | 8,9 | 9,6  | 9,8  | T89-39 | 6,2 | 8,1 | 9,2  | 9,3  |
| T89-09 | 6,1 | 7,6 | 8,6  | 8,7  | T89-40 | 6,2 | 7,9 | 9,6  | 9,5  |
| T89-10 | 5,5 | 7,5 | 8,6  | 8,6  | T89-41 | 5,9 | 8,2 | 8,9  | 9,5  |
| T89-11 | 7,4 | 8,4 | 9,3  | 8,7  | T89-42 | 6,8 | 8,4 | 9,1  | 10,4 |
| T89-12 | 5,9 | 7,4 | 8,7  | 9,5  | T89-43 | 6,7 | 8,5 | 9,7  | 9,3  |
| T89-13 | 6,2 | 7,7 | 9,2  | 9,5  | T89-44 | 7,1 | 9,1 | 9,2  | 9,4  |
| T89-14 | 5,9 | 7,8 | 9,2  | 8,7  | T89-45 | 6,6 | 7,8 | 9,2  | 9,2  |
| T89-15 | 6,8 | 8,1 | 9,4  | 9,7  | T89-46 | 6,8 | 9,3 | 10,2 | 10,0 |
| T89-16 | 7,3 | 9,2 | 10,6 | 10,3 | T89-47 | 5,3 | 7,0 | 7,9  | 8,4  |
| T89-17 | 6,4 | 8,0 | 8,9  | 9,1  | T89-48 | 2,3 | 3,0 | 3,2  | 3,5  |
| T89-18 | 7,0 | 7,5 | 8,1  | 8,8  | T89-49 | 7,5 | 8,7 | 9,1  | 9,8  |
| T89-19 | 5,6 | 7,4 | 8,6  | 8,9  | T89-50 | 6,8 | 8,6 | 9,3  | 8,9  |
| T89-20 | 6,5 | 8,3 | 8,6  | 9,5  | T89-51 | 7,2 | 8,3 | 9,2  | 9,1  |
| T89-21 | 6,2 | 8,1 | 8,0  | 8,7  | T89-52 | 7,5 | 8,8 | 9,4  | 9,7  |
| T89-22 | 6,2 | 8,5 | 9,3  | 10,1 | T89-53 | 7,3 | 9,3 | 9,5  | 10,2 |
| T89-23 | 6,2 | 8,1 | 9,2  | 9,5  | T89-54 | 7,0 | 9,0 | 9,2  | 9,6  |
| T89-24 | 3,1 | 4,6 | 5,0  | 4,5  | T89-55 | 7,0 | 8,9 | 9,2  | 9,8  |

Results from growth analysis are specified in the overview table 2.60. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and 5 MDC.

Table 2.60 Overview table of growth effects of construct TFSTT013

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TFSTT013           | 1,03                 | 0,99                   | 1,01                               | 0,96                         | 0,99                 | 0,88                   | 1,01                                  | 0,87                         |

Construction group TFSTT016

Tables 2.61 and 2.62 contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

Table 2.61 Height growth data for TFSTT016

| Days in greenhouse | Height (cm) |     |     |     |     |     |     |     |     |     |
|--------------------|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                    | 19          | 28  | 34  | 40  | 44  | 47  | 51  | 54  | 61  | 65  |
| TFSTT016-1A        | 19          | 37  | 57  | 71  | 83  | 91  | 101 | 111 | 127 | 137 |
| TFSTT016-1B        | 19          | 36  | 54  | 67  | 78  | 87  | 98  | 107 | 126 | 138 |
| TFSTT016-2A        | 18          | 34  | 51  | 67  | 76  | 84  | 93  | 101 | 118 | 130 |
| TFSTT016-2B        | 18          | 34  | 55  | 70  | 80  | 87  | 97  | 105 | 125 | 137 |
| TFSTT016-3A-1      | 19          | 34  | 51  | 65  | 76  | 84  | 95  | 106 | 125 | 137 |
| TFSTT016-3A-2      | 17          | 33  | 50  | 64  | 76  | 85  | 96  | 107 | 129 | 143 |
| TFSTT016-4A        | 16          | 33  | 52  | 69  | 83  | 91  | 103 | 112 | 136 | 151 |
| T89-01             | 18          | 30  | 46  | 58  | 69  | 77  | 87  | 96  | 113 | 122 |
| T89-02             | 18          | 30  | 49  | 62  | 72  | 77  | 84  | 90  | 102 | 109 |
| T89-03             | 15          | 27  | 41  | 54  | 65  | 73  | 82  | 91  | 112 | 123 |
| T89-10             | N/A         | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| T89-11             | 19          | 31  | 49  | 61  | 74  | 83  | 94  | 103 | 124 | 133 |
| T89-12             | 17          | 30  | 45  | 58  | 69  | 77  | 90  | 100 | 123 | 134 |
| T89-13             | 18          | 27  | 43  | 56  | 68  | 78  | 91  | 100 | 121 | 133 |
| T89-14             | 5           | 26  | 42  | 56  | 67  | 74  | 83  | 90  | 109 | 119 |
| T89-15             | 10          | 15  | 25  | 33  | 41  | 45  | 52  | 57  | 72  | 82  |
| T89-16             | 19          | 33  | 53  | 63  | 73  | 82  | 93  | 102 | 119 | 130 |
| T89-17             | 17          | 29  | 46  | 58  | 66  | 72  | 80  | 86  | 96  | 102 |
| T89-18             | 16          | 30  | 48  | 59  | 71  | 81  | 93  | 103 | 122 | 132 |
| T89-19             | 18          | 32  | 50  | 65  | 77  | 84  | 94  | 102 | 126 | 139 |
| T89-20             | 16          | 33  | 52  | 67  | 79  | 88  | 98  | 105 | 124 | 139 |
| T89-21             | 17          | 29  | 44  | 58  | 67  | 73  | 83  | 90  | 110 | 122 |
| T89-22             | 14          | 28  | 47  | 61  | 71  | 80  | 89  | 98  | 119 | 133 |
| T89-23             | 10          | 33  | 45  | 53  | 63  | 71  | 82  | 90  | 112 | 123 |
| T89-24             | 20          | 28  | 43  | 51  | 62  | 69  | 78  | 87  | 106 | 119 |
| T89-25             | 14          | 26  | 38  | 52  | 64  | 72  | 82  | 89  | 110 | 122 |
| T89-26             | 15          | 28  | 44  | 57  | 69  | 77  | 87  | 96  | 120 | 133 |
| T89-27             | 18          | 29  | 47  | 62  | 75  | 82  | 92  | 103 | 125 | 138 |
| T89-28             | 22          | 37  | 54  | 67  | 78  | 88  | 97  | 104 | 123 | 133 |
| T89-29             | 16          | 33  | 49  | 63  | 76  | 84  | 93  | 100 | 123 | 138 |
| T89-30             | 15          | 40  | 46  | 58  | 67  | 74  | 85  | 92  | 113 | 124 |

Table 2.62 Diameter growth data for TFSTT016

| Days in greenhouse | Diameter (mm) |     |     |     |     |     |     |      |      |
|--------------------|---------------|-----|-----|-----|-----|-----|-----|------|------|
|                    | 28            | 34  | 40  | 44  | 47  | 51  | 54  | 61   | 65   |
| TFSTT016-1A        | 3,9           | 5,8 | 7,3 | 8,5 | 8,1 | 9,4 | 9,6 | 9,9  | 10,7 |
| TFSTT016-1B        | 4,1           | 5,7 | 6,4 | 7,2 | 8,3 | 9,1 | 9,3 | 10,9 | 11,1 |
| TFSTT016-2A        | 3,6           | 5,5 | 6,4 | 7,2 | 8,3 | 8,6 | 9,2 | 10,0 | 10,5 |

|               |     |     |     |     |     |     |      |      |      |
|---------------|-----|-----|-----|-----|-----|-----|------|------|------|
| TFSTT016-2B   | 4,3 | 5,7 | 7,0 | 7,5 | 7,8 | 7,9 | 8,6  | 8,9  | 9,1  |
| TFSTT016-3A-1 | 3,8 | 5,6 | 6,7 | 7,8 | 8,9 | 9,9 | 10,7 | 11,4 | 11,7 |
| TFSTT016-3A-2 | 3,6 | 5,0 | 6,5 | 7,7 | 7,8 | 9,3 | 9,1  | 10,4 | 10,9 |
| TFSTT016-4A   | 4,2 | 5,2 | 6,6 | 8,0 | 8,6 | 9,7 | 9,7  | 11,3 | 11,5 |
| T89-01        | 3,2 | 4,6 | 5,4 | 6,2 | 6,8 | 7,9 | 8,3  | 9,5  | 9,3  |
| T89-02        | 3,4 | 4,7 | 5,5 | 7,3 | 6,3 | 6,6 | 6,9  | 8,3  | 7,5  |
| T89-03        | 3,9 | 4,4 | 5,2 | 6,2 | 6,4 | 7,8 | 7,6  | 9,7  | 9,4  |
| T89-10        | N/A | N/A | N/A | N/A | N/A | N/A | N/A  | N/A  | N/A  |
| T89-11        | 3,4 | 5,1 | 6,2 | 7,6 | 6,8 | 6,9 | 7,7  | 10,1 | 9,5  |
| T89-12        | 2,9 | 4,7 | 5,8 | 6,6 | 7,8 | 8,0 | 8,7  | 9,1  | 9,2  |
| T89-13        | 3,0 | 4,3 | 5,4 | 5,8 | 6,4 | 7,6 | 7,8  | 8,2  | 8,8  |
| T89-14        | 3,0 | 4,5 | 5,7 | 6,3 | 6,7 | 7,9 | 7,8  | 9,0  | 8,9  |
| T89-15        | N/A | 2,1 | 3,0 | 4,0 | 4,0 | 4,5 | 4,9  | 5,5  | 5,6  |
| T89-16        | 3,5 | 5,3 | 6,4 | 6,6 | 7,0 | 7,2 | 8,3  | 8,2  | 9,0  |
| T89-17        | 3,4 | 4,6 | 5,1 | 5,4 | 6,0 | 6,4 | 6,5  | 6,8  | 7,1  |
| T89-18        | 3,6 | 5,2 | 6,0 | 7,0 | 7,8 | 8,2 | 9,9  | 10,3 | 9,7  |
| T89-19        | 4,2 | 5,5 | 6,6 | 7,7 | 8,5 | 8,9 | 9,5  | 11,1 | 12,3 |
| T89-20        | 4,1 | 5,5 | 6,6 | 8,1 | 9,3 | 9,6 | 9,3  | 10,0 | 11,1 |
| T89-21        | 3,1 | 5,6 | 5,8 | 6,7 | 7,1 | 7,8 | 8,4  | 9,7  | 10,1 |
| T89-22        | 3,2 | 4,4 | 5,6 | 6,5 | 7,5 | 7,6 | 7,8  | 8,9  | 9,2  |
| T89-23        | 2,4 | 4,2 | 5,1 | 6,1 | 6,5 | 7,5 | 10,1 | 9,3  | 10,2 |
| T89-24        | 3,2 | 4,5 | 5,1 | 6,3 | 7,0 | 7,6 | 8,1  | 8,8  | 9,1  |
| T89-25        | 3,3 | 4,3 | 5,2 | 5,8 | 6,5 | 7,4 | 7,8  | 9,3  | 9,7  |
| T89-26        | 3,3 | 4,4 | 5,5 | 6,6 | 7,2 | 8,1 | 8,9  | 9,5  | 10,5 |
| T89-27        | 3,3 | 4,9 | 6,0 | 7,8 | 8,0 | 8,9 | 9,7  | 11,2 | 11,5 |
| T89-28        | 4,5 | 5,7 | 7,4 | 7,8 | 8,5 | 9,4 | 9,7  | 10,2 | 11,1 |
| T89-29        | 3,1 | 4,7 | 6,3 | 7,2 | 7,9 | 9,2 | 9,8  | 11,1 | 10,7 |
| T89-30        | 3,0 | 5,8 | 6,2 | 7,7 | 7,9 | 8,6 | 8,2  | 10,1 | 10,3 |

Results from growth analysis are specified in the overview table 2.63. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and 5 MDC.

Table 2.63 Overview table of growth effects of construct TFSTT016

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TFSTT016           | 1,11                 | 1,13                   | 1,03                               | 1,09                         | 1,09                 | 0,95                   | 1,04                                  | 0,96                         |

Construction group TFSTT019Rp1

Tables 2.64 and 2.65 contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

Table 2.64 Height growth data for TFSTT019Rp1

| Days in greenhouse | Height (cm) |     |     |     |     |     |     |     |     |     |
|--------------------|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                    | 20          | 25  | 29  | 35  | 41  | 46  | 50  | 53  | 57  | 60  |
| TFSTT019rp1-2A-1   | 17          | 24  | 32  | 45  | 58  | 71  | 81  | 88  | 98  | 104 |
| TFSTT019rp1-2A-2   | 15          | 23  | 30  | 42  | 57  | 72  | 80  | 88  | 99  | 108 |
| TFSTT019rp1-2A-3   | 16          | 22  | 28  | 40  | 55  | 67  | 78  | 87  | 97  | 105 |
| TFSTT019rp1-3A-1   | 16          | 24  | 32  | 47  | 62  | 79  | 87  | 96  | 104 | 111 |
| TFSTT019rp1-3A-2   | 14          | 20  | 24  | 28  | 38  | 54  | 61  | 69  | 79  | 85  |
| TFSTT019rp1-3A-3   | 18          | 30  | 35  | 47  | 62  | 79  | 89  | 97  | 107 | 116 |
| TFSTT019rp1-4BA-1  | 18          | 23  | 29  | 40  | 54  | 66  | 78  | 86  | 96  | 104 |
| TFSTT019rp1-4BA-2  | 19          | 27  | 35  | 48  | 65  | 79  | 92  | 101 | 112 | 121 |
| TFSTT019rp1-4BA-3  | N/A         | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| TFSTT019rp1-4BB-1  | 18          | 27  | 35  | 50  | 65  | 80  | 90  | 99  | 111 | 117 |
| TFSTT019rp1-4BB-2  | 17          | 23  | 31  | 43  | 57  | 70  | 80  | 86  | 96  | 104 |
| TFSTT019rp1-4BB-3  | 17          | 23  | 30  | 42  | 60  | 74  | 82  | 90  | 98  | 107 |
| T89-01             | 17          | 26  | 31  | 45  | 61  | 76  | 87  | 95  | 107 | 116 |
| T89-02             | 16          | 21  | 26  | 38  | 53  | 67  | 76  | 83  | N/A | N/A |
| T89-03             | 18          | 24  | 32  | 47  | 64  | 78  | 87  | 96  | 106 | 115 |
| T89-04             | 18          | 26  | 35  | 50  | 66  | 80  | 87  | 96  | 107 | 115 |
| T89-05             | 17          | 26  | 33  | 44  | 57  | 73  | 81  | 91  | 100 | 107 |
| T89-06             | 16          | 21  | 28  | 40  | 55  | 74  | 79  | 89  | 99  | 106 |
| T89-07             | 17          | 23  | 31  | 43  | 57  | 71  | 80  | 88  | 98  | 107 |
| T89-08             | 15          | 20  | 26  | 37  | 51  | 65  | 75  | 84  | 94  | 100 |
| T89-09             | 18          | 25  | 32  | 46  | 61  | 74  | 85  | 93  | 103 | 112 |
| T89-10             | 19          | 25  | 32  | 46  | 60  | 75  | 86  | 95  | 104 | 112 |
| T89-11             | 20          | 27  | 36  | 51  | 68  | 86  | 98  | 107 | 120 | 127 |
| T89-12             | 19          | 27  | 36  | 50  | 67  | 80  | 89  | 97  | 108 | 118 |
| T89-13             | 18          | 25  | 32  | 45  | 59  | 75  | 83  | 92  | 101 | 108 |
| T89-14             | 18          | 23  | 26  | 36  | 51  | 65  | 72  | 79  | 89  | 96  |
| T89-15             | 17          | 21  | 28  | 39  | 53  | 70  | 78  | 87  | 97  | 105 |
| T89-16             | 19          | 25  | 32  | 43  | 57  | 71  | 81  | 90  | 101 | 109 |
| T89-17             | 16          | 20  | 29  | 41  | 54  | 68  | 78  | 84  | 93  | 101 |
| T89-18             | 16          | 23  | 30  | 45  | 63  | 78  | 87  | 94  | 103 | 110 |
| T89-19             | 16          | 22  | 28  | 42  | 56  | 69  | 79  | 89  | 100 | 107 |
| T89-20             | 18          | 25  | 32  | 47  | 63  | 78  | 89  | 99  | 109 | 115 |
| T89-21             | 19          | 27  | 34  | 50  | 67  | 82  | 92  | 102 | 111 | 120 |
| T89-22             | 19          | 25  | 32  | 44  | 58  | 76  | 84  | 93  | 102 | 109 |
| T89-23             | 18          | 26  | 33  | 47  | 63  | 79  | 88  | 99  | 108 | 116 |
| T89-24             | 16          | 24  | 28  | 42  | 53  | 70  | 78  | 85  | 94  | 103 |
| T89-25             | 16          | 25  | 32  | 45  | 61  | 76  | 85  | 95  | 107 | 114 |
| T89-26             | 16          | 20  | 26  | 38  | 52  | 68  | 78  | 86  | 97  | 103 |
| T89-27             | 16          | 21  | 25  | 35  | 48  | 61  | 70  | 78  | N/A | 98  |

|        |    |    |    |    |    |    |    |    |     |     |
|--------|----|----|----|----|----|----|----|----|-----|-----|
| T89-28 | 14 | 18 | 25 | 38 | 51 | 64 | 73 | 81 | 90  | 96  |
| T89-29 | 7  | 13 | 18 | 30 | 45 | 60 | 69 | 77 | 90  | 98  |
| T89-30 | 15 | 22 | 29 | 42 | 55 | 69 | 80 | 88 | 97  | 106 |
| T89-31 | 21 | 29 | 37 | 50 | 65 | 80 | 88 | 98 | 108 | 116 |
| T89-32 | 19 | 24 | 32 | 42 | 55 | 70 | 78 | 87 | 96  | 105 |

Table 2.65 Diameter growth data for TFSTT019Rp1

| Days in greenhouse | Diameter (mm) |     |     |     |     |
|--------------------|---------------|-----|-----|-----|-----|
|                    | 35            | 41  | 46  | 53  | 60  |
| TFSTT019rp1-2A-1   | 5,4           | 6,1 | 7,3 | 8,2 | 8,5 |
| TFSTT019rp1-2A-2   | 5,2           | 6,6 | 8,0 | 8,9 | 9,3 |
| TFSTT019rp1-2A-3   | 5,0           | 6,4 | 7,1 | 8,9 | 9,0 |
| TFSTT019rp1-3A-1   | 5,5           | 6,5 | 7,4 | 8,2 | 8,9 |
| TFSTT019rp1-3A-2   | 4,2           | 5,8 | 5,9 | 6,0 | 6,9 |
| TFSTT019rp1-3A-3   | 5,1           | 6,6 | 7,8 | 8,9 | 9,4 |
| TFSTT019rp1-4BA-1  | 4,8           | 6,5 | 8,5 | 7,9 | 9,1 |
| TFSTT019rp1-4BA-2  | 5,0           | 6,4 | 6,9 | 8,3 | 9,2 |
| TFSTT019rp1-4BA-3  | N/A           | N/A | N/A | N/A | N/A |
| TFSTT019rp1-4BB-1  | 5,2           | 6,6 | 7,5 | 8,1 | 8,8 |
| TFSTT019rp1-4BB-2  | 4,7           | N/A | 7,1 | 8,2 | 8,6 |
| TFSTT019rp1-4BB-3  | 5,5           | 6,9 | 7,5 | 8,1 | 8,8 |
| T89-01             | 4,7           | 6,0 | 6,5 | 6,9 | 8,3 |
| T89-02             | 4,4           | 5,7 | 6,6 | 7,6 | 7,8 |
| T89-03             | 4,7           | 6,3 | 6,7 | 7,7 | 8,4 |
| T89-04             | 4,7           | 6,0 | 7,1 | 8,0 | 8,5 |
| T89-05             | 4,0           | 5,3 | 6,3 | 7,8 | 8,1 |
| T89-06             | 4,6           | 5,9 | 6,3 | 7,7 | 8,2 |
| T89-07             | 4,6           | 6,1 | 6,5 | 7,9 | 8,5 |
| T89-08             | 4,0           | 5,2 | 5,8 | 6,9 | 7,1 |
| T89-09             | 4,4           | 5,8 | 6,4 | 7,6 | 8,2 |
| T89-10             | 4,9           | 6,0 | 6,6 | 7,4 | 8,5 |
| T89-11             | 4,7           | 5,8 | 6,4 | 7,9 | 8,3 |
| T89-12             | 4,7           | 5,9 | 7,3 | 7,4 | 7,6 |
| T89-13             | 5,9           | 5,9 | 6,7 | 7,5 | 8,3 |
| T89-14             | 4,5           | 5,2 | 5,8 | 6,1 | 7,0 |
| T89-15             | 4,7           | N/A | 6,0 | 6,4 | 7,3 |
| T89-16             | 4,5           | 5,6 | 7,7 | 7,5 | 8,6 |
| T89-17             | 4,1           | 5,4 | 6,0 | 6,8 | 7,5 |
| T89-18             | 4,4           | 5,8 | 6,0 | 7,7 | 8,3 |
| T89-19             | 4,7           | 5,8 | 7,1 | 8,5 | 9,4 |
| T89-20             | 4,7           | 5,8 | 6,6 | 7,4 | 8,3 |
| T89-21             | 4,7           | 6,2 | 6,3 | 7,7 | 8,5 |
| T89-22             | 4,2           | 5,1 | 6,3 | 6,9 | 8,0 |
| T89-23             | 4,6           | 5,8 | 7,1 | 7,5 | 8,3 |
| T89-24             | 4,4           | 5,8 | 6,9 | 7,7 | 8,8 |
| T89-25             | 4,5           | 5,4 | 6,2 | 8,0 | 8,7 |
| T89-26             | 4,1           | 5,4 | 6,0 | 7,2 | 8,0 |
| T89-27             | 4,5           | 5,7 | 6,5 | 7,9 | 9,2 |
| T89-28             | 4,3           | 5,1 | 6,0 | 6,6 | 7,7 |
| T89-29             | 3,5           | 4,7 | 5,5 | 6,3 | 7,1 |
| T89-30             | 4,1           | 5,4 | 5,8 | 7,2 | 7,8 |

|        |     |     |     |     |     |
|--------|-----|-----|-----|-----|-----|
| T89-31 | 5,0 | 5,8 | 6,8 | 7,3 | 8,2 |
| T89-32 | 4,4 | 6,4 | 6,6 | 8,0 | 8,4 |

Results from growth analysis are specified in the overview table 2.66. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and 5 MDC.

Table 2.66 Overview table of growth effects of construct TFSTT019Rp1

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TFSTT019Rp1        | 0,99                 | 1,08                   | 0,98                               | 0,99                         | 0,95                 | 1,00                   | 0,93                                  | 0,88                         |

Construction group TFSTT036

This construct induces increased growth. The final height is 10% higher comparing the average of the construction group and wild type control group. The final height is 8% higher comparing the largest individuals of the construction group and wild type control group. The maximum height growth rate is 14% higher comparing the average of the construction group and wild type control group. The maximum height growth rate is 12% higher comparing the largest individuals of the construction group and wild type control group. The final diameter is 7% higher comparing the average of the construction group and wild type control group. The final diameter is 14% higher comparing the largest individuals of the construction group and wild type control group. The TFSTT036 construction group meets growth difference selection criterion (1) as shown in table 2.69.

Tables 2.67 and 2.68 contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

Table 2.67 Height growth data for TFSTT036

| Days in greenhouse | Height (cm) |    |    |     |    |    |     |     |     |
|--------------------|-------------|----|----|-----|----|----|-----|-----|-----|
|                    | 18          | 25 | 28 | 32  | 36 | 39 | 46  | 53  | 55  |
| TFSTT036-1B        | 23          | 37 | 46 | 56  | 68 | 79 | 103 | 126 | 132 |
| TFSTT036-2A        | 18          | 36 | 46 | 57  | 72 | 83 | 108 | 126 | 132 |
| TFSTT036-2B        | 21          | 33 | 45 | 54  | 67 | 80 | 111 | 135 | 143 |
| TFSTT036-3A        | 21          | 36 | 48 | 59  | 77 | 90 | 113 | 133 | 140 |
| TFSTT036-4A        | 25          | 39 | 51 | 61  | 76 | 88 | 117 | 141 | 151 |
| TFSTT036-4B        | 23          | 38 | 53 | 67  | 83 | 92 | 119 | 144 | 148 |
| TFSTT036-5B        | 21          | 33 | 44 | 55  | 69 | 81 | 106 | 130 | 139 |
| T89-01             | 18          | 32 | 43 | 54  | 66 | 76 | 98  | 124 | 133 |
| T89-02             | 20          | 33 | 43 | 53  | 67 | 76 | 101 | 124 | 129 |
| T89-03             | 17          | 31 | 43 | 53  | 68 | 76 | 102 | 128 | 135 |
| T89-04             | 19          | 33 | 44 | 54  | 67 | 74 | 97  | 122 | 129 |
| T89-05             | 20          | 33 | 44 | 54  | 67 | 76 | 100 | 121 | 129 |
| T89-06             | 18          | 31 | 42 | 53  | 67 | 76 | 97  | 121 | 128 |
| T89-07             | 16          | 28 | 41 | 53  | 65 | 74 | 96  | 121 | 129 |
| T89-08             | 19          | 34 | 43 | 53  | 65 | 75 | 98  | 123 | 131 |
| T89-09             | 20          | 30 | 40 | 52  | 64 | 73 | 97  | 119 | 125 |
| T89-10             | 21          | 33 | 41 | 49  | 61 | 70 | 92  | 114 | 121 |
| T89-11             | 18          | 31 | 40 | 49  | 61 | 71 | 94  | 117 | 123 |
| T89-12             | 18          | 31 | 40 | N/A | 60 | 68 | 90  | 107 | 115 |
| T89-13             | 19          | 35 | 47 | 58  | 70 | 78 | 103 | 128 | 135 |
| T89-14             | 19          | 31 | 40 | 50  | 61 | 72 | 93  | 118 | 124 |
| T89-15             | 20          | 32 | 41 | 50  | 62 | 70 | 91  | 114 | 120 |

|        |    |    |    |    |    |    |     |     |     |
|--------|----|----|----|----|----|----|-----|-----|-----|
| T89-16 | 18 | 30 | 39 | 49 | 62 | 71 | 92  | 114 | 122 |
| T89-17 | 17 | 33 | 45 | 55 | 70 | 78 | 104 | 129 | 136 |
| T89-18 | 19 | 32 | 44 | 56 | 71 | 82 | 106 | 130 | 137 |
| T89-19 | 16 | 26 | 36 | 46 | 51 | 69 | 89  | 112 | 119 |
| T89-20 | 16 | 31 | 41 | 49 | 60 | 71 | 91  | 111 | 118 |
| T89-21 | 20 | 31 | 44 | 54 | 68 | 76 | 99  | 122 | 127 |
| T89-22 | 14 | 26 | 37 | 46 | 61 | 72 | 96  | 120 | 127 |
| T89-23 | 19 | 32 | 40 | 50 | 63 | 73 | 100 | 121 | 127 |
| T89-24 | 20 | 31 | 41 | 47 | 58 | 68 | 90  | 111 | 117 |
| T89-25 | 20 | 36 | 45 | 57 | 69 | 78 | 101 | 127 | 134 |
| T89-26 | 20 | 37 | 49 | 58 | 71 | 80 | 107 | 131 | 140 |
| T89-27 | 19 | 34 | 44 | 55 | 71 | 81 | 107 | 131 | 138 |
| T89-28 | 17 | 35 | 44 | 56 | 68 | 76 | 99  | 126 | 132 |
| T89-29 | 17 | 32 | 45 | 55 | 68 | 78 | 101 | 125 | 132 |
| T89-30 | 18 | 31 | 41 | 50 | 63 | 72 | 95  | 119 | 125 |
| T89-31 | 17 | 27 | 35 | 45 | 58 | 67 | 87  | 108 | 116 |
| T89-32 | 19 | 32 | 44 | 52 | 65 | 74 | 98  | 121 | 127 |
| T89-33 | 20 | 33 | 43 | 53 | 64 | 74 | 96  | 119 | 126 |
| T89-34 | 19 | 34 | 44 | 55 | 68 | 78 | 100 | 124 | 130 |
| T89-35 | 17 | 30 | 40 | 51 | 64 | 74 | 95  | 116 | 122 |
| T89-36 | 18 | 30 | 40 | 49 | 62 | 71 | 91  | 114 | 121 |
| T89-82 | 21 | 33 | 43 | 54 | 65 | 75 | 98  | 118 | 125 |
| T89-83 | 22 | 35 | 47 | 55 | 71 | 80 | 105 | 130 | 137 |
| T89-85 | 21 | 36 | 46 | 56 | 67 | 76 | 98  | 123 | 131 |

Table 2.68 Diameter growth data for TFSTT036

| Days in<br>greenhouse | Diameter (mm) |     |     |      |      | Days in<br>greenhouse | Diameter (mm) |     |     |     |     |
|-----------------------|---------------|-----|-----|------|------|-----------------------|---------------|-----|-----|-----|-----|
|                       | 32            | 39  | 46  | 53   | 55   |                       | 32            | 39  | 46  | 53  | 55  |
| TFSTT036-1B           | 5,2           | 6,6 | 7,4 | 8,1  | 8,5  | T89-17                | 4,8           | 6,7 | 7,0 | 8,3 | 8,4 |
| TFSTT036-2A           | 5,8           | 6,8 | 8,0 | 9,5  | 8,7  | T89-18                | 4,2           | 5,5 | 6,7 | 7,3 | 7,4 |
| TFSTT036-2B           | 3,9           | 5,1 | 6,2 | 7,5  | 7,5  | T89-19                | 4,7           | 5,5 | 6,8 | 7,2 | 7,8 |
| TFSTT036-3A           | 4,2           | 4,2 | 5,1 | 6,2  | 6,4  | T89-20                | 4,5           | 5,6 | 6,5 | 7,0 | 7,3 |
| TFSTT036-4A           | 6,3           | 6,9 | 8,9 | 10,1 | 10,5 | T89-21                | 4,9           | 5,6 | 6,4 | 7,4 | 7,6 |
| TFSTT036-4B           | 5,5           | 6,8 | 8,2 | 8,7  | 8,4  | T89-22                | 4,3           | 5,4 | 6,5 | 7,3 | 7,6 |
| TFSTT036-5B           | 5,7           | 6,8 | 7,6 | 8,7  | 8,9  | T89-23                | 3,9           | 5,5 | 6,7 | 7,7 | 7,0 |
| T89-01                | 5,2           | 6,0 | 6,8 | 8,2  | 7,6  | T89-24                | 4,3           | 5,9 | 6,8 | 8,1 | 7,9 |
| T89-02                | 4,5           | 5,8 | 7,1 | 8,6  | 8,3  | T89-25                | 4,7           | 6,5 | 7,5 | 9,2 | 9,1 |
| T89-03                | 4,4           | 5,7 | 6,8 | 7,9  | 8,1  | T89-26                | 5,4           | 5,9 | 7,7 | 8,6 | 8,8 |
| T89-04                | 4,4           | 6,0 | 6,9 | 8,6  | 8,5  | T89-27                | 4,7           | 5,6 | 7,4 | 7,9 | 8,0 |
| T89-05                | 4,6           | 5,8 | 6,7 | 7,9  | 8,0  | T89-28                | 4,7           | 5,7 | 6,3 | 7,2 | 7,4 |
| T89-06                | 4,7           | 5,9 | 7,2 | 8,1  | 9,2  | T89-29                | 4,8           | 5,6 | 6,6 | 7,7 | 8,1 |
| T89-07                | 4,8           | 5,5 | 6,2 | 6,9  | 7,1  | T89-30                | 4,6           | 5,5 | 6,7 | 7,3 | 7,3 |
| T89-08                | 4,5           | 5,4 | 6,0 | 6,9  | 7,1  | T89-31                | 4,3           | 5,8 | 6,3 | 7,5 | 7,6 |
| T89-09                | 4,7           | 5,6 | 6,7 | 8,8  | 8,0  | T89-32                | 4,6           | 5,9 | 7,6 | 9,3 | 9,1 |
| T89-10                | 4,1           | 4,9 | 5,6 | 7,1  | 7,0  | T89-33                | 4,4           | 5,3 | 6,2 | 7,1 | 7,1 |
| T89-11                | 3,8           | 5,3 | 7,3 | 8,0  | 7,6  | T89-34                | 4,6           | 5,6 | 6,8 | 8,1 | 8,7 |
| T89-12                | N/<br>A       | 5,1 | 6,2 | 7,3  | 6,9  | T89-35                | 5,3           | 6,0 | 7,5 | 8,8 | 8,9 |
| T89-13                | 4,8           | 5,7 | 6,5 | 7,6  | 7,6  | T89-36                | 4,4           | 6,1 | 6,9 | 8,1 | 8,6 |
| T89-14                | 4,2           | 5,5 | 6,6 | 7,6  | 6,5  | T89-82                | 4,7           | 5,3 | 6,5 | 7,5 | 7,4 |

|        |     |     |     |     |     |        |     |     |     |     |     |
|--------|-----|-----|-----|-----|-----|--------|-----|-----|-----|-----|-----|
| T89-15 | 5,0 | 6,1 | 7,2 | 7,9 | 8,3 | T89-83 | 4,7 | 6,1 | 7,1 | 8,3 | 8,3 |
| T89-16 | 4,4 | 5,6 | 6,2 | 7,3 | 7,9 | T89-85 | 5,1 | 6,3 | 7,3 | 7,7 | 8,2 |
| T89-17 | 4,8 | 6,7 | 7,0 | 8,3 | 8,4 |        |     |     |     |     |     |

Results from growth analysis are specified in the overview table 2.69. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and 5 MDC.

Table 2.69 Overview table of growth effects of construct TFSTT036

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TFSTT036           | 1,10                 | 1,07                   | 1,14                               | 0,99                         | 1,08                 | 1,14                   | 1,12                                  | 0,95                         |

Construction group TFSTT038

The gene over-expressed with construct TFSTT038 generates the same top hits as the gene over-expressed with construct TFSTT013, when using BLAST search against the *P. trichocarpa* Jamboree Gene Model database at the Joint Genome Institute web page

- 5 ([http://genome.jgi-psf.org/cgi-bin/runAlignment?db=Poptr1\\_1](http://genome.jgi-psf.org/cgi-bin/runAlignment?db=Poptr1_1)), indicating high homology between the two genes.

Tables 2.70 and 2.71 contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of  
 10 individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

Table 2.70 Height growth data for TFSTT038

| Days in greenhouse | Height (cm) |     |     |     |     |     |     |     |     |     |
|--------------------|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                    | 19          | 28  | 34  | 40  | 44  | 47  | 51  | 54  | 61  | 65  |
| TFSTT038-1A-1      | 23          | 42  | 62  | 82  | 92  | 100 | 110 | 118 | 138 | 153 |
| TFSTT038-1A-2      | 19          | 38  | 58  | 70  | 83  | 90  | 102 | 110 | 130 | 142 |
| TFSTT038-1B        | 18          | 33  | 48  | 62  | 73  | 83  | 93  | 99  | 117 | 128 |
| TFSTT038-2A        | 21          | 38  | 58  | 71  | 85  | 96  | 108 | 119 | 143 | 157 |
| TFSTT038-2B        | 14          | 29  | 46  | 60  | 70  | 78  | 87  | 96  | 118 | 130 |
| TFSTT038-3A        | 18          | 38  | 57  | 70  | 83  | 92  | 105 | 116 | 133 | 142 |
| TFSTT038-3B        | 21          | 38  | 57  | 72  | 84  | 92  | 102 | 110 | 122 | 126 |
| TFSTT038-4B        | 17          | 34  | 52  | 67  | 78  | 87  | 96  | 104 | 123 | 133 |
| T89-01             | 18          | 30  | 46  | 58  | 69  | 77  | 87  | 96  | 113 | 122 |
| T89-02             | 18          | 30  | 49  | 62  | 72  | 77  | 84  | 90  | 102 | 109 |
| T89-03             | 15          | 27  | 41  | 54  | 65  | 73  | 82  | 91  | 112 | 123 |
| T89-10             | N/A         | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| T89-11             | 19          | 31  | 49  | 61  | 74  | 83  | 94  | 103 | 124 | 133 |
| T89-12             | 17          | 30  | 45  | 58  | 69  | 77  | 90  | 100 | 123 | 134 |
| T89-13             | 18          | 27  | 43  | 56  | 68  | 78  | 91  | 100 | 121 | 133 |
| T89-14             | 5           | 26  | 42  | 56  | 67  | 74  | 83  | 90  | 109 | 119 |
| T89-15             | 10          | 15  | 25  | 33  | 41  | 45  | 52  | 57  | 72  | 82  |
| T89-16             | 19          | 33  | 53  | 63  | 73  | 82  | 93  | 102 | 119 | 130 |
| T89-17             | 17          | 29  | 46  | 58  | 66  | 72  | 80  | 86  | 96  | 102 |
| T89-18             | 16          | 30  | 48  | 59  | 71  | 81  | 93  | 103 | 122 | 132 |
| T89-19             | 18          | 32  | 50  | 65  | 77  | 84  | 94  | 102 | 126 | 139 |
| T89-20             | 16          | 33  | 52  | 67  | 79  | 88  | 98  | 105 | 124 | 139 |
| T89-21             | 17          | 29  | 44  | 58  | 67  | 73  | 83  | 90  | 110 | 122 |
| T89-22             | 14          | 28  | 47  | 61  | 71  | 80  | 89  | 98  | 119 | 133 |
| T89-23             | 10          | 33  | 45  | 53  | 63  | 71  | 82  | 90  | 112 | 123 |
| T89-24             | 20          | 28  | 43  | 51  | 62  | 69  | 78  | 87  | 106 | 119 |
| T89-25             | 14          | 26  | 38  | 52  | 64  | 72  | 82  | 89  | 110 | 122 |
| T89-26             | 15          | 28  | 44  | 57  | 69  | 77  | 87  | 96  | 120 | 133 |
| T89-27             | 18          | 29  | 47  | 62  | 75  | 82  | 92  | 103 | 125 | 138 |
| T89-28             | 22          | 37  | 54  | 67  | 78  | 88  | 97  | 104 | 123 | 133 |

|        |    |    |    |    |    |    |    |     |     |     |
|--------|----|----|----|----|----|----|----|-----|-----|-----|
| T89-29 | 16 | 33 | 49 | 63 | 76 | 84 | 93 | 100 | 123 | 138 |
| T89-30 | 15 | 40 | 46 | 58 | 67 | 74 | 85 | 92  | 113 | 124 |

Table 2.71 Diameter growth data for TFSTT038

| Days in greenhouse | Diameter (mm) |     |     |     |     |     |      |      |      |
|--------------------|---------------|-----|-----|-----|-----|-----|------|------|------|
|                    | 28            | 34  | 40  | 44  | 47  | 51  | 54   | 61   | 65   |
| TFSTT038-1A-1      | 4,4           | 6,1 | 7,4 | 8,4 | 9,3 | 9,8 | 10,5 | 11,3 | 11,8 |
| TFSTT038-1A-2      | 3,8           | 5,5 | 6,6 | 7,7 | 7,9 | 8,9 | 9,4  | 10,6 | 11,2 |
| TFSTT038-1B        | 3,4           | 5,1 | 6,5 | 7,2 | 7,8 | 8,3 | 10,1 | 9,3  | 9,5  |
| TFSTT038-2A        | 3,8           | 5,4 | 6,7 | 7,2 | 8,7 | 9,6 | 9,8  | 11,5 | 11,3 |
| TFSTT038-2B        | 3,8           | 4,4 | 5,4 | 6,4 | 7,2 | 7,8 | 8,5  | 10,1 | 10,7 |
| TFSTT038-3A        | 3,9           | 5,7 | 7,4 | 7,8 | 8,4 | 9,3 | 9,8  | 10,6 | 11,1 |
| TFSTT038-3B        | 4,3           | 5,9 | 6,8 | 7,8 | 8,0 | 8,0 | 8,4  | 9,0  | 9,9  |
| TFSTT038-4B        | 4,2           | 4,5 | 6,3 | 6,8 | 7,3 | 8,2 | 8,6  | 9,0  | 9,1  |
| T89-01             | 3,2           | 4,6 | 5,4 | 6,2 | 6,8 | 7,9 | 8,3  | 9,5  | 9,3  |
| T89-02             | 3,4           | 4,7 | 5,5 | 7,3 | 6,3 | 6,6 | 6,9  | 8,3  | 7,5  |
| T89-03             | 3,9           | 4,4 | 5,2 | 6,2 | 6,4 | 7,8 | 7,6  | 9,7  | 9,4  |
| T89-10             | N/A           | N/A | N/A | N/A | N/A | N/A | N/A  | N/A  | N/A  |
| T89-11             | 3,4           | 5,1 | 6,2 | 7,6 | 6,8 | 6,9 | 7,7  | 10,1 | 9,5  |
| T89-12             | 2,9           | 4,7 | 5,8 | 6,6 | 7,8 | 8,0 | 8,7  | 9,1  | 9,2  |
| T89-13             | 3,0           | 4,3 | 5,4 | 5,8 | 6,4 | 7,6 | 7,8  | 8,2  | 8,8  |
| T89-14             | 3,0           | 4,5 | 5,7 | 6,3 | 6,7 | 7,9 | 7,8  | 9,0  | 8,9  |
| T89-15             | N/A           | 2,1 | 3,0 | 4,0 | 4,0 | 4,5 | 4,9  | 5,5  | 5,6  |
| T89-16             | 3,5           | 5,3 | 6,4 | 6,6 | 7,0 | 7,2 | 8,3  | 8,2  | 9,0  |
| T89-17             | 3,4           | 4,6 | 5,1 | 5,4 | 6,0 | 6,4 | 6,5  | 6,8  | 7,1  |
| T89-18             | 3,6           | 5,2 | 6,0 | 7,0 | 7,8 | 8,2 | 9,9  | 10,3 | 9,7  |
| T89-19             | 4,2           | 5,5 | 6,6 | 7,7 | 8,5 | 8,9 | 9,5  | 11,1 | 12,3 |
| T89-20             | 4,1           | 5,5 | 6,6 | 8,1 | 9,3 | 9,6 | 9,3  | 10,0 | 11,1 |
| T89-21             | 3,1           | 5,6 | 5,8 | 6,7 | 7,1 | 7,8 | 8,4  | 9,7  | 10,1 |
| T89-22             | 3,2           | 4,4 | 5,6 | 6,5 | 7,5 | 7,6 | 7,8  | 8,9  | 9,2  |
| T89-23             | 2,4           | 4,2 | 5,1 | 6,1 | 6,5 | 7,5 | 10,1 | 9,3  | 10,2 |
| T89-24             | 3,2           | 4,5 | 5,1 | 6,3 | 7,0 | 7,6 | 8,1  | 8,8  | 9,1  |
| T89-25             | 3,3           | 4,3 | 5,2 | 5,8 | 6,5 | 7,4 | 7,8  | 9,3  | 9,7  |
| T89-26             | 3,3           | 4,4 | 5,5 | 6,6 | 7,2 | 8,1 | 8,9  | 9,5  | 10,5 |
| T89-27             | 3,3           | 4,9 | 6,0 | 7,8 | 8,0 | 8,9 | 9,7  | 11,2 | 11,5 |
| T89-28             | 4,5           | 5,7 | 7,4 | 7,8 | 8,5 | 9,4 | 9,7  | 10,2 | 11,1 |
| T89-29             | 3,1           | 4,7 | 6,3 | 7,2 | 7,9 | 9,2 | 9,8  | 11,1 | 10,7 |
| T89-30             | 3,0           | 5,8 | 6,2 | 7,7 | 7,9 | 8,6 | 8,2  | 10,1 | 10,3 |

Results from growth analysis are specified in the overview table 2.72. The determined  
5 growth effects of specified construction group are presented as ratios between  
construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and  
MDC.

Table 2.72 Overview table of growth effects of construct TFSTT038

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TFSTT038           | 1,11                 | 1,11                   | 1,04                               | 1,06                         | 1,13                 | 0,96                   | 1,05                                  | 0,92                         |

Construction group TFSTT045

Tables 2.73 and 2.74 contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

Table 2.73 Height growth data for TFSTT045

| Days in greenhouse | Height (cm) |    |    |     |    |    |     |     |     |
|--------------------|-------------|----|----|-----|----|----|-----|-----|-----|
|                    | 18          | 25 | 28 | 32  | 36 | 39 | 46  | 53  | 55  |
| TFSTT045-1B        | 19          | 33 | 43 | 52  | 64 | 75 | 94  | 116 | 123 |
| TFSTT045-2B        | 24          | 37 | 49 | 58  | 71 | 80 | 105 | 127 | 133 |
| TFSTT045-3A        | 20          | 35 | 48 | 60  | 76 | 87 | 113 | 143 | 153 |
| TFSTT045-3B        | 16          | 28 | 37 | 47  | 57 | 65 | 86  | 111 | 118 |
| TFSTT045-4A        | 23          | 34 | 45 | 56  | 70 | 82 | 105 | 133 | 139 |
| TFSTT045-4B        | 25          | 38 | 51 | 60  | 75 | 87 | 109 | 119 | 120 |
| TFSTT045-7B        | 23          | 35 | 46 | 60  | 70 | 80 | N/A | 124 | 130 |
| T89-01             | 18          | 32 | 43 | 54  | 66 | 76 | 98  | 124 | 133 |
| T89-02             | 20          | 33 | 43 | 53  | 67 | 76 | 101 | 124 | 129 |
| T89-03             | 17          | 31 | 43 | 53  | 68 | 76 | 102 | 128 | 135 |
| T89-04             | 19          | 33 | 44 | 54  | 67 | 74 | 97  | 122 | 129 |
| T89-05             | 20          | 33 | 44 | 54  | 67 | 76 | 100 | 121 | 129 |
| T89-06             | 18          | 31 | 42 | 53  | 67 | 76 | 97  | 121 | 128 |
| T89-07             | 16          | 28 | 41 | 53  | 65 | 74 | 96  | 121 | 129 |
| T89-08             | 19          | 34 | 43 | 53  | 65 | 75 | 98  | 123 | 131 |
| T89-09             | 20          | 30 | 40 | 52  | 64 | 73 | 97  | 119 | 125 |
| T89-10             | 21          | 33 | 41 | 49  | 61 | 70 | 92  | 114 | 121 |
| T89-11             | 18          | 31 | 40 | 49  | 61 | 71 | 94  | 117 | 123 |
| T89-12             | 18          | 31 | 40 | N/A | 60 | 68 | 90  | 107 | 115 |
| T89-13             | 19          | 35 | 47 | 58  | 70 | 78 | 103 | 128 | 135 |
| T89-14             | 19          | 31 | 40 | 50  | 61 | 72 | 93  | 118 | 124 |
| T89-15             | 20          | 32 | 41 | 50  | 62 | 70 | 91  | 114 | 120 |
| T89-16             | 18          | 30 | 39 | 49  | 62 | 71 | 92  | 114 | 122 |
| T89-17             | 17          | 33 | 45 | 55  | 70 | 78 | 104 | 129 | 136 |
| T89-18             | 19          | 32 | 44 | 56  | 71 | 82 | 106 | 130 | 137 |
| T89-19             | 16          | 26 | 36 | 46  | 51 | 69 | 89  | 112 | 119 |
| T89-20             | 16          | 31 | 41 | 49  | 60 | 71 | 91  | 111 | 118 |
| T89-21             | 20          | 31 | 44 | 54  | 68 | 76 | 99  | 122 | 127 |
| T89-22             | 14          | 26 | 37 | 46  | 61 | 72 | 96  | 120 | 127 |
| T89-23             | 19          | 32 | 40 | 50  | 63 | 73 | 100 | 121 | 127 |
| T89-24             | 20          | 31 | 41 | 47  | 58 | 68 | 90  | 111 | 117 |
| T89-25             | 20          | 36 | 45 | 57  | 69 | 78 | 101 | 127 | 134 |
| T89-26             | 20          | 37 | 49 | 58  | 71 | 80 | 107 | 131 | 140 |
| T89-27             | 19          | 34 | 44 | 55  | 71 | 81 | 107 | 131 | 138 |
| T89-28             | 17          | 35 | 44 | 56  | 68 | 76 | 99  | 126 | 132 |
| T89-29             | 17          | 32 | 45 | 55  | 68 | 78 | 101 | 125 | 132 |
| T89-30             | 18          | 31 | 41 | 50  | 63 | 72 | 95  | 119 | 125 |
| T89-31             | 17          | 27 | 35 | 45  | 58 | 67 | 87  | 108 | 116 |
| T89-32             | 19          | 32 | 44 | 52  | 65 | 74 | 98  | 121 | 127 |

|        |    |    |    |    |    |    |     |     |     |
|--------|----|----|----|----|----|----|-----|-----|-----|
| T89-33 | 20 | 33 | 43 | 53 | 64 | 74 | 96  | 119 | 126 |
| T89-34 | 19 | 34 | 44 | 55 | 68 | 78 | 100 | 124 | 130 |
| T89-35 | 17 | 30 | 40 | 51 | 64 | 74 | 95  | 116 | 122 |
| T89-36 | 18 | 30 | 40 | 49 | 62 | 71 | 91  | 114 | 121 |
| T89-82 | 21 | 33 | 43 | 54 | 65 | 75 | 98  | 118 | 125 |
| T89-83 | 22 | 35 | 47 | 55 | 71 | 80 | 105 | 130 | 137 |
| T89-85 | 21 | 36 | 46 | 56 | 67 | 76 | 98  | 123 | 131 |

Table 2.74 Diameter growth data for TFSTT045

| Days in<br>greenhouse | Diameter (mm) |     |     |      |      | Days in<br>greenhouse | Diameter (mm) |     |     |     |     |
|-----------------------|---------------|-----|-----|------|------|-----------------------|---------------|-----|-----|-----|-----|
|                       | 32            | 39  | 46  | 53   | 55   |                       | 32            | 39  | 46  | 53  | 55  |
| TFSTT045-1B           | 5,2           | 5,7 | 7,0 | 8,1  | 8,6  | T89-17                | 4,8           | 6,7 | 7,0 | 8,3 | 8,4 |
| TFSTT045-2B           | 5,5           | 6,7 | 7,8 | 8,8  | 9,1  | T89-18                | 4,2           | 5,5 | 6,7 | 7,3 | 7,4 |
| TFSTT045-3A           | 6,5           | 7,2 | 8,7 | 10,4 | 10,6 | T89-19                | 4,7           | 5,5 | 6,8 | 7,2 | 7,8 |
| TFSTT045-3B           | 4,8           | 5,6 | 7,4 | 8,0  | 8,6  | T89-20                | 4,5           | 5,6 | 6,5 | 7,0 | 7,3 |
| TFSTT045-4A           | 5,1           | 6,3 | 7,0 | 7,9  | 8,2  | T89-21                | 4,9           | 5,6 | 6,4 | 7,4 | 7,6 |
| TFSTT045-4B           | 5,5           | 6,1 | 7,3 | 8,0  | 8,8  | T89-22                | 4,3           | 5,4 | 6,5 | 7,3 | 7,6 |
| TFSTT045-7B           | 5,1           | 6,9 | 8,3 | 9,0  | 9,6  | T89-23                | 3,9           | 5,5 | 6,7 | 7,7 | 7,0 |
| T89-01                | 5,2           | 6,0 | 6,8 | 8,2  | 7,6  | T89-24                | 4,3           | 5,9 | 6,8 | 8,1 | 7,9 |
| T89-02                | 4,5           | 5,8 | 7,1 | 8,6  | 8,3  | T89-25                | 4,7           | 6,5 | 7,5 | 9,2 | 9,1 |
| T89-03                | 4,4           | 5,7 | 6,8 | 7,9  | 8,1  | T89-26                | 5,4           | 5,9 | 7,7 | 8,6 | 8,8 |
| T89-04                | 4,4           | 6,0 | 6,9 | 8,6  | 8,5  | T89-27                | 4,7           | 5,6 | 7,4 | 7,9 | 8,0 |
| T89-05                | 4,6           | 5,8 | 6,7 | 7,9  | 8,0  | T89-28                | 4,7           | 5,7 | 6,3 | 7,2 | 7,4 |
| T89-06                | 4,7           | 5,9 | 7,2 | 8,1  | 9,2  | T89-29                | 4,8           | 5,6 | 6,6 | 7,7 | 8,1 |
| T89-07                | 4,8           | 5,5 | 6,2 | 6,9  | 7,1  | T89-30                | 4,6           | 5,5 | 6,7 | 7,3 | 7,3 |
| T89-08                | 4,5           | 5,4 | 6,0 | 6,9  | 7,1  | T89-31                | 4,3           | 5,8 | 6,3 | 7,5 | 7,6 |
| T89-09                | 4,7           | 5,6 | 6,7 | 8,8  | 8,0  | T89-32                | 4,6           | 5,9 | 7,6 | 9,3 | 9,1 |
| T89-10                | 4,1           | 4,9 | 5,6 | 7,1  | 7,0  | T89-33                | 4,4           | 5,3 | 6,2 | 7,1 | 7,1 |
| T89-11                | 3,8           | 5,3 | 7,3 | 8,0  | 7,6  | T89-34                | 4,6           | 5,6 | 6,8 | 8,1 | 8,7 |
| T89-12                | N/A           | 5,1 | 6,2 | 7,3  | 6,9  | T89-35                | 5,3           | 6,0 | 7,5 | 8,8 | 8,9 |
| T89-13                | 4,8           | 5,7 | 6,5 | 7,6  | 7,6  | T89-36                | 4,4           | 6,1 | 6,9 | 8,1 | 8,6 |
| T89-13                | 4,8           | 5,7 | 6,5 | 7,6  | 7,6  | T89-82                | 4,7           | 5,3 | 6,5 | 7,5 | 7,4 |
| T89-14                | 4,2           | 5,5 | 6,6 | 7,6  | 6,5  | T89-83                | 4,7           | 6,1 | 7,1 | 8,3 | 8,3 |
| T89-15                | 5,0           | 6,1 | 7,2 | 7,9  | 8,3  | T89-85                | 5,1           | 6,3 | 7,3 | 7,7 | 8,2 |
| T89-16                | 4,4           | 5,6 | 6,2 | 7,3  | 7,9  |                       |               |     |     |     |     |

Results from growth analysis are specified in the overview table 2.75. The determined  
5 growth effects of specified construction group are presented as ratios between  
construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and  
MDC.

Table 2.75 Overview table of growth effects of construct TFSTT045

| Construction<br>group | Average<br>Final<br>Height | Average<br>Final<br>Diameter | Average<br>Maximum<br>Height<br>Growth<br>Rate | Average<br>Diameter<br>Growth<br>Rate | Maximum<br>Final<br>Height | Maximum<br>Final<br>Diameter | Maximum<br>of<br>Maximum<br>Height<br>Growth | Maximum<br>Diameter<br>Growth<br>Rate |
|-----------------------|----------------------------|------------------------------|------------------------------------------------|---------------------------------------|----------------------------|------------------------------|----------------------------------------------|---------------------------------------|
|-----------------------|----------------------------|------------------------------|------------------------------------------------|---------------------------------------|----------------------------|------------------------------|----------------------------------------------|---------------------------------------|

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|          |      |      |      |      |      |      | Rate |      |
|----------|------|------|------|------|------|------|------|------|
| TFSTT045 | 1,03 | 1,15 | 1,03 | 1,14 | 1,09 | 1,16 | 1,11 | 0,94 |

Construction group TFSTT051Rp1

Tables 2.76 and 2.77 contain growth data for specified construction group and corresponding wild type group. Table rows contain height and diameter measurements of individuals of specified construction group and corresponding wild type group. Time of measurement as number of days in greenhouse is shown in table headers.

Table 2.76 Height growth data for TFSTT051Rp1

| Days in greenhouse | Height (cm) |    |    |    |    |    |     |     |     |     |
|--------------------|-------------|----|----|----|----|----|-----|-----|-----|-----|
|                    | 20          | 25 | 29 | 35 | 41 | 46 | 50  | 53  | 57  | 60  |
| TFSTT051rp1-3B-1   | 19          | 25 | 29 | 44 | 60 | 70 | 76  | 83  | 90  | 97  |
| TFSTT051rp1-3B-2   | 17          | 24 | 30 | 43 | 56 | 68 | 75  | 82  | 89  | 97  |
| TFSTT051rp1-3B-3   | 18          | 24 | 28 | 37 | 49 | 63 | 69  | 75  | 83  | 90  |
| TFSTT051rp1-4A-1   | 18          | 23 | 30 | 43 | 58 | 71 | 81  | 90  | 101 | 110 |
| TFSTT051rp1-4A-2   | 16          | 25 | 33 | 45 | 62 | 78 | 88  | 97  | 109 | 119 |
| TFSTT051rp1-4A-3   | 20          | 28 | 38 | 54 | 73 | 90 | 101 | 110 | 122 | 132 |
| T89-01             | 17          | 26 | 31 | 45 | 61 | 76 | 87  | 95  | 107 | 116 |
| T89-02             | 16          | 21 | 26 | 38 | 53 | 67 | 76  | 83  | N/A | N/A |
| T89-03             | 18          | 24 | 32 | 47 | 64 | 78 | 87  | 96  | 106 | 115 |
| T89-04             | 18          | 26 | 35 | 50 | 66 | 80 | 87  | 96  | 107 | 115 |
| T89-05             | 17          | 26 | 33 | 44 | 57 | 73 | 81  | 91  | 100 | 107 |
| T89-06             | 16          | 21 | 28 | 40 | 55 | 74 | 79  | 89  | 99  | 106 |
| T89-07             | 17          | 23 | 31 | 43 | 57 | 71 | 80  | 88  | 98  | 107 |
| T89-08             | 15          | 20 | 26 | 37 | 51 | 65 | 75  | 84  | 94  | 100 |
| T89-09             | 18          | 25 | 32 | 46 | 61 | 74 | 85  | 93  | 103 | 112 |
| T89-10             | 19          | 25 | 32 | 46 | 60 | 75 | 86  | 95  | 104 | 112 |
| T89-11             | 20          | 27 | 36 | 51 | 68 | 86 | 98  | 107 | 120 | 127 |
| T89-12             | 19          | 27 | 36 | 50 | 67 | 80 | 89  | 97  | 108 | 118 |
| T89-13             | 18          | 25 | 32 | 45 | 59 | 75 | 83  | 92  | 101 | 108 |
| T89-14             | 18          | 23 | 26 | 36 | 51 | 65 | 72  | 79  | 89  | 96  |
| T89-15             | 17          | 21 | 28 | 39 | 53 | 70 | 78  | 87  | 97  | 105 |
| T89-16             | 19          | 25 | 32 | 43 | 57 | 71 | 81  | 90  | 101 | 109 |
| T89-17             | 16          | 20 | 29 | 41 | 54 | 68 | 78  | 84  | 93  | 101 |
| T89-18             | 16          | 23 | 30 | 45 | 63 | 78 | 87  | 94  | 103 | 110 |
| T89-19             | 16          | 22 | 28 | 42 | 56 | 69 | 79  | 89  | 100 | 107 |
| T89-20             | 18          | 25 | 32 | 47 | 63 | 78 | 89  | 99  | 109 | 115 |
| T89-21             | 19          | 27 | 34 | 50 | 67 | 82 | 92  | 102 | 111 | 120 |
| T89-22             | 19          | 25 | 32 | 44 | 58 | 76 | 84  | 93  | 102 | 109 |
| T89-23             | 18          | 26 | 33 | 47 | 63 | 79 | 88  | 99  | 108 | 116 |
| T89-24             | 16          | 24 | 28 | 42 | 53 | 70 | 78  | 85  | 94  | 103 |
| T89-25             | 16          | 25 | 32 | 45 | 61 | 76 | 85  | 95  | 107 | 114 |
| T89-26             | 16          | 20 | 26 | 38 | 52 | 68 | 78  | 86  | 97  | 103 |
| T89-27             | 16          | 21 | 25 | 35 | 48 | 61 | 70  | 78  | N/A | 98  |
| T89-28             | 14          | 18 | 25 | 38 | 51 | 64 | 73  | 81  | 90  | 96  |
| T89-29             | 7           | 13 | 18 | 30 | 45 | 60 | 69  | 77  | 90  | 98  |
| T89-30             | 15          | 22 | 29 | 42 | 55 | 69 | 80  | 88  | 97  | 106 |
| T89-31             | 21          | 29 | 37 | 50 | 65 | 80 | 88  | 98  | 108 | 116 |
| T89-32             | 19          | 24 | 32 | 42 | 55 | 70 | 78  | 87  | 96  | 105 |

Table 2.77 Diameter growth data for TFSTT051Rp1

| Days in<br>greenhouse | Diameter (mm) |     |     |     |     | Days in<br>greenhouse | Diameter (mm) |     |     |     |     |
|-----------------------|---------------|-----|-----|-----|-----|-----------------------|---------------|-----|-----|-----|-----|
|                       | 35            | 41  | 46  | 53  | 60  |                       | 35            | 41  | 46  | 53  | 60  |
| TFSTT051rp1-3B-1      | 4,6           | 5,9 | 6,4 | 7,2 | 7,7 | T89-14                | 4,5           | 5,2 | 5,8 | 6,1 | 7,0 |
| TFSTT051rp1-3B-2      | 4,3           | 5,6 | 6,0 | 6,1 | 7,3 | T89-15                | 4,7           | N/A | 6,0 | 6,4 | 7,3 |
| TFSTT051rp1-3B-3      | 4,2           | 5,4 | 6,8 | 6,9 | 8,3 | T89-16                | 4,5           | 5,6 | 7,7 | 7,5 | 8,6 |
| TFSTT051rp1-4A-1      | 4,5           | 5,9 | 6,6 | 7,8 | 9,1 | T89-17                | 4,1           | 5,4 | 6,0 | 6,8 | 7,5 |
| TFSTT051rp1-4A-2      | 4,5           | 5,9 | 6,6 | 7,4 | 8,1 | T89-18                | 4,4           | 5,8 | 6,0 | 7,7 | 8,3 |
| TFSTT051rp1-4A-3      | 5,2           | 6,4 | 7,1 | 7,9 | 8,3 | T89-19                | 4,7           | 5,8 | 7,1 | 8,5 | 9,4 |
| T89-01                | 4,7           | 6,0 | 6,5 | 6,9 | 8,3 | T89-20                | 4,7           | 5,8 | 6,6 | 7,4 | 8,3 |
| T89-02                | 4,4           | 5,7 | 6,6 | 7,6 | 7,8 | T89-21                | 4,7           | 6,2 | 6,3 | 7,7 | 8,5 |
| T89-03                | 4,7           | 6,3 | 6,7 | 7,7 | 8,4 | T89-22                | 4,2           | 5,1 | 6,3 | 6,9 | 8,0 |
| T89-04                | 4,7           | 6,0 | 7,1 | 8,0 | 8,5 | T89-23                | 4,6           | 5,8 | 7,1 | 7,5 | 8,3 |
| T89-05                | 4,0           | 5,3 | 6,3 | 7,8 | 8,1 | T89-24                | 4,4           | 5,8 | 6,9 | 7,7 | 8,8 |
| T89-06                | 4,6           | 5,9 | 6,3 | 7,7 | 8,2 | T89-25                | 4,5           | 5,4 | 6,2 | 8,0 | 8,7 |
| T89-07                | 4,6           | 6,1 | 6,5 | 7,9 | 8,5 | T89-26                | 4,1           | 5,4 | 6,0 | 7,2 | 8,0 |
| T89-08                | 4,0           | 5,2 | 5,8 | 6,9 | 7,1 | T89-27                | 4,5           | 5,7 | 6,5 | 7,9 | 9,2 |
| T89-09                | 4,4           | 5,8 | 6,4 | 7,6 | 8,2 | T89-28                | 4,3           | 5,1 | 6,0 | 6,6 | 7,7 |
| T89-10                | 4,9           | 6,0 | 6,6 | 7,4 | 8,5 | T89-29                | 3,5           | 4,7 | 5,5 | 6,3 | 7,1 |
| T89-11                | 4,7           | 5,8 | 6,4 | 7,9 | 8,3 | T89-30                | 4,1           | 5,4 | 5,8 | 7,2 | 7,8 |
| T89-12                | 4,7           | 5,9 | 7,3 | 7,4 | 7,6 | T89-31                | 5,0           | 5,8 | 6,8 | 7,3 | 8,2 |
| T89-13                | 5,9           | 5,9 | 6,7 | 7,5 | 8,3 | T89-32                | 4,4           | 6,4 | 6,6 | 8,0 | 8,4 |

- 5 Results from growth analysis are specified in the overview table 2.78. The determined growth effects of specified construction group are presented as ratios between construction and wild type group AFH, AFD, AMHGR, ADGR, MFH, MFD, MMHGR and MDC.

10 Table 2.78 Overview table of growth effects of construct TFSTT051Rp1

| Construction group | Average Final Height | Average Final Diameter | Average Maximum Height Growth Rate | Average Diameter Growth Rate | Maximum Final Height | Maximum Final Diameter | Maximum of Maximum Height Growth Rate | Maximum Diameter Growth Rate |
|--------------------|----------------------|------------------------|------------------------------------|------------------------------|----------------------|------------------------|---------------------------------------|------------------------------|
| TFSTT051Rp1        | 0,99                 | 1,00                   | 0,96                               | 0,95                         | 1,04                 | 0,97                   | 0,98                                  | 0,95                         |

**Example 3**Volumetric growth calculation

The volume of the stem of each individual plant is approximated from final height and final diameter measurements using cone volume.

5

Stem volume approximation

$$V = \frac{\pi * h * r^2}{3}$$

where

$V = \text{Volume}$

10  $h = \text{height (Final height)}$ 

$r = \text{radius (Final diameter / 2)}$

Average final volumes of each construction group population and corresponding wild type population are subsequently calculated. A volumetric growth selection criterion is applied,

15 where a construction group is considered having a significant or pronounced volume increase compared to the wild type population if construction group average final volume is at least 25% (or 50% in the second more stringent level) greater than corresponding wild type group average final volume.

Results from volume approximation are specified in the overview table 3.1. The

20 determined growth effects are presented as ratios between construction and wild type group average final volumes AFV.

The following construction groups meet the volumetric growth criterion. Construction group TF0002Rp2 has an average final volume increase of 36%; construction group

TF0013 has an average final volume increase of 27%; construction group TF0045 has an

25 average final volume increase of 33%; construction group TF0096 has an average final volume increase of 44%; construction group TF0109 has an average final volume

increase of 44%; construction group TF0116 has an average final volume increase of

31%; construction group TF0132rp1 has an average final volume increase of 46%, where construction group line TF0132rp1-4AC has an average final volume increase of 70% (+/-

30 20%); construction group TF0146 has an average final volume increase of 34%;

construction group TF0247 has an average final volume increase of 49%; construction

group TF0405 has an average final volume increase of 45%; construction group

TFSTT016 has an average final volume increase of 36%; construction group TFSTT036

has an average final volume increase of 28%; construction group TFSTT038 has an average final volume increase of 32%; construction group TFSTT045 has an average final volume increase of 38%.

The following construction groups meet the more stringent level of the volumetric growth criterion (5) as shown in table 3.1. Construction group TF0097Rp1 has an average final volume increase of 68%, where construction group line TF0097Rp1-3A has an average final volume increase of 116% (+/- 37%); construction group TF0104 has an average final volume increase of 79%; construction group TF0109Rp1 has an average final volume increase of 58%, where construction group line TF0109Rp1-4A has an average final volume increase of 92% (+/- 5%); construction group TF0132.2nd has an average final volume increase of 65%; construction group TFSTT004 has an average final volume increase of 51%. These construction groups meet the more stringent level of volumetric growth criterion (5) as shown in table 3.1.

Table 3.1

| Construction group | Average Final Volume |
|--------------------|----------------------|
| TF0002Rp2          | 1,36                 |
| TF0013             | 1,27                 |
| TF0045             | 1,33                 |
| TF0096             | 1,44                 |
| TF0097Rp1          | 1,68                 |
| TF0104             | 1,79                 |
| TF0109             | 1,44                 |
| TF0109Rp1          | 1,58                 |
| TF0116             | 1,31                 |
| TF0132.2nd         | 1,65                 |

| Construction group | Average Final Volume |
|--------------------|----------------------|
| TF0132rp1          | 1,46                 |
| TF0146             | 1,34                 |
| TF0247             | 1,49                 |
| TF0405             | 1,45                 |
| TFSTT004           | 1,51                 |
| TFSTT016           | 1,36                 |
| TFSTT036           | 1,28                 |
| TFSTT038           | 1,32                 |
| TFSTT045           | 1,38                 |

**Exemple 4****Dry weight measurements**

Dry weight measurements were performed on replanted construction groups. Plants were harvested according to a standard procedure: stem, bark, five fully developed leafs, rest of leafs and roots were collected as separate samples. The leaf area were measured of the five fully developed leafs and the length of 20 fully developed internodes were measured. The separate samples of plant material were put in a drier oven for more than 48 hours. The dry weights were measured and analysed according differences compared to corresponding wild type groups. Abbreviations and parameters used for dry weight analyses is shown in table 4.1.

Table 4.1 Abbreviations and parameters associated with dry weight

|                          |                                                                                                                            |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------|
| Stem (g)                 | Dry weight of stem of one plant individual                                                                                 |
| Bark (g)                 | Dry weight of bark of one plant individual                                                                                 |
| Root (g)                 | Dry weight of root of one plant individual                                                                                 |
| Leaf (g)                 | Dry weight of all leafs of one plant individual                                                                            |
| TOTAL(g)                 | Total dry weight of stem, bark and leafs of one plant individual                                                           |
| SLA (m <sup>2</sup> /kg) | Specific Leaf Area, square meter per kg leaf dry weight, calculated from five fully developed leaf of one plant individual |
| Internode (cm)           | Average internode length, calculated from 20 internodes of one plant individual                                            |
| Average Stem             | Average stem dry weight of the wild type population and each construction group population                                 |
| Average Bark             | Average bark dry weight of the wild type population and each construction group population                                 |
| Average Root             | Average root dry weight of the wild type population and each construction group population                                 |
| Average Leaf             | Average Leaf dry weight of the wild type population and each construction group population                                 |
| Average TOTAL            | Average TOTAL dry weight of the wild type population and each construction group population                                |
| Average SLA              | Average SLA of the wild type population and each construction group population                                             |

|                        |                                                                                             |
|------------------------|---------------------------------------------------------------------------------------------|
| Average Internode      | Average internode of the wild type population and each construction group population        |
| Maximum Stem           | Maximum stem dry weight of the wild type population and each construction group population  |
| Maximum Bark           | Maximum bark dry weight of the wild type population and each construction group population  |
| Maximum Root           | Maximum root dry weight of the wild type population and each construction group population  |
| Maximum Leaf           | Maximum Leaf dry weight of the wild type population and each construction group population  |
| Maximum TOTAL          | Maximum TOTAL dry weight of the wild type population and each construction group population |
| Line Average Stem      | Average stem dry weight of the wild type population and each construction group line        |
| Line Average Bark      | Average bark dry weight of the wild type population and each construction group line        |
| Line Average Root      | Average root dry weight of the wild type population and each construction group line        |
| Line Average Leaf      | Average leaf dry weight of the wild type population and each construction group line        |
| Line Average TOTAL     | Average TOTAL dry weight of the wild type population and each construction group line       |
| Line Average SLA       | Average SLA of the wild type population and each construction group line                    |
| Line Average Internode | Average internode length of the wild type population and each construction group line       |

## Dry weight experiment results

### Construction group TF0013

This construct induce increase of biomass production. Dry weight measurements of the construction group show 20% increase of average stem, 14% increase of average bark, 14% increase of average leaf and 16% increase of average TOTAL compared to the corresponding wildtype group. One of the construction group lines show 48% increase of average stem, 37% increase of average bark, 31% increase of average leaf and 36% increase of average TOTAL compared to the corresponding wildtype group.

Table 4.2 contains dry weight data for specified construction group and corresponding wild type group.

Table 4.2

| Construction Group Individual | Stem (g) | Bark (g) | Root (g) | Leaf (g) | TOTAL(g) | SLA (m2/kg) | Internode (cm) |
|-------------------------------|----------|----------|----------|----------|----------|-------------|----------------|
| TF0013rp2-1A-1                | 4,4      | 2,1      |          | 15,1     | 21,6     | 33,7        | 3,0            |
| TF0013rp2-1A-2                | 6,5      | 2,7      |          | 15,0     | 24,2     | 41,2        | 3,6            |
| TF0013rp2-1A-3                | 5,9      | 2,8      |          | 14,4     | 23,0     | 33,6        | 3,5            |
| TF0013rp2-3BA-1               | 8,7      | 3,7      |          | 19,5     | 31,9     | 34,4        | 3,8            |
| TF0013rp2-3BA-2               | 9,1      | 3,9      |          | 20,6     | 33,6     | 32,8        | 3,7            |
| TF0013rp2-3BA-3               | 8,7      | 3,7      |          | 19,8     | 32,2     | 34,2        | 4,1            |
| T89-20                        | 5,8      | 2,7      | 6,4      | 14,0     | 22,5     | 35,4        | 3,7            |
| T89-21                        | 5,9      | 3,0      | 8,5      | 16,9     | 25,8     | 30,3        | 3,2            |
| T89-22                        | 6,0      | 2,7      |          | 15,4     | 24,1     | 34,4        | 3,7            |
| T89-23                        | 4,3      | 2,0      | 4,6      | 12,1     | 18,4     | 48,9        | 3,3            |
| T89-24                        | 5,5      | 2,5      | 6,5      | 14,3     | 22,2     | 32,8        | 3,6            |
| T89-25                        | 7,6      | 3,4      | 8,0      | 18,8     | 29,8     | 31,2        | 3,3            |
| T89-26                        | 6,6      | 3,0      |          | 17,2     | 26,8     | 33,5        | 3,7            |
| T89-27                        | 6,9      | 3,1      |          | 16,0     | 26,0     | 31,4        | 3,8            |
| T89-28                        | 5,2      | 2,6      |          | 12,8     | 20,5     | 32,7        | 3,4            |

Table 4.3 contains the dry weight ratios of specified construction group relative to corresponding wildtype group of average stem, average bark, average root, average leaf and average TOTAL. Table 4.3 also show ratios of average SLA and average internode length of specified construction group relative to corresponding wildtype group.

5 Table 4.3

| Construction Group | Average Stem | Average Bark | Average Root | Average Leaf | Average TOTAL | Average SLA | Average Internode |
|--------------------|--------------|--------------|--------------|--------------|---------------|-------------|-------------------|
| TF0013rp2          | 1,20         | 1,14         |              | 1,14         | 1,16          | 1,01        | 1,03              |

Table 4.4 contains the dry weight ratios for specified construction group relative to corresponding wildtype group for maximum stem, maximum bark, maximum root, maximum leaf and maximum TOTAL.

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Table 4.4

| Construction Group | Maximum Stem | Maximum Bark | Maximum Root | Maximum Leaf | Maximum TOTAL |
|--------------------|--------------|--------------|--------------|--------------|---------------|
| TF0013rp2          | 1,20         | 1,16         |              | 1,09         | 1,13          |

Table 4.5 contains dry weight ratios for specified construction group line relative to corresponding wildtype group of average stem, average bark, average root, average leaf and average TOTAL. Table 4.5 also show ratios of average SLA and average internode length of specified construction group line relative to corresponding wildtype group.

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Table 4.5

| Construction Group Line | Line Average Stem | Line Average Bark | Line Average Root | Line Average Leaf | Line Average TOTAL | Line Average SLA | Line Average Internode |
|-------------------------|-------------------|-------------------|-------------------|-------------------|--------------------|------------------|------------------------|
| TF0013rp2-1A            | 0,93              | 0,91              |                   | 0,97              | 0,95               | 1,05             | 0,96                   |
| TF0013rp2-3BA           | 1,48              | 1,37              |                   | 1,31              | 1,36               | 0,98             | 1,10                   |

Construction group TF0132

This construct induce increase of biomass production. Dry weight measurements of the construction group show 83% increase of average stem, 58% increase of average bark, 34% increase of average leaf and 49% increase of average TOTAL compared to the corresponding wildtype group. One of the construction group lines show 119% increase of average stem, 82% increase of average bark, 53% increase of average leaf and 73% increase of average TOTAL compared to the corresponding wildtype group. For the lines were root dry weight were measured an increase in the shot-root ratio were observed.

Table 4.6 contains dry weight data for specified construction group and corresponding wild type group.

Table 4.6

| Construction Group Individual | Stem (g) | Bark (g) | Root (g) | Leaf (g) | TOTAL(g) | SLA (m2/kg) | Internode (cm) |
|-------------------------------|----------|----------|----------|----------|----------|-------------|----------------|
| TF0132rp1-1B-2                | 11,7     | 4,6      | 10,3     | 18,1     | 34,5     | 33,3        |                |
| TF0132rp1-1B-3                | 9,1      | 3,5      | 6,0      | 15,7     | 28,4     | 33,3        | 4,2            |
| TF0132rp1-3BB-1               | 9,8      | 4,1      | 10,7     | 18,7     | 32,6     | 33,7        | 4,2            |
| TF0132rp1-3BB-2               | 11,4     | 4,9      | 9,8      | 24,8     | 41,2     | 30,8        | 4,3            |
| TF0132rp1-3BB-3               | 10,8     | 4,3      | 10,7     | 20,4     | 35,5     | 34,1        | 4,3            |
| TF0132rp1-4AC-1               | 13,3     | 5,1      |          | 20,7     | 39,1     | 32,8        | 3,6            |
| TF0132rp1-4AC-2               | 14,5     | 5,5      |          | 26,7     | 46,7     | 34,2        | 3,9            |
| TF0132rp1-4AC-3               | 11,4     | 4,5      |          | 22,5     | 38,4     | 34,6        | 3,7            |
| TF0132rp1-4B-1                | 10,7     | 4,3      |          | 18,2     | 33,2     | 32,4        | 4,1            |
| TF0132rp1-4B-2                | 6,7      | 2,9      |          | 16,9     | 26,4     | 34,3        | 4,0            |
| TF0132rp1-4B-3                | 10,2     | 3,8      |          | 17,7     | 31,7     | 38,9        | 4,1            |
| TF0132rp1-6B-1                | 7,5      | 3,6      |          | 21,3     | 32,5     | 32,5        | 4,0            |
| TF0132rp1-6B-2                | 11,9     | 4,6      |          | 20,7     | 37,2     | 34,0        | 4,3            |
| TF0132rp1-6B-3                | 11,1     | 4,6      |          | 22,5     | 38,2     | 31,4        | 4,3            |
| T89-20                        | 5,8      | 2,7      | 6,4      | 14,0     | 22,5     | 35,4        | 3,7            |
| T89-21                        | 5,9      | 3,0      | 8,5      | 16,9     | 25,8     | 30,3        | 3,2            |
| T89-22                        | 6,0      | 2,7      |          | 15,4     | 24,1     | 34,4        | 3,7            |
| T89-23                        | 4,3      | 2,0      | 4,6      | 12,1     | 18,4     | 48,9        | 3,3            |
| T89-24                        | 5,5      | 2,5      | 6,5      | 14,3     | 22,2     | 32,8        | 3,6            |
| T89-25                        | 7,6      | 3,4      | 8,0      | 18,8     | 29,8     | 31,2        | 3,3            |
| T89-26                        | 6,6      | 3,0      |          | 17,2     | 26,8     | 33,5        | 3,7            |
| T89-27                        | 6,9      | 3,1      |          | 16,0     | 26,0     | 31,4        | 3,8            |
| T89-28                        | 5,2      | 2,6      |          | 12,8     | 20,5     | 32,7        | 3,4            |

Table 4.7 contains the dry weight ratios of specified construction group relative to corresponding wildtype group of average stem, average bark, average root, average leaf and average TOTAL. Table 4.7 also show ratios of average SLA and average internode length of specified construction group relative to corresponding wildtype group.

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Table 4.7

| Construction Group | Average Stem | Average Bark | Average Root | Average Leaf | Average TOTAL | Average SLA | Average Internode |
|--------------------|--------------|--------------|--------------|--------------|---------------|-------------|-------------------|
| TF0132rp1          | 1,83         | 1,58         | 1,58         | 1,34         | 1,49          | 0,96        | 1,17              |

Table 4.8 contains the dry weight ratios for specified construction group relative to corresponding wildtype group for maximum stem, maximum bark, maximum root, maximum leaf and maximum TOTAL.

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Table 4.8

| Construction Group | Maximum Stem | Maximum Bark | Maximum Root | Maximum Leaf | Maximum TOTAL |
|--------------------|--------------|--------------|--------------|--------------|---------------|
| TF0132rp1          | 1,92         | 1,62         | 1,99         | 1,42         | 1,57          |

Table 4.9 contains dry weight ratios for specified construction group line relative to corresponding wildtype group of average stem, average bark, average root, average leaf and average TOTAL. Table 4.9 also show ratios of average SLA and average internode length of specified construction group line relative to corresponding wildtype group.

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Table 4.9

| Construction Group Line | Line Average Stem | Line Average Bark | Line Average Root | Line Average Leaf | Line Average TOTAL | Line Average SLA | Line Average Internode |
|-------------------------|-------------------|-------------------|-------------------|-------------------|--------------------|------------------|------------------------|
| TF0132rp1-1B            | 1,93              | 1,61              | 1,63              | 1,24              | 1,45               | 0,92             | 1,25                   |
| TF0132rp1-3BB           | 1,79              | 1,59              | 1,53              | 1,40              | 1,52               | 0,95             | 1,22                   |
| TF0132rp1-4AC           | 2,19              | 1,82              |                   | 1,53              | 1,73               | 0,98             | 1,07                   |
| TF0132rp1-4B            | 1,54              | 1,32              |                   | 1,15              | 1,27               | 1,02             | 1,15                   |
| TF0132rp1-6B            | 1,70              | 1,53              |                   | 1,41              | 1,50               | 0,95             | 1,20                   |

Construction group TF0002

- This construct induce increase of biomass production. Dry weight measurements of the construction group show 50% increase of average stem, 52% increase of average bark, 6% increase of average leaf and 20% increase of average TOTAL compared to the corresponding wildtype group. One of the construction group lines show 72% increase of average stem, 61% increase of average bark, 20% increase of average leaf and 35% increase of average TOTAL compared to the corresponding wildtype group. . For the line were root dry weight were measured an increase in the shot-root ratio were observed.
- 10 Table 4.10 contains dry weight data for specified construction group and corresponding wild type group.

Table 4.10

| Construction Group Individual | Stem (g) | Bark (g) | Root (g) | Leaf (g) | TOTAL(g) | SLA (m2/kg) | Internode (cm) |
|-------------------------------|----------|----------|----------|----------|----------|-------------|----------------|
| TF0002rp2-1B-1                | 8,5      | 3,4      | 8,1      | 17,4     | 29,4     | 33,4        | 3,5            |
| TF0002rp2-1B-2                | 10,7     | 4,7      | 12,6     | 20,5     | 35,8     | 32,2        | 3,2            |
| TF0002rp2-1B-3                | 10,0     | 3,7      | 8,0      | 19,2     | 32,9     | 36,2        | 3,3            |
| TF0002rp2-2A-1                | 8,0      | 3,4      |          | 14,5     | 25,9     | 34,3        | 3,3            |
| TF0002rp2-2A-2                | 5,0      | 2,4      |          | 10,1     | 17,4     | 35,9        | 3,0            |
| TF0002rp2-2A-3                | 6,4      | 3,3      |          | 12,2     | 22,0     | 25,3        | 3,1            |
| TF0002rp2-3B-1                | 4,7      | 2,3      |          | 12,0     | 19,0     | 34,5        | 3,0            |
| TF0002rp2-3B-2                | 10,7     | 4,7      |          | 20,7     | 36,1     | 32,1        | 3,3            |
| TF0002rp2-3B-3                | 12,3     | 5,8      |          | 25,3     | 43,3     | 27,4        | 2,5            |
| T89-01                        | 5,1      | 2,2      |          | 13,1     | 20,4     | 39,9        | 2,7            |
| T89-02                        |          |          |          | 13,8     | 28,4     | 36,3        | 2,6            |
| T89-03                        | 6,8      | 2,7      |          | 17,1     | 26,6     | 37,8        | 2,6            |
| T89-04                        | 6,9      | 2,7      |          | 17,3     | 27,0     | 37,1        | 2,4            |
| T89-05                        | 5,7      | 2,5      |          | 16,6     | 24,9     | 31,8        | 2,6            |
| T89-06                        | 6,1      | 2,7      | 8,2      | 18,4     | 27,1     | 31,7        | 2,7            |
| T89-07                        | 5,8      | 2,5      | 9,2      | 15,9     | 24,2     | 31,7        | 2,6            |
| T89-08                        | 3,9      | 2,1      |          | 16,1     | 22,0     | 29,2        | 2,6            |
| T89-09                        | 6,9      | 3,1      |          | 20,7     | 30,7     | 30,3        | 2,5            |
| T89-10                        | 5,5      | 2,5      | 10,3     | 16,6     | 24,6     | 36,9        | 2,6            |
| T89-11                        | 6,9      | 3,0      |          | 17,9     | 27,8     | 34,0        | 3,0            |
| T89-12                        | 6,6      | 3,0      |          | 15,2     | 24,8     | 31,9        | 2,8            |
| T89-13                        | 5,9      | 2,2      |          | 15,0     | 23,1     | 39,6        | 2,4            |
| T89-14                        | 3,4      | 1,7      |          | 13,2     | 18,3     | 32,7        | 2,5            |

|        |     |     |     |      |      |      |     |
|--------|-----|-----|-----|------|------|------|-----|
| T89-15 | 4,6 | 2,0 |     | 14,9 | 21,6 | 33,4 | 2,7 |
| T89-16 | 6,1 | 2,7 |     | 17,7 | 26,4 | 31,8 | 2,6 |
| T89-17 | 4,4 | 2,1 |     | 15,9 | 22,4 | 31,5 | 2,6 |
| T89-18 | 5,6 | 2,6 |     | 15,0 | 23,3 | 32,7 | 2,7 |
| T89-19 | 6,2 | 2,7 |     | 18,4 | 27,3 | 33,6 | 2,5 |
| T89-20 | 5,9 | 2,7 | 8,4 | 16,5 | 25,2 | 35,9 | 2,7 |
| T89-21 | 6,9 | 2,8 |     | 17,8 | 27,5 | 39,0 | 2,6 |
| T89-22 | 5,4 | 2,2 |     | 13,7 | 21,3 | 37,9 | 2,7 |
| T89-23 | 7,0 | 2,9 |     | 17,7 | 27,5 | 33,3 | 2,9 |
| T89-24 | 6,6 | 2,7 |     | 17,3 | 26,6 | 33,8 | 2,6 |
| T89-25 | 6,5 | 2,8 | 7,4 | 17,2 | 26,5 | 32,4 | 2,8 |
| T89-26 | 4,7 | 2,2 | 6,2 | 14,3 | 21,2 | 33,0 | 2,8 |
| T89-27 | 5,4 | 2,4 |     | 16,1 | 23,9 | 31,3 | 2,5 |
| T89-28 | 3,6 | 1,5 |     | 11,7 | 16,7 | 39,5 | 2,5 |
| T89-29 | 3,1 | 1,3 |     | 9,9  | 14,4 | 36,3 | 3,0 |
| T89-30 | 5,0 | 2,1 |     | 13,7 | 20,8 | 36,2 | 2,9 |
| T89-31 | 7,0 | 2,9 |     | 17,2 | 27,2 | 32,7 | 2,7 |
| T89-32 | 6,0 | 2,5 |     | 16,7 | 25,2 | 32,3 | 2,5 |

Table 4.11 contains the dry weight ratios of specified construction group relative to corresponding wildtype group of average stem, average bark, average root, average leaf and average TOTAL. Table 4.11 also show ratios of average SLA and average internode length of specified construction group relative to corresponding wildtype group.

Table 4.11

| Construction Group | Average Stem | Average Bark | Average Root | Average Leaf | Average TOTAL | Average SLA | Average Internode |
|--------------------|--------------|--------------|--------------|--------------|---------------|-------------|-------------------|
| TF0002rp2          | 1,50         | 1,52         | 1,16         | 1,06         | 1,20          | 0,94        | 1,19              |

Table 4.12 contains the dry weight ratios for specified construction group relative to corresponding wildtype group for maximum stem, maximum bark, maximum root, maximum leaf and maximum TOTAL.

Table 4.12

| Construction Group | Maximum Stem | Maximum Bark | Maximum Root | Maximum Leaf | Maximum TOTAL |
|--------------------|--------------|--------------|--------------|--------------|---------------|
| TF0002rp2          | 1,76         | 1,85         | 1,23         | 1,22         | 1,41          |

Table 4.13 contains dry weight ratios for specified construction group line relative to corresponding wildtype group of average stem, average bark, average root, average leaf and average TOTAL. Table 4.13 also show ratios of average SLA and average internode length of specified construction group line relative to corresponding wildtype group.

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Table 4.13

| Construction Group Line | Line Average Stem | Line Average Bark | Line Average Root | Line Average Leaf | Line Average TOTAL | Line Average SLA | Line Average Internode |
|-------------------------|-------------------|-------------------|-------------------|-------------------|--------------------|------------------|------------------------|
| TF0002rp2-1B            | 1,72              | 1,61              | 1,16              | 1,20              | 1,35               | 0,99             | 1,27                   |
| TF0002rp2-2A            | 1,15              | 1,23              |                   | 0,77              | 0,90               | 0,93             | 1,18                   |
| TF0002rp2-3B            | 1,63              | 1,73              |                   | 1,22              | 1,36               | 0,91             | 1,12                   |

Construction group TF0052

This construct induce increase of biomass production. Dry weight measurements of one of the construction group lines show 49% increase of average stem, 64% increase of average bark, 32% increase of average leaf and 38% increase of average TOTAL

5 compared to the corresponding wildtype group.

Table 4.14 contains dry weight data for specified construction group and corresponding wild type group.

Table 4.14

| Construction Group Individual | Stem (g) | Bark (g) | Root (g) | Leaf (g) | TOTAL(g) | SLA (m2/kg) | Internode (cm) |
|-------------------------------|----------|----------|----------|----------|----------|-------------|----------------|
| TF0052rp1-2A-1                | 9,5      | 4,5      |          | 23,8     | 37,8     | 30,0        | 3,0            |
| TF0052rp1-2A-2                | 7,3      | 3,6      |          | 18,4     | 29,2     | 33,7        | 3,0            |
| TF0052rp1-2A-3                | 8,5      | 4,0      |          | 21,0     | 33,4     | 37,8        | 3,0            |
| TF0052rp1-2B-1                | 4,7      | 2,2      |          | 14,1     | 21,0     | 39,8        | 2,6            |
| TF0052rp1-2B-2                | 4,0      | 2,0      |          | 13,5     | 19,6     | 32,3        | 2,6            |
| TF0052rp1-2B-3                | 2,4      | 1,3      |          | 7,3      | 11,0     | 31,0        | 2,5            |
| T89-01                        | 5,1      | 2,2      |          | 13,1     | 20,4     | 39,9        | 2,7            |
| T89-02                        |          |          |          | 13,8     | 28,4     | 36,3        | 2,6            |
| T89-03                        | 6,8      | 2,7      |          | 17,1     | 26,6     | 37,8        | 2,6            |
| T89-04                        | 6,9      | 2,7      |          | 17,3     | 27,0     | 37,1        | 2,4            |
| T89-05                        | 5,7      | 2,5      |          | 16,6     | 24,9     | 31,8        | 2,6            |
| T89-06                        | 6,1      | 2,7      | 8,2      | 18,4     | 27,1     | 31,7        | 2,7            |
| T89-07                        | 5,8      | 2,5      | 9,2      | 15,9     | 24,2     | 31,7        | 2,6            |
| T89-08                        | 3,9      | 2,1      |          | 16,1     | 22,0     | 29,2        | 2,6            |
| T89-09                        | 6,9      | 3,1      |          | 20,7     | 30,7     | 30,3        | 2,5            |
| T89-10                        | 5,5      | 2,5      | 10,3     | 16,6     | 24,6     | 36,9        | 2,6            |
| T89-11                        | 6,9      | 3,0      |          | 17,9     | 27,8     | 34,0        | 3,0            |
| T89-12                        | 6,6      | 3,0      |          | 15,2     | 24,8     | 31,9        | 2,8            |
| T89-13                        | 5,9      | 2,2      |          | 15,0     | 23,1     | 39,6        | 2,4            |
| T89-14                        | 3,4      | 1,7      |          | 13,2     | 18,3     | 32,7        | 2,5            |
| T89-15                        | 4,6      | 2,0      |          | 14,9     | 21,6     | 33,4        | 2,7            |
| T89-16                        | 6,1      | 2,7      |          | 17,7     | 26,4     | 31,8        | 2,6            |
| T89-17                        | 4,4      | 2,1      |          | 15,9     | 22,4     | 31,5        | 2,6            |
| T89-18                        | 5,6      | 2,6      |          | 15,0     | 23,3     | 32,7        | 2,7            |
| T89-19                        | 6,2      | 2,7      |          | 18,4     | 27,3     | 33,6        | 2,5            |
| T89-20                        | 5,9      | 2,7      | 8,4      | 16,5     | 25,2     | 35,9        | 2,7            |
| T89-21                        | 6,9      | 2,8      |          | 17,8     | 27,5     | 39,0        | 2,6            |
| T89-22                        | 5,4      | 2,2      |          | 13,7     | 21,3     | 37,9        | 2,7            |

|        |     |     |     |      |      |      |     |
|--------|-----|-----|-----|------|------|------|-----|
| T89-23 | 7,0 | 2,9 |     | 17,7 | 27,5 | 33,3 | 2,9 |
| T89-24 | 6,6 | 2,7 |     | 17,3 | 26,6 | 33,8 | 2,6 |
| T89-25 | 6,5 | 2,8 | 7,4 | 17,2 | 26,5 | 32,4 | 2,8 |
| T89-26 | 4,7 | 2,2 | 6,2 | 14,3 | 21,2 | 33,0 | 2,8 |
| T89-27 | 5,4 | 2,4 |     | 16,1 | 23,9 | 31,3 | 2,5 |
| T89-28 | 3,6 | 1,5 |     | 11,7 | 16,7 | 39,5 | 2,5 |
| T89-29 | 3,1 | 1,3 |     | 9,9  | 14,4 | 36,3 | 3,0 |
| T89-30 | 5,0 | 2,1 |     | 13,7 | 20,8 | 36,2 | 2,9 |
| T89-31 | 7,0 | 2,9 |     | 17,2 | 27,2 | 32,7 | 2,7 |
| T89-32 | 6,0 | 2,5 |     | 16,7 | 25,2 | 32,3 | 2,5 |

Table 4.15 contains the dry weight ratios of specified construction group relative to corresponding wildtype group of average stem, average bark, average root, average leaf and average TOTAL. Table 4.15 also show ratios of average SLA and average internode length of specified construction group relative to corresponding wildtype group.

Table 4.15

| Construction Group | Average Stem | Average Bark | Average Root | Average Leaf | Average TOTAL | Average SLA | Average Internode |
|--------------------|--------------|--------------|--------------|--------------|---------------|-------------|-------------------|
| TF0052rp1          | 1,07         | 1,20         |              | 1,03         | 1,05          | 0,99        | 1,05              |

Table 4.16 contains the dry weight ratios for specified construction group relative to corresponding wildtype group for maximum stem, maximum bark, maximum root, maximum leaf and maximum TOTAL.

Table 4.16

| Construction Group | Maximum Stem | Maximum Bark | Maximum Root | Maximum Leaf | Maximum TOTAL |
|--------------------|--------------|--------------|--------------|--------------|---------------|
| TF0052rp1          | 1,36         | 1,43         |              | 1,15         | 1,23          |

Table 4.17 contains dry weight ratios for specified construction group line relative to corresponding wildtype group of average stem, average bark, average root, average leaf and average TOTAL. Table 4.17 also show ratios of average SLA and average internode length of specified construction group line relative to corresponding wildtype group.

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Table 4.17

| Construction Group Line | Line Average Stem | Line Average Bark | Line Average Root | Line Average Leaf | Line Average TOTAL | Line Average SLA | Line Average Internode |
|-------------------------|-------------------|-------------------|-------------------|-------------------|--------------------|------------------|------------------------|
| TF0052rp1-2A            | 1,49              | 1,64              |                   | 1,32              | 1,38               | 0,99             | 1,12                   |
| TF0052rp1-2B            | 0,65              | 0,76              |                   | 0,73              | 0,71               | 1,00             | 0,97                   |

Construction group TF0076

This construct induce increase of biomass production. Dry weight measurements of the construction group show 16% increase of average stem, 11% increase of average bark, 4% increase of average leaf and 7% increase of average TOTAL compared to the

5 corresponding wildtype group. One of the construction group lines show 42% increase of average stem, 29% increase of average bark, 16% increase of average leaf and 23% increase of average TOTAL compared to the corresponding wildtype group. . For the line were root dry weight were measured an increase in the shot-root ratio were observed.

Table 4.18 contains dry weight data for specified construction group and corresponding

10 wild type group.

Table 4.18

| Construction Group Individual | Stem (g) | Bark (g) | Root (g) | Leaf (g) | TOTAL(g) | SLA (m2/kg) | Internode (cm) |
|-------------------------------|----------|----------|----------|----------|----------|-------------|----------------|
| TF0076rp2-3BB-1               | 5,8      | 2,7      |          | 15,7     | 24,2     | 32,9        | 3,0            |
| TF0076rp2-3BB-2               | 6,9      | 3,1      |          | 17,0     | 27,1     | 29,3        | 2,7            |
| TF0076rp2-3BB-3               | 8,0      | 3,5      |          | 23,1     | 34,6     | 33,0        | 2,8            |
| TF0076rp2-4B-1                | 7,9      | 3,2      | 7,8      | 19,6     | 30,6     | 33,1        | 2,6            |
| TF0076rp2-4B-2                | 7,5      | 3,2      | 7,7      | 18,0     | 28,7     | 35,4        | 2,7            |
| TF0076rp2-4B-3                | 8,7      | 3,1      | 8,1      | 17,9     | 29,6     | 37,3        | 2,3            |
| TF0076rp2-5BA-1               | 3,9      | 1,5      |          | 9,0      | 14,4     | 43,8        | 2,3            |
| TF0076rp2-5BA-2               | 6,6      | 2,7      |          | 14,7     | 23,9     | 36,8        | 2,8            |
| TF0076rp2-5BA-3               | 7,6      | 2,8      |          | 18,1     | 28,5     | 36,2        | 2,9            |
| TF0076rp2-5BB-1               | 5,4      | 2,2      |          | 14,9     | 22,4     | 39,2        | 3,0            |
| TF0076rp2-5BB-2               | 5,5      | 2,6      |          | 17,2     | 25,3     | 32,6        | 2,9            |
| TF0076rp2-5BB-3               | 5,4      | 2,1      |          | 12,8     | 20,2     | 28,5        | 2,5            |
| T89-01                        | 5,1      | 2,2      |          | 13,1     | 20,4     | 39,9        | 2,7            |
| T89-02                        |          |          |          | 13,8     | 28,4     | 36,3        | 2,6            |
| T89-03                        | 6,8      | 2,7      |          | 17,1     | 26,6     | 37,8        | 2,6            |
| T89-04                        | 6,9      | 2,7      |          | 17,3     | 27,0     | 37,1        | 2,4            |
| T89-05                        | 5,7      | 2,5      |          | 16,6     | 24,9     | 31,8        | 2,6            |
| T89-06                        | 6,1      | 2,7      | 8,2      | 18,4     | 27,1     | 31,7        | 2,7            |
| T89-07                        | 5,8      | 2,5      | 9,2      | 15,9     | 24,2     | 31,7        | 2,6            |
| T89-08                        | 3,9      | 2,1      |          | 16,1     | 22,0     | 29,2        | 2,6            |
| T89-09                        | 6,9      | 3,1      |          | 20,7     | 30,7     | 30,3        | 2,5            |
| T89-10                        | 5,5      | 2,5      | 10,3     | 16,6     | 24,6     | 36,9        | 2,6            |
| T89-11                        | 6,9      | 3,0      |          | 17,9     | 27,8     | 34,0        | 3,0            |
| T89-12                        | 6,6      | 3,0      |          | 15,2     | 24,8     | 31,9        | 2,8            |
| T89-13                        | 5,9      | 2,2      |          | 15,0     | 23,1     | 39,6        | 2,4            |

|        |     |     |     |      |      |      |     |
|--------|-----|-----|-----|------|------|------|-----|
| T89-14 | 3,4 | 1,7 |     | 13,2 | 18,3 | 32,7 | 2,5 |
| T89-15 | 4,6 | 2,0 |     | 14,9 | 21,6 | 33,4 | 2,7 |
| T89-16 | 6,1 | 2,7 |     | 17,7 | 26,4 | 31,8 | 2,6 |
| T89-17 | 4,4 | 2,1 |     | 15,9 | 22,4 | 31,5 | 2,6 |
| T89-18 | 5,6 | 2,6 |     | 15,0 | 23,3 | 32,7 | 2,7 |
| T89-19 | 6,2 | 2,7 |     | 18,4 | 27,3 | 33,6 | 2,5 |
| T89-20 | 5,9 | 2,7 | 8,4 | 16,5 | 25,2 | 35,9 | 2,7 |
| T89-21 | 6,9 | 2,8 |     | 17,8 | 27,5 | 39,0 | 2,6 |
| T89-22 | 5,4 | 2,2 |     | 13,7 | 21,3 | 37,9 | 2,7 |
| T89-23 | 7,0 | 2,9 |     | 17,7 | 27,5 | 33,3 | 2,9 |
| T89-24 | 6,6 | 2,7 |     | 17,3 | 26,6 | 33,8 | 2,6 |
| T89-25 | 6,5 | 2,8 | 7,4 | 17,2 | 26,5 | 32,4 | 2,8 |
| T89-26 | 4,7 | 2,2 | 6,2 | 14,3 | 21,2 | 33,0 | 2,8 |
| T89-27 | 5,4 | 2,4 |     | 16,1 | 23,9 | 31,3 | 2,5 |
| T89-28 | 3,6 | 1,5 |     | 11,7 | 16,7 | 39,5 | 2,5 |
| T89-29 | 3,1 | 1,3 |     | 9,9  | 14,4 | 36,3 | 3,0 |
| T89-30 | 5,0 | 2,1 |     | 13,7 | 20,8 | 36,2 | 2,9 |
| T89-31 | 7,0 | 2,9 |     | 17,2 | 27,2 | 32,7 | 2,7 |
| T89-32 | 6,0 | 2,5 |     | 16,7 | 25,2 | 32,3 | 2,5 |

Table 4.19 contains the dry weight ratios of specified construction group relative to corresponding wildtype group of average stem, average bark, average root, average leaf and average TOTAL. Table 4.19 also show ratios of average SLA and average internode length of specified construction group relative to corresponding wildtype group.

Table 4.19

| Construction Group | Average Stem | Average Bark | Average Root | Average Leaf | Average TOTAL | Average SLA | Average Internode |
|--------------------|--------------|--------------|--------------|--------------|---------------|-------------|-------------------|
| TF0076rp2          | 1,16         | 1,11         | 0,95         | 1,04         | 1,07          | 1,02        | 1,02              |

Table 4.20 contains the dry weight ratios for specified construction group relative to corresponding wildtype group for maximum stem, maximum bark, maximum root, maximum leaf and maximum TOTAL.

Table 4.20

| Construction<br>Group | Maximum<br>Stem | Maximum<br>Bark | Maximum<br>Root | Maximum<br>Leaf | Maximum<br>TOTAL |
|-----------------------|-----------------|-----------------|-----------------|-----------------|------------------|
| TF0076rp2             | 1,24            | 1,13            | 0,79            | 1,12            | 1,13             |

Table 4.21 contains dry weight ratios for specified construction group line relative to corresponding wildtype group of average stem, average bark, average root, average leaf and average TOTAL. Table 4.21 also show ratios of average SLA and average internode length of specified construction group line relative to corresponding wildtype group.

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Table 4.21

| Construction Group Line | Line Average Stem | Line Average Bark | Line Average Root | Line Average Leaf | Line Average TOTAL | Line Average SLA | Line Average Internode |
|-------------------------|-------------------|-------------------|-------------------|-------------------|--------------------|------------------|------------------------|
| TF0076rp2-3BB           | 1,22              | 1,27              |                   | 1,17              | 1,18               | 0,92             | 1,06                   |
| TF0076rp2-4B            | 1,42              | 1,29              | 0,95              | 1,16              | 1,23               | 1,03             | 0,96                   |
| TF0076rp2-5BA           | 1,06              | 0,94              |                   | 0,88              | 0,92               | 1,14             | 1,00                   |
| TF0076rp2-5BB           | 0,95              | 0,94              |                   | 0,94              | 0,94               | 0,98             | 1,06                   |

Construction group TF0097

This construct induce increase of biomass production. Dry weight measurements of the construction group show 74% increase of average stem, 82% increase of average bark, 28% increase of average leaf and 43% increase of average TOTAL compared to the corresponding wildtype group. One of the construction group lines show 136% increase of average stem, 141% increase of average bark, 63% increase of average leaf and 87% increase of average TOTAL compared to the corresponding wildtype group. . For the line were root dry weight were measured an increase in the shot-root ratio were observed.

Table 4.22 contains dry weight data for specified construction group and corresponding wild type group.

Table 4.22

| Construction Group Individual | Stem (g) | Bark (g) | Root (g) | Leaf (g) | TOTAL(g) | SLA (m2/kg) | Internode (cm) |
|-------------------------------|----------|----------|----------|----------|----------|-------------|----------------|
| TF0097rp1-1A-1                | 12,2     | 5,5      |          | 21,8     | 39,4     | 27,1        | 3,6            |
| TF0097rp1-1A-2                | 11,1     | 5,3      |          | 18,3     | 34,7     | 28,6        | 3,8            |
| TF0097rp1-1A-3                | 8,3      | 4,1      |          | 16,6     | 29,0     | 28,2        | 3,6            |
| TF0097rp1-2A-1                | 9,1      | 3,3      |          | 21,9     | 34,3     | 35,5        | 2,6            |
| TF0097rp1-2A-2                | 9,4      | 3,8      |          | 23,8     | 37,0     | 33,6        | 2,7            |
| TF0097rp1-2A-3                | 8,2      | 3,2      |          | 21,0     | 32,4     | 30,6        | 2,7            |
| TF0097rp1-2B-1                | 5,7      | 3,8      |          | 13,4     | 22,8     | 20,5        | 3,1            |
| TF0097rp1-2B-2                | 10,5     | 5,3      |          | 21,6     | 37,4     | 25,2        | 3,8            |
| TF0097rp1-2B-3                | 14,2     | 6,1      |          | 27,9     | 48,1     | 25,1        | 3,3            |
| TF0097rp1-3A-1                | 15,3     | 7,2      |          | 28,9     | 51,4     | 28,5        | 3,6            |
| TF0097rp1-3A-2                | 10,1     | 4,0      | 6,3      | 20,7     | 34,7     | 33,2        | 3,7            |
| TF0097rp1-3A-3                | 14,6     | 6,6      | 11,3     | 28,2     | 49,4     | 27,0        | 3,6            |
| TF0097rp1-4A-1                | 4,3      | 2,2      |          | 8,9      | 15,4     | 27,9        | 2,8            |
| TF0097rp1-4A-2                | 5,1      | 2,5      |          | 13,1     | 20,6     | 28,7        | 3,5            |
| TF0097rp1-4A-3                | 9,4      | 4,3      |          | 18,6     | 32,4     | 26,5        | 3,6            |
| T89-01                        | 5,1      | 2,2      |          | 13,1     | 20,4     | 39,9        | 2,7            |
| T89-02                        |          |          |          | 13,8     | 28,4     | 36,3        | 2,6            |
| T89-03                        | 6,8      | 2,7      |          | 17,1     | 26,6     | 37,8        | 2,6            |
| T89-04                        | 6,9      | 2,7      |          | 17,3     | 27,0     | 37,1        | 2,4            |
| T89-05                        | 5,7      | 2,5      |          | 16,6     | 24,9     | 31,8        | 2,6            |
| T89-06                        | 6,1      | 2,7      | 8,2      | 18,4     | 27,1     | 31,7        | 2,7            |
| T89-07                        | 5,8      | 2,5      | 9,2      | 15,9     | 24,2     | 31,7        | 2,6            |
| T89-08                        | 3,9      | 2,1      |          | 16,1     | 22,0     | 29,2        | 2,6            |
| T89-09                        | 6,9      | 3,1      |          | 20,7     | 30,7     | 30,3        | 2,5            |
| T89-10                        | 5,5      | 2,5      | 10,3     | 16,6     | 24,6     | 36,9        | 2,6            |

|        |     |     |     |      |      |      |     |
|--------|-----|-----|-----|------|------|------|-----|
| T89-11 | 6,9 | 3,0 |     | 17,9 | 27,8 | 34,0 | 3,0 |
| T89-12 | 6,6 | 3,0 |     | 15,2 | 24,8 | 31,9 | 2,8 |
| T89-13 | 5,9 | 2,2 |     | 15,0 | 23,1 | 39,6 | 2,4 |
| T89-14 | 3,4 | 1,7 |     | 13,2 | 18,3 | 32,7 | 2,5 |
| T89-15 | 4,6 | 2,0 |     | 14,9 | 21,6 | 33,4 | 2,7 |
| T89-16 | 6,1 | 2,7 |     | 17,7 | 26,4 | 31,8 | 2,6 |
| T89-17 | 4,4 | 2,1 |     | 15,9 | 22,4 | 31,5 | 2,6 |
| T89-18 | 5,6 | 2,6 |     | 15,0 | 23,3 | 32,7 | 2,7 |
| T89-19 | 6,2 | 2,7 |     | 18,4 | 27,3 | 33,6 | 2,5 |
| T89-20 | 5,9 | 2,7 | 8,4 | 16,5 | 25,2 | 35,9 | 2,7 |
| T89-21 | 6,9 | 2,8 |     | 17,8 | 27,5 | 39,0 | 2,6 |
| T89-22 | 5,4 | 2,2 |     | 13,7 | 21,3 | 37,9 | 2,7 |
| T89-23 | 7,0 | 2,9 |     | 17,7 | 27,5 | 33,3 | 2,9 |
| T89-24 | 6,6 | 2,7 |     | 17,3 | 26,6 | 33,8 | 2,6 |
| T89-25 | 6,5 | 2,8 | 7,4 | 17,2 | 26,5 | 32,4 | 2,8 |
| T89-26 | 4,7 | 2,2 | 6,2 | 14,3 | 21,2 | 33,0 | 2,8 |
| T89-27 | 5,4 | 2,4 |     | 16,1 | 23,9 | 31,3 | 2,5 |
| T89-28 | 3,6 | 1,5 |     | 11,7 | 16,7 | 39,5 | 2,5 |
| T89-29 | 3,1 | 1,3 |     | 9,9  | 14,4 | 36,3 | 3,0 |
| T89-30 | 5,0 | 2,1 |     | 13,7 | 20,8 | 36,2 | 2,9 |
| T89-31 | 7,0 | 2,9 |     | 17,2 | 27,2 | 32,7 | 2,7 |
| T89-32 | 6,0 | 2,5 |     | 16,7 | 25,2 | 32,3 | 2,5 |

Table 4.23 contains the dry weight ratios of specified construction group relative to corresponding wildtype group of average stem, average bark, average root, average leaf and average TOTAL. Table 4.23 also show ratios of average SLA and average internode length of specified construction group relative to corresponding wildtype group.

Table 4.23

| Construction Group | Average Stem | Average Bark | Average Root | Average Leaf | Average TOTAL | Average SLA | Average Internode |
|--------------------|--------------|--------------|--------------|--------------|---------------|-------------|-------------------|
| TF0097rp1          | 1,74         | 1,82         | 1,07         | 1,28         | 1,43          | 0,83        | 1,25              |

Table 4.24 contains the dry weight ratios for specified construction group relative to corresponding wildtype group for maximum stem, maximum bark, maximum root, maximum leaf and maximum TOTAL.

Table 4.24

| Construction<br>Group | Maximum<br>Stem | Maximum<br>Bark | Maximum<br>Root | Maximum<br>Leaf | Maximum<br>TOTAL |
|-----------------------|-----------------|-----------------|-----------------|-----------------|------------------|
| TF0097rp1             | 2,19            | 2,31            | 1,10            | 1,40            | 1,68             |

Table 4.25 contains dry weight ratios for specified construction group line relative to corresponding wildtype group of average stem, average bark, average root, average leaf and average TOTAL. Table 4.25 also show ratios of average SLA and average internode length of specified construction group line relative to corresponding wildtype group.

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Table 4.25

| Construction Group Line | Line Average Stem | Line Average Bark | Line Average Root | Line Average Leaf | Line Average TOTAL | Line Average SLA | Line Average Internode |
|-------------------------|-------------------|-------------------|-------------------|-------------------|--------------------|------------------|------------------------|
| TF0097rp1-1A            | 1,86              | 2,02              |                   | 1,19              | 1,42               | 0,82             | 1,37                   |
| TF0097rp1-2A            | 1,58              | 1,41              |                   | 1,40              | 1,43               | 0,97             | 1,00                   |
| TF0097rp1-2B            | 1,79              | 2,06              |                   | 1,32              | 1,49               | 0,69             | 1,29                   |
| TF0097rp1-3A            | 2,36              | 2,41              | 1,07              | 1,63              | 1,87               | 0,86             | 1,36                   |
| TF0097rp1-4A            | 1,11              | 1,22              |                   | 0,85              | 0,94               | 0,81             | 1,25                   |

Construction group TF0109

This construct induce increase of biomass production. Dry weight measurements of the construction group show 57% increase of average stem, 56% increase of average bark, 34% increase of average leaf and 40% increase of average TOTAL compared to the corresponding wildtype group. One of the construction group lines show 82% increase of average stem, 62% increase of average bark, 10% increase of average leaf and 31% increase of average TOTAL compared to the corresponding wildtype group. . For the line were root dry weight were measured an increase in the shot-root ratio were observed.

Table 4.26 contains dry weight data for specified construction group and corresponding wild type group.

Table 4.26

| Construction Group Individual | Stem (g) | Bark (g) | Root (g) | Leaf (g) | TOTAL(g) | SLA (m2/kg) | Internode (cm) |
|-------------------------------|----------|----------|----------|----------|----------|-------------|----------------|
| TF0109rp1-2A-1                | 10,5     | 4,2      |          | 25,5     | 40,2     | 29,0        | 2,8            |
| TF0109rp1-2A-2                | 7,5      | 3,2      |          | 19,0     | 29,7     | 31,9        | 3,0            |
| TF0109rp1-2A-3                | 7,7      | 3,3      |          | 21,9     | 32,9     | 30,4        | 2,7            |
| TF0109rp1-2B-1                | 8,6      | 4,1      | 6,2      | 16,3     | 29,1     | 29,9        | 4,0            |
| TF0109rp1-2B-2                | 11,4     | 4,3      | 6,5      | 19,8     | 35,5     | 32,6        | 3,9            |
| TF0109rp1-2B-3                | 10,9     | 3,5      | 7,5      | 16,3     | 30,7     | 36,2        | 3,1            |
| TF0109rp1-3B-1                | 9,0      | 3,9      |          | 21,4     | 34,3     | 38,5        | 2,8            |
| TF0109rp1-3B-2                | 8,1      | 3,6      |          | 19,8     | 31,5     | 34,1        | 2,8            |
| TF0109rp1-3B-3                | 8,6      | 3,6      |          | 22,0     | 34,1     | 31,6        | 2,9            |
| TF0109rp1-4A-1                | 8,0      | 3,9      |          | 24,1     | 36,0     | 27,5        | 3,3            |
| TF0109rp1-4A-2                | 8,3      | 4,0      |          | 24,6     | 37,0     | 33,3        | 3,1            |
| TF0109rp1-4A-3                | 7,8      | 4,3      |          | 24,2     | 36,3     | 27,3        | 3,1            |
| T89-01                        | 5,1      | 2,2      |          | 13,1     | 20,4     | 39,9        | 2,7            |
| T89-02                        |          |          |          | 13,8     | 28,4     | 36,3        | 2,6            |
| T89-03                        | 6,8      | 2,7      |          | 17,1     | 26,6     | 37,8        | 2,6            |
| T89-04                        | 6,9      | 2,7      |          | 17,3     | 27,0     | 37,1        | 2,4            |
| T89-05                        | 5,7      | 2,5      |          | 16,6     | 24,9     | 31,8        | 2,6            |
| T89-06                        | 6,1      | 2,7      | 8,2      | 18,4     | 27,1     | 31,7        | 2,7            |
| T89-07                        | 5,8      | 2,5      | 9,2      | 15,9     | 24,2     | 31,7        | 2,6            |
| T89-08                        | 3,9      | 2,1      |          | 16,1     | 22,0     | 29,2        | 2,6            |
| T89-09                        | 6,9      | 3,1      |          | 20,7     | 30,7     | 30,3        | 2,5            |
| T89-10                        | 5,5      | 2,5      | 10,3     | 16,6     | 24,6     | 36,9        | 2,6            |
| T89-11                        | 6,9      | 3,0      |          | 17,9     | 27,8     | 34,0        | 3,0            |
| T89-12                        | 6,6      | 3,0      |          | 15,2     | 24,8     | 31,9        | 2,8            |
| T89-13                        | 5,9      | 2,2      |          | 15,0     | 23,1     | 39,6        | 2,4            |

|        |     |     |     |      |      |      |     |
|--------|-----|-----|-----|------|------|------|-----|
| T89-14 | 3,4 | 1,7 |     | 13,2 | 18,3 | 32,7 | 2,5 |
| T89-15 | 4,6 | 2,0 |     | 14,9 | 21,6 | 33,4 | 2,7 |
| T89-16 | 6,1 | 2,7 |     | 17,7 | 26,4 | 31,8 | 2,6 |
| T89-17 | 4,4 | 2,1 |     | 15,9 | 22,4 | 31,5 | 2,6 |
| T89-18 | 5,6 | 2,6 |     | 15,0 | 23,3 | 32,7 | 2,7 |
| T89-19 | 6,2 | 2,7 |     | 18,4 | 27,3 | 33,6 | 2,5 |
| T89-20 | 5,9 | 2,7 | 8,4 | 16,5 | 25,2 | 35,9 | 2,7 |
| T89-21 | 6,9 | 2,8 |     | 17,8 | 27,5 | 39,0 | 2,6 |
| T89-22 | 5,4 | 2,2 |     | 13,7 | 21,3 | 37,9 | 2,7 |
| T89-23 | 7,0 | 2,9 |     | 17,7 | 27,5 | 33,3 | 2,9 |
| T89-24 | 6,6 | 2,7 |     | 17,3 | 26,6 | 33,8 | 2,6 |
| T89-25 | 6,5 | 2,8 | 7,4 | 17,2 | 26,5 | 32,4 | 2,8 |
| T89-26 | 4,7 | 2,2 | 6,2 | 14,3 | 21,2 | 33,0 | 2,8 |
| T89-27 | 5,4 | 2,4 |     | 16,1 | 23,9 | 31,3 | 2,5 |
| T89-28 | 3,6 | 1,5 |     | 11,7 | 16,7 | 39,5 | 2,5 |
| T89-29 | 3,1 | 1,3 |     | 9,9  | 14,4 | 36,3 | 3,0 |
| T89-30 | 5,0 | 2,1 |     | 13,7 | 20,8 | 36,2 | 2,9 |
| T89-31 | 7,0 | 2,9 |     | 17,2 | 27,2 | 32,7 | 2,7 |
| T89-32 | 6,0 | 2,5 |     | 16,7 | 25,2 | 32,3 | 2,5 |

Table 4.27 contains the dry weight ratios of specified construction group relative to corresponding wildtype group of average stem, average bark, average root, average leaf and average TOTAL. Table 4.27 also show ratios of average SLA and average internode length of specified construction group relative to corresponding wildtype group.

Table 4.27

| Construction Group | Average Stem | Average Bark | Average Root | Average Leaf | Average TOTAL | Average SLA | Average Internode |
|--------------------|--------------|--------------|--------------|--------------|---------------|-------------|-------------------|
| TF0109rp1          | 1,57         | 1,56         | 0,81         | 1,34         | 1,40          | 0,93        | 1,18              |

Table 4.28 contains the dry weight ratios for specified construction group relative to corresponding wildtype group for maximum stem, maximum bark, maximum root, maximum leaf and maximum TOTAL.

Table 4.28

| Construction Group | Maximum Stem | Maximum Bark | Maximum Root | Maximum Leaf | Maximum TOTAL |
|--------------------|--------------|--------------|--------------|--------------|---------------|
| TF0109rp1          | 1,63         | 1,39         | 0,74         | 1,23         | 1,31          |

Table 4.29 contains dry weight ratios for specified construction group line relative to corresponding wildtype group of average stem, average bark, average root, average leaf and average TOTAL. Table 4.29 also show ratios of average SLA and average internode length of specified construction group line relative to corresponding wildtype group.

5

Table 4.29

| Construction Group Line | Line Average Stem | Line Average Bark | Line Average Root | Line Average Leaf | Line Average TOTAL | Line Average SLA | Line Average Internode |
|-------------------------|-------------------|-------------------|-------------------|-------------------|--------------------|------------------|------------------------|
| TF0109rp1-2A            | 1,51              | 1,45              |                   | 1,39              | 1,41               | 0,89             | 1,06                   |
| TF0109rp1-2B            | 1,82              | 1,62              | 0,81              | 1,10              | 1,31               | 0,96             | 1,39                   |
| TF0109rp1-3B            | 1,51              | 1,51              |                   | 1,32              | 1,38               | 1,01             | 1,07                   |
| TF0109rp1-4A            | 1,42              | 1,66              |                   | 1,53              | 1,50               | 0,86             | 1,19                   |

Construction group TFSTT019

This construct induce increase of biomass production. Dry weight measurements of one of the construction group lines show 19% increase of average stem, 12% increase of average bark, 10% increase of average leaf and 11% increase of average TOTAL

- 5 compared to the corresponding wildtype group. This gene also gives an increased SLA in many lines, which in many cases are coupled to efficient growth.

Table 4.30 contains dry weight data for specified construction group and corresponding wild type group.

10 Table 4.30

| Construction Group Individual | Stem (g) | Bark (g) | Root (g) | Leaf (g) | TOTAL(g) | SLA (m <sup>2</sup> /kg) | Internode (cm) |
|-------------------------------|----------|----------|----------|----------|----------|--------------------------|----------------|
| TFSTT019rp1-2A-1              | 5,1      | 2,1      |          | 15,0     | 22,2     | 39,0                     | 2,5            |
| TFSTT019rp1-2A-2              |          |          |          | 18,7     | 18,7     | 35,4                     | 2,7            |
| TFSTT019rp1-2A-3              | 5,8      | 2,5      |          | 16,9     | 25,1     | 40,0                     | 2,6            |
| TFSTT019rp1-3A-1              | 6,3      | 2,6      |          | 18,6     | 27,5     | 41,1                     | 2,6            |
| TFSTT019rp1-3A-2              | 2,2      | 1,2      |          | 11,2     | 14,5     | 30,9                     | 2,1            |
| TFSTT019rp1-3A-3              | 9,0      | 3,4      |          | 22,9     | 35,3     | 33,1                     | 2,7            |
| TFSTT019rp1-4BA-1             | 5,9      | 2,4      |          | 15,7     | 24,0     | 35,5                     | 2,6            |
| TFSTT019rp1-4BA-2             | 7,6      | 3,1      |          | 19,3     | 29,9     | 35,8                     | 2,6            |
| TFSTT019rp1-4BA-3             |          |          |          |          |          |                          |                |
| TFSTT019rp1-4BB-1             | 6,0      | 2,5      |          | 15,9     | 24,4     | 40,4                     | 2,6            |
| TFSTT019rp1-4BB-2             | 5,7      | 2,4      |          | 17,6     | 25,6     | 40,0                     | 2,2            |
| TFSTT019rp1-4BB-3             | 6,0      | 2,3      |          | 16,4     | 24,7     | 39,9                     | 2,5            |
| T89-01                        | 5,1      | 2,2      |          | 13,1     | 20,4     | 39,9                     | 2,7            |
| T89-02                        |          |          |          | 13,8     | 28,4     | 36,3                     | 2,6            |
| T89-03                        | 6,8      | 2,7      |          | 17,1     | 26,6     | 37,8                     | 2,6            |
| T89-04                        | 6,9      | 2,7      |          | 17,3     | 27,0     | 37,1                     | 2,4            |
| T89-05                        | 5,7      | 2,5      |          | 16,6     | 24,9     | 31,8                     | 2,6            |
| T89-06                        | 6,1      | 2,7      | 8,2      | 18,4     | 27,1     | 31,7                     | 2,7            |
| T89-07                        | 5,8      | 2,5      | 9,2      | 15,9     | 24,2     | 31,7                     | 2,6            |
| T89-08                        | 3,9      | 2,1      |          | 16,1     | 22,0     | 29,2                     | 2,6            |
| T89-09                        | 6,9      | 3,1      |          | 20,7     | 30,7     | 30,3                     | 2,5            |
| T89-10                        | 5,5      | 2,5      | 10,3     | 16,6     | 24,6     | 36,9                     | 2,6            |
| T89-11                        | 6,9      | 3,0      |          | 17,9     | 27,8     | 34,0                     | 3,0            |
| T89-12                        | 6,6      | 3,0      |          | 15,2     | 24,8     | 31,9                     | 2,8            |
| T89-13                        | 5,9      | 2,2      |          | 15,0     | 23,1     | 39,6                     | 2,4            |
| T89-14                        | 3,4      | 1,7      |          | 13,2     | 18,3     | 32,7                     | 2,5            |
| T89-15                        | 4,6      | 2,0      |          | 14,9     | 21,6     | 33,4                     | 2,7            |

|        |     |     |     |      |      |      |     |
|--------|-----|-----|-----|------|------|------|-----|
| T89-16 | 6,1 | 2,7 |     | 17,7 | 26,4 | 31,8 | 2,6 |
| T89-17 | 4,4 | 2,1 |     | 15,9 | 22,4 | 31,5 | 2,6 |
| T89-18 | 5,6 | 2,6 |     | 15,0 | 23,3 | 32,7 | 2,7 |
| T89-19 | 6,2 | 2,7 |     | 18,4 | 27,3 | 33,6 | 2,5 |
| T89-20 | 5,9 | 2,7 | 8,4 | 16,5 | 25,2 | 35,9 | 2,7 |
| T89-21 | 6,9 | 2,8 |     | 17,8 | 27,5 | 39,0 | 2,6 |
| T89-22 | 5,4 | 2,2 |     | 13,7 | 21,3 | 37,9 | 2,7 |
| T89-23 | 7,0 | 2,9 |     | 17,7 | 27,5 | 33,3 | 2,9 |
| T89-24 | 6,6 | 2,7 |     | 17,3 | 26,6 | 33,8 | 2,6 |
| T89-25 | 6,5 | 2,8 | 7,4 | 17,2 | 26,5 | 32,4 | 2,8 |
| T89-26 | 4,7 | 2,2 | 6,2 | 14,3 | 21,2 | 33,0 | 2,8 |
| T89-27 | 5,4 | 2,4 |     | 16,1 | 23,9 | 31,3 | 2,5 |
| T89-28 | 3,6 | 1,5 |     | 11,7 | 16,7 | 39,5 | 2,5 |
| T89-29 | 3,1 | 1,3 |     | 9,9  | 14,4 | 36,3 | 3,0 |
| T89-30 | 5,0 | 2,1 |     | 13,7 | 20,8 | 36,2 | 2,9 |
| T89-31 | 7,0 | 2,9 |     | 17,2 | 27,2 | 32,7 | 2,7 |
| T89-32 | 6,0 | 2,5 |     | 16,7 | 25,2 | 32,3 | 2,5 |

Table 4.31 contains the dry weight ratios of specified construction group relative to corresponding wildtype group of average stem, average bark, average root, average leaf and average TOTAL. Table 4.31 also show ratios of average SLA and average internode length of specified construction group relative to corresponding wildtype group.

Table 4.31

| Construction Group | Average Stem | Average Bark | Average Root | Average Leaf | Average TOTAL | Average SLA | Average Internode |
|--------------------|--------------|--------------|--------------|--------------|---------------|-------------|-------------------|
| TFSTT019rp1        | 1,05         | 1,00         |              | 1,08         | 1,02          | 1,09        | 0,95              |

Table 4.32 contains the dry weight ratios for specified construction group relative to corresponding wildtype group for maximum stem, maximum bark, maximum root, maximum leaf and maximum TOTAL.

Table 4.32

| Construction Group | Maximum Stem | Maximum Bark | Maximum Root | Maximum Leaf | Maximum TOTAL |
|--------------------|--------------|--------------|--------------|--------------|---------------|
| TFSTT019rp1        | 1,28         | 1,10         |              | 1,11         | 1,15          |

Table 4.33 contains dry weight ratios for specified construction group line relative to corresponding wildtype group of average stem, average bark, average root, average leaf and average TOTAL. Table 4.33 also show ratios of average SLA and average internode length of specified construction group line relative to corresponding wildtype group.

Table 4.33

| Construction Group Line | Line Average Stem | Line Average Bark | Line Average Root | Line Average Leaf | Line Average TOTAL | Line Average SLA | Line Average Internode |
|-------------------------|-------------------|-------------------|-------------------|-------------------|--------------------|------------------|------------------------|
| TFSTT019rp1-2A          | 0,97              | 0,93              |                   | 1,06              | 0,91               | 1,11             | 0,98                   |
| TFSTT019rp1-3A          | 1,03              | 0,98              |                   | 1,10              | 1,06               | 1,02             | 0,93                   |
| TFSTT019rp1-4BA         | 1,19              | 1,12              |                   | 1,10              | 1,11               | 1,04             | 0,97                   |
| TFSTT019rp1-4BB         | 1,04              | 0,98              |                   | 1,05              | 1,03               | 1,17             | 0,91                   |

Construction group TFSTT051

This construct induce increase of biomass production. Dry weight measurements of one of the construction group lines show 22% increase of average stem, 30% increase of average bark, 29% increase of average leaf and 26% increase of average TOTAL

5 compared to the corresponding wildtype group.

Table 4.34 contains dry weight data for specified construction group and corresponding wild type group.

Table 4.34

| Construction Group Individual | Stem (g) | Bark (g) | Root (g) | Leaf (g) | TOTAL(g) | SLA (m2/kg) | Internode (cm) |
|-------------------------------|----------|----------|----------|----------|----------|-------------|----------------|
| TFSTT051rp1-3B-1              | 4,6      | 2,4      |          | 12,4     | 19,4     | 24,6        | 2,1            |
| TFSTT051rp1-3B-2              | 4,0      | 2,3      |          | 11,4     | 17,6     | 24,1        | 2,0            |
| TFSTT051rp1-3B-3              | 4,6      | 2,6      |          | 13,1     | 20,3     | 22,5        | 2,0            |
| TFSTT051rp1-4A-1              | 6,7      | 2,9      |          | 20,1     | 29,7     | 30,5        | 2,9            |
| TFSTT051rp1-4A-2              | 6,1      | 2,9      |          | 18,5     | 27,4     | 33,3        | 2,8            |
| TFSTT051rp1-4A-3              | 8,0      | 3,7      |          | 22,9     | 34,6     | 31,8        | 2,5            |
| T89-01                        | 5,1      | 2,2      |          | 13,1     | 20,4     | 39,9        | 2,7            |
| T89-02                        |          |          |          | 13,8     | 28,4     | 36,3        | 2,6            |
| T89-03                        | 6,8      | 2,7      |          | 17,1     | 26,6     | 37,8        | 2,6            |
| T89-04                        | 6,9      | 2,7      |          | 17,3     | 27,0     | 37,1        | 2,4            |
| T89-05                        | 5,7      | 2,5      |          | 16,6     | 24,9     | 31,8        | 2,6            |
| T89-06                        | 6,1      | 2,7      | 8,2      | 18,4     | 27,1     | 31,7        | 2,7            |
| T89-07                        | 5,8      | 2,5      | 9,2      | 15,9     | 24,2     | 31,7        | 2,6            |
| T89-08                        | 3,9      | 2,1      |          | 16,1     | 22,0     | 29,2        | 2,6            |
| T89-09                        | 6,9      | 3,1      |          | 20,7     | 30,7     | 30,3        | 2,5            |
| T89-10                        | 5,5      | 2,5      | 10,3     | 16,6     | 24,6     | 36,9        | 2,6            |
| T89-11                        | 6,9      | 3,0      |          | 17,9     | 27,8     | 34,0        | 3,0            |
| T89-12                        | 6,6      | 3,0      |          | 15,2     | 24,8     | 31,9        | 2,8            |
| T89-13                        | 5,9      | 2,2      |          | 15,0     | 23,1     | 39,6        | 2,4            |
| T89-14                        | 3,4      | 1,7      |          | 13,2     | 18,3     | 32,7        | 2,5            |
| T89-15                        | 4,6      | 2,0      |          | 14,9     | 21,6     | 33,4        | 2,7            |
| T89-16                        | 6,1      | 2,7      |          | 17,7     | 26,4     | 31,8        | 2,6            |
| T89-17                        | 4,4      | 2,1      |          | 15,9     | 22,4     | 31,5        | 2,6            |
| T89-18                        | 5,6      | 2,6      |          | 15,0     | 23,3     | 32,7        | 2,7            |
| T89-19                        | 6,2      | 2,7      |          | 18,4     | 27,3     | 33,6        | 2,5            |
| T89-20                        | 5,9      | 2,7      | 8,4      | 16,5     | 25,2     | 35,9        | 2,7            |
| T89-21                        | 6,9      | 2,8      |          | 17,8     | 27,5     | 39,0        | 2,6            |
| T89-22                        | 5,4      | 2,2      |          | 13,7     | 21,3     | 37,9        | 2,7            |

|        |     |     |     |      |      |      |     |
|--------|-----|-----|-----|------|------|------|-----|
| T89-23 | 7,0 | 2,9 |     | 17,7 | 27,5 | 33,3 | 2,9 |
| T89-24 | 6,6 | 2,7 |     | 17,3 | 26,6 | 33,8 | 2,6 |
| T89-25 | 6,5 | 2,8 | 7,4 | 17,2 | 26,5 | 32,4 | 2,8 |
| T89-26 | 4,7 | 2,2 | 6,2 | 14,3 | 21,2 | 33,0 | 2,8 |
| T89-27 | 5,4 | 2,4 |     | 16,1 | 23,9 | 31,3 | 2,5 |
| T89-28 | 3,6 | 1,5 |     | 11,7 | 16,7 | 39,5 | 2,5 |
| T89-29 | 3,1 | 1,3 |     | 9,9  | 14,4 | 36,3 | 3,0 |
| T89-30 | 5,0 | 2,1 |     | 13,7 | 20,8 | 36,2 | 2,9 |
| T89-31 | 7,0 | 2,9 |     | 17,2 | 27,2 | 32,7 | 2,7 |
| T89-32 | 6,0 | 2,5 |     | 16,7 | 25,2 | 32,3 | 2,5 |

Table 4.35 contains the dry weight ratios of specified construction group relative to corresponding wildtype group of average stem, average bark, average root, average leaf and average TOTAL. Table 4.35 also show ratios of average SLA and average internode length of specified construction group relative to corresponding wildtype group.

Table 4.35

| Construction Group | Average Stem | Average Bark | Average Root | Average Leaf | Average TOTAL | Average SLA | Average Internode |
|--------------------|--------------|--------------|--------------|--------------|---------------|-------------|-------------------|
| TFSTT051rp1        | 1,00         | 1,15         |              | 1,03         | 1,03          | 0,81        | 0,90              |

Table 4.36 contains the dry weight ratios for specified construction group relative to corresponding wildtype group for maximum stem, maximum bark, maximum root, maximum leaf and maximum TOTAL.

Table 4.36

| Construction Group | Maximum Stem | Maximum Bark | Maximum Root | Maximum Leaf | Maximum TOTAL |
|--------------------|--------------|--------------|--------------|--------------|---------------|
| TFSTT051rp1        | 1,15         | 1,20         |              | 1,11         | 1,13          |

Table 4.37 contains dry weight ratios for specified construction group line relative to corresponding wildtype group of average stem, average bark, average root, average leaf and average TOTAL. Table 4.37 also show ratios of average SLA and average internode length of specified construction group line relative to corresponding wildtype group.

5

Table 4.37

| Construction Group Line | Line Average Stem | Line Average Bark | Line Average Root | Line Average Leaf | Line Average TOTAL | Line Average SLA | Line Average Internode |
|-------------------------|-------------------|-------------------|-------------------|-------------------|--------------------|------------------|------------------------|
| TFSTT051rp1-3B          | 0,77              | 1,00              |                   | 0,77              | 0,79               | 0,69             | 0,76                   |
| TFSTT051rp1-4A          | 1,22              | 1,30              |                   | 1,29              | 1,26               | 0,93             | 1,04                   |

**Example 5**Density measurement

A 5cm long stem section (the segment between 36 cm and 41 cm from the soil) of each plant was stored in a freezer (-20°C) after harvest. Samples subjected to density measurement were first defrosted and debarked and then the central core was removed. The weight (w) was measured using a balance and the volume (v) was determined using the principle of Archimedes, the wood samples were pushed (using a needle) into a beaker (placed on a balance) with water and the increase in weight is equivalent to weight of the water pushed aside by the wood sample and since the density of water is (1 g/cm<sup>3</sup>) it is equivalent to the volume of the wood samples. The samples were then dried in oven for >48h at 45°C.

10 The dry weight (dw) were measured and the density (d) was calculated according to (1).

$$(1) d=dw/v$$

Samples for each construction are compared with wild type samples (T89) from the same cultivation round. Each construction must fulfil two criteria's to be seen as a construction group with altered density.

1. Significant differences in average density according to a t-test (p-value<0,01). The t-test is two sided and assuming unequal variance.
2. Two or more individuals outside (on the same side) a 95% confidence interval around the wild type population.

**Summary table density**

|            | <b>Average<br/>KR</b> | <b>Average<br/>T89</b> | <b>Average(KR)/<br/>Average(T89)</b> | <b>T-Test<br/>99%</b> | <b>Samples Above<br/>95% conf int</b> | <b>Signifcant<br/>change</b> |
|------------|-----------------------|------------------------|--------------------------------------|-----------------------|---------------------------------------|------------------------------|
| TF0002Rp2  | 0,335                 | 0,284                  | 1,179                                | Sign                  | 4                                     | YES                          |
| TF0003     | 0,291                 | 0,255                  | 1,140                                | Sign                  | 2                                     | YES                          |
| TF0011     | 0,314                 | 0,284                  | 1,106                                | Sign                  | 2                                     | YES                          |
| TF0013     | 0,252                 | 0,260                  | 0,970                                | Not sign              | 0                                     | NO                           |
| TF0045     | 0,306                 | 0,274                  | 1,117                                | Sign                  | 2                                     | YES                          |
| TF0052     | 0,302                 | 0,275                  | 1,099                                | Not sign              | 2                                     | NO                           |
| TF0065     | 0,273                 | 0,260                  | 1,051                                | Not sign              | 1                                     | NO                           |
| TF0076     | 0,267                 | 0,260                  | 1,027                                | Not sign              | 0                                     | NO                           |
| TF0076Rp2  | 0,285                 | 0,284                  | 1,002                                | Not sign              | 1                                     | NO                           |
| TF0096     | 0,307                 | 0,274                  | 1,121                                | Not sign              | 1                                     | NO                           |
| TF0097Rp1  | 0,314                 | 0,284                  | 1,107                                | Sign                  | 7                                     | YES                          |
| TF0104     | 0,284                 | 0,274                  | 1,036                                | Not sign              | 0                                     | NO                           |
| TF0109Rp1  | 0,286                 | 0,284                  | 1,007                                | Not sign              | 3                                     | NO*                          |
| TF0116     | 0,277                 | 0,275                  | 1,008                                | Not sign              | 0                                     | NO                           |
| TF0132.2nd | 0,294                 | 0,274                  | 1,071                                | Not sign              | 1                                     | NO                           |
| TF0132rp1  | 0,272                 | 0,255                  | 1,068                                | Sign                  | 4                                     | YES                          |
| TF0146     | 0,318                 | 0,274                  | 1,161                                | Sign                  | 3                                     | YES                          |
| TF0173     | 0,256                 | 0,254                  | 1,008                                | Not sign              | 0                                     | NO                           |
| TF0247     | 0,294                 | 0,274                  | 1,073                                | Not sign              | 1                                     | NO                           |
| TF0405     | 0,287                 | 0,274                  | 1,045                                | Not sign              | 0                                     | NO                           |
| TFSTT004   | 0,284                 | 0,275                  | 1,033                                | Not sign              | 0                                     | NO                           |
| TFSTT013   | 0,319                 | 0,284                  | 1,123                                | Sign                  | 2                                     | YES                          |
| TFSTT016   | 0,270                 | 0,275                  | 0,980                                | Not sign              | 0                                     | NO                           |
| TFSTT019   | 0,257                 | 0,260                  | 0,989                                | Not sign              | 0                                     | NO                           |
| TFSTT035   | 0,249                 | 0,260                  | 0,957                                | Not sign              | 0                                     | NO                           |
| TFSTT036   | 0,306                 | 0,274                  | 1,117                                | Sign                  | 2                                     | YES                          |
| TFSTT038   | 0,295                 | 0,275                  | 1,073                                | Not sign              | 0                                     | NO                           |
| TFSTT045   | 0,274                 | 0,274                  | 1,000                                | Not sign              | 1                                     | NO                           |
| TFSTT051   | 0,278                 | 0,275                  | 1,013                                | Not sign              | 0                                     | NO                           |

\*) The construction group TF0109 (Replant 1) does not fulfil the criteria for altered density, but the  
5 construction group lines; TF0109Rp1-2B (+18%) and TF0109Rp1-4A (-16%) do.

**Explanation of construction group summary tables density.**

All densities are given in g/cm<sup>3</sup>

|                        |                                                                                  |
|------------------------|----------------------------------------------------------------------------------|
| TFXXX                  |                                                                                  |
| Average TFXXX :        | Construction group average                                                       |
| Max TFXXX :            | Construction group max                                                           |
| Min TFXXX :            | Construction group min                                                           |
| Number of TFXXX :      | Number of sample for the group construction                                      |
| Number of TFXXX lines: | Number of lines (only shown when number of lines differs form number of samples) |

|                           |                                                                                                   |
|---------------------------|---------------------------------------------------------------------------------------------------|
| Average T89:              | Wild type average                                                                                 |
| Max T89:                  | Wild type max                                                                                     |
| Min T89:                  | Wild type min                                                                                     |
| Number of T89:            | Number of wild type samples                                                                       |
| Confidence interval (95%) | (Wild type mean) +/- (t <sub>table</sub> (2-tailed 95%)*Standard deviation for wild type samples) |

|                                  |                                                                    |
|----------------------------------|--------------------------------------------------------------------|
| T-test                           | T-test                                                             |
| Number of TFXXX > CI upper limit | Number TFXXX samples outside the confidence interval's upper limit |
| Number of TFXXX < CI lower limit | Number TFXXX samples outside the confidence interval's lower limit |
| Average (TFXXX)/Average(T89)     | Construction group average/<br>Wild type average                   |
| Max(TFXXX)/Max(T89)              | Construction group max/<br>Wild type max                           |

- 5 The following construction groups have not generated any data TF0089, TF0097, TF0109, TF0132 and TFSTT047.

**Construction group TF0002 (replant 2)**

Raw data TF002Rp2 density

| <b>TF0002Rp2</b>        | <b>Density</b>            |
|-------------------------|---------------------------|
| <i>Individual name:</i> | <i>(g/cm<sup>3</sup>)</i> |
| TF0002Rp2-1B-1          | 0,317                     |
| TF0002Rp2-1B-2          | 0,360                     |
| TF0002Rp2-1B-3          | 0,323                     |
| TF0002Rp2-2A-1          | 0,322                     |
| TF0002Rp2-2A-2          | 0,323                     |
| TF0002Rp2-2A-3          | 0,366                     |
| TF0002Rp2-3B-1          | 0,330                     |
| TF0002Rp2-3B-2          | 0,321                     |
| TF0002Rp2-3B-3          | 0,352                     |

Summary density TF002Rp2

|                            |       |
|----------------------------|-------|
| TF0002Rp2                  |       |
| Average TF0002Rp2 :        | 0,335 |
| Max TF0002Rp2 :            | 0,366 |
| Min TF0002Rp2 :            | 0,317 |
| Number of TF0002Rp2 :      | 9     |
| Number of TF0002Rp2 lines: | 3     |

|                           |                 |
|---------------------------|-----------------|
| Average T89:              | 0,284           |
| Max T89:                  | 0,338           |
| Min T89:                  | 0,252           |
| Number of T89:            | 32              |
| Confidence interval (95%) | 0,284 +/- 0,041 |

|                                  |           |
|----------------------------------|-----------|
| T-test                           | 4,066E-08 |
| Number of TF0002Rp2 > 0,325      | 4         |
| Number of TF0002Rp2 < 0,243      | 0         |
| Average (TF0002Rp2)/Average(T89) | 1,179     |
| Max(TF0002Rp2)/Max(T89)          | 1,083     |

5

TF0002Rp2 has significant higher density (according to criteria 1 and 2) (+18% in average) than corresponding T89 group. The density change (compared to T89) for the 3 construction group lines of TF0002Rp2 (3 individuals of each line), TF0002Rp2-1B (+17% in average), TF0002Rp2-2A (+19% in average) and TF0002Rp2-3B (+18 in average). Line TF0002Rp2-3B itself fulfils the criteria 1 and 2.

**Construction group TF0003**

Raw data TF0003 density

| <b>TF0003</b>           | <b>Density</b>            |
|-------------------------|---------------------------|
| <i>Individual name:</i> | <i>(g/cm<sup>3</sup>)</i> |
| TF0003-1A               | 0,318                     |
| TF0003-1B               | 0,323                     |
| TF0003-2A               | 0,242                     |
| TF0003-3A               |                           |
| TF0003-3B               |                           |
| TF0003-4A               |                           |
| TF0003-4B               | 0,282                     |

Summary density TF0003

|                         |       |
|-------------------------|-------|
| TF0003                  |       |
| Average TF0003 :        | 0,291 |
| Max TF0003 :            | 0,323 |
| Min TF0003 :            | 0,242 |
| Number of TF0003 :      | 4     |
| Number of TF0003 lines: |       |

|                           |                 |
|---------------------------|-----------------|
| Average T89:              | 0,255           |
| Max T89:                  | 0,313           |
| Min T89:                  | 0,221           |
| Number of T89:            | 39              |
| Confidence interval (95%) | 0,255 +/- 0,045 |

|                               |           |
|-------------------------------|-----------|
| T-test                        | 6,712E-03 |
| Number of TF0003 > 0,301      | 2         |
| Number of TF0003 < 0,21       | 0         |
| Average (TF0003)/Average(T89) | 1,140     |
| Max(TF0003)/Max(T89)          | 1,032     |

5

Construction group TF0003 has significant higher density (according to criteria 1 and 2) (+14% in average) than corresponding T89 group.

**Construction group TF0011**

Raw data TF0011 density

| <b>TF0011</b>           | <b>Density</b>            |
|-------------------------|---------------------------|
| <i>Individual name:</i> | <i>(g/cm<sup>3</sup>)</i> |
| TF0011-1A-1             | 0,308                     |
| TF0011-1A-2             | 0,360                     |
| TF0011-1B               | 0,264                     |
| TF0011-2A-1             | 0,337                     |
| TF0011-2A-2             | 0,298                     |
| TF0011-3A-1             | 0,326                     |
| TF0011-3A-2             | 0,350                     |
| TF0011-3B-1             | 0,333                     |
| TF0011-3B-2             | 0,303                     |
| TF0011-4A               | 0,261                     |

Summary density TF0011

|                         |       |
|-------------------------|-------|
| TF0011                  |       |
| Average TF0011 :        | 0,314 |
| Max TF0011 :            | 0,360 |
| Min TF0011 :            | 0,261 |
| Number of TF0011 :      | 10    |
| Number of TF0011 lines: |       |

|                           |                |
|---------------------------|----------------|
| Average T89:              | 0,284          |
| Max T89:                  | 0,361          |
| Min T89:                  | 0,222          |
| Number of T89:            | 41             |
| Confidence interval (95%) | 0,284 +/- 0,06 |

|                               |           |
|-------------------------------|-----------|
| T-test                        | 7,377E-03 |
| Number of TF0011 > 0,344      | 2         |
| Number of TF0011 < 0,224      | 0         |
| Average (TF0011)/Average(T89) | 1,106     |
| Max(TF0011)/Max(T89)          | 0,997     |

5

Construction group TF0011 has significant higher density (according to criteria 1 and 2) (+11% in average) than corresponding T89 group.

**Construction group TF0013**

Raw data TF0013 density

| <b>TF0013</b>           | Density                   |
|-------------------------|---------------------------|
| <i>Individual name:</i> | <i>(g/cm<sup>3</sup>)</i> |
| TF0013-1A-1             | 0,246                     |
| TF0013-1A-2             | 0,236                     |
| TF0013-2A               |                           |
| TF0013-2B               | 0,265                     |
| TF0013-3A               | 0,258                     |
| TF0013-3BA              | 0,254                     |
| TF0013-3BB              | 0,245                     |
| TF0013-4BA              | 0,258                     |
| TF0013-4BB              | 0,253                     |

Summary density TF0013

|                         |       |
|-------------------------|-------|
| TF0013                  |       |
| Average TF0013 :        | 0,252 |
| Max TF0013 :            | 0,265 |
| Min TF0013 :            | 0,236 |
| Number of TF0013 :      | 8     |
| Number of TF0013 lines: |       |

|                           |                |
|---------------------------|----------------|
| Average T89:              | 0,260          |
| Max T89:                  | 0,358          |
| Min T89:                  | 0,218          |
| Number of T89:            | 45             |
| Confidence interval (95%) | 0,26 +/- 0,049 |

|                               |           |
|-------------------------------|-----------|
| T-test                        | 3,760E-01 |
| Number of TF0013 > 0,309      | 0         |
| Number of TF0013 < 0,211      | 0         |
| Average (TF0013)/Average(T89) | 0,970     |
| Max(TF0013)/Max(T89)          | 0,740     |

5

Construction group TF0013 has no significant difference in density (according to criteria 1 and 2) compared with corresponding T89 group.

**Construction group TF0045**

Raw data TF0045 density

| <b>TF0045</b>           | <b>Density</b>            |
|-------------------------|---------------------------|
| <i>Individual name:</i> | <i>(g/cm<sup>3</sup>)</i> |
| TF0045-1A-1             | 0,344                     |
| TF0045-1A-2             |                           |
| TF0045-1A-3             | 0,270                     |
| TF0045-1B-1             | 0,320                     |
| TF0045-1B-2             | 0,323                     |
| TF0045-1B-3             | 0,328                     |
| TF0045-2B-1             | 0,303                     |
| TF0045-2B-3             | 0,255                     |

Summary density TF0045

|                         |       |
|-------------------------|-------|
| TF0045                  |       |
| Average TF0045 :        | 0,306 |
| Max TF0045 :            | 0,344 |
| Min TF0045 :            | 0,255 |
| Number of TF0045 :      | 7     |
| Number of TF0045 lines: | 3     |

|                           |                 |
|---------------------------|-----------------|
| Average T89:              | 0,274           |
| Max T89:                  | 0,354           |
| Min T89:                  | 0,226           |
| Number of T89:            | 36              |
| Confidence interval (95%) | 0,274 +/- 0,052 |

|                               |           |
|-------------------------------|-----------|
| T-test                        | 5,760E-03 |
| Number of TF0045 > 0,326      | 2         |
| Number of TF0045 < 0,222      | 0         |
| Average (TF0045)/Average(T89) | 1,117     |
| Max(TF0045)/Max(T89)          | 0,972     |

- 5 TF0045 has significant higher density (according to criteria 1 and 2) (+12% in average) than corresponding T89 group. The density change (compared to T89) for the 3 construction group lines of TF0045, TF0045-1A (+12% in average (2 measured individuals)), TF0045-1B (+18% in average (3 individuals)) and TF0045-2B (+2% in average (2 individuals)).

**Construction group TF0052**

Raw data TF0052 density

| <b>TF0052</b>           | <b>Density</b>            |
|-------------------------|---------------------------|
| <i>Individual name:</i> | <i>(g/cm<sup>3</sup>)</i> |
| TF0052-1A               | 0,241                     |
| TF0052-1B               | 0,346                     |
| TF0052-2A               | 0,323                     |
| TF0052-2B               | 0,251                     |
| TF0052-3A               | 0,393                     |
| TF0052-3B               | 0,278                     |
| TF0052-4A               | 0,261                     |
| TF0052-4B               | 0,322                     |

## 5 Summary density TF0052

|                         |       |
|-------------------------|-------|
| TF0052                  |       |
| Average TF0052 :        | 0,302 |
| Max TF0052 :            | 0,393 |
| Min TF0052 :            | 0,241 |
| Number of TF0052 :      | 8     |
| Number of TF0052 lines: |       |

|                           |                 |
|---------------------------|-----------------|
| Average T89:              | 0,275           |
| Max T89:                  | 0,345           |
| Min T89:                  | 0,223           |
| Number of T89:            | 23              |
| Confidence interval (95%) | 0,275 +/- 0,069 |

|                               |           |
|-------------------------------|-----------|
| T-test                        | 9,876E-02 |
| Number of TF0052 > 0,343      | 2         |
| Number of TF0052 < 0,206      | 0         |
| Average (TF0052)/Average(T89) | 1,099     |
| Max(TF0052)/Max(T89)          | 1,139     |

Construction group TF0052 has no significant difference in density (according to criteria 1) compared with corresponding T89 group. Although TF0052 has an increased density (+10%) in average and fulfil criteria 2.

**Construction group TF0065**

Raw data TF0065 density

| <b>TF0065</b>           | <b>Density</b>            |
|-------------------------|---------------------------|
| <i>Individual name:</i> | <i>(g/cm<sup>3</sup>)</i> |
| TF0065-1AA              | 0,333                     |
| TF0065-1AB              | 0,245                     |
| TF0065-1BA              | 0,267                     |
| TF0065-1BB              | 0,253                     |
| TF0065-2B               | 0,278                     |
| TF0065-3A               | 0,262                     |
| TF0065-4B               | 0,272                     |

5

Summary density TF0065

|                         |       |
|-------------------------|-------|
| TF0065                  |       |
| Average TF0065 :        | 0,273 |
| Max TF0065 :            | 0,333 |
| Min TF0065 :            | 0,245 |
| Number of TF0065 :      | 7     |
| Number of TF0065 lines: |       |

|                           |                |
|---------------------------|----------------|
| Average T89:              | 0,260          |
| Max T89:                  | 0,358          |
| Min T89:                  | 0,218          |
| Number of T89:            | 45             |
| Confidence interval (95%) | 0,26 +/- 0,049 |

|                               |           |
|-------------------------------|-----------|
| T-test                        | 2,012E-01 |
| Number of TF0065 > 0,309      | 1         |
| Number of TF0065 < 0,211      | 0         |
| Average (TF0065)/Average(T89) | 1,051     |
| Max(TF0065)/Max(T89)          | 0,931     |

Construction group TF0065 has no significant difference in density (according to criteria 1 and 2) compared with corresponding T89 group.

**Construction group TF0076**

Raw data TF0076 density

| <b>TF0076</b>           | <b>Density</b>            |
|-------------------------|---------------------------|
| <i>Individual name:</i> | <i>(g/cm<sup>3</sup>)</i> |
| TF0076-2AA              | 0,250                     |
| TF0076-2AB              | 0,253                     |
| TF0076-3BA              | 0,252                     |
| TF0076-3BB              | 0,257                     |
| TF0076-4B               |                           |
| TF0076-5BA              | 0,288                     |
| TF0076-5BB              | 0,300                     |

## 5 Summary density TF0065

|                         |       |
|-------------------------|-------|
| TF0076                  |       |
| Average TF0076 :        | 0,267 |
| Max TF0076 :            | 0,300 |
| Min TF0076 :            | 0,250 |
| Number of TF0076 :      | 6     |
| Number of TF0076 lines: |       |

|                           |                |
|---------------------------|----------------|
| Average T89:              | 0,260          |
| Max T89:                  | 0,358          |
| Min T89:                  | 0,218          |
| Number of T89:            | 45             |
| Confidence interval (95%) | 0,26 +/- 0,049 |

|                               |           |
|-------------------------------|-----------|
| T-test                        | 5,054E-01 |
| Number of TF0076 > 0,309      | 0         |
| Number of TF0076 < 0,211      | 0         |
| Average (TF0076)/Average(T89) | 1,027     |
| Max(TF0076)/Max(T89)          | 0,839     |

Construction group TF0076 has no significant difference in density (according to criteria 1 and 2) compared with corresponding T89 group.

**Construction group TF0076 (Replant 2)**

Raw data TF0076Rp2 density

| <b>TF0076Rp2</b>        | <b>Density</b>            |
|-------------------------|---------------------------|
| <i>Individual name:</i> | <i>(g/cm<sup>3</sup>)</i> |
| TF0076Rp2-3BB-1         | 0,237                     |
| TF0076Rp2-3BB-2         | 0,311                     |
| TF0076Rp2-3BB-3         | 0,274                     |
| TF0076Rp2-4B-1          | 0,304                     |
| TF0076Rp2-4B-2          | 0,293                     |
| TF0076Rp2-4B-3          | 0,301                     |
| TF0076Rp2-5BA-1         | 0,262                     |
| TF0076Rp2-5BA-2         | 0,288                     |
| TF0076Rp2-5BA-3         | 0,259                     |
| TF0076Rp2-5BB-1         | 0,267                     |
| TF0076Rp2-5BB-2         | 0,263                     |
| TF0076Rp2-5BB-3         | 0,356                     |

5

Summary density TF0076Rp2

|                            |       |
|----------------------------|-------|
| TF0076Rp2                  |       |
| Average TF0076Rp2 :        | 0,285 |
| Max TF0076Rp2 :            | 0,356 |
| Min TF0076Rp2 :            | 0,237 |
| Number of TF0076Rp2 :      | 12    |
| Number of TF0076Rp2 lines: | 4     |

|                           |                 |
|---------------------------|-----------------|
| Average T89:              | 0,284           |
| Max T89:                  | 0,338           |
| Min T89:                  | 0,252           |
| Number of T89:            | 32              |
| Confidence interval (95%) | 0,284 +/- 0,041 |

|                                  |           |
|----------------------------------|-----------|
| T-test                           | 9,407E-01 |
| Number of TF0076Rp2 > 0,325      | 1         |
| Number of TF0076Rp2 < 0,243      | 1         |
| Average (TF0076Rp2)/Average(T89) | 1,002     |
| Max(TF0076Rp2)/Max(T89)          | 1,054     |

Construction group TF0076Rp2 has no significant difference in density (according to criteria 1 and 2) compared with corresponding T89 group.

**Construction group TF0096**

10 Raw data TF0096 density

| TF0096                  | Density                   |
|-------------------------|---------------------------|
| <i>Individual name:</i> | <i>(g/cm<sup>3</sup>)</i> |
| TF0096-2A               | 0,296                     |
| TF0096-2B               | 0,249                     |
| TF0096-3A               | 0,321                     |
| TF0096-3B               | 0,308                     |
| TF0096-4A               | 0,363                     |

Summary density TF0096

|                         |       |
|-------------------------|-------|
| TF0096                  |       |
| Average TF0096 :        | 0,307 |
| Max TF0096 :            | 0,363 |
| Min TF0096 :            | 0,249 |
| Number of TF0096 :      | 5     |
| Number of TF0096 lines: |       |

|                           |                 |
|---------------------------|-----------------|
| Average T89:              | 0,274           |
| Max T89:                  | 0,354           |
| Min T89:                  | 0,226           |
| Number of T89:            | 36              |
| Confidence interval (95%) | 0,274 +/- 0,052 |

|                               |           |
|-------------------------------|-----------|
| T-test                        | 1,562E-02 |
| Number of TF0096 > 0,326      | 1         |
| Number of TF0096 < 0,222      | 0         |
| Average (TF0096)/Average(T89) | 1,121     |
| Max(TF0096)/Max(T89)          | 1,024     |

Construction group TF0096 has no significant difference in density (according to criteria 1 and 2)  
5 compared with corresponding T89 group.

**Construction group TF0097 (replant 1)**

Raw data TF0097Rp1 density

| <b>TF0097Rp1</b>        | <b>Density</b>            | <b>TF0097Rp1</b>        | <b>Density</b>            |
|-------------------------|---------------------------|-------------------------|---------------------------|
| <i>Individual name:</i> | <i>(g/cm<sup>3</sup>)</i> | <i>Individual name:</i> | <i>(g/cm<sup>3</sup>)</i> |
| TF0097Rp1-1A-1          | 0,327                     | TF0097Rp1-2B-2          | 0,351                     |
| TF0097Rp1-1A-2          | 0,335                     | TF0097Rp1-2B-3          | 0,309                     |
| TF0097Rp1-1A-3          | 0,344                     | TF0097Rp1-3A-1          | 0,309                     |
| TF0097Rp1-2A-1          | 0,275                     | TF0097Rp1-3A-2          | 0,268                     |
| TF0097Rp1-2A-2          | 0,284                     | TF0097Rp1-3A-3          | 0,297                     |
| TF0097Rp1-2A-3          | 0,308                     | TF0097Rp1-4A-1          | 0,333                     |
| TF0097Rp1-2B-1          | 0,328                     | TF0097Rp1-4A-2          | 0,325                     |
|                         |                           | TF0097Rp1-4A-3          | 0,319                     |

## 5 Summary density TF0097Rp1

|                            |       |
|----------------------------|-------|
| TF0097Rp1                  |       |
| Average TF0097Rp1 :        | 0,314 |
| Max TF0097Rp1 :            | 0,351 |
| Min TF0097Rp1 :            | 0,268 |
| Number of TF0097Rp1 :      | 15    |
| Number of TF0097Rp1 lines: | 5     |

|                           |                 |
|---------------------------|-----------------|
| Average T89:              | 0,284           |
| Max T89:                  | 0,338           |
| Min T89:                  | 0,252           |
| Number of T89:            | 32              |
| Confidence interval (95%) | 0,284 +/- 0,041 |

|                                  |           |
|----------------------------------|-----------|
| T-test                           | 4,607E-05 |
| Number of TF0097Rp1 > 0,325      | 7         |
| Number of TF0097Rp1 < 0,243      | 0         |
| Average (TF0097Rp1)/Average(T89) | 1,107     |
| Max(TF0097Rp1)/Max(T89)          | 1,038     |

TF0097Rp1 has significant higher density (according to criteria 1 and 2) (+11% in average) than corresponding T89 group. The density change (compared to T89) for the 5 construction group lines of TF0097Rp1 (3 individuals of each line), TF00097Rp1-1A (+18% in average), TF00097Rp1-2A (+2% in average), TF00097Rp1-2B(+16% in average), TF00097Rp1-3A (+3% in average) and TF00097Rp1-4A (+15 in average). The lines TF00097Rp1-1A, TF00097Rp1-2B and TF00097Rp1-4A them self fulfil criteria 1 and 2.

**Construction group TF0104**

Raw data TF0104 density

| <b>TF0104</b>           | <b>Density</b>            |
|-------------------------|---------------------------|
| <i>Individual name:</i> | <i>(g/cm<sup>3</sup>)</i> |
| TF0104-1A               | 0,282                     |
| TF0104-1B               | 0,282                     |
| TF0104-2A               | 0,297                     |
| TF0104-3A               | 0,298                     |
| TF0104-3B               | 0,261                     |

Summary density TF0104

|                         |       |
|-------------------------|-------|
| TF0104                  |       |
| Average TF0104 :        | 0,284 |
| Max TF0104 :            | 0,298 |
| Min TF0104 :            | 0,261 |
| Number of TF0104 :      | 5     |
| Number of TF0104 lines: |       |

|                           |                 |
|---------------------------|-----------------|
| Average T89:              | 0,274           |
| Max T89:                  | 0,354           |
| Min T89:                  | 0,226           |
| Number of T89:            | 36              |
| Confidence interval (95%) | 0,274 +/- 0,052 |

|                               |           |
|-------------------------------|-----------|
| T-test                        | 4,063E-01 |
| Number of TF0104 > 0,326      | 0         |
| Number of TF0104 < 0,222      | 0         |
| Average (TF0104)/Average(T89) | 1,036     |
| Max(TF0104)/Max(T89)          | 0,842     |

5

Construction group TF0104 has no significant difference in density (according to criteria 1 and 2) compared with corresponding T89 group.

**Construction group TF0109 (Replant 1)**

Raw data TF0109Rp1 density

| <b>TF0109Rp1</b>        | <b>Density</b>            | <b>TF0109Rp1</b>        | <b>Density</b>            |
|-------------------------|---------------------------|-------------------------|---------------------------|
| <i>Individual name:</i> | <i>(g/cm<sup>3</sup>)</i> | <i>Individual name:</i> | <i>(g/cm<sup>3</sup>)</i> |
| TF0109Rp1-2A-1          | 0,301                     | TF0109Rp1-3B-1          | 0,279                     |
| TF0109Rp1-2A-2          | 0,294                     | TF0109Rp1-3B-2          | 0,279                     |
| TF0109Rp1-2A-3          | 0,284                     | TF0109Rp1-3B-3          | 0,271                     |
| TF0109Rp1-2B-1          | 0,329                     | TF0109Rp1-4A-1          | 0,253                     |
| TF0109Rp1-2B-2          | 0,342                     | TF0109Rp1-4A-2          | 0,238                     |
| TF0109Rp1-2B-3          | 0,336                     | TF0109Rp1-4A-3          | 0,222                     |

Summary density TF0109Rp1

|                            |       |
|----------------------------|-------|
| TF0109Rp1                  |       |
| Average TF0109Rp1 :        | 0,286 |
| Max TF0109Rp1 :            | 0,342 |
| Min TF0109Rp1 :            | 0,222 |
| Number of TF0109Rp1 :      | 12    |
| Number of TF0109Rp1 lines: | 4     |

|                           |                 |
|---------------------------|-----------------|
| Average T89:              | 0,284           |
| Max T89:                  | 0,338           |
| Min T89:                  | 0,252           |
| Number of T89:            | 32              |
| Confidence interval (95%) | 0,284 +/- 0,041 |

|                                  |           |
|----------------------------------|-----------|
| T-test                           | 8,314E-01 |
| Number of TF0109Rp1 > 0,325      | 3         |
| Number of TF0109Rp1 < 0,243      | 2         |
| Average (TF0109Rp1)/Average(T89) | 1,007     |
| Max(TF0109Rp1)/Max(T89)          | 1,014     |

- 5 Construction group TF0109Rp1 has no significant difference in density (according to criteria 1 and 2) compared with corresponding T89 group. The density change (compared to T89) for the 4 construction group lines of TF0109Rp1 (3 individuals of each line), TF0109Rp1 -2A (+3% in average), TF0109Rp1 -2B (+18% in average), TF0109Rp1 -3B(-3% in average and TF0109Rp1-4A (-16 in average). The lines TF0109Rp1-2B and TF0109Rp1-4A them self fulfil criteria 1 and 2.

**Construction group TF0116**

Raw data TF0116 density

| <b>TF0116</b>           | <b>Density</b>            |
|-------------------------|---------------------------|
| <i>Individual name:</i> | <i>(g/cm<sup>3</sup>)</i> |
| TF0116-1B               |                           |
| TF0116-2A               | 0,306                     |
| TF0116-2B-1             | 0,293                     |
| TF0116-2B-2             | 0,263                     |
| TF0116-4A               | 0,292                     |
| TF0116-5B               | 0,247                     |
| TF0116-6A               | 0,271                     |
| TF0116-6B               | 0,268                     |

Summary density TF0116

|                         |       |
|-------------------------|-------|
| TF0116                  |       |
| Average TF0116 :        | 0,277 |
| Max TF0116 :            | 0,306 |
| Min TF0116 :            | 0,247 |
| Number of TF0116 :      | 7     |
| Number of TF0116 lines: |       |

|                           |                 |
|---------------------------|-----------------|
| Average T89:              | 0,275           |
| Max T89:                  | 0,345           |
| Min T89:                  | 0,223           |
| Number of T89:            | 23              |
| Confidence interval (95%) | 0,275 +/- 0,069 |

|                               |           |
|-------------------------------|-----------|
| T-test                        | 8,725E-01 |
| Number of TF0116 > 0,343      | 0         |
| Number of TF0116 < 0,206      | 0         |
| Average (TF0116)/Average(T89) | 1,008     |
| Max(TF0116)/Max(T89)          | 0,887     |

5

Construction group TF0116 has no significant difference in density (according to criteria 1 and 2) compared with corresponding T89 group.

10

**Construction group TF0132 (2nd set of construction group lines)**

Raw data TF0132.2nd density

| <b>TF0132.2nd</b>       | <b>Density</b>            |
|-------------------------|---------------------------|
| <i>Individual name:</i> | <i>(g/cm<sup>3</sup>)</i> |
| TF0132.2nd-1A           | 0,263                     |
| TF0132.2nd-1B           | 0,284                     |
| TF0132.2nd-2A           | 0,350                     |
| TF0132.2nd-4B           | 0,315                     |
| TF0132.2nd-5A           | 0,271                     |
| TF0132.2nd-5B           | 0,286                     |
| TF0132.2nd-6B           | 0,285                     |
| TF0132.2nd-7A           | 0,294                     |

## 5 Summary density TF0132.2nd

|                             |       |
|-----------------------------|-------|
| TF0132.2nd                  |       |
| Average TF0132.2nd :        | 0,294 |
| Max TF0132.2nd :            | 0,350 |
| Min TF0132.2nd :            | 0,263 |
| Number of TF0132.2nd :      | 8     |
| Number of TF0132.2nd lines: |       |

|                           |                 |
|---------------------------|-----------------|
| Average T89:              | 0,274           |
| Max T89:                  | 0,354           |
| Min T89:                  | 0,226           |
| Number of T89:            | 36              |
| Confidence interval (95%) | 0,274 +/- 0,052 |

|                                   |           |
|-----------------------------------|-----------|
| T-test                            | 6,257E-02 |
| Number of TF0132.2nd > 0,326      | 1         |
| Number of TF0132.2nd < 0,222      | 0         |
| Average (TF0132.2nd)/Average(T89) | 1,071     |
| Max(TF0132.2nd)/Max(T89)          | 0,988     |

Construction group TF0132.2nd has no significant difference in density (according to criteria 1 and 2) compared with corresponding T89 group.

**Construction group TF0132 (Replant 1)**

Raw data TF0132rp1 density

| <b>TF0132rp1</b>        | <b>Density</b>            | <b>TF0132rp1</b>        | <b>Density</b>            |
|-------------------------|---------------------------|-------------------------|---------------------------|
| <i>Individual name:</i> | <i>(g/cm<sup>3</sup>)</i> | <i>Individual name:</i> | <i>(g/cm<sup>3</sup>)</i> |
| TF0132Rp1-1B-1          | 0,274                     | TF0132Rp1-4AC-3         | 0,278                     |
| TF0132Rp1-1B-2          | 0,265                     | TF0132Rp1-4B-1          | 0,291                     |
| TF0132Rp1-1B-3          | 0,265                     | TF0132Rp1-4B-2          | 0,260                     |
| TF0132Rp1-3BB-1         | 0,260                     | TF0132Rp1-4B-3          | 0,282                     |
| TF0132Rp1-3BB-2         | 0,265                     | TF0132Rp1-6B-1          | 0,270                     |
| TF0132Rp1-3BB-3         | 0,267                     | TF0132Rp1-6B-2          | 0,281                     |
| TF0132Rp1-4AC-1         | 0,283                     | TF0132Rp1-6B-3          | 0,269                     |
| TF0132Rp1-4AC-2         | 0,275                     |                         |                           |

Summary density TF0132Rp1

|                            |       |
|----------------------------|-------|
| TF0132rp1                  |       |
| Average TF0132rp1 :        | 0,272 |
| Max TF0132rp1 :            | 0,291 |
| Min TF0132rp1 :            | 0,260 |
| Number of TF0132rp1 :      | 15    |
| Number of TF0132rp1 lines: | 5     |

|                           |                 |
|---------------------------|-----------------|
| Average T89:              | 0,255           |
| Max T89:                  | 0,275           |
| Min T89:                  | 0,232           |
| Number of T89:            | 27              |
| Confidence interval (95%) | 0,255 +/- 0,025 |

|                                  |           |
|----------------------------------|-----------|
| T-test                           | 2,603E-05 |
| Number of TF0132rp1 > 0,280      | 4         |
| Number of TF0132rp1 < 0,230      | 0         |
| Average (TF0132rp1)/Average(T89) | 1,068     |
| Max(TF0132rp1)/Max(T89)          | 1,059     |

- 5 Construction group TF0132Rp1 has significant higher density (according to criteria 1 and 2) (+7% in average) than corresponding T89 group. The density change (compared to T89) for the 5 construction group lines of TF0132Rp1 (3 individuals of each line), T TF0132Rp1 -1B (+5% in average), TF0132Rp1 -3BB (+4% in average), TF0132Rp1-4AC (+9% in average), TF0132Rp1-4B (+9% in average) and TF0132Rp1-6B (+7% in average). The line TF0132Rp1-4B itself fulfil criteria 1 and 2.

**Construction group TF0146**

Raw data TF0146 density

| <b>TF0146</b>           | <b>Density</b>            |
|-------------------------|---------------------------|
| <i>Individual name:</i> | <i>(g/cm<sup>3</sup>)</i> |
| TF0146-1A               | 0,341                     |
| TF0146-1B               | 0,314                     |
| TF0146-2A               | 0,303                     |
| TF0146-2B               | 0,300                     |
| TF0146-3A               | 0,333                     |
| TF0146-3B               | 0,313                     |
| TF0146-4A               | 0,374                     |
| TF0146-4B               | 0,269                     |

Summary density TF0146

|                         |       |
|-------------------------|-------|
| TF0146                  |       |
| Average TF0146 :        | 0,318 |
| Max TF0146 :            | 0,374 |
| Min TF0146 :            | 0,269 |
| Number of TF0146 :      | 8     |
| Number of TF0146 lines: |       |

|                           |                 |
|---------------------------|-----------------|
| Average T89:              | 0,274           |
| Max T89:                  | 0,354           |
| Min T89:                  | 0,226           |
| Number of T89:            | 36              |
| Confidence interval (95%) | 0,274 +/- 0,052 |

|                               |           |
|-------------------------------|-----------|
| T-test                        | 1,127E-04 |
| Number of TF0146 > 0,326      | 3         |
| Number of TF0146 < 0,222      | 0         |
| Average (TF0146)/Average(T89) | 1,161     |
| Max(TF0146)/Max(T89)          | 1,054     |

- 5 Construction group TF0146 has significant higher density (according to criteria 1 and 2) (+16% in average) than corresponding T89 group.

**Construction group TF0173**

Raw data TF0173 density

| <b>TF0173</b>           | <b>Density</b>            |
|-------------------------|---------------------------|
| <i>Individual name:</i> | <i>(g/cm<sup>3</sup>)</i> |
| TF0173-3A-1             | 0,232                     |
| TF0173-3A-2             | 0,291                     |
| TF0173-3B-1             | 0,239                     |
| TF0173-3B-2             | 0,242                     |
| TF0173-4A-1             | 0,251                     |
| TF0173-4A-2             | 0,231                     |
| TF0173-4B-1             | 0,256                     |
| TF0173-4B-2             | 0,305                     |

Summary density TF0173

|                         |       |
|-------------------------|-------|
| TF0173                  |       |
| Average TF0173 :        | 0,256 |
| Max TF0173 :            | 0,305 |
| Min TF0173 :            | 0,231 |
| Number of TF0173 :      | 8     |
| Number of TF0173 lines: |       |

|                           |                 |
|---------------------------|-----------------|
| Average T89:              | 0,254           |
| Max T89:                  | 0,345           |
| Min T89:                  | 0,221           |
| Number of T89:            | 34              |
| Confidence interval (95%) | 0,254 +/- 0,056 |

|                               |           |
|-------------------------------|-----------|
| T-test                        | 8,478E-01 |
| Number of TF0173 > 0,31       | 0         |
| Number of TF0173 < 0,198      | 0         |
| Average (TF0173)/Average(T89) | 1,008     |
| Max(TF0173)/Max(T89)          | 0,884     |

5

Construction group TF0173 has no significant difference in density (according to criteria 1 and 2) compared with corresponding T89 group.

**Construction group TF0247**

Raw data TF0247 density

| <b>TF0247</b>           | <b>Density</b>            |
|-------------------------|---------------------------|
| <i>Individual name:</i> | <i>(g/cm<sup>3</sup>)</i> |
| TF0247-1A               | 0,257                     |
| TF0247-3A               | 0,250                     |
| TF0247-3B               | 0,309                     |
| TF0247-4A               | 0,288                     |
| TF0247-6B               | 0,366                     |

Summary density TF0247

|                         |       |
|-------------------------|-------|
| TF0247                  |       |
| Average TF0247 :        | 0,294 |
| Max TF0247 :            | 0,366 |
| Min TF0247 :            | 0,250 |
| Number of TF0247 :      | 5     |
| Number of TF0247 lines: |       |

|                           |                 |
|---------------------------|-----------------|
| Average T89:              | 0,274           |
| Max T89:                  | 0,354           |
| Min T89:                  | 0,226           |
| Number of T89:            | 36              |
| Confidence interval (95%) | 0,274 +/- 0,052 |

|                               |           |
|-------------------------------|-----------|
| T-test                        | 1,498E-01 |
| Number of TF0247 > 0,326      | 1         |
| Number of TF0247 < 0,222      | 0         |
| Average (TF0247)/Average(T89) | 1,073     |
| Max(TF0247)/Max(T89)          | 1,032     |

- 5 Construction group TF0247 has no significant difference in density (according to criteria 1 and 2) compared with corresponding T89 group.

**Construction group TF0405**

Raw data TF0405 density

| <b>TF0405</b>           | <b>Density</b>            |
|-------------------------|---------------------------|
| <i>Individual name:</i> | <i>(g/cm<sup>3</sup>)</i> |
| TF0405-2A-1             | 0,271                     |
| TF0405-2A-2             | 0,291                     |
| TF0405-2B-2             |                           |
| TF0405-3A-1             | 0,275                     |
| TF0405-3A-2             | 0,309                     |
| TF0405-3B-1             | 0,295                     |
| TF0405-3B-2             | 0,279                     |

Summary density TF0405

|                         |       |
|-------------------------|-------|
| TF0405                  |       |
| Average TF0405 :        | 0,287 |
| Max TF0405 :            | 0,309 |
| Min TF0405 :            | 0,271 |
| Number of TF0405 :      | 6     |
| Number of TF0405 lines: |       |

|                           |                 |
|---------------------------|-----------------|
| Average T89:              | 0,274           |
| Max T89:                  | 0,354           |
| Min T89:                  | 0,226           |
| Number of T89:            | 36              |
| Confidence interval (95%) | 0,274 +/- 0,052 |

|                               |           |
|-------------------------------|-----------|
| T-test                        | 2,560E-01 |
| Number of TF0405 > 0,326      | 0         |
| Number of TF0405 < 0,222      | 0         |
| Average (TF0405)/Average(T89) | 1,045     |
| Max(TF0405)/Max(T89)          | 0,871     |

5

Construction group TF0405 has no significant difference in density (according to criteria 1 and 2) compared with corresponding T89 group.

**Construction group TFSTT004**

Raw data TFSTT004 density

| <b>TFSTT004</b>         | <b>Density</b>            |
|-------------------------|---------------------------|
| <i>Individual name:</i> | <i>(g/cm<sup>3</sup>)</i> |
| TFSTT004-1A             | 0,300                     |
| TFSTT004-2A-1           | 0,285                     |
| TFSTT004-2A-2           | 0,283                     |
| TFSTT004-2B-1           | 0,272                     |
| TFSTT004-2B-2           | 0,262                     |
| TFSTT004-3B             | 0,329                     |
| TFSTT004-4B-1           | 0,266                     |
| TFSTT004-4B-2           | 0,274                     |

Summary density TFSTT004

|                           |       |
|---------------------------|-------|
| TFSTT004                  |       |
| Average TFSTT004 :        | 0,284 |
| Max TFSTT004 :            | 0,329 |
| Min TFSTT004 :            | 0,262 |
| Number of TFSTT004 :      | 8     |
| Number of TFSTT004 lines: |       |

|                           |                 |
|---------------------------|-----------------|
| Average T89:              | 0,275           |
| Max T89:                  | 0,345           |
| Min T89:                  | 0,223           |
| Number of T89:            | 23              |
| Confidence interval (95%) | 0,275 +/- 0,069 |

|                                 |           |
|---------------------------------|-----------|
| T-test                          | 4,777E-01 |
| Number of TFSTT004 > 0,343      | 0         |
| Number of TFSTT004 < 0,206      | 0         |
| Average (TFSTT004)/Average(T89) | 1,033     |
| Max(TFSTT004)/Max(T89)          | 0,955     |

5

Construction group TFSTT004 has no significant difference in density (according to criteria 1 and 2) compared with corresponding T89 group.

**Construction group TFSTT013**

Raw data TFSTT013 density

| <b>TFSTT013</b>         | <b>Density</b>            |
|-------------------------|---------------------------|
| <i>Individual name:</i> | <i>(g/cm<sup>3</sup>)</i> |
| TFSTT013-1A             | 0,323                     |
| TFSTT013-1B             | 0,328                     |
| TFSTT013-2B             | 0,288                     |
| TFSTT013-3A             | 0,345                     |
| TFSTT013-3B             | 0,291                     |
| TFSTT013-4A             | 0,304                     |
| TFSTT013-4B             | 0,324                     |
| TFSTT013-5B             | 0,346                     |

Summary density TFSTT013

|                           |       |
|---------------------------|-------|
| TFSTT013                  |       |
| Average TFSTT013 :        | 0,319 |
| Max TFSTT013 :            | 0,346 |
| Min TFSTT013 :            | 0,288 |
| Number of TFSTT013 :      | 8     |
| Number of TFSTT013 lines: |       |

|                           |                |
|---------------------------|----------------|
| Average T89:              | 0,284          |
| Max T89:                  | 0,361          |
| Min T89:                  | 0,222          |
| Number of T89:            | 41             |
| Confidence interval (95%) | 0,284 +/- 0,06 |

|                                 |           |
|---------------------------------|-----------|
| T-test                          | 3,006E-03 |
| Number of TFSTT013 > 0,344      | 2         |
| Number of TFSTT013 < 0,224      | 0         |
| Average (TFSTT013)/Average(T89) | 1,123     |
| Max(TFSTT013)/Max(T89)          | 0,958     |

5

Construction group TFSTT013 has significant higher density (according to criteria 1 and 2) (+12% in average) than corresponding T89 group.

**Construction group TFSTT016**

Raw data TFSTT016 density

| <b>TFSTT016</b>         | <b>Density</b>            |
|-------------------------|---------------------------|
| <i>Individual name:</i> | <i>(g/cm<sup>3</sup>)</i> |
| TFSTT016-1A             | 0,306                     |
| TFSTT016-1B             | 0,254                     |
| TFSTT016-2A             | 0,249                     |
| TFSTT016-2B             | 0,279                     |
| TFSTT016-3A-1           | 0,272                     |
| TFSTT016-3A-2           | 0,274                     |
| TFSTT016-4A             | 0,252                     |

Summary density TFSTT016

|                           |       |
|---------------------------|-------|
| TFSTT016                  |       |
| Average TFSTT016 :        | 0,270 |
| Max TFSTT016 :            | 0,306 |
| Min TFSTT016 :            | 0,249 |
| Number of TFSTT016 :      | 7     |
| Number of TFSTT016 lines: |       |

|                           |                 |
|---------------------------|-----------------|
| Average T89:              | 0,275           |
| Max T89:                  | 0,345           |
| Min T89:                  | 0,223           |
| Number of T89:            | 23              |
| Confidence interval (95%) | 0,275 +/- 0,069 |

|                                 |           |
|---------------------------------|-----------|
| T-test                          | 6,884E-01 |
| Number of TFSTT016 > 0,343      | 0         |
| Number of TFSTT016 < 0,206      | 0         |
| Average (TFSTT016)/Average(T89) | 0,980     |
| Max(TFSTT016)/Max(T89)          | 0,886     |

5

Construction group TFSTT016 has no significant difference in density (according to criteria 1 and 2) compared with corresponding T89 group.

**Construction group TFSTT019**

Raw data TFSTT019 density

| <b>TFSTT019</b>         | <b>Density</b>            |
|-------------------------|---------------------------|
| <i>Individual name:</i> | <i>(g/cm<sup>3</sup>)</i> |
| TFSTT019-1A             |                           |
| TFSTT019-1BA            | 0,216                     |
| TFSTT019-1BB            | 0,283                     |
| TFSTT019-2A             | 0,265                     |
| TFSTT019-2B             | 0,231                     |
| TFSTT019-3A             | 0,277                     |
| TFSTT019-4BA            | 0,244                     |
| TFSTT019-4BB            | 0,282                     |

Summary density TFSTT019

|                           |       |
|---------------------------|-------|
| TFSTT019                  |       |
| Average TFSTT019 :        | 0,257 |
| Max TFSTT019 :            | 0,283 |
| Min TFSTT019 :            | 0,216 |
| Number of TFSTT019 :      | 7     |
| Number of TFSTT019 lines: |       |

|                           |                |
|---------------------------|----------------|
| Average T89:              | 0,260          |
| Max T89:                  | 0,358          |
| Min T89:                  | 0,218          |
| Number of T89:            | 45             |
| Confidence interval (95%) | 0,26 +/- 0,049 |

|                                 |           |
|---------------------------------|-----------|
| T-test                          | 7,862E-01 |
| Number of TFSTT019 > 0,309      | 0         |
| Number of TFSTT019 < 0,211      | 0         |
| Average (TFSTT019)/Average(T89) | 0,989     |
| Max(TFSTT019)/Max(T89)          | 0,789     |

- 5 Construction group TFSTT019 has no significant difference in density (according to criteria 1 and 2) compared with corresponding T89 group.

**Construction group TFSTT035**

Raw data TFSTT035density

| <b>TFSTT035</b>         | <b>Density</b>            |
|-------------------------|---------------------------|
| <i>Individual name:</i> | <i>(g/cm<sup>3</sup>)</i> |
| TFSTT035-1A             | 0,236                     |
| TFSTT035-1BA            | 0,260                     |
| TFSTT035-1BB            | 0,265                     |
| TFSTT035-2AA            | 0,247                     |
| TFSTT035-2AB            | 0,257                     |
| TFSTT035-2B             | 0,217                     |
| TFSTT035-3B             | 0,240                     |
| TFSTT035-4B             | 0,267                     |

## 5 Summary density TFSTT035

|                           |       |
|---------------------------|-------|
| TFSTT035                  |       |
| Average TFSTT035 :        | 0,249 |
| Max TFSTT035 :            | 0,267 |
| Min TFSTT035 :            | 0,217 |
| Number of TFSTT035 :      | 8     |
| Number of TFSTT035 lines: |       |

|                           |                |
|---------------------------|----------------|
| Average T89:              | 0,260          |
| Max T89:                  | 0,358          |
| Min T89:                  | 0,218          |
| Number of T89:            | 45             |
| Confidence interval (95%) | 0,26 +/- 0,049 |

|                                 |           |
|---------------------------------|-----------|
| T-test                          | 2,247E-01 |
| Number of TFSTT035 > 0,309      | 0         |
| Number of TFSTT035 < 0,211      | 0         |
| Average (TFSTT035)/Average(T89) | 0,957     |
| Max(TFSTT035)/Max(T89)          | 0,745     |

Construction group TFSTT035 has no significant difference in density (according to criteria 1 and 2) compared with corresponding T89 group.

**Construction group TFSTT036**

Raw data TFSTT036 density

| <b>TFSTT036</b>         | <b>Density</b>            |
|-------------------------|---------------------------|
| <i>Individual name:</i> | <i>(g/cm<sup>3</sup>)</i> |
| TFSTT036-1B             | 0,291                     |
| TFSTT036-2A             | 0,306                     |
| TFSTT036-2B             | 0,365                     |
| TFSTT036-3A             | 0,322                     |
| TFSTT036-4A             | 0,274                     |
| TFSTT036-4B             | 0,331                     |
| TFSTT036-5B             | 0,254                     |

Summary density TFSTT036

|                           |       |
|---------------------------|-------|
| TFSTT036                  |       |
| Average TFSTT036 :        | 0,306 |
| Max TFSTT036 :            | 0,365 |
| Min TFSTT036 :            | 0,254 |
| Number of TFSTT036 :      | 7     |
| Number of TFSTT036 lines: |       |

|                           |                 |
|---------------------------|-----------------|
| Average T89:              | 0,274           |
| Max T89:                  | 0,354           |
| Min T89:                  | 0,226           |
| Number of T89:            | 36              |
| Confidence interval (95%) | 0,274 +/- 0,052 |

|                                 |           |
|---------------------------------|-----------|
| T-test                          | 7,640E-03 |
| Number of TFSTT036 > 0,326      | 2         |
| Number of TFSTT036 < 0,222      | 0         |
| Average (TFSTT036)/Average(T89) | 1,117     |
| Max(TFSTT036)/Max(T89)          | 1,030     |

5

Construction group TFSTT036 has significant higher density (according to criteria 1 and 2) (+12% in average) than corresponding T89 group.

**Construction group TFSTT038**

Raw data TFSTT038density

| <b>TFSTT038</b>         | <b>Density</b>            |
|-------------------------|---------------------------|
| <i>Individual name:</i> | <i>(g/cm<sup>3</sup>)</i> |
| TFSTT038-1A-1           | 0,256                     |
| TFSTT038-1A-2           | 0,292                     |
| TFSTT038-1B             | 0,312                     |
| TFSTT038-2A             | 0,308                     |
| TFSTT038-2B             | 0,264                     |
| TFSTT038-3A             | 0,301                     |
| TFSTT038-3B             | 0,343                     |
| TFSTT038-4B             | 0,284                     |

Summary density TFSTT038

|                           |       |
|---------------------------|-------|
| TFSTT038                  |       |
| Average TFSTT038 :        | 0,295 |
| Max TFSTT038 :            | 0,343 |
| Min TFSTT038 :            | 0,256 |
| Number of TFSTT038 :      | 8     |
| Number of TFSTT038 lines: |       |

|                           |                 |
|---------------------------|-----------------|
| Average T89:              | 0,275           |
| Max T89:                  | 0,345           |
| Min T89:                  | 0,223           |
| Number of T89:            | 23              |
| Confidence interval (95%) | 0,275 +/- 0,069 |

|                                 |           |
|---------------------------------|-----------|
| T-test                          | 1,343E-01 |
| Number of TFSTT038 > 0,343      | 0         |
| Number of TFSTT038 < 0,206      | 0         |
| Average (TFSTT038)/Average(T89) | 1,073     |
| Max(TFSTT038)/Max(T89)          | 0,995     |

- 5 Construction group TFSTT038 has no significant difference in density (according to criteria 1 and 2) compared with corresponding T89 group.

**Construction group TFSTT045**

Raw data TFSTT045 density

| <b>TFSTT045</b>         | <b>Density</b>            |
|-------------------------|---------------------------|
| <i>Individual name:</i> | <i>(g/cm<sup>3</sup>)</i> |
| TFSTT045-1B             | 0,231                     |
| TFSTT045-2B             | 0,243                     |
| TFSTT045-3A             | 0,258                     |
| TFSTT045-3B             | 0,257                     |
| TFSTT045-4A             | 0,258                     |
| TFSTT045-4B             | 0,349                     |
| TFSTT045-7B             | 0,324                     |

## 5 Summary density TFSTT045

|                           |       |
|---------------------------|-------|
| TFSTT045                  |       |
| Average TFSTT045 :        | 0,274 |
| Max TFSTT045 :            | 0,349 |
| Min TFSTT045 :            | 0,231 |
| Number of TFSTT045 :      | 7     |
| Number of TFSTT045 lines: |       |

|                           |                 |
|---------------------------|-----------------|
| Average T89:              | 0,274           |
| Max T89:                  | 0,354           |
| Min T89:                  | 0,226           |
| Number of T89:            | 36              |
| Confidence interval (95%) | 0,274 +/- 0,052 |

|                                 |           |
|---------------------------------|-----------|
| T-test                          | 9,934E-01 |
| Number of TFSTT045 > 0,326      | 1         |
| Number of TFSTT045 < 0,222      | 0         |
| Average (TFSTT045)/Average(T89) | 1,000     |
| Max(TFSTT045)/Max(T89)          | 0,984     |

Construction group TFSTT045 has no significant difference in density (according to criteria 1 and 2) compared with corresponding T89 group.

**Construction group TFSTT051**

Raw data TFSTT051 density

| <b>TFSTT051</b>         | <b>Density</b>            |
|-------------------------|---------------------------|
| <i>Individual name:</i> | <i>(g/cm<sup>3</sup>)</i> |
| TFSTT051-1B             | 0,315                     |
| TFSTT051-2A             | 0,318                     |
| TFSTT051-2B             | 0,292                     |
| TFSTT051-3A             | 0,289                     |
| TFSTT051-3B             | 0,270                     |
| TFSTT051-4A             | 0,240                     |
| TFSTT051-4B-1           | 0,269                     |
| TFSTT051-4B-2           | 0,234                     |

**5 Summary density TFSTT051**

|                           |       |
|---------------------------|-------|
| TFSTT051                  |       |
| Average TFSTT051 :        | 0,278 |
| Max TFSTT051 :            | 0,318 |
| Min TFSTT051 :            | 0,234 |
| Number of TFSTT051 :      | 8     |
| Number of TFSTT051 lines: |       |

|                           |                 |
|---------------------------|-----------------|
| Average T89:              | 0,275           |
| Max T89:                  | 0,345           |
| Min T89:                  | 0,223           |
| Number of T89:            | 23              |
| Confidence interval (95%) | 0,275 +/- 0,069 |

|                                 |           |
|---------------------------------|-----------|
| T-test                          | 7,969E-01 |
| Number of TFSTT051 > 0,343      | 0         |
| Number of TFSTT051 < 0,206      | 0         |
| Average (TFSTT051)/Average(T89) | 1,013     |
| Max(TFSTT051)/Max(T89)          | 0,921     |

Construction group TFSTT051 has no significant difference in density (according to criteria 1 and 2) compared with corresponding T89 group.

**Example 6**Fibre measurements

Fibre measurements were performed on samples at 33 to 36 cm height of the stem. A piece of pure wood, about 1.5 mm x 1.5 mm x 15 mm was cut out from the stem piece. A  
 5 maceration preparation (Franklin et al. 1945) was performed to get a macerate of single fibres from the small piece of wood. The sample was then measured using a KajaaniFibreLab™ from Metso Automation, giving the average of fibre length, average fibre width and an estimation of the fibre cell wall thickness. The supplied computer  
 10 software calculates these numbers using the below formulas according to the manufacturer.

Fibre length

Average of fibre length,  $L(n)$ , using true length of fibres, measured along the centreline:

$$L(n) = \frac{\sum (n_i * l_i)}{\sum n_i} \quad [\text{mm}]$$

15 where

$n_i$  = number of fibres in class  $i$ ,

$i = 1 \dots 152$ ,

$l_i = (0,05*i) - 0,025$ ,

$l_i$  = length of class  $i$ ,

20

**Fibre width**

Average of fibre width,  $W$ ; based on cross sectional measurements:

$$W = \frac{\sum (n_i * w_i)}{\sum n_i} \quad [\mu\text{m}]$$

where

25  $n_i$  = number of fibres in class  $i$ ,

$i = 1 \dots 100$ ,

$w_i = kw*(i-0,5)$ ,

$w_i$  = width of class  $i$ ,

$kw$  = width calibration factor,

#### Cell wall thickness

- 5 Average of cell wall thickness,  $CWT$ , based on cross sectional measurements:

$$CWT = \frac{\sum (n_i * CWT_i)}{\sum n_i} \quad [\mu\text{m}]$$

where

$n_i$  = number of fibres in class  $i$ ,

$i = 1 \dots 100$ ,

- 10  $CWT_i = kt * (i - 0,5)$ ,

$CWT_i$  = cell wall thickness of class  $i$ ,

$kt$  = cell wall thickness calibration factor.

Construction Groups with fibres with at least an 10% increase or 15% decrease in fibre length or widths were selected as being effected in genes useful for modifying fibre

- 15 dimension according to the selection criteria's below.

#### Fibre parameters selection criteria

In Table 6.1 the abbreviations used for the phenotypes used for the fibre selection criteria are listed.

- 20 Table 6.1 Abbreviations for phenotypes

|       |                                                                                         |
|-------|-----------------------------------------------------------------------------------------|
| AFL   | average fibre length of the wild type population and each Construction group population |
| AFW   | average fibre width of the wild type population and each Construction group population  |
| maxFL | maximum fibre length of the wild type population and each Construction group population |
| maxFW | maximum fibre width of the wild type population and each Construction group population  |
| minFL | minimum fibre length of the wild type population and each Construction group population |

minFW     minimum fibre width of the wild type population and each Construction group population

Construction groups that showed a difference compared to the wild type population in any of the fibre parameters mentioned above were scored as construction groups that are altered in their growth properties and therefore the corresponding genes can be used to  
5 alter these properties.

As a 10% increase or a 15% decrease in fibre dimensions are of interest for the industry, the selection criteria below were used to select genes that can be used to altered fibre dimensions.

10

The fibre parameters selection criteria are as follows:

1. If construction group AFL is at least 10% higher than corresponding wildtype group AFL , or
2. If construction group AFW is at least 10% higher than corresponding  
15 wildtype group AFW, or
3. If construction group maxFL is at least 10% higher than corresponding wildtype group maxFL, or
4. If construction group maxFW is at least 10% higher than corresponding wildtype group maxFW, or
- 20 5. If construction group AFL is at least 15% lower than corresponding wildtype group AFL, or
6. If construction group AFW is at least 15% lower than corresponding wildtype group AFW, or
7. If construction group minFL is at least 15% lower than corresponding  
25 wildtype group minFL, or
8. If construction group minFW is at least 15% lower than corresponding wildtype group minFW.

Construction groups meeting one or more of these criteria were selected.

The results below are presented according to construction group.

#### Construction group TF0002

This construct induces changes in fibre parameters. The maximum fibre width is 16% higher than corresponding maximum wildtype. The TF0002 construction group meets the 5 fibre parameters selection criterion (4).

Table 6.2 contains fibre measurements data for specified construction group and corresponding wild type group.

Table 6.2

| Construction group Individual | Fibre Length (mm) | Fibre Width (µm) | CWT (µm) | Construction group Individual | Fibre Length (mm) | Fibre Width (µm) | CWT (µm) |
|-------------------------------|-------------------|------------------|----------|-------------------------------|-------------------|------------------|----------|
| TF0002-1B                     | 0,37              | 17,73            | 4,32     | T89-27                        | 0,37              | 16,03            | 3,87     |
| TF0002-2A                     | 0,39              | 19               | 4,8      | T89-3                         | 0,36              | 14,89            | 3,5      |
| TF0002-2B                     | 0,34              | 14,57            | 3,47     | T89-30                        | 0,37              | 14,11            | 3,3      |
| TF0002-3A                     | 0,36              | 16,23            | 3,9      | T89-31                        | 0,38              | 15,44            | 3,63     |
| TF0002-3B                     | 0,34              | 14,71            | 3,51     | T89-32                        | 0,37              | 15,34            | 3,63     |
| TF0002-4B                     | 0,36              | 15,86            | 3,85     | T89-34                        | 0,37              | 15,56            | 3,71     |
| T89-1                         | 0,33              | 14,2             | 3,37     | T89-36                        | 0,36              | 14,43            | 3,39     |
| T89-18                        | 0,35              | 14,1             | 3,23     | T89-4                         | 0,37              | 16,4             | 3,93     |
| T89-20                        | 0,35              | 14,57            | 3,37     | T89-6                         | 0,37              | 14,68            | 3,46     |
| T89-24                        | 0,36              | 14,39            | 3,34     | T89-7                         | 0,33              | 14,25            | 3,36     |
|                               |                   |                  |          | T89-9                         | 0,38              | 15,94            | 3,8      |

10

Results from the fibre measurements are presented in table 6.3 as ratios of average fibre length (AFL), average fibre width (AFW), maximum fibre length (maxFL), maximum fibre width (maxFW), minimum fibre length (minFL), minimum fibre width (minFW) of specified construction group relative to corresponding wildtype group.

15

Table 6.3

| Construction Group | Average Fibre Length | Average Fibre Width | Max Fibre Length | Max Fibre Width | Min Fibre Length | Min Fibre Width |
|--------------------|----------------------|---------------------|------------------|-----------------|------------------|-----------------|
| TF0002             | 1,00                 | 1,09                | 1,03             | 1,16            | 1,03             | 1,03            |

Construction group TF0052

This construct induces changes in fibre parameters. The average fibre width is 13% higher than of corresponding wildtype group. The maximum fibre width is 22% higher than corresponding maximum wildtype. The TF0052 construction group meets the fibre  
5 parameters selection criterion (2) and (4).

Table 6.4 contains fibre measurements data for specified construction group and corresponding wild type group.

Table 6.4

| Construction group Individual | Fibre Length (mm) | Fibre Width (µm) | CWT (µm) |
|-------------------------------|-------------------|------------------|----------|
| TF0052-1A                     | 0,3               | 12,77            | 3,11     |
| TF0052-1B                     | 0,33              | 14,4             | 3,46     |
| TF0052-2A                     | 0,34              | 15,9             | 3,86     |
| TF0052-2B                     | 0,36              | 18,22            | 4,49     |
| TF0052-3A                     | 0,34              | 18,54            | 4,71     |
| TF0052-3B                     | 0,34              | 14,52            | 3,49     |
| TF0052-4A                     | 0,35              | 15,94            | 3,9      |
| TF0052-4B                     | 0,32              | 15,33            | 3,76     |
| T89-1                         | 0,35              | 15,15            | 3,59     |
| T89-12                        | 0,34              | 14,79            | 3,44     |
| T89-14                        | 0,33              | 12,52            | 2,83     |
| T89-16                        | 0,34              | 13,67            | 3,14     |

| Construction group Individual | Fibre Length (mm) | Fibre Width (µm) | CWT (µm) |
|-------------------------------|-------------------|------------------|----------|
| T89-18                        | 0,34              | 14,25            | 3,28     |
| T89-19                        | 0,33              | 13,82            | 3,17     |
| T89-20                        | 0,36              | 15,11            | 3,58     |
| T89-21                        | 0,34              | 13,42            | 3,14     |
| T89-24                        | 0,33              | 14,54            | 3,39     |
| T89-25                        | 0,37              | 15,2             | 3,58     |
| T89-26                        | 0,35              | 14,12            | 3,31     |
| T89-27                        | 0,33              | 13,52            | 3,12     |
| T89-28                        | 0,33              | 13,41            | 3,13     |
| T89-3                         | 0,3               | 13,3             | 3,18     |
| T89-30                        | 0,32              | 12,52            | 2,91     |
|                               |                   |                  |          |

10

Results from the fibre measurements are presented in table 6.5 as ratios of average fibre length (AFL), average fibre width (AFW), maximum fibre length (maxFL), maximum fibre width (maxFW), minimum fibre length (minFL), minimum fibre width (minFW) of specified construction group relative to corresponding wildtype group.

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Table 6.5

| Construction Group | Average Fibre Length | Average Fibre Width | Max Fibre Length | Max Fibre Width | Min Fibre Length | Min Fibre Width |
|--------------------|----------------------|---------------------|------------------|-----------------|------------------|-----------------|
| TF0052             | 0,99                 | 1,13                | 0,97             | 1,22            | 1,00             | 1,02            |

Construction group TF0058

This construct induces changes in fibre parameters. The average fibre width is 16% higher than of corresponding wildtype group. The maximum fibre width is 23% higher than corresponding maximum wildtype. The TF0058 construction group meets the fibre  
5 parameters selection criterion (2) and (4).

Table 6.6 contains fibre measurements data for specified construction group and corresponding wild type group.

Table 6.6

| Construction group Individual | Fibre Length (mm) | Fibre Width (µm) | CWT (µm) |
|-------------------------------|-------------------|------------------|----------|
| TF0058-1A                     | 0,34              | 15,29            | 3,74     |
| TF0058-1B                     | 0,31              | 15,07            | 3,66     |
| TF0058-2A                     | 0,36              | 16,98            | 4,21     |
| TF0058-2B                     | 0,34              | 15,89            | 3,89     |
| TF0058-3A                     | 0,36              | 15,28            | 3,67     |
| TF0058-3B                     | 0,36              | 15,62            | 3,77     |
| TF0058-4A                     | 0,37              | 16,97            | 4,14     |
| TF0058-4B                     | 0,39              | 18,7             | 4,57     |
| T89-1                         | 0,35              | 15,15            | 3,59     |
| T89-12                        | 0,34              | 14,79            | 3,44     |
| T89-14                        | 0,33              | 12,52            | 2,83     |
| T89-16                        | 0,34              | 13,67            | 3,14     |

| Construction group Individual | Fibre Length (mm) | Fibre Width (µm) | CWT (µm) |
|-------------------------------|-------------------|------------------|----------|
| T89-18                        | 0,34              | 14,25            | 3,28     |
| T89-19                        | 0,33              | 13,82            | 3,17     |
| T89-20                        | 0,36              | 15,11            | 3,58     |
| T89-21                        | 0,34              | 13,42            | 3,14     |
| T89-24                        | 0,33              | 14,54            | 3,39     |
| T89-25                        | 0,37              | 15,2             | 3,58     |
| T89-26                        | 0,35              | 14,12            | 3,31     |
| T89-27                        | 0,33              | 13,52            | 3,12     |
| T89-28                        | 0,33              | 13,41            | 3,13     |
| T89-3                         | 0,3               | 13,3             | 3,18     |
| T89-30                        | 0,32              | 12,52            | 2,91     |
|                               |                   |                  |          |

10

Results from the fibre measurements are presented in table 6.7 as ratios of average fibre length (AFL), average fibre width (AFW), maximum fibre length (maxFL), maximum fibre width (maxFW), minimum fibre length (minFL), minimum fibre width (minFW) of specified construction group relative to corresponding wildtype group.

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Table 6.7

| Construction Group | Average Fibre Length | Average Fibre Width | Max Fibre Length | Max Fibre Width | Min Fibre Length | Min Fibre Width |
|--------------------|----------------------|---------------------|------------------|-----------------|------------------|-----------------|
| TF0058             | 1,05                 | 1,16                | 1,05             | 1,23            | 1,03             | 1,20            |

Construction group TF0097

This construct induces changes in fibre parameters. The maximum fibre width is 13% higher than corresponding maximum wildtype. The TF0097 construction group meets the fibre parameters selection criterion (4).

- 5 Table 6.8 contains fibre measurements data for specified construction group and corresponding wild type group.

Table 6.8

| Construction group Individual | Fibre Length (mm) | Fibre Width (µm) | CWT (µm) | Construction group Individual | Fibre Length (mm) | Fibre Width (µm) | CWT (µm) |
|-------------------------------|-------------------|------------------|----------|-------------------------------|-------------------|------------------|----------|
| TF0097-1A                     | 0,38              | 16,6             | 4,07     | T89-19                        | 0,32              | 15,14            | 3,67     |
| TF0097-1B                     | 0,36              | 14,84            | 3,53     | T89-26                        | 0,32              | 12,06            | 2,7      |
| TF0097-2A                     | 0,33              | 12,65            | 2,92     | T89-29                        | 0,36              | 15,19            | 3,63     |
| TF0097-2B                     | 0,37              | 15,92            | 3,8      | T89-31                        | 0,36              | 14,51            | 3,44     |
| TF0097-3A-1                   | 0,38              | 17,11            | 4,13     | T89-32                        | 0,35              | 13,73            | 3,17     |
| TF0097-3A-2                   | 0,33              | 14,05            | 3,37     | T89-34                        | 0,33              | 12,93            | 2,96     |
| TF0097-4A-1                   | 0,34              | 12,27            | 2,79     | T89-35                        | 0,32              | 13,28            | 3,12     |
| TF0097-4A-2                   | 0,33              | 13,03            | 2,98     | T89-38                        | 0,34              | 14,69            | 3,52     |
| TF0097-4B                     | 0,3               | 12,34            | 2,9      | T89-44                        | 0,32              | 13,64            | 3,24     |
| T89-02                        | 0,3               | 11,82            | 2,7      | T89-46                        | 0,34              | 13,96            | 3,26     |
| T89-07                        | 0,36              | 14,1             | 3,25     | T89-61                        | 0,34              | 14,09            | 3,35     |
| T89-11                        | 0,35              | 13,66            | 3,2      | T89-68                        | 0,29              | 12,49            | 2,99     |
| T89-17                        | 0,31              | 13,26            | 3,15     |                               |                   |                  |          |

- 10 Results from the fibre measurements are presented in table 6.9 as ratios of average fibre length (AFL), average fibre width (AFW), maximum fibre length (maxFL), maximum fibre width (maxFW), minimum fibre length (minFL), minimum fibre width (minFW) of specified construction group relative to corresponding wildtype group.

15 Table 6.9

| Construction Group | Average Fibre Length | Average Fibre Width | Max Fibre Length | Max Fibre Width | Min Fibre Length | Min Fibre Width |
|--------------------|----------------------|---------------------|------------------|-----------------|------------------|-----------------|
| TF0097             | 1,04                 | 1,05                | 1,06             | 1,13            | 1,03             | 1,04            |

Construction group TF0109

This construct induces changes in fibre parameters. The average fibre length is 11% higher than of corresponding wildtype group. The maximum fibre length is 25% higher than of corresponding maximum wildtype. The maximum fibre width is 23% higher than  
 5 corresponding maximum wildtype. The TF0109 construction group meets the fibre parameters selection criterion (1) (3) and (4).

Table 6.10 contains fibre measurements data for specified construction group and corresponding wild type group.

10 Table 6.10

| Construction group Individual | Fibre Length (mm) | Fibre Width (µm) | CWT (µm) |
|-------------------------------|-------------------|------------------|----------|
| TF0109-1B-1                   | 0,35              | 15,06            | 3,54     |
| TF0109-1B-2                   | 0,35              | 15,83            | 3,8      |
| TF0109-2A                     | 0,34              | 15,4             | 3,69     |
| TF0109-2B                     | 0,35              | 15,7             | 3,75     |
| TF0109-3B                     | 0,36              | 15,73            | 3,75     |
| TF0109-4A                     | 0,45              | 21,49            | 5,12     |
| TF0109-4B                     | 0,37              | 16,82            | 4,08     |
| T89-16                        | 0,35              | 15,93            | 3,82     |
| T89-17                        | 0,34              | 15,56            | 3,79     |
| T89-19                        | 0,34              | 15,87            | 3,9      |
| T89-2                         | 0,33              | 13,88            | 3,25     |

| Construction group Individual | Fibre Length (mm) | Fibre Width (µm) | CWT (µm) |
|-------------------------------|-------------------|------------------|----------|
| T89-20                        | 0,33              | 14,43            | 3,42     |
| T89-24                        | 0,34              | 14,52            | 3,46     |
| T89-25                        | 0,35              | 15,48            | 3,73     |
| T89-26                        | 0,32              | 14,93            | 3,61     |
| T89-34                        | 0,33              | 14,68            | 3,54     |
| T89-35                        | 0,36              | 15,84            | 3,77     |
| T89-36                        | 0,31              | 16,92            | 4,23     |
| T89-37                        | 0,31              | 15,95            | 4,02     |
| T89-38                        | 0,3               | 13,64            | 3,23     |
| T89-4                         | 0,33              | 17,48            | 4,44     |
| T89-6                         | 0,3               | 14,5             | 3,55     |

Results from the fibre measurements are presented in table 6.11 as ratios of average fibre length (AFL), average fibre width (AFW), maximum fibre length (maxFL), maximum fibre width (maxFW), minimum fibre length (minFL), minimum fibre width (minFW) of specified  
 15 construction group relative to corresponding wildtype group.

Table 6.11

| Construction Group | Average Fibre Length | Average Fibre Width | Max Fibre Length | Max Fibre Width | Min Fibre Length | Min Fibre Width |
|--------------------|----------------------|---------------------|------------------|-----------------|------------------|-----------------|
| TF0109             | 1,11                 | 1,08                | 1,25             | 1,23            | 1,13             | 1,10            |

Construction group TF0116

This construct induces changes in fibre parameters. The average fibre width is 11% higher than of corresponding wildtype group. The maximum fibre width is 20% higher than corresponding maximum wildtype. The TF0116 construction group meets the fibre  
5 parameters selection criterion (2) and (4).

Table 6.12 contains fibre measurements data for specified construction group and corresponding wild type group.

Table 6.12

| Construction group Individual | Fibre Length (mm) | Fibre Width (µm) | CWT (µm) | Construction group Individual | Fibre Length (mm) | Fibre Width (µm) | CWT (µm) |
|-------------------------------|-------------------|------------------|----------|-------------------------------|-------------------|------------------|----------|
| TF0116-2A                     | 0,33              | 14,84            | 3,55     | T89-18                        | 0,34              | 14,25            | 3,28     |
| TF0116-2B-1                   | 0,34              | 18,24            | 4,52     | T89-19                        | 0,33              | 13,82            | 3,17     |
| TF0116-2B-2                   | 0,34              | 15,66            | 3,7      | T89-20                        | 0,36              | 15,11            | 3,58     |
| TF0116-4A                     | 0,37              | 15,85            | 3,76     | T89-21                        | 0,34              | 13,42            | 3,14     |
| TF0116-5B                     | 0,33              | 12,15            | 2,82     | T89-24                        | 0,33              | 14,54            | 3,39     |
| TF0116-6A                     | 0,33              | 15,2             | 3,69     | T89-25                        | 0,37              | 15,2             | 3,58     |
| TF0116-6B                     | 0,37              | 16,5             | 3,94     | T89-26                        | 0,35              | 14,12            | 3,31     |
| T89-1                         | 0,35              | 15,15            | 3,59     | T89-27                        | 0,33              | 13,52            | 3,12     |
| T89-12                        | 0,34              | 14,79            | 3,44     | T89-28                        | 0,33              | 13,41            | 3,13     |
| T89-14                        | 0,33              | 12,52            | 2,83     | T89-3                         | 0,3               | 13,3             | 3,18     |
| T89-16                        | 0,34              | 13,67            | 3,14     | T89-30                        | 0,32              | 12,52            | 2,91     |

10

Results from the fibre measurements are presented in table 6.13 as ratios of average fibre length (AFL), average fibre width (AFW), maximum fibre length (maxFL), maximum fibre width (maxFW), minimum fibre length (minFL), minimum fibre width (minFW) of specified construction group relative to corresponding wildtype group.

15

Table 6.13

| Construction Group | Average Fibre Length | Average Fibre Width | Max Fibre Length | Max Fibre Width | Min Fibre Length | Min Fibre Width |
|--------------------|----------------------|---------------------|------------------|-----------------|------------------|-----------------|
| TF0116             | 1,02                 | 1,11                | 1,00             | 1,20            | 1,10             | 0,97            |

Construction group TFSTT001

This construct induces changes in fibre parameters. The average fibre width is 14% lower than of corresponding wildtype group. The minimum fibre length is 17% lower than corresponding minimum wildtype. The minimum fibre width is 30% lower than corresponding minimum wildtype. The TFSTT001 construction group meets the fibre parameters selection criterion (7) and (8).

Table 6.14 contains fibre measurements data for specified construction group and corresponding wild type group.

10 Table 6.14

| Construction group Individual | Fibre Length (mm) | Fibre Width (µm) | CWT (µm) | Construction group Individual | Fibre Length (mm) | Fibre Width (µm) | CWT (µm) |
|-------------------------------|-------------------|------------------|----------|-------------------------------|-------------------|------------------|----------|
| TFSTT001-1BX-2                | 0,31              | 11,68            | 2,7      | T89-20                        | 0,33              | 14,43            | 3,42     |
| TFSTT001-1BY-1                | 0,3               | 12,11            | 2,83     | T89-24                        | 0,34              | 14,52            | 3,46     |
| TFSTT001-1BY-2                | 0,25              | 9,57             | 2,51     | T89-25                        | 0,35              | 15,48            | 3,73     |
| TFSTT001-2A-1                 | 0,28              | 12,87            | 3,06     | T89-26                        | 0,32              | 14,93            | 3,61     |
| TFSTT001-2A-2                 | 0,36              | 15,23            | 3,65     | T89-34                        | 0,33              | 14,68            | 3,54     |
| TFSTT001-3B-1                 | 0,35              | 15,26            | 3,63     | T89-35                        | 0,36              | 15,84            | 3,77     |
| TFSTT001-3B-2                 | 0,35              | 15,66            | 3,77     | T89-36                        | 0,31              | 16,92            | 4,23     |
| T89-16                        | 0,35              | 15,93            | 3,82     | T89-37                        | 0,31              | 15,95            | 4,02     |
| T89-17                        | 0,34              | 15,56            | 3,79     | T89-38                        | 0,3               | 13,64            | 3,23     |
| T89-19                        | 0,34              | 15,87            | 3,9      | T89-4                         | 0,33              | 17,48            | 4,44     |
| T89-2                         | 0,33              | 13,88            | 3,25     | T89-6                         | 0,3               | 14,5             | 3,55     |

Results from the fibre measurements are presented in table 6.15 as ratios of average fibre length (AFL), average fibre width (AFW), maximum fibre length (maxFL), maximum fibre width (maxFW), minimum fibre length (minFL), minimum fibre width (minFW) of specified construction group relative to corresponding wildtype group.

Table 6.15

| Construction Group | Average Fibre Length | Average Fibre Width | Max Fibre Length | Max Fibre Width | Min Fibre Length | Min Fibre Width |
|--------------------|----------------------|---------------------|------------------|-----------------|------------------|-----------------|
| TFSTT001           | 0,95                 | 0,86                | 1,00             | 0,90            | 0,83             | 0,70            |

Construction group TFSTT004

This construct induces changes in fibre parameters. The average fibre width is 15% higher than of corresponding wildtype group. The maximum fibre width is 29% higher than corresponding maximum wildtype. The TFSTT004 construction group meets the fibre  
5 parameters selection criterion (2) and (4).

Table 6.16 contains fibre measurements data for specified construction group and corresponding wild type group.

Table 6.16

| Construction group Individual | Fibre Length (mm) | Fibre Width (µm) | CWT (µm) | Construction group Individual | Fibre Length (mm) | Fibre Width (µm) | CWT (µm) |
|-------------------------------|-------------------|------------------|----------|-------------------------------|-------------------|------------------|----------|
| TFSTT004-1A                   | 0,31              | 14,81            | 3,63     | T89-18                        | 0,34              | 14,25            | 3,28     |
| TFSTT004-2A-1                 | 0,35              | 16,07            | 3,84     | T89-19                        | 0,33              | 13,82            | 3,17     |
| TFSTT004-2A-2                 | 0,37              | 19,54            | 4,92     | T89-20                        | 0,36              | 15,11            | 3,58     |
| TFSTT004-2B-1                 | 0,37              | 16               | 3,86     | T89-21                        | 0,34              | 13,42            | 3,14     |
| TFSTT004-2B-2                 | 0,35              | 14,67            | 3,53     | T89-24                        | 0,33              | 14,54            | 3,39     |
| TFSTT004-3B                   | 0,3               | 14,73            | 4,13     | T89-25                        | 0,37              | 15,2             | 3,58     |
| TFSTT004-4B-1                 | 0,35              | 16,72            | 4,1      | T89-26                        | 0,35              | 14,12            | 3,31     |
| TFSTT004-4B-2                 | 0,37              | 16,21            | 3,88     | T89-27                        | 0,33              | 13,52            | 3,12     |
| T89-1                         | 0,35              | 15,15            | 3,59     | T89-28                        | 0,33              | 13,41            | 3,13     |
| T89-12                        | 0,34              | 14,79            | 3,44     | T89-3                         | 0,3               | 13,3             | 3,18     |
| T89-14                        | 0,33              | 12,52            | 2,83     | T89-30                        | 0,32              | 12,52            | 2,91     |
| T89-16                        | 0,34              | 13,67            | 3,14     |                               |                   |                  |          |

10

Results from the fibre measurements are presented in table 6.17 as ratios of average fibre length (AFL), average fibre width (AFW), maximum fibre length (maxFL), maximum fibre width (maxFW), minimum fibre length (minFL), minimum fibre width (minFW) of specified construction group relative to corresponding wildtype group.

15

Table 6.17

| Construction Group | Average Fibre Length | Average Fibre Width | Max Fibre Length | Max Fibre Width | Min Fibre Length | Min Fibre Width |
|--------------------|----------------------|---------------------|------------------|-----------------|------------------|-----------------|
| TFSTT004           | 1,03                 | 1,15                | 1,00             | 1,29            | 1,00             | 1,17            |

Construction group TFSTT017

This construct induces changes in fibre parameters. The minimum fibre length is 17% lower than corresponding minimum wildtype. The TFSTT017 construction group meets the fibre parameters selection criterion (7).

- 5 Table 6.18 contains fibre measurements data for specified construction group and corresponding wild type group.

Table 6.18

| Construction group Individual | Fibre Length (mm) | Fibre Width (µm) | CWT (µm) | Construction group Individual | Fibre Length (mm) | Fibre Width (µm) | CWT (µm) |
|-------------------------------|-------------------|------------------|----------|-------------------------------|-------------------|------------------|----------|
| TFSTT017-1A-1                 | 0,38              | 14,46            | 3,57     | T89-16                        | 0,34              | 13,67            | 3,14     |
| TFSTT017-1A-2                 | 0,25              | 12,95            | 3,23     | T89-18                        | 0,34              | 14,25            | 3,28     |
| TFSTT017-1B                   | 0,28              | 12,88            | 3,41     | T89-19                        | 0,33              | 13,82            | 3,17     |
| TFSTT017-2A-1                 | 0,35              | 16,02            | 3,89     | T89-20                        | 0,36              | 15,11            | 3,58     |
| TFSTT017-2A-2                 | 0,33              | 13,46            | 3,1      | T89-21                        | 0,34              | 13,42            | 3,14     |
| TFSTT017-2B                   | 0,31              | 13,48            | 3,25     | T89-24                        | 0,33              | 14,54            | 3,39     |
| TFSTT017-3A                   | 0,32              | 14,97            | 3,63     | T89-25                        | 0,37              | 15,2             | 3,58     |
| TFSTT017-3B                   | 0,3               | 12,75            | 3,01     | T89-26                        | 0,35              | 14,12            | 3,31     |
| TFSTT017-4B                   | 0,29              | 11,93            | 2,77     | T89-27                        | 0,33              | 13,52            | 3,12     |
| T89-1                         | 0,35              | 15,15            | 3,59     | T89-28                        | 0,33              | 13,41            | 3,13     |
| T89-12                        | 0,34              | 14,79            | 3,44     | T89-3                         | 0,3               | 13,3             | 3,18     |
| T89-14                        | 0,33              | 12,52            | 2,83     | T89-30                        | 0,32              | 12,52            | 2,91     |

- 10 Results from the fibre measurements are presented in table 6.19 as ratios of average fibre length (AFL), average fibre width (AFW), maximum fibre length (maxFL), maximum fibre width (maxFW), minimum fibre length (minFL), minimum fibre width (minFW) of specified construction group relative to corresponding wildtype group.

15 Table 6.19

| Construction Group | Average Fibre Length | Average Fibre Width | Max Fibre Length | Max Fibre Width | Min Fibre Length | Min Fibre Width |
|--------------------|----------------------|---------------------|------------------|-----------------|------------------|-----------------|
| TFSTT017           | 0,93                 | 0,98                | 1,03             | 1,05            | 0,83             | 0,95            |

Construction group TFSTT038

This construct induces changes in fibre parameters. The average fibre width is 16% higher than of corresponding wildtype group. The maximum fibre width is 21% higher than corresponding maximum wildtype. The TFSTT038 construction group meets the fibre parameters selection criterion (2) and (4).

Table 6.20 contains fibre measurements data for specified construction group and corresponding wild type group.

Table 6.20

| Construction group Individual | Fibre Length (mm) | Fibre Width (µm) | CWT (µm) |
|-------------------------------|-------------------|------------------|----------|
| TFSTT038-1A-1                 | 0,35              | 16,43            | 4        |
| TFSTT038-1A-2                 | 0,35              | 16,88            | 4,1      |
| TFSTT038-1B                   | 0,36              | 17,48            | 4,27     |
| TFSTT038-2A                   | 0,37              | 18,37            | 4,55     |
| TFSTT038-2B                   | 0,34              | 16,41            | 4,04     |
| TFSTT038-3A                   | 0,32              | 15,95            | 3,93     |
| TFSTT038-3B                   | 0,36              | 14,95            | 3,56     |
| TFSTT038-4B                   | 0,32              | 12,89            | 2,98     |
| T89-1                         | 0,35              | 15,15            | 3,59     |
| T89-12                        | 0,34              | 14,79            | 3,44     |
| T89-14                        | 0,33              | 12,52            | 2,83     |

| Construction group Individual | Fibre Length (mm) | Fibre Width (µm) | CWT (µm) |
|-------------------------------|-------------------|------------------|----------|
| T89-18                        | 0,34              | 14,25            | 3,28     |
| T89-19                        | 0,33              | 13,82            | 3,17     |
| T89-20                        | 0,36              | 15,11            | 3,58     |
| T89-21                        | 0,34              | 13,42            | 3,14     |
| T89-24                        | 0,33              | 14,54            | 3,39     |
| T89-25                        | 0,37              | 15,2             | 3,58     |
| T89-26                        | 0,35              | 14,12            | 3,31     |
| T89-27                        | 0,33              | 13,52            | 3,12     |
| T89-28                        | 0,33              | 13,41            | 3,13     |
| T89-3                         | 0,3               | 13,3             | 3,18     |
| T89-30                        | 0,32              | 12,52            | 2,91     |

Results from the fibre measurements are presented in table 6.21 as ratios of average fibre length (AFL), average fibre width (AFW), maximum fibre length (maxFL), maximum fibre width (maxFW), minimum fibre length (minFL), minimum fibre width (minFW) of specified construction group relative to corresponding wildtype group.

Table 6.21

| Construction Group | Average Fibre Length | Average Fibre Width | Max Fibre Length | Max Fibre Width | Min Fibre Length | Min Fibre Width |
|--------------------|----------------------|---------------------|------------------|-----------------|------------------|-----------------|
| TFSTT038           | 1,03                 | 1,16                | 1,00             | 1,21            | 1,07             | 1,03            |

## Example 7

### Selected constructs used for tobacco transformation

#### *Tobacco transformation*

Based on growth data from poplar experiments, a selected set of constructs, namely

- 5 CaMV 35S: over-expression DNA constructs TF0097, TF0132 and TFSTT019, were used for transformation into tobacco (*Nicotiana tabacum* cv. SR1). Plants were transformed and regenerated essentially as described in Nilsson et al. (1992), but using leaf disc explants.

Approximately 10-15 independent lines were generated for each construct. One such group of transgenic plants produced using one construct is hereafter called a

- 10 “construction group”, e.g. different transgenic plants emanating from one construct. Each transgenic line within each construction group, e.g. TF0555-01, TF0555-02, TF0555-03 and so on, are different transformation events and therefore most probably have the recombinant DNA inserted into different locations in the plant genome. This makes the different lines within one construction group partly different. For example it is known that  
15 different transformation events will produce plants with different levels of gene over-expression.

#### *Plant growth*

- The transgenic tobacco plants, comprising three construction groups each having 9-15  
20 independent lines, were grown together with 14 wildtype control plants, in a greenhouse under a photoperiod of 18h and a temperature of 22°C/18°C (day/night). The plants were fertilized with Weibulls Rika S NPK 7-1-5 diluted 1 to 100 (final concentrations NO<sub>3</sub>, 55g/l; NH<sub>4</sub>, 29g/l; P, 12g/l; K, 56g/l; Mg 7,2g/l; S, 7,2g/l; B, 0,18g/l; Cu, 0,02g/l; Fe, 0,84g/l; Mn, 0,42g/l; Mo, 0,03g/l; Zn, 0,13g/L). Plant height and diameter was measured regularly  
25 during growth in the greenhouse.

- Observed growth effects in tobacco transformants included faster regeneration of tobacco plants transformed with construct TF0132, where regenerated plantlets had markedly larger leaves during early tissue culture phases. Also, in tobacco plants transformed with either of the selected constructs (i.e. TF0097, TF0132 or TFSTT019) a longer period of  
30 vegetative growth and hence later flowering than wild-type SR1 plants was observed.

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**Claims**

1. A method of producing a plant having a modulated growth and/or biomass compared to its wild type, comprising altering in the plant the level of a gene product of at least one gene comprising a nucleotide sequence selected from the group consisting of
- 5
- a) a nucleotide sequence from SEQ ID NO 1-13, 97-115;
  - b) a nucleotide sequence being at least 60% identical to a nucleotide sequence from SEQ ID NO 1-13, 97-115
  - c) a subsequence or fragment of a nucleotide sequence of a) or b).
- 10
2. The method according to claim 1 the method steps comprising:
- (i) providing an expression vector comprising a nucleotide sequence selected from the group consisting of
    - a) a nucleotide sequence from SEQ ID NO 1-13, 97-115; or
    - 15 b) a nucleotide sequence being at least 60% identical to a nucleotide sequence from SEQ ID NO 1-13, 97-115 or
    - c) a subsequence or fragment of a nucleotide sequence of a) or b.and
  - d) at least one regulatory element operably linked to the polynucleotide sequence, wherein said at least one regulatory element controls expression of the polynucleotide sequence in a target plant;
- 20
- (ii) introducing the expression vector into at least one plant; and
  - (iii) selecting at least one transgenic plant that has a modulated growth and/or biomass compared to its wild type.
- 25
3. The method according to claim 1, comprising
- i) selecting plant species expressing at least one of the nucleotide sequences selected from the group consisting of
    - a) a nucleotide sequence from SEQ ID NO 1-13, 97-115;

- b) a nucleotide sequence being at least 60% identical to a nucleotide sequence from SEQ ID NO 1-13, 97-115
- c) a subsequence or fragment of a nucleotide sequence of a) or b),
- 5 ii) crossing a plant species selected in i) with the same or another plant species selected in i),
- iii) selecting plants with modulated expression of at least one of the nucleotide sequences selected from the group consisting of
- a) nucleotide sequence from SEQ ID NO 1-13, 97-115;
- 10 b) a nucleotide sequence being at least 60% identical to a nucleotide sequence from SEQ ID NO 1-13, 97-115
- c) a subsequence or fragment of a nucleotide sequence of a) or b).  
compared to the plant species selected under i)
- iv) optionally backcrossing one or more times the plants obtained in iii) and selecting plants with modulated expression of at least one of the nucleotide sequences selected from the group consisting of
- 15 a) a nucleotide sequence from SEQ ID NO 1-13, 97-115;
- b) a nucleotide sequence being at least 60% identical to a nucleotide sequence from SEQ ID NO 1-13, 97-115
- c) a subsequence or fragment of a nucleotide sequence of a) or b)
- 20 compared to any of the plant species used in i) and/or plants obtained in iii).
4. The method according to any one of claims 1-3, wherein said modulated expression is effected by introducing a genetic modification preferably in the locus of a gene encoding a polypeptide comprising SEQ ID NO: 1-13, 97-115 or a
- 25 homologue of such polypeptide.
5. Method according to claim 4, wherein said modification is effected by one of: T-DNA activation, TILLING, homologous recombination, site-directed mutagenesis or directed breeding using one or more of SEQ ID NO: 1-13, 97-115 as markers in
- 30 any step of the process.

6. The method according to any of claims 1-4, wherein the modulation is increased yield in growth and/or in biomass.
- 5 7. The method according to any of the preceding claim 1,2, 4-6, comprising the step of providing a recombinant DNA construct comprising a nucleotide sequence selected from the group consisting of:
- a) a nucleotide sequence comprising a sequence selected from SEQ ID NO: 1-13, 97-115;
  - 10 b) a complementary nucleotide sequence of a nucleotide sequence of a);
  - c) a sub-sequence or fragment of a nucleotide sequence of a) or b);
  - d) a nucleic acid sequence being at least 60% identical to any one of the sequences in a), b) and c); and
  - 15 e) a nucleotide sequence which hybridizes under stringent conditions to a nucleotide sequence of a), b) or c).
8. The method according to any one of claims 1, 2, 4-7, wherein the nucleotide sequence encodes a polypeptide comprising a conservatively substituted variant of a polypeptide of (a).
- 20 9. The method according to any one of claims 1, 2, 4-8, wherein the nucleotide sequence comprises a silent substitution in a nucleotide sequence.
10. The method according to any one of claims 1, 2, 4-9, wherein the sub-sequences or
- 25 fragments have at least 65% sequence identity to a conserved domain of a nucleotide sequence as described in claim 7 a).
11. The method according to any one of claims 7 to 10, wherein the recombinant DNA construct further comprises a constitutive, inducible, or tissue specific promoter
- 30 operably linked to said nucleotide sequence.

12. The method according to any one of claims 7 to 10, wherein the recombinant DNA construct further comprises a strong constitutive promoter in front of a transcribed cassette comprising a nucleotide sequence as defined in claim 7 followed by a plant functional intron followed by the nucleotide sequence as defined in claim 4 in reverse orientation.
13. The method according to any one of claims 7 to 12, wherein the method comprising the further step of transforming regenerable cells of a plant with said recombinant DNA construct and regenerating a transgenic plant from said transformed cell.
14. A plant having a modulated growth and/or biomass compared to its wild type, comprising a nucleotide capable of altering in the plant the level of a gene product of at least one gene wherein the at least one gene comprises a nucleotide sequence selected from the group consisting of
- a) a nucleotide sequence from SEQ ID NO 1-13, 97-115;
  - b) a nucleotide sequence being at least 60% identical to a nucleotide sequence from SEQ ID NO 1-13, 97-115
  - c) a subsequence or fragment of a nucleotide sequence of a) or b).
15. A transgenic plant comprising a recombinant polynucleotide (DNA construct) comprising a nucleotide sequence selected from the group consisting of:
- a) a nucleotide sequence comprising a sequence selected from SEQ ID NO: 1-13, 97-115;
  - b) a complementary nucleotide sequence of a nucleotide sequence of a);
  - c) a sub-sequence or fragment of a nucleotide sequence of a) or b);
  - d) a nucleic acid sequence being at least 60% identical to any one of the sequences in a), b) and c); and
  - e) a nucleotide sequence which hybridizes under stringent conditions to a nucleotide sequence of a), b) or c).

16. The transgenic plant according to claim 15, wherein the nucleotide sequence encoding a polypeptide comprising a conservatively substituted variant of a polypeptide of a) or d).

5

17. The transgenic plant according to any one of claims 15 to 16, wherein nucleotide sequence comprising a silent substitution in a nucleotide sequence.

18. The transgenic plant according to any one of claims 15 to 17, wherein the sub-sequences or fragments have at least 65% sequence identity to a conserved domain of a nucleotide sequence of a claim 16.

19. The transgenic plant according to any one of claims 15 to 18, wherein the recombinant DNA construct further comprising a constitutive, inducible, or tissue specific promoter operably linked to said nucleotide sequence.

20. The transgenic plant to any one of claims 14 to 19, wherein the recombinant DNA construct further comprises a strong constitutive promoter in front of a transcribed cassette comprising a nucleotide sequence as defined in claim 4 followed by a plant functional intron followed by the nucleotide sequence as defined in claim 16 in reverse orientation.

21. A plant cell or plant progeny of a plant, which may be transgenic according to any of claims 14 to 20.

25

22. Wood produced by a plant, which may be transgenic according to any of claims 14 to 20.

23. A DNA construct comprising at least one sequence described in claims 7 to 10.

30 24. A plant cell or plant progeny comprising the DNA construct according to claim 23.

25. The nucleotide sequence in any of claims 1-24, wherein the sequence of a) is selected from the group consisting of SEQ ID NOs: 1,4,6,7,9,10, 101, 102, 104, 106 and 107.

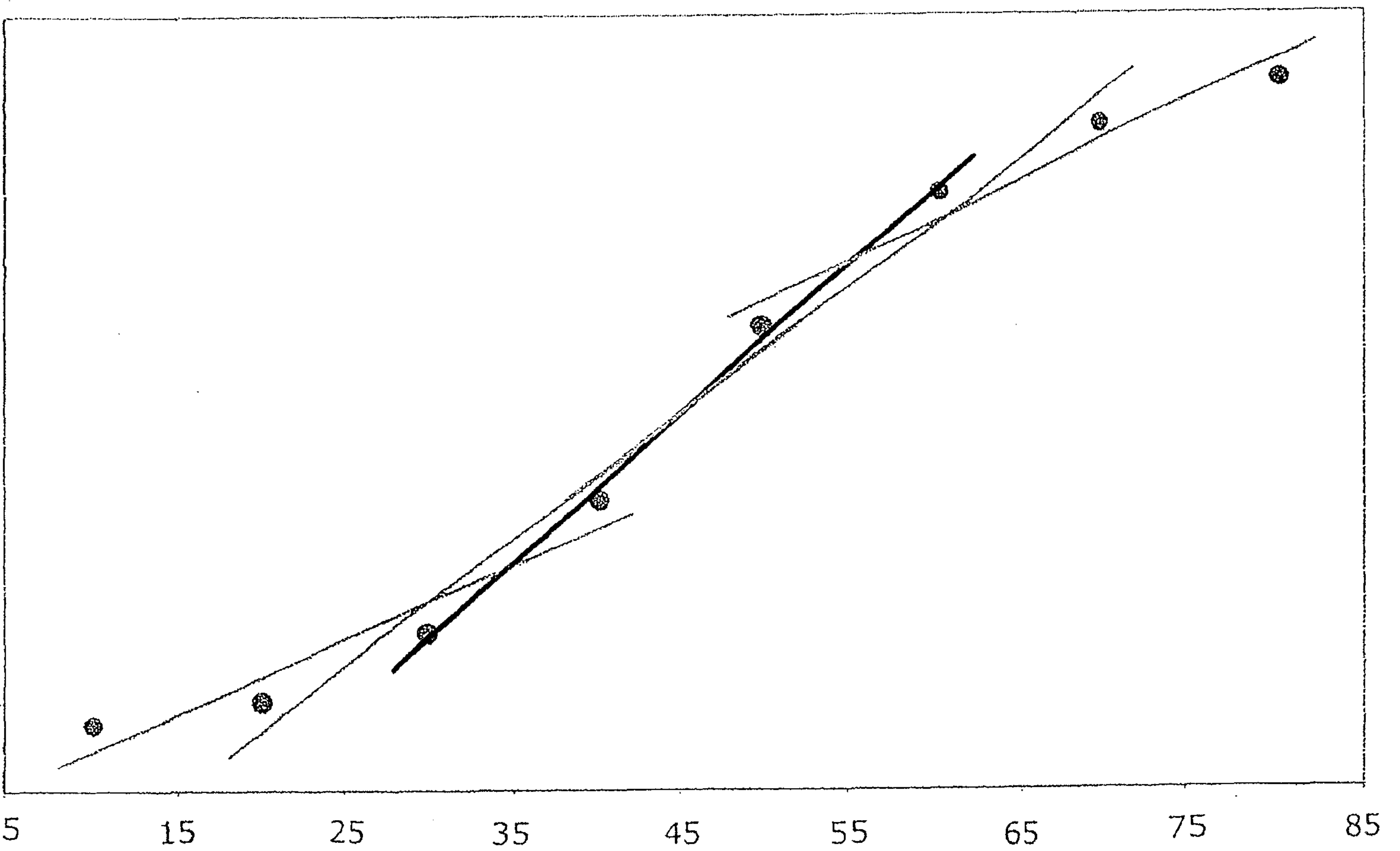


Figure 1

Time in green house in days

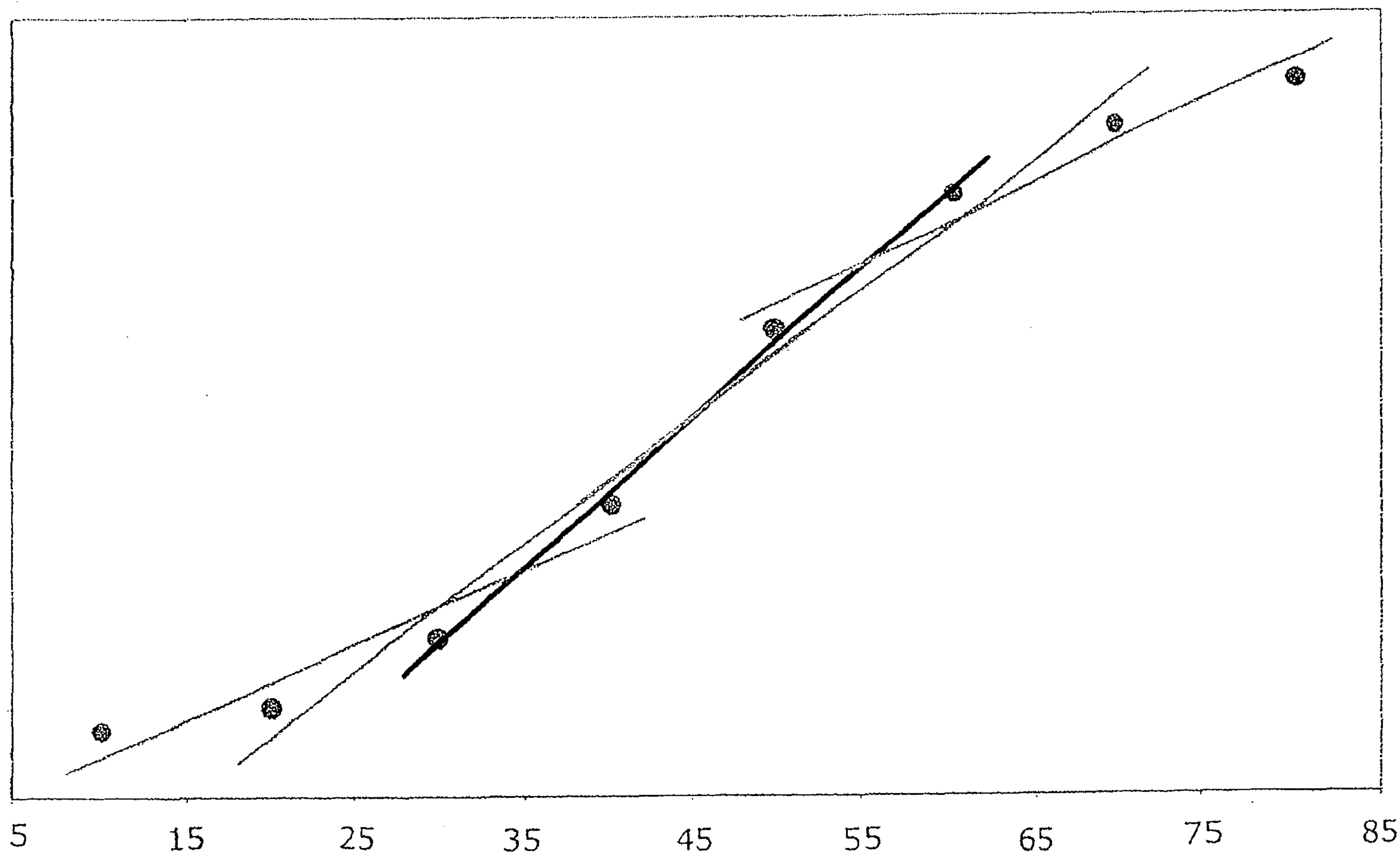


Figure 1

Time in green house in days