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(54) Title: MEANS AND METHODS FOR IMPROVING PLANT GROWTH AND YIELD

(57) Abstract: The current invention relates to a purified bacterial strain for improving plant growth and/or yield. The invention also relates to a bacterial population, a microbial active ingredient, an agriculturally active ingredient, a synthetic composition, and methods for improving plant growth and/or yield by improving a trait of agronomic importance in a plant and by conferring resistance to a plant pathogen infection.

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MEANS AND METHODS FOR IMPROVING PLANT GROWTH AND YIELD

FIELD OF THE INVENTION

5 The invention relates to the fields of plant biology and bacterial strains. More specifically, the invention provides novel bacterial strains which provide beneficial features to the plant upon colonization of the same. In particular, the compositions and methods disclosed herein are useful for enhancing plant growth and/or yield.

BACKGROUND

10 There is a need for improved agricultural plants that will enable the food production demands with fewer resources and more environmentally sustainable inputs, for plants with improved responses to various biotic and abiotic stresses.

Crop performance is optimized primarily via technologies directed towards the interplay between crop genotype (e.g. plant breeding, genetically-modified (GM) crops) and its surrounding environment (e.g. fertilizer, synthetic herbicides, pesticides). While these paradigms have assisted in the increasing global food
15 production, yield growth rates have stalled in many major crops. Shifts in the climate are linked to production instabilities as well as changing pest and disease pressures. In addition, genetically manipulated (GM) crops and agrochemicals have challenged their use in a large number of agricultural important crops and countries, resulting in a lack of acceptance for many GM traits and the exclusion of GM crops
20 and many agrochemicals from global markets. Therefor there is an urgent need for novel solutions to crop improvement, more particularly, there is a need for innovative, effective, environmentally-sustainable, and publicly-acceptable approaches to improve the growth, yield, and other agronomically important characteristics of plants.
25

A promising practice is the use of microorganisms that enhance plant growth and yield, increase tolerance to unfavorable conditions, or improve the resource use efficiency. In particular, a vast array of bacteria that live both within and around the plant tissues support the plant's health and growth.

30 WO 2016 200 987 discloses methods and compositions for providing a benefit to a plant by associating the plant with a beneficial endophyte of the genus *Streptomyces*. In particular, the invention relates to compositions and methods of improving soybean and maize plants.

WO 2015 035 099 relates to methods and materials for providing a benefit to a seed or seedling of an agricultural plant, in particular Glycine agricultural plants.

WO 2017 019 633 discloses bacterial endophyte strains for enhancing growth and yield of agronomically important crop species. Overall biomass improvement has
5 been demonstrated in the laboratory and growth chambers, but lacks in greenhouses and in the field.

Liaqat et al. 2016 describes endophytic bacterial isolates from peer rootstocks. A biochemical analysis of the isolates revealed plant promoting properties. Nonetheless, there is no evidence of said plant promoting properties in a host plant
10 nor a pointer toward the use of the isolates for crop improvement and/or improvement.

Williamson et al. 2010 and Zhang et al. 2010 describe the microbial community of soil, but remain silent on the use of bacteria for crop protection or improvement of bacterial isolates, however none of the studies disclose the use of the bacterial
15 isolates for crop protection and/or improvement.

Bacteria influence plant growth through multiple mechanisms, and in some cases through interactions with other bacteria. Specific bacterial strains inhabit various host plant tissues and have been isolated from plant leaves, stems, and roots. Several bacteria have been disclosed that increase plant growth and/or reduce
20 susceptibility to diseases caused by fungi, bacteria, viruses or other plant pathogens.

However, to successfully enhance the growth and/or yield of a plant, the purified bacterial strain has to maintain a critical population mass in the plant element, or plant where to it has been disposed. Furthermore the purified bacterial strain should
25 be able to outcompete other microbes for resources in a plant growth medium. In addition, it is advisable that the purified bacterial strain not only reduce susceptibility to diseases but also effectively suppresses the growth of pathogens.

The present invention aims to resolve at least some of the disadvantages mentioned above. The aim of the invention is to provide means and methods to improve the
30 growth and/or yield of an agricultural plant.

SUMMARY OF THE INVENTION

The applicants have identified novel bacterial strains as effective promoters of plant growth and/or yield, by improving a trait of agronomic importance on the one hand and conferring resistance to a plant pathogen infection on the other hand.

- 5 To this end, the present invention relates to a purified bacterial strain according to claim 1 to 3.

Current invention also relates to a bacterial population for improving plant growth and/or yield according to claim 4 or 5.

- 10 Furthermore the invention relates to a microbial active ingredient for improving plant growth and/or yield according to claim 6.

The invention also relates to an agricultural active formulation and a synthetic composition for improving plant growth and/or yield according to claim 7 and 8.

- 15 In a following aspect, the present invention relates to a use according to claim 9 and 10. The use as described herein provides an improved plant growth and/or yield by improving a trait of agronomic importance. The use according to another embodiment of the invention provides an improved growth and/or yield of plants by effectively inhibiting the growth of a plant pathogen.

Yet another aspect of the invention relates to a method for conferring resistance to a plant pathogen infection in a plant according to claim 11.

- 20 Another aspect of the invention relates to methods for enhancing growth and/or yield of a plant by improving a trait of agronomic importance according to any of the claims 12 to 17.

In a final aspect the invention relates to a plant element according to claim 18.

DESCRIPTION OF FIGURES

- 25 The following description of the figures of specific embodiments of the invention is merely exemplary in nature and is not intended to limit the present teachings, their application or uses.

- 30 Per figure 1 to 5 the graph on the left visualizes the estimates of the dry biomass with 95% confidence intervals for treated seeds and mock treated seeds, whereas the graph on the right visualizes the estimates of the difference between treated and mock treated seeds in dry biomass with its 95% confidence interval. The

percentage indicates the difference in dry biomass expressed as a percentage of the mock treatment.

Figure 1A-1L show a graphical representation of the increased dry biomass per plant at 6 weeks after sowing of wheat plants obtained from seeds treated with a formulation comprising a purified bacterial strain. Bacterial strains with Deposit ID B/00180 (**Figure 1A**); B/00185, B/00189, and B/00177 (**Figure 1B**); B/00184 (**Figure 1C**); B/00175, B/00192, and B/00193 (**Figure 1D**); B/00194 (**Figure 1E**); B/00196, B/00197, and B/00199 (**Figure 1F**); B/00202 (**Figure 1G**); B/00205 (**Figure 1H**); B/00204 and B/00206 (**Figure 1I**); B/00207 and B/00191 (**Figure 1J**); B/00195 (**Figure 1K**); and B/00178, B/00209, B/00214, and B/00211 (**Figure 1L**) demonstrate an increase in dry biomass per wheat plant.

Figure 2A-2J show a graphical representation of the increased number of tillers per wheat plant at 6 weeks after sowing of wheat plants obtained from seeds treated with a formulation comprising a purified bacterial strain. Bacterial strains with Deposit ID B/00179 (**Figure 2A**); B/00190 (**Figure 2B**); B/00183 (**Figure 2C**); B/00196 (**Figure 2D**); B/00200 (**Figure 2E**); B/00201 and B/00202 (**Figure 2F**); B/00205 (**Figure 2G**); B/00203 and B/00204 (**Figure 2H**); B/00207; B/00213 (**Figure 2I**); and B/00195 (**Figure 2J**) demonstrate an increase in the number of tillers per wheat plant.

Figure 3 shows a graphical representation of the increased dry biomass per wheat plant at 6 weeks after sowing of wheat plants obtained from seeds treated with a formulation comprising two bacterial strains, indicated on the graph with 'Consortium 2 strains', and from seeds treated with a formulation comprising six bacterial strains, indicated on the graph with 'Consortium 6 strains'. The two combined bacterial strains with Deposit ID B/00195 and B/00207 demonstrate an increase in dry biomass per wheat plant. Even the combination of six bacterial strains with Deposit ID B/00178, B/00182, B/00195, B/00198, B/00202, and B/00207.

Figure 4 shows a graphical representation of the increased dry biomass per maize plant at 6 weeks after sowing of maize plants obtained from seeds treated with a whole cell broth culture of a bacterial strain, a member of genus *Rhizobium*, with Deposit ID B/00196 (**Figure 4A**), or a bacterial strain, a member of genus *Brevundimonas*, with Deposit ID B/00179 (**Figure 4B**).

Figure 5 shows a graphical representation of the increased wet biomass per plant at 6 weeks after sowing of wheat plants obtained from seeds treated with a formulation comprising a purified bacterial strain with Deposit ID B/00178. An increase in wet biomass per wheat plant is demonstrated.

- 5 **Figure 6** shows a graphical representation of the increased seed yield. The wheat plants are obtained from wheat seeds treated with a formulation comprising a purified bacterial strain with Deposit ID B/00196 or B/00206.

- Figure 7** shows a graphical representation of the increased seed yield. The wheat plants are obtained from wheat seeds treated with a formulation comprising a
10 purified bacterial strain with Deposit ID B/00196 or B/00202.

DETAILED DESCRIPTION OF THE INVENTION

Definitions

- Unless otherwise defined, all terms used in disclosing the invention, including technical and scientific terms, have the meaning as commonly understood by one
15 of ordinary skill in the art to which this invention belongs. By means of further guidance, term definitions are included to better appreciate the teaching of the present invention.

As used herein, the following terms have the following meanings:

- 20 "A", "an", and "the" as used herein refers to both singular and plural referents unless the context clearly dictates otherwise. By way of example, "a compartment" refers to one or more than one compartment.

- "About" as used herein referring to a measurable value such as a parameter, an amount, a temporal duration, and the like, is meant to encompass variations of +/- 20% or less, preferably +/-10% or less, more preferably +/-5% or less, even more
25 preferably +/-1% or less, and still more preferably +/-0.1% or less of and from the specified value, in so far such variations are appropriate to perform in the disclosed invention. However, it is to be understood that the value to which the modifier "about" refers is itself also specifically disclosed.

- 30 "Comprise", "comprising", and "comprises" and "comprised of" as used herein are synonymous with "include", "including", "includes" or "contain", "containing", "contains" and are inclusive or open-ended terms that specifies the presence of what follows e.g. component and do not exclude or preclude the presence of additional,

non-recited components, features, element, members, steps, known in the art or disclosed therein.

Furthermore, the terms first, second, third and the like in the description and in the claims, are used for distinguishing between similar elements and not necessarily for
5 describing a sequential or chronological order, unless specified. It is to be understood that the terms so used are interchangeable under appropriate circumstances and that the embodiments of the invention described herein are capable of operation in other sequences than described or illustrated herein.

The recitation of numerical ranges by endpoints includes all numbers and fractions
10 subsumed within that range, as well as the recited endpoints.

Whereas the terms "one or more" or "at least one", such as one or more or at least one member(s) of a group of members, is clear *per se*, by means of further exemplification, the term encompasses *inter alia* a reference to any one of said members, or to any two or more of said members, such as, *e.g.*, any ≥ 3 , ≥ 4 , ≥ 5 ,
15 ≥ 6 or ≥ 7 etc. of said members, and up to all said members.

As used herein, "strain" or "bacterial strain" refers to any of the prokaryotic microorganism belonging to the same class of species, including the species. The purified bacterial strain of current invention may be an endophyte.

An "endophyte" is an organism capable of living on a plant element (e.g. rhizoplane
20 or phyllosphere) or within a plant element (e.g. endosphere) or on a surface in close physical proximity with a plant element (e.g. the rhizosphere or on a seed). Endophytes can occupy the intracellular or extracellular spaces of plant tissue, including but not limited to leaves, stems, flowers, fruits, seeds, or roots. An endophyte can be, for example, a bacterial or fungal organism, and can confer a
25 beneficial property to the host plant such as an increase in yield, biomass, resistance, or fitness. An endophyte can be a fungus or a bacterium. As used herein, the term "microbe" or "strain" is sometimes used to describe an endophyte. As used herein, the microbes or strains as described herein can be labelled as endophytes.

As used herein, the term "microorganism" or "microbe" refers to any strain, any
30 species or taxon of microorganism, including, but not limited to, archaea, bacteria, microalgae, fungi (including mold and yeast species), mycoplasmas, microspores, nanobacteria, oomycetes, and protozoa. In some embodiments, a microbe or microorganism is a bacterial strain. In some embodiments, a microbe or microorganism is an endophyte, for example a bacterial or fungal endophyte, which

is capable of living within a plant. In some embodiments, a microbe or microorganism encompasses individual cells (e.g., unicellular microorganisms) or more than one cell (e.g., multi-cellular microorganism).

As used herein, the term "bacterium", "bacteria", or "bacterial" refers in general to any prokaryotic organism, and may reference an organism from either Kingdom Eubacteria (Bacteria), Kingdom Archaeobacteria (Archaea), or both. In some cases, bacterial genera have been reassigned due to various reasons (such as, but not limited to, the evolving field of whole genome sequencing), and it is understood that such nomenclature reassignments are within the scope of any claimed genus.

10 The term "16S nucleotide sequence" or "16S" refers to the DNA sequence of the 16S ribosomal RNA (rRNA) sequence of a bacterium. 16S rRNA gene sequencing is a well-established method for studying phylogeny and taxonomy of bacteria. A full length 16S nucleic acid sequence counts for approximately 1500 nucleotides in length.

15 "Biomass" means the total mass or weight (fresh or dry), at a given time, of a plant tissue, plant tissues, an entire plant, or population of plants. Biomass is usually given as weight per unit area. The term may also refer to all the plants or species in the community (community biomass).

The term "purified" is intended to specifically reference an organism, cell, tissue, polynucleotide, or polypeptide that is removed from its original source. The term "purified" does not necessarily reflect the extent to which the microbe has been purified.

As used herein, a "purified bacterial strain" is a strain that has been removed from its natural milieu. The term "purified bacterial strain" refers to substantially no other strains than the desired strain, and is therefore substantially free of other contaminants, which can include microbial contaminants. Further, as used herein, "purified bacterial strain" is intended to mean the strain separated from materials with which it is normally found in nature. A strain heterologous disposed to other strains, or with compounds or materials that it is not normally found with in nature, is still defined as "purified bacterial strain".

A "plant" or "host plant" includes any plant, particularly a plant of agronomic importance, within which or onto which a strain, is heterologous disposed. As used herein, a strain is said to colonize a plant, plant element, root or seed, when it can exist as a strain in relationship with a plant or plant element during at least part of

either the plant's or the microbe's life cycle. In some embodiments, a strain is said to "colonize" a plant or plant element when it can be stably detected within the plant or plant element over a period time, such as one or more days, weeks, months or years. Some of the compositions and methods described herein involve a plurality
5 of microbes in an amount effective to colonize a plant.

The terms "identity" or "identical" in the context of nucleotide sequences refer to the nucleotides in the two sequences that are the same when aligned for maximum correspondence. There are different algorithms known in the art that can be used to measure nucleotide sequence identity. Nucleotide sequence identity can be
10 measured by a local or global alignment, preferably implementing an optimal local or optimal global alignment algorithm. For example, a global alignment may be generated using an implementation of the Needleman-Wunsch algorithm. For example, a local alignment may be generated using an implementation of the Smith-Waterman algorithm.

15 A gap is a region of an alignment wherein a sequence does not align to a position in the other sequence of the alignment. In global alignments, terminal gaps are discarded before identity is calculated. For both local and global alignments, internal gaps are counted as differences. A terminal gap is a region beginning at the end of a sequence in an alignment wherein the nucleotide in the terminal position of that
20 sequence does not correspond to a nucleotide position in the other sequence of the alignment and extending for all contiguous positions in that sequence wherein the nucleotides of that sequence do not correspond to a nucleotide position in the other sequence of the alignment.

The term "reference plant" or "reference" is a comparative term, and references
25 plants that are genetically identical, but may differ in treatment. In one example, two genetically identical maize plant embryos may be separated into two different groups, one receiving a treatment (such as transformation with a heterologous polynucleotide, to create a genetically modified plant) and one control, e.g., reference, that does not receive such treatment. Any phenotypic differences
30 between the two groups may thus be attributed solely to the treatment and not to any inherency of the plant's genetic makeup. In another example, two genetically identical wheat seeds may be treated with a formulation, one that introduces an bacterial population and one that does not. Any phenotypic differences between the plants derived from (e.g., grown from or obtained from) those seeds may be
35 attributed to the bacterial treatment.

Similarly, by the term "reference agricultural plant," it is meant an agricultural plant of the same species, variety, or cultivar to which a treatment, formulation, composition or bacterial strain preparation as described herein is not administered/contacted. A reference agricultural plant, therefore, is identical to the treated plant with the exception of the presence of the bacterial strain and can serve as a control for detecting the effects of the bacterial strain that is conferred to the plant.

A "reference environment" refers to the environment, treatment or condition of the plant in which a measurement is made. For example, production of a compound in a plant heterologous disposed to a bacterial strain can be measured in a reference environment of drought stress, and compared with the levels of the compound in a reference agricultural plant under the same conditions of drought stress. Alternatively, the levels of a compound in plant heterologous disposed to a bacterial strain and reference agricultural plant can be measured under identical conditions of no stress.

A "plant element" is intended to generically reference either a whole plant or a plant component, including but not limited to plant tissues, parts, and cell types. A plant element is preferably one of the following: whole plant, seedling, meristematic tissue, ground tissue, vascular tissue, dermal tissue, seed, leaf, root, shoot, stem, flower, ear, spike, spikelet, fruit, stolon, bulb, tuber, corm, keikis, bud. As used herein, a "plant element" is synonymous to a "portion" of a plant, and refers to any part of the plant, and can include distinct tissues and/or organs, and may be used interchangeably with the term "tissue" throughout. In addition, a "plant element" is intended to generically reference any part of a plant that is able to initiate other plants via either sexual or asexual reproduction of that plant, for example but not limited to: seed, seedling, root, shoot, cutting, scion, graft, stolon, bulb, tuber, corm, keikis, or bud.

"Agricultural plants" or "plants of agronomic importance" include plants that are cultivated by humans for food, feed, fiber, fuel, and/or industrial purposes. In some embodiments, plants (including seeds and other plant elements) treated in accordance with the present invention are monocots. In a particular embodiment, the agricultural plant is selected from the group consisting of wheat (*Triticum aestivum* and related varieties), barley (*Hordeum vulgare* and related varieties) or maize (*Zea mays* and related varieties).

An "active formulation" refers to a mixture of chemicals that facilitate the stability, storage, and/or application of the purified bacterial strain(s). Treatment formulations may comprise any one or more agents such as: a carrier, a solvent, an adjuvant, an oil, an emulsifier, a spreader, a cryoprotectant, a binder, a dispersant, a surfactant, a buffer, a tackifier, a microbial stabilizer, a fungicide, a complexing agent, an herbicide, a nematicide, an insecticide, a plant growth regulator, a rodenticide, a desiccant, a nutrient, an excipient, a wetting agent, or a salt.

As used herein an "agriculturally compatible carrier" refers to any material, other than water, that can be added to a plant element without causing or having an adverse effect on the plant element (e.g., reducing seed germination) or the plant that grows from the plant element, or the like.

As used herein, a "colony-forming unit" or "CFU" is used as a measure of viable microorganisms in a sample. A CFU is an individual viable cell capable of forming on a solid medium a visible colony whose individual cells are derived by cell division from one parental cell.

The term "supernatant" refers to the liquid broth remaining when cells grown in said broth are removed by centrifugation, filtration, sedimentation or other means well known in the art.

The term "extract" refers to various forms of microbial products. Said microbial products are obtained by removing the cell walls and/or cell membranes of the bacterial strains, a process known as lysis. Thereby obtaining one or more endogenous products of the bacterial strains in culture.

As used herein, a microbe, plant, or plant element is "modified" when it comprises an artificially introduced genetic or epigenetic "modification". In some embodiments, the modification is introduced by a genome engineering technology. In some embodiments, the modification is introduced by a targeted nuclease. In some embodiments, targeted nucleases include, but are not limited to, transcription activator-like effector nuclease (TALEN), zinc finger nuclease (ZNF), clustered regulatory interspaced short palindromic repeats (CRISPR), CRISPR/Cas9, CRISPR/CPFL and combinations thereof. In some embodiments, the modification is an epigenetic modification. In some embodiments, the modification is introduced by treatment with a DNA methyltransferase inhibitor such as 5-azacytidine, or a histone deacetylase inhibitor such as 2-amino-7-methoxy-3H-phenoxazin-3-one. In some

embodiments, the modification is introduced via tissue culture. In some embodiments, a modified microbe, plant, or plant element comprises a transgene.

All references cited in the present specification are hereby incorporated by reference in their entirety. In particular, the teachings of all references herein specifically
5 referred to are incorporated by reference.

Unless otherwise defined, all terms used in disclosing the invention, including technical and scientific terms, have the meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. By means of further guidance, definitions for the terms used in the description are included to better
10 appreciate the teaching of the present invention. The terms or definitions used herein are provided solely to aid in the understanding of the invention.

Reference throughout this specification to "one embodiment" or "an embodiment" means that a particular feature, structure or characteristic described in connection with the embodiment is included in at least one embodiment of the present
15 invention. Thus, appearances of the phrases "in one embodiment" or "in an embodiment" in various places throughout this specification are not necessarily all referring to the same embodiment, but may. Furthermore, the particular features, structures or characteristics may be combined in any suitable manner, as would be apparent to a person skilled in the art from this disclosure, in one or more
20 embodiments. Furthermore, while some embodiments described herein include some but not other features included in other embodiments, combinations of features of different embodiments are meant to be within the scope of the invention, and form different embodiments, as would be understood by those in the art. For example, in the following claims, any of the claimed embodiments can be used in
25 any combination.

Diverse plant-associated microorganisms can positively impact plant health and physiology in a variety of ways. The bacterial strains described in the current invention provide several significant advantages to plants, in particular agricultural plants, like wheat, barley and maize.

30 In a first aspect the invention concerns a purified bacterial strain, wherein said strain is useful for improving plant growth and/or yield, wherein said bacterial strain comprises at least one 16S nucleotide sequence that is at least 95% identical to a sequence selected from the group consisting of SEQ ID NOs: 1 to 30 or as described in Table 1. Preferably, said strain has a 16S sequence that is at least 95% identical

to a sequence selected from SEQ ID NOs: 1, 3, 4, 5, 6, 10, 11, 13, 14, 15, 19, 21, or 29. Preferably, said purified bacterial strain comprises at least one 16S nucleotide sequence that is between 95% and 96%, at least 96%, between 96% and 97%, at least 97%, between 97% and 98%, at least 98%, between 98% and 99%, at least 99%, at least 99.1%, at least 99.2%, at least 99.3%, at least 99.4%, at least 99.5%, at least 99.6%, at least 99.7%, at least 99.8%, at least 99.9% identical to a sequence selected from the group consisting of SEQ ID NOs: 1 to 30 or as described in Table 1, more preferably according to SEQ ID NOs: 1, 3, 4, 5, 6, 10, 11, 13, 14, 15, 19, 21, or 29.

- 10 In an embodiment of current invention, the purified bacterial strain comprises at least one 16S nucleotide sequence as described in Table 1. In other words, the purified bacterial strain comprises at least one 16S nucleotide sequence identical, i.e. 100%, to a 16S nucleotide sequence as described in Table 1. Preferably, said strain has a 16S sequence identical to a sequence selected from SEQ ID NOs: 1, 3, 4, 5, 6, 10, 11, 13, 14, 15, 19, 21, or 29.

- In another embodiment, the purified bacterial strain comprises one 16S nucleotide sequence that is at least 95% identical to at least one sequence selected from the group consisting of SEQ ID NOs: 1 to 30 or as described in Table 1, more preferably according to SEQ ID NOs: 1, 3, 4, 5, 6, 10, 11, 13, 14, 15, 19, 21, or 29. In a further embodiment, said purified bacterial strain comprises one 16S nucleotide sequence that is between 95% and 96%, at least 96%, between 96% and 97%, at least 97%, between 97% and 98%, at least 98%, between 98% and 99%, at least 99%, at least 99.1%, at least 99.2%, at least 99.3%, at least 99.4%, at least 99.5%, at least 99.6%, at least 99.7%, at least 99.8%, at least 99.9% identical to a sequence selected from the group consisting of SEQ ID NOs: 1 to 30 or as described in Table 1, more preferably according to SEQ ID NOs: 1, 3, 4, 5, 6, 10, 11, 13, 14, 15, 19, 21, or 29.

- In another or further embodiment, the purified bacterial strain comprises two 16S nucleotide sequence copies that is at least 95% identical to at least one sequence selected from the group consisting of SEQ ID NOs: 1 to 30 or as described in Table 1, more preferably according to SEQ ID NOs: 1, 3, 4, 5, 6, 10, 11, 13, 14, 15, 19, 21, or 29. According to a particular embodiment, said purified bacterial strain comprises two 16S nucleotide sequence that is between 95% and 96%, at least 96%, between 96% and 97%, at least 97%, between 97% and 98%, at least 98%, between 98% and 99%, at least 99%, at least 99.1%, at least 99.2%, at least 99.3%, at least 99.4%, at least 99.5%, at least 99.6%, at least 99.7%, at least

99.8%, at least 99.9% identical to a sequence selected from the group consisting of SEQ ID NOs: 1 to 30 or as described in Table 1, more preferably according to SEQ ID NOs: 1, 3, 4, 5, 6, 10, 11, 13, 14, 15, 19, 21, or 29.

5 In another embodiment, the purified bacterial strain comprises at least two 16S nucleotide sequence copies that are at least 95% identical to at least two sequences selected from the group consisting of SEQ ID NOs: 1 to 30 or as described in Table 1, more preferably according to SEQ ID NOs: 1, 3, 4, 5, 6, 10, 11, 13, 14, 15, 19, 21, or 29. In another or further embodiment, said purified bacterial strain comprises at least two 16S nucleotide sequence that is between 95% and 96%, at least 96%,
10 between 96% and 97%, at least 97%, between 97% and 98%, at least 98%, between 98% and 99%, at least 99%, at least 99.1%, at least 99.2%, at least 99.3%, at least 99.4%, at least 99.5%, at least 99.6%, at least 99.7%, at least 99.8%, at least 99.9% identical to a sequence selected from the group consisting of SEQ ID NOs: 1 to 30 or as described in Table 1, more preferably according to
15 SEQ ID NOs: 1, 3, 4, 5, 6, 10, 11, 13, 14, 15, 19, 21, or 29.

According to another embodiment, the purified bacterial strain comprises at least three, preferably at least four, at least five, at least six, at least seven, at least eight, at least nine, at least ten, at least eleven, at least twelve, at least thirteen, at least fourteen, at least fifteen 16S nucleotide sequence copies that are at least
20 95% identical to at least two sequences selected from the group consisting of SEQ ID NOs: 1 to 30 or as described in Table 1, more preferably according to SEQ ID NOs: 1, 3, 4, 5, 6, 10, 11, 13, 14, 15, 19, 21, or 29. In another or further embodiment, said purified bacterial strain comprises at least two 16S nucleotide sequence that is between 95% and 96%, at least 96%, between 96% and 97%, at
25 least 97%, between 97% and 98%, at least 98%, between 98% and 99%, at least 99%, at least 99.1%, at least 99.2%, at least 99.3%, at least 99.4%, at least 99.5%, at least 99.6%, at least 99.7%, at least 99.8%, at least 99.9% identical to a sequence selected from the group consisting of SEQ ID NOs: 1 to 30 or as described in Table 1, more preferably according to SEQ ID NOs: 1, 3, 4, 5, 6, 10,
30 11, 13, 14, 15, 19, 21, or 29.

According to another embodiment, the purified bacterial strain comprises multicopy 16S nucleotide sequence copies, that are at least 95% identical to at least two sequences selected from the group consisting of SEQ ID NOs: 1 to 30 or as described in Table 1, more preferably according to SEQ ID NOs: 1, 3, 4, 5, 6, 10, 11, 13, 14,
35 15, 19, 21, or 29. In another or further embodiment, said purified bacterial strain comprises at least two 16S nucleotide sequence that is between 95% and 96%, at

least 96%, between 96% and 97%, at least 97%, between 97% and 98%, at least 98%, between 98% and 99%, at least 99%, at least 99.1%, at least 99.2%, at least 99.3%, at least 99.4%, at least 99.5%, at least 99.6%, at least 99.7%, at least 99.8%, at least 99.9% identical to a sequence selected from the group consisting of SEQ ID NOs: 1 to 30 or as described in Table 1, more preferably according to SEQ ID NOs: 1, 3, 4, 5, 6, 10, 11, 13, 14, 15, 19, 21, or 29.

In a preferred embodiment, the purified bacterial strain is useful for improving a trait of agronomic importance in a plant, wherein said bacterial strain comprises at least one 16S nucleotide sequence at least 95% identical to at least one sequence selected from the group consisting of SEQ ID NOs: 1 to 30 or as described in Table 1, more preferably according to SEQ ID NOs: 1, 3, 4, 5, 6, 10, 11, 13, 14, 15, 19, 21, or 29.

In a more preferred embodiment, the purified bacterial strain is useful for the plant to overcome stress conditions, such as nutrient stress, wherein said bacterial strain comprises at least one 16S nucleotide sequence at least 95% identical to at least one sequence selected from the group consisting of SEQ ID NOs: 1 to 30 or as described in Table 1, more preferably according to SEQ ID NOs: 1, 3, 4, 5, 6, 10, 11, 13, 14, 15, 19, 21, or 29.

In another embodiment, the purified bacterial strain is useful for conferring resistance to a plant pathogen infection in a plant, wherein said bacterial strain comprises at least one 16S nucleotide sequence at least 95% identical to at least one sequence selected from the group consisting of SEQ ID NOs: 1 to 30 or as described in Table 1, more preferably according to SEQ ID NOs: 1, 3, 4, 5, 6, 10, 11, 13, 14, 15, 19, 21, or 29.

In more preferred embodiment, the purified bacterial strain is useful for conferring resistance to a *Fusarium* infection in a plant, wherein said bacterial strain comprises at least one 16S nucleotide sequence at least 95% identical to at least one sequence selected from the group consisting of SEQ ID NOs: 20, 23 or 30 or as described in Table 1.

The purified bacterial strains of current invention are useful for conferring resistance to a plant pathogen infection in a plant, plant element and growth medium.

In a preferred embodiment, the purified bacterial strain is deposited with the Polish Collection of Microorganisms, under the terms of the Budapest Treaty respectively with Deposit ID: B/00182, B/00183, B/00184, B/00195, B/00196, B/00197,

B/00199, B/00200, B/00201, B/00202, B/00203, B/00204, B/00205, B/00206, B/00213, B/00175, B/00194, B/00198, B/00207, B/00191, B/00192, B/00193, B/00177, B/00180, B/00185, B/00189, B/00190, B/00179, B/00178, B/00223.

In an embodiment, the purified bacterial strain improves the plant growth and/or yield, and said strain is as deposited with Deposit ID: B/00182, B/00183, B/00184, B/00195, B/00196, B/00197, B/00199, B/00200, B/00201, B/00202, B/00203, B/00204, B/00205, B/00206, B/00213, B/00175, B/00194, B/00198, B/00207, B/00191, B/00192, B/00193, B/00177, B/00180, B/00185, B/00189, B/00190, B/00179, B/00178, or B/00223. Preferably, said strain is as deposited with Deposit ID: B/00182, B/00184, B/00195, B/00196, B/00197, B/00202, B/00203, B/00205, B/00206, B/00213, B/00207, B/00192, or B/00178.

In a further embodiment of current invention, the 16S nucleotide sequence identity is determined over a region of alignment of at least 100 nucleotides. In a preferred embodiment, the 16S nucleotide sequence identity is determined over a region of alignment of at least 100 nucleotides inclusive of any internal gaps.

In another embodiment, the 16S nucleotide sequence identity is determined over a region of alignment of at least 200 nucleotides, more preferably at least 300 nucleotides, more preferably at least 400 nucleotides, more preferably at least 500 nucleotides. In a preferred embodiment, the 16S nucleotide sequence identity is determined over a region of alignment of at least 200 nucleotides, preferably at least 300 nucleotides, preferably at least 400 nucleotides, more preferably at least 500 nucleotides inclusive of any internal gaps. In a more preferred embodiment the 16S nucleotide sequence identity is determined over a region of alignment considering a full length 16S sequence nucleotide.

In a second aspect the invention concerns a bacterial population comprising one or more, preferably two or more purified bacterial strains, wherein said strains are described in the invention.

The bacterial population of current invention comprises one or more, preferably two or more (e.g. 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 25 or greater than 25) purified bacterial strains, wherein said strains originate from different families of bacteria, or different genera of bacteria, or from the same genera but different species of bacteria. The taxonomic different bacterial strains can be obtained from the same cultivar of plant, different cultivars of the same plant, or different species of the same type of plant. The bacterial strains can be obtained from the soil wherein the plant is grown. In an

embodiment in which one or more, preferably two or more purified bacterial strains are used, each of the bacterial strains can have different properties or activities, e.g. produce different metabolites, produce different enzyme, confer different beneficial traits.

- 5 Preferably, the purified bacterial strains in said bacterial population are present in about equal amounts. Preferably, the concentration of each purified bacterial strain in said bacterial population is at least 10^2 CFU/ml or spores/ml at least 10^2 CFU/ml or spores/ml, at least 10^4 CFU/ml or spores/ml, at least 10^5 CFU/ml or spores/ml, at least 10^6 CFU/ml or spores/ml, at least 10^7 CFU/ml or spores/ml, at least 10^8 CFU/ml or spores/ml, at least 10^9 CFU/ml or spores/ml, or at least 10^{10} CFU/ml or spores/ml when said formulation is a liquid formulation. More preferably, the concentration of each purified bacterial strain in said bacterial population is between 10^3 to 10^{10} CFU/ml or spores/ml, between 10^4 to 10^{10} CFU/ml or spores/ml, between 10^5 to 10^{10} CFU/ml or spores/ml, between 10^6 to 10^{10} CFU/ml or spores/ml, between 10^6 to 10^9 CFU/ml or spores/ml, between 10^7 to 10^9 CFU/ml or spores/ml, or between 10^8 to 10^9 CFU/ml or spores/ml when said formulation is a liquid formulation. When said formulation is a non-liquid formulation, the concentration of each purified bacterial strain in said bacterial population is similar to the concentration in a liquid formulation, as mentioned above, but expressed as CFU/mg non-liquid formulation.

The purified bacterial strains described in current invention are capable of colonizing plants. Successful colonization can be confirmed by detecting the presence of the strain within the plant. For example, after applying the strain to the plant elements, high titers of the strain can be detected in the roots and shoots of the plants that germinate from said plant elements. Detecting the presence of the strain inside the plant can be accomplished by measuring the viability of the strain after surface sterilization of the plant element or the plant: strain colonization results in an internal localization of the strain, rendering it resistant to conditions of surface sterilization. The presence and quantity of strain can also be established using other means known in the art, for example, immunofluorescence microscopy using microbe-specific antibodies, or fluorescence in situ hybridization. Alternatively, specific nucleic acid probes recognizing conserved sequences from an strain can be employed to amplify a region, for example by quantitative PCR, and correlated to CFUs by means of a standard curve.

- 35 In some cases, the strains described herein are capable of moving from one tissue type to another. For example, the present invention's detection and isolation of

strains within the mature tissues of plants after treating the exterior of a plant element demonstrates their ability to move from the plant element into the vegetative tissues of a maturing plant. Therefore, in some embodiments, the population of bacterial strains is capable of moving from the plant element exterior into the vegetative tissues of a plant. In some embodiments, the strain that is disposed onto the plant element of a plant is capable, upon germination of the plant element into a vegetative state, of localizing to a different tissue of the plant. For example, strains can be capable of localizing to any one of the tissues in the plant, including: the root, adventitious root, seminal root, root hair, shoot, leaf, flower, ear, spike, spikelet, bud, tassel, meristem, pollen, pistil, ovaries, stamen, fruit, stolon, rhizome, nodule, tuber, trichome, guard cells, hydathode, petal, sepal, glume, rachis, vascular cambium, phloem, and xylem. In an embodiment, the strain is capable of localizing to the root and/or the root hair of the plant. In another embodiment, the strain is capable of localizing to the photosynthetic tissues, for example, leaves and shoots of the plant. In other cases, the strain is localized to the vascular tissues of the plant, for example, in the xylem and phloem. In still another embodiment, the strain is capable of localizing to the reproductive tissues (flower, pollen, pistil, ovaries, stamen, fruit, spike, spikelet) of the plant. In another embodiment, the strain is capable of localizing to the root, shoots, leaves and reproductive tissues of the plant. In still another embodiment, the strain colonizes a fruit or plant element tissue of the plant. In still another embodiment, the strain is able to colonize the plant such that it is present in the surface of the plant (i.e. its presence is detectably present on the plant exterior). In still other embodiments, the strain is capable of localizing to substantially all, or all, tissues of the plant. In some cases, strains are capable of replicating within the host plant and colonizing the plant.

In one embodiment, the purified bacterial strain or bacterial population can be cultured on a culture medium or can be adapted to culture on the culture medium. Said culture medium is sterile prior to being inoculated with said bacterial strain and comprises all nutrients for growth and maintenance of the strain on the culture medium. In addition, the culture medium can be in a solid, semi-solid or liquid form.

In a following aspect, current invention concerns a microbial active ingredient for improving plant growth and/or yield, wherein said ingredient comprises one or more substances isolated from a culture wherein the purified bacterial strain of current invention or the bacterial population of current invention is incubated.

Preferably the microbial active ingredient comprises one or more substances isolated from a bacterial culture comprising one or more bacterial strains or bacterial population of current invention.

5 Bacterial strains produce a plethora of small compounds and secondary metabolites that can be secreted in the culture or be stored endogenously. Therefore, in a particular embodiment, a supernatant from the culture wherein the bacterial strain or bacterial population of current invention has been cultured is useful for improving plant growth and/or yield. In another embodiment, an extract or extract fraction from the culture wherein the bacterial strain or bacterial population of current
10 invention has been cultured is useful for improving plant growth and/or yield. Non-limiting examples of endogenous products are amino acids, peptides, enzymes, secondary metabolites, vitamins, minerals. Removing the cell walls and/or cell membranes of the bacterial strains in culture can be obtained by several procedures which are well-known by the person skilled in the art. Non-limiting examples are
15 the addition of chemicals to said culture, heating said culture or induce lysis in a mechanical way. An extract can also be obtained by autolysis of the bacterial strains.

In a preferred embodiment, the microbial active ingredient comprises a spore suspension, spray dried spores, or whole cell broth.

20 To administer the purified bacterial strain or bacterial population to plants, plant elements or growth media, it is advisable to formulate the strains in a formulation or composition, wherein said formulation or composition may also comprise other biologicals or agrochemicals to simulate plant growth.

In certain embodiments, the strain is selected on the basis of its compatibility with commonly used biologicals or agrochemicals. Plants, particularly agricultural plants,
25 can be treated with a vast array of biologicals or agrochemicals.

In some cases, it can be important for the strain to be compatible with biologicals or agrochemicals, particularly those with complexing properties, in order to persist in the plant although, there are many such complexing agents that do not penetrate the plant, at least at a concentration sufficient to interfere with the strain. Therefore,
30 where a systemic complexing agent is used in the plant, compatibility of the strain to be inoculated with such agents will be an important criterion. In an embodiment, purified bacterial strains that are compatible with biologicals or agrochemicals can be used to inoculate plants, plant elements or growth media according to the methods described herein.

Bactericide-compatible strain can also be isolated by selection on liquid medium. The culture of strains can be plated on petri dishes without any forms of mutagenesis; alternatively, strains can be mutagenized using any means known in the art. For example, strain cultures can be exposed to UV light, gamma-irradiation, or chemical mutagens such as ethylmethanesulfonate (EMS), ethidium bromide (EtBr), dichlorvos (DDVP), methyl methane sulphonate (MMS), triethylphosphate (TEP), trimethylphosphate (TMP), nitrous acid, or DNA base analogs, prior to selection on fungicide comprising media. Finally, where the mechanism of action of a particular bactericide is known, the target gene can be specifically mutated (either by gene deletion, gene replacement, site-directed mutagenesis, etc.) to generate a strain that is resilient against that particular chemical. It is noted that the above-described methods can be used to isolate strains that are compatible with both bacteriostatic and bactericidal compounds.

The biological or agrochemical compatible strains generated can be detected in samples. For example, where a transgene was introduced to render the strain compatible with the biological(s) or agrochemical(s), the transgene can be used as a target gene for amplification and detection by PCR. In addition, where point mutations or deletions to a portion of a specific gene or a number of genes results in compatibility with the biological(s) or agrochemical(s), the unique point mutations can likewise be detected by PCR or other means known in the art. Such methods allow the detection of the strain even if it is no longer viable.

Furthermore, the invention concerns an agricultural active formulation comprising an agriculturally compatible carrier and one or more bacterial strains or a bacterial population at a concentration of at least about 10^2 CFU/ml or spores/ml in a liquid formulation or about 10^2 CFU/mg in a non-liquid formulation, wherein said bacterial strain and bacterial population are described herein.

Preferably, said agriculturally compatible carrier may be a natural or synthetic organic or inorganic material with which the bacterial strains or products derived from the culture of said bacterial strains are combined to facilitate their application into the plant element, plant or plant growth medium. Furthermore, said carrier is generally inert and must be acceptable for use in agriculture. One of ordinary skill in the art can readily determine the appropriate carrier to be used.

Non-limiting examples of said agricultural active formulation are soluble powders, soluble granules, wettable granules, tablet formulations, dry flowables, aqueous flowables, wettable dispersible granules, oil dispersions, suspension concentrates,

dispersible concentrates, emulsifiable concentrates, aqueous suspensions, a fertilizer granule, or a sprayable.

In a preferred embodiment said agricultural active formulation comprises at least one oil, surfactant and polymer. Preferably, said formulation further comprises one or more of the following: fungicide, nematocide, bactericide, insecticide, molluscicide, algicide, herbicide, fertilizer, micronutrient fertilizer material, stabilizer, preservative, carrier, complexing agent, or any combination thereof. In a preferred embodiment, the bacterial strain and bacterial population of the formulation are shelf-stable, and said formulation is shelf-stable. Optionally, the shelf-stable formulation is in a dry formulation, a powder formulation, or a lyophilized formulation. In some embodiments, the formulation is formulated to provide stability for the strains. In one embodiment, the formulation is substantially stable at temperatures between about -20° C. and about 50° C. for at least about 1, 2, 3, 4, 5, or 6 days, or 1, 2, 3 or 4 weeks, or 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 or 12 months, or one or more years. In another embodiment, the formulation is substantially stable at temperatures between about 4°C. and about 37°C. for at least about 5, 10, 15, 20, 25, 30 or greater than 30 days.

In another embodiment, an agricultural active formulation comprises an agriculturally compatible carrier and one or more microbial active ingredients at a concentration of at least about 10^2 CFU/ml or spores/ml in a liquid formulation or about 10^2 CFU/mg in a non-liquid formulation, wherein the microbial active ingredient is described in current invention. Preferably, the concentration of one or more microbial active ingredients is effective to improve the plant growth and/or yield.

In a preferred embodiment, any of the bacterial strains of current invention is heterologous disposed to the plant element in the agricultural active formulation. In another preferred embodiment, any of the bacterial populations of current invention is heterologous disposed to the plant element in the agricultural active formulation. In another and further embodiment, any of the microbial active ingredients of current invention is heterologous disposed to the plant element in the agricultural active formulation. In addition to the plant element, the plant itself or the growth medium wherein the plant or plant element is grown can be treated with any of the bacterial strains, bacterial populations, microbial active ingredients or agricultural active formulations of current invention.

In another aspect, the invention provides a synthetic composition comprising a plant element and a heterologous disposed bacterial strain or bacterial population to said plant element, wherein the bacterial strain or bacterial population is described in current invention, and wherein the synthetic composition is capable of improving plant growth and/or yield as compared to a reference plant element not further comprising the strain or bacterial population.

In a preferred embodiment, the synthetic composition comprises the plant element and a heterologous disposed bacterial population to said plant element. In a more preferred embodiment, the synthetic composition comprises the plant element and a heterologous disposed microbial active ingredient to said plant element.

In another embodiment, any of the synthetic compositions described herein are shelf-stable. The bacterial strain may be shelf-stable, where at least 0.01%, of the CFUs are viable after storage in desiccated form (i.e. moisture content of 30% or less) for 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 or greater than 10 weeks at 4°C or at room temperature. Optionally, a shelf-stable composition is in a dry composition, a powder composition, or a lyophilized composition. In some embodiments, the composition is formulated to provide stability for the strains. In an embodiment, the composition is substantially stable at temperatures between about -20°C and about 50°C for at least about 1, 2, 3, 4, 5, or 6 days, or 1, 2, 3 or 4 weeks, or 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 or 12 months, or one or more years. In another embodiment, the composition is substantially stable at temperatures between about 4°C and about 37°C for at least about 5, 10, 15, 20, 25, 30 or greater than 30 days. Preferably the composition is substantially stable at temperatures between about 4°C and about 37°C for at least one year or greater than one year.

In a further embodiment, any of the synthetic compositions described herein further comprise a plant element, wherein said plant element is a seed, optionally wherein the seed is modified. Preferably, the plant element is placed into a substrate that promotes plant growth, optionally soil. In a particular embodiment, a plurality of said plant elements are placed in the soil in rows, with substantially equal spacing between each seed within each row.

In another or further embodiment, any of the synthetic compositions described herein further comprise one or more of the following: stabilizer, preservative, carrier, surfactant, complexing agent, or any combination thereof and/or one or more of the following: fungicide, nematicide, bactericide, insecticide, or herbicide.

In a preferred embodiment, any of the synthetic compositions described herein are confined within an object selected from the group consisting of: bottle, jar, ampule, package, vessel, bag, box, bin, envelope, carton, container, silo, shipping container, truck bed, or case.

- 5 In a preferred embodiment related to the aspect, current invention concerns a plant grown from the synthetic composition as described in previous embodiments, wherein said plant exhibits a trait of agronomic interest, selected from the group consisting of disease resistance, drought tolerance, heat tolerance, cold tolerance, salinity tolerance, metal tolerance, herbicide tolerance, chemical tolerance,
- 10 improved water use efficiency, improved phosphorus solubilization, improved phosphorus mobilization, improved nitrogen utilization, improved nitrogen fixation, pest resistance, herbivore resistance, pathogen resistance, increase in yield, increase in yield under water-limited conditions, health enhancement, vigor improvement, growth improvement, improved plant emergence, photosynthetic
- 15 capability improvement, nutrition enhancement, altered protein content, altered oil content, increase in biomass, increase in number of tillers per plant, increase in shoot length, increase in root length, improved root architecture, increase in seed weight, altered seed carbohydrate composition, altered seed oil composition, increase in radical length, delayed senescence, stay-green, altered seed protein
- 20 composition, increase in dry weight of mature plant reproductive elements, increase in fresh weight of mature plant reproductive elements, increase in number of mature plant reproductive elements per plant, increase in chlorophyll content, reduced number of wilted leaves per plant, reduced number of severely wilted leaves per plant, increase in number of non-wilted leaves per plant, or improved plant visual
- 25 appearance.

- In some embodiments, the invention uses microbes that are heterologous to a plant or plant element in making a microbial active ingredient, an agricultural active formulation or a synthetic composition. A microbe is considered heterologous to the plant, plant element or plant growth medium if the plant, plant element or plant
- 30 growth medium is untreated (e.g., a seed that is not treated with a bacterial strain described herein) does not contain detectable levels of the microbe. A microbe is considered "heterologous disposed" on the exterior surface of or within a plant or plant tissue when the microbe is applied or disposed on the plant in a number that is not found on that plant before application of the microbe. For example, a purified
- 35 bacterial strain disposed on an exterior surface or within the seed can be an endophytic bacterium that may be associated with the mature plant, but is not found

on the surface of or within the seed. As such, a microbe is deemed heterologous disposed when applied on the plant that either does not naturally have the microbe on its surface or within the particular tissue to which the microbe is disposed, or does not naturally have the microbe on its surface or within the particular tissue in the number that is being applied.

In another embodiment, the strain is heterologous disposed, for example, on the surface of a reproductive element of a plant, in an amount effective to be detectable in the mature a plant. In a particular embodiment, the strain is heterologous disposed in an amount effective to be detectable in an amount of at least about 100 CFU between 100 and 200 CFU, at least about 200 CFU, between 200 and 300 CFU, at least about 300 CFU, between 300 and 400 CFU, at least about 500 CFU, between 500 and 1,000 CFU, at least about 1,000 CFU, between 1,000 and 3,000 CFU, at least about 3,000 CFU, between 3,000 and 10,000 CFU, at least about 10,000 CFU, between 10,000 and 30,000 CFU, at least about 30,000 CFU, between 30,000 and 100,000 CFU, at least about 100,000 CFU or more in the mature plant.

In yet another aspect, current invention concerns the bacterial strain, the bacterial population, the microbial active ingredient, the agricultural active formulation, or the synthetic composition as described above for use in improving plant growth and/or yield by improving a trait of agronomic importance in a plant.

Said bacterial strain is capable of increasing nutrient uptake and/or nutrient use efficiency of a treated plant as compared to a reference plant. Furthermore said bacterial strain is capable of increasing the nitrogen fixing capacities or phosphorus uptake of a treated plant as compared to a reference plant. In particular, said bacterial strain is capable of increasing the amount of biomass of a treated plant as compared to a reference plant. Preferably, said bacterial strain is capable of increasing the number of tillers per plant of a treated plant as compared to a reference plant. Preferably, these improved traits of agronomic importance result in an increased growth of plants, more specifically in an increased yield.

For example, the purified bacterial strain may provide an improved trait of agronomic importance in a plant that is of at least 3%, between 3% and 5%, at least 5%, between 5% and 10%, least 10%, between 10% and 15%, for example at least 15%, between 15% and 20%, at least 20%, between 20% and 30%, at least 30%, between 30% and 40%, at least 40%, between 40% and 50%, at least 50%, between 50% and 60%, at least 60%, between 60% and 75%, at least 75%, between 75% and 100%, at least 100%, between 100% and 150%, at least 150%,

between 150% and 200%, at least 200%, between 200% and 300%, at least 300% or more, when compared with the reference plants grown under the same conditions.

5 The bacterial population and microbial active ingredient of current invention improve the same traits of agronomic importance in a plant as described above.

10 An aspect of current invention also concerns the bacterial strain, the bacterial population, the microbial active ingredient, agricultural active formulation, or the synthetic composition as earlier described for use in improving plant growth and/or yield by effectively inhibiting the growth of a plant pathogen, preferably a plant pathogen of the genus *Fusarium*.

Said use of bacterial strains, bacterial populations, microbial active ingredients, agricultural active formulations, or synthetic compositions for conferring resistance to a plant pathogen infection is an efficient and ecological application of biocontrol.

15 *Fusarium* is a large genus of filamentous fungi, widely distributed in soil and associated with plants. Some *Fusarium spp.* produce mycotoxins in cereal crops and can affect human and animal health if they enter the food chain.

It is contemplated that methods may be used to improve plant growth and/or yield by improving a characteristic of agronomic importance to a plant and/or by conferring resistance to a plant pathogen infection in a plant.

20 The methods described herein can also be used with transgenic plants comprising one or more exogenous transgenes, for example, to yield additional trait benefits conferred by the newly introduced bacterial strain(s).

25 In another aspect, current invention concerns a method for conferring resistance to a plant pathogen infection in a plant, by means of treating said plant with a purified bacterial strain, a bacterial population, a microbial active ingredient or an agriculturally active formulation, wherein said strain, population, ingredient, or formulation are described in current invention.

30 In another embodiment related to the aspect, current invention also provides a method for conferring resistance to a plant pathogen infection in a plant element by means of treating said plant element with the strain, population, ingredient, or formulation as described herein.

In a further embodiment, the invention provides a method for conferring resistance to a plant pathogen infection in a plant by means of treating the plant and/or a plant and/or growth medium wherein said plant is grown, with the strain, population, ingredient, or formulation are described herein. In another embodiment related to the aspect, current invention also provides a method for conferring resistance to a plant pathogen infection in a plant element by means of treating the plant element and/or the plant growth medium wherein said plant element is cultured with the strain, population, ingredient, or formulation as described herein. Preferably, the method for conferring resistance to a *Fusarium* infection in a plant is provided by means of treating (e.g. spraying) plant ears with the strain, population, ingredient, or formulation described herein. Preferably, a wheat ear, spike, spikelet, stem and/or leave is treated with the strain, population, ingredient, or formulation of current invention to confer resistance to a *Fusarium* infection. More preferably, the strain, population, ingredient, or formulation with Deposit ID B/00177, B/00191 and/or B/00XXX are used in a method for conferring resistance to a *Fusarium* infection. Optionally, one may treat the plant growth medium (e.g. soil) with the strain, population, ingredient, or formulation as described herein for conferring resistance to a soil borne plant pathogen.

Treatment of the plant element, plant or plant growth medium with the purified bacterial strain, bacterial population, microbial active ingredient, agriculturally active formulation confers resistance to a plant pathogen infection. Furthermore, said treatment effectively inhibits growth of the plant pathogen in the plant element, plant or plant growth medium, wherein said plant element, plant or plant growth medium is infected with the plant pathogen.

As a result plant pathogen infection can be prevented in treated agricultural plants. And if agricultural plants are infected with the plant pathogen, in case said plant was not treated against the plant pathogen or was wrongly treated against the plant pathogen, the treatment results in an growth inhibition of the plant pathogen. Despite the pathogen infection, the plant growth and/or yield can improve.

In a following aspect, the current invention concerns a method of improving plant growth and/or yield, comprising the step of treating a plant element with a purified bacterial strain, a bacterial population, or a microbial active ingredient in an amount effective to increase the growth and/or yield in the plant derived from the treated plant element relative to a plant derived from a reference plant element, wherein said purified bacterial strain comprises at least one 16S nucleotide sequence at least 95% identical to a sequence selected from the group consisting of SEQ ID NOs: 1

to 30 or as described in Table 1, more preferably according to SEQ ID NOs: 1, 3, 4, 5, 6, 10, 11, 13, 14, 15, 19, 21, or 29, said bacterial population comprises one or more, preferably two or more of said strains, and said microbial active ingredient comprises one or more substances isolated from a culture wherein said bacterial strain or said bacterial population is incubated.

Preferably said purified bacterial strain comprises at least one 16S nucleotide sequence that is between 95% and 96%, at least 96%, between 96% and 97%, at least 97%, between 97% and 98%, at least 98%, between 98% and 99%, at least 99%, at least 99.1%, at least 99.2%, at least 99.3%, at least 99.4%, at least 99.5%, at least 99.6%, at least 99.7%, at least 99.8%, at least 99.9% identical to a sequence selected from the group consisting of SEQ ID NOs: 1 to 30 or as described in Table 1, more preferably according to SEQ ID NOs: 1, 3, 4, 5, 6, 10, 11, 13, 14, 15, 19, 21, or 29.

As used herein, a purified bacterial strain is considered to have conferred an improved agricultural trait whether or not the improved trait arose from the plant, the strain, or the concerted action between the plant and bacterial strain. Therefore, for example, whether a beneficial hormone or chemical is produced by the plant or the strain, for purposes, the strain will be considered to have conferred an improved agronomic trait upon the host plant, as compared to a reference plant that has not been heterologously disposed to said strain.

In a preferred embodiment, the purified bacterial strain is heterologously disposed to a plant element in an amount effective to increase a trait of agronomic importance in the plant derived from the treated plant element relative to a plant derived from a reference plant element, wherein said purified bacterial strain is described in current invention. In a preferred embodiment, the amount of the heterologously disposed strain to the plant element is effective to maintain a critical population mass in said plant element. In a further embodiment, the amount of the heterologously disposed strain to the plant element is effective to maintain a critical population mass in the mature plant germinated from said plant element.

In a more preferred embodiment, the bacterial population, the microbial active ingredient, the agricultural active formulation, or the synthetic composition is heterologously disposed to a plant element in an amount effective to increase a trait of agronomic importance in the plant derived from the treated plant element relative to a plant derived from a reference plant element, wherein said population, ingredient, formulation or composition are described in current invention.

In one embodiment, said plant element is modified. A person skilled in the art is familiar with a variety of conventional and more advanced methods to modify plant elements. According to another embodiment the plant element is any plant element with the intrinsic characteristics of plant propagation. Because of the totipotency of plants, any part of the plant may be used (e.g. a stem cutting, a leaf section, a portion of a root), though it is usually a highly meristematic part such as root and stem ends, buds, tubers, bulbs, rhizome, stolon or any plant part for vegetative reproduction. In sexual reproduction, a plant element is a seed or spore. According to a preferred embodiment the plant element is a portion of the root or a seed. Preferably, a wheat ear, spike, spikelet, stem and/or leave is modified.

In some embodiments, plant elements of the present invention include wild plants and domesticated varieties. Plant elements may be developed by any technique, including but not limited to directed evolution, selection, marker assisted selection, hybridization, outcrossing, backcrossing, in-breeding, polyploidization, reverse breeding, doubled haploids, induced mutation, other genetic or epigenetic modifications, and combinations thereof.

In one embodiment, it is contemplated that the plant, more in particular the agricultural plant, of the present invention is wheat (*Triticum aestivum* and related varieties), barley (*Hordeum vulgare* and related varieties) or maize (*Zea mays* and related varieties).

In another aspect, the current invention concerns a method of improving plant growth and/or yield, comprising the step of treating a plant element with a first purified bacterial strain and a second purified bacterial strain in an amount effective to increase growth and/or yield in the plant derived from the treated plant element relative to a plant derived from a reference plant element, characterized in that, said first strain comprises at least one 16S nucleotide sequence at least 95% identical to a sequence selected from the group consisting of SEQ ID NOs 1 to 30 or as described in Table 1, more preferably according to SEQ ID NOs: 1, 3, 4, 5, 6, 10, 11, 13, 14, 15, 19, 21, or 29; and said second strain comprises at least one 16S nucleotide sequence at least 95% identical to a sequence selected from the group consisting of SEQ ID NOs 1 to 30 or as described in Table 1, more preferably according to SEQ ID NOs: 1, 3, 4, 5, 6, 10, 11, 13, 14, 15, 19, 21, or 29.

Said first and second purified bacterial strain are described in current invention as purified bacterial strains. In one embodiment related to the aspect the first and second bacterial strain are two taxonomic identical bacterial strains. In particular,

said strains originate from the same families, genera, or species of bacteria. Said strains may differ on the strain level. Optionally, the first and second bacterial strain related to the aspect are two taxonomic different bacterial strains. In particular, said strains originate from different families of bacteria, or different genera of bacteria, or from the same genera but different species of bacteria. The taxonomic different bacterial strains can be obtained from the same cultivar of plant, different cultivars of the same plant, or different species of the same type of plant. In embodiments in which two bacterial strains are used, each of the bacterial strains can have different properties or activities, e.g., produce different metabolites, produce different enzyme, confer different beneficial traits, show synergistic effects.

In another embodiment an additional, a third, purified bacterial strain is heterologous disposed to a plant element in an amount effective to improve growth and/or yield in the plant derived from the treated plant element relative to a plant derived from a reference plant element. Preferably, the plant element is treated with one or more, preferably two or more purified bacterial strains in an amount effective to increase growth and/or yield in the plant derived from the treated plant element relative to a plant derived from a reference plant element. In particular, the plant element is treated with a bacterial population in an amount effective to increase growth and/or yield in the plant derived from the treated plant element relative to a plant derived from a reference plant element. In another or further embodiment, one or more, preferably two or more purified bacterial strains are heterologous disposed to a plant element in an amount effective to inhibit the growth of the plant pathogen of the genus *Fusarium* on the plant grown from the treated plant element.

Current invention also discloses a method of improving plant growth and/or yield, comprising the steps of inoculating a plant growth medium with a purified bacterial strain, a bacterial population, or a microbial active ingredient; and growing a plant in said medium, wherein said strain comprises at least one 16S nucleotide sequence at least 95% identical to at least one sequence selected from the group consisting of SEQ ID NOs: 1 to 30 or as described in Table 1, more preferably according to SEQ ID NOs: 1, 3, 4, 5, 6, 10, 11, 13, 14, 15, 19, 21, or 29, said bacterial population comprises one or more, preferably two or more of said strains, and said microbial active ingredient comprises one or more substances isolated from a culture wherein said bacterial strain or said bacterial population is incubated.

Inoculating a plant growth medium can be performed, by way of example and without the intention to be limiting, using a liquid, a powder, a granule, a pellet. Plants, in particular agricultural plants, can be grown in plant growth medium. In

one embodiment, said plant growth medium is soil, sand, gravel, polysaccharide, mulch, compost, peat moss, straw, logs, clay, or a combination thereof. In another embodiment, the plant growth medium can also include a hydroculture system or an in vitro culture system.

- 5 In a particular embodiment, the method is provided for improving growth and/or yield of a plant, wherein said plant is free of disease and/or pathogen pressure and/or pest organisms. In a preferred embodiment, the method is provided to inhibit the growth of the plant pathogen.

10 Hydroculture is the growing of plants in a soilless medium or an aquatic based environment, while in vitro culture system refers to the growing of plants or explants on or in a recipient with synthetic medium, in sterile conditions, in a controlled environment and in reduced space. Explants refer to parts of a plant, from all the aerial part to isolated cells, as parts of leaves, of roots, seeds, bulbs, tubers, buds. The inoculation of said plant growth medium with, the purified bacterial strain, the
15 bacterial population or the microbial active ingredient can be done before, during and/or after sowing or before, during and/or after the start of the plant growth cycle in case of hydroculture or in vitro culture. The inoculation can be performed once or multiple times during the plant growth cycle.

20 In a following aspect, the invention provides a method for improving plant growth and/or yield by artificially inoculating the plant with one or more purified bacterial strains, wherein said strain comprises at least one 16S nucleotide sequence at least 95% identical to at least one sequence selected from the group consisting of SEQ ID NOs: 1 to 30 or as described in Table 1, more preferably according to SEQ ID NOs: 1, 3, 4, 5, 6, 10, 11, 13, 14, 15, 19, 21, or 29, and wherein said strains are
25 applied to said plant as a powder, pellet, granule or liquid.

In a preferred embodiment current invention provides a method for improving plant growth and/or yield by artificially inoculating said plant with the bacterial population, the microbial active ingredient, or the agriculturally active formulation as described in current invention.

30 In another embodiment the invention provides a method for enhancing plant growth and/or plant yield of a plant by artificially inoculating a plant element, in particular the root, of said plant with one or more purified bacterial strains, wherein said strain comprises at least one 16S nucleotide sequence at least 95% identical to at least one sequence selected from the group consisting of SEQ ID NOs: 1 to 30 or as

described in Table 1, more preferably according to SEQ ID NOs: 1, 3, 4, 5, 6, 10, 11, 13, 14, 15, 19, 21, or 29, and wherein said strains are applied to said plant as a powder, pellet, granule or liquid.

5 In a more preferred embodiment of the invention, the method for enhancing plant growth and/or yield of the plant by artificially inoculating said plant with one or more purified bacterial strains, the bacterial population, the microbial active ingredient, or the agriculturally active formulation, wherein said strain, population, ingredient, or formulation are applied in an amount effective to increase the biomass and/or yield of the fruit or seed produced by the plant by at least 1%, at least 2%, at least 10 3%, at least 5%, at least 10%, at least 15%, at least 20%, at least 30%, at least 40%, at least 50%, at least 60%, at least 70%, at least 80%, at least 90%, at least 100%, or more, when compared with the fruit or seed of a reference agricultural plant.

15 In another aspect, the invention concerns a method of treating seeds of a plant to improve plant growth and/or yield, comprising mechanically or manually inoculating a plurality of plant seeds with an agricultural active formulation comprising an agriculturally acceptable carrier and a purified bacterial strain, wherein said strain comprises at least one 16S nucleotide sequence that is at least 95% identical to a 16S nucleotide sequence selected from the group consisting of SEQ ID NOs: 1 to 30 20 or as described in Table 1, more preferably according to SEQ ID NOs: 1, 3, 4, 5, 6, 10, 11, 13, 14, 15, 19, 21, or 29, wherein the seed is inoculated with said strain in an amount effective to colonize a plant germinated from the inoculated seed and to increase the seed yield of a plant germinated from the inoculated seed as compared to a plant germinated from a reference seed grown and sowed under the same 25 conditions.

In another embodiment, the method concerns inoculating the seeds of a plant with an agricultural active formulation, wherein said formulation comprises an agriculturally acceptable carrier and the purified bacterial strain, the bacterial population, or the microbial active ingredient of current invention.

30 In a preferred embodiment related to the aspect, the seed is coated with the bacterial strain, cultured with the bacterial strain or planted near the bacterial strain such that the strain is able to colonize the seed.

A further aspect of current invention also concerns a plant element, such as a seed, coated with the agricultural active formulation according to current invention. Also

the purified bacterial strains or microbial consortia may be applied on a plant element as a coating.

Current invention also concerns a method for preparing a synthetic composition, wherein said method comprises the step of treating a plant element with a bacterial strain, wherein said strain comprises at least one 16S nucleotide sequence that is at least 95% identical to a 16S nucleic acid sequence selected from the group consisting of SEQ ID NOs: 1 to 30 or as described in Table 1, more preferably according to SEQ ID NOs: 1, 3, 4, 5, 6, 10, 11, 13, 14, 15, 19, 21, or 29, wherein the bacterial strain is present in the composition in an amount capable of modulating at least one trait of agronomic importance in a plant selected from the group consisting of transcription of a gene, level of a transcript, the expression of a protein, level of a hormone, level of a metabolite, and population of endogenous microbes; in plants grown from said plant elements, as compared to reference plants grown from plant elements not treated with said composition.

A preferred embodiment of current invention concerns a method for preparing a synthetic composition, wherein said method comprises the steps of treating a plant element with the bacterial strain, the bacterial population, or the microbial active ingredient, wherein said strain, population and ingredient are described herein.

In a preferred embodiment of the method for preparing a synthetic composition, the bacterial strain is present in an amount of at least about 10^2 CFU per plant element. In a more preferred embodiment of the method for preparing a synthetic composition, the bacterial strain is present in an amount of at least about 10^2 per plant grown from the plant element.

Preferably the bacterial strain is present on the plant element in an amount effective to be detectable within a target tissue of the mature plant selected from a fruit, a seed, a leaf, or a root, or portion thereof. For example, the bacterial strain can be detected in an amount of at least about 100 CFU or spores, between 100 and 200 CFU or spores, at least about 200 CFU or spores, between 200 and 300 CFU or spores, at least about 300 CFU or spores, between 300 and 400 CFU or spores, at least about 500 CFU or spores, between 500 and 1,000 CFU or spores, at least about 1,000 CFU or spores, between 1,000 and 3,000 CFU or spores, at least about 3,000 CFU or spores, between 3,000 and 10,000 CFU or spores, at least about 10,000 CFU or spores, between 10,000 and 30,000 CFU or spores, at least about 30,000 CFU or spores, between 30,000 and 100,000 CFU or spores, at least about 10^5 CFU or

spores, between 10^5 and 10^6 CFU or spores at least about 10^6 CFU or spores or more in the mature plant.

In a final aspect of current invention, the invention concerns a method of improving the efficacy of a purified bacterial strain in an application, comprising the selection
5 of an additional purified bacterial strain, wherein said strain comprises at least one 16S nucleotide sequence at least 95% identical to at least one sequence selected from the group consisting of SEQ ID NOs: 1 to 30 or as described in Table 1, more preferably according to SEQ ID NOs: 1, 3, 4, 5, 6, 10, 11, 13, 14, 15, 19, 21, or 29, and wherein said additional strain comprises at least one 16S nucleotide sequence
10 at least 95% identical to at least one sequence selected from the group consisting of SEQ ID NOs: 1 to 30 or as described in Table 1, more preferably according to SEQ ID NOs: 1, 3, 4, 5, 6, 10, 11, 13, 14, 15, 19, 21, or 29.

In a preferred embodiment of the method of improving the efficacy, the application is selected from the group consisting of: agriculture, plant improvement, water
15 quality improvement, bioremediation, industrial compound production, pharmaceutical compound production, and production of bioengineered substances. In particular, the application is a production method of a composition belonging to a class of compound selected from the group consisting of: acids, alcohols, amino acids, amylases, antibiotics, biogases, bioplastics, citric acid, enzymes, esters, fatty
20 acids, flavoring agents, glutamic acid, human or animal hormones, human growth hormone, ice, insulin, lactic acid, lipases, lipids, minerals, nitrogen, oils, nucleic acids, pectinases, preservatives, proteins, snow, sugars, vaccines, viruses, vitamins, and waxes.

Furthermore current invention concerns a method of improving the performance of
25 a purified bacterial strain in an application, comprising the selection of an additional purified bacterial strain, wherein said strain comprises at least one 16S nucleotide sequence at least 95% identical to at least one sequence selected from the group consisting of SEQ ID NOs: 1 to 30 or as described in Table 1, more preferably according to SEQ ID NOs: 1, 3, 4, 5, 6, 10, 11, 13, 14, 15, 19, 21, or 29, and
30 wherein said additional strain comprises at least one 16S nucleotide sequence at least 95% identical to at least one sequence selected from the group consisting of SEQ ID NOs: 1 to 30 or as described in Table 1, more preferably according to SEQ ID NOs: 1, 3, 4, 5, 6, 10, 11, 13, 14, 15, 19, 21, or 29.

In some embodiments, the additional bacterial strain is associated with a plant
35 element, and/or the bacterial strain is Gram-negative, and/or the bacterial strain is

Gram-positive, and/or the bacterial strain has improved sporulation capability, and/or the bacterial strain comprises a characteristic selected from the group consisting of: efficacy, survivability, shelf-stability, tolerance to an antibiotic, tolerance to reduced environmental moisture.

5

The invention is further described by the following non-limiting examples which further illustrate the invention, and are not intended to, nor should they be interpreted to, limit the scope of the invention.

EXAMPLES

- 10 The present invention will now be further exemplified with reference to the following example(s). The present invention is in no way limited to the given examples or to the embodiments presented in the figures.

Example 1: Increased dry biomass and increased number of tillers per plant in wheat

- 15 Per treatment, 5 x 24 wheat seeds are treated with a formulation containing a bacterial strain. Five planter boxes are filled with potting soil mix and saturated with water. As a control, 10 x 24 wheat seeds are treated with a formulation without bacterial strain to compare (mock treatment). Seeds are sown in three rows of 8 seeds per planter box. Nutrients are being added to the planter boxes at two and three weeks after sowing. The number of tillers per plant are counted at 6 weeks
- 20 after sowing the wheat plants obtained from seeds treated with said the bacterial strain. After counting the number of tiller per plant, all shoots are cut off and fresh biomass is weighed per planter box (i.e. all 24 shoots together). Plant shoots are then dried at 60°C for 1 week and dry biomass (in mg) is determined per planter box.

- 25 For all evaluated formulations, each containing a bacterial strain of current invention, an increase in dry biomass and/or an increase in number of tillers per plant is seen in reference to a formulation without bacterial strain. The increase in dry biomass ranges between 6,2% and 31,7% for the evaluated formulations, as visualized in Figures 1A-1L. The increase in number of tillers is visualized in Figures
- 30 2A-2I, and ranges between 16,1% and 111,6%.

Example 2: Increased dry biomass per plant in wheat

Per treatment, 5 x 24 wheat seeds are treated with a formulation comprising two or six bacterial strains of current invention. Five planter boxes are filled with potting

soil mix and saturated with water. As a control, 10 x 24 wheat seeds are treated with a formulation without bacterial strain to compare (mock treatment). Seeds are sown in three rows of 8 seeds per planter box. Nutrients are being added to the planter boxes at two and three weeks after sowing. Plant height of the middle row is measured 5 weeks after sowing. Six weeks after sowing, all shoots are cut off and fresh biomass is weighed per planter box (i.e. all 24 shoots together). Plant shoots are then dried at 60°C for 1 week and dry biomass (in mg) is determined per planter box. A combination of two bacterial strains of current invention demonstrate an increase of 12,7% dry biomass (in mg) in reference to the mock (Figure 3). A combination of six bacterial strains of current invention demonstrate an increase of 12,8% dry biomass (in mg) in reference to the mock (Figure 3). The combination of bacterial strains establishes a synergistic effect, increasing the dry biomass of treated wheat.

Example 3: Increased dry biomass per plant in maize

Per treatment, 5 x 24 maize seeds are treated with a whole cell broth wherein a purified bacterial strain a member of genus *Rhizobium* with Deposit ID B/00196 (Figure 4A) or whole cell broth wherein a purified bacterial strain a member of genus *Brevundimonas* with Deposit ID B/00179 (Figure 4B) was incubated. Five planter boxes are filled with potting soil mix and saturated with water. As a control, 10 x 24 maize seeds are treated with a formulation without bacterial strain to compare (mock treatment). Seeds are sown in three rows of 8 seeds per planter box. Nutrients are being added to the planter boxes at two and three weeks after sowing. Plant height of the middle row is measured 5 weeks after sowing. Six weeks after sowing, all shoots are cut off and fresh biomass is weighed per planter box (i.e. all 24 shoots together). Plant shoots are then dried at 60°C for 1 week and dry biomass (in mg) is determined per planter box. Maize plants treated with a whole cell broth wherein B/00196 was incubated or wherein B/00179 was incubated show respectively a 12,5% and 14,2% increase of dry biomass in reference to maize plants treated with a mock.

Example 4: Growth inhibition of the plant pathogen of genus *Fusarium*

A co-culturing experiment of a purified bacterial strain member of the genus *Burkholderia* with Deposit ID B/00191 is executed with the fungal pathogen *Fusarium*, which is known to be a pathogen of many agricultural plants. Solid NA medium is prepared and dispensed over petri dishes with a diameter of 8 cm. The purified bacterial strain is cultured in a liquid Luria broth culture until a dense

bacterial culture. An amount, in particular 10 µl, of the liquid culture is taken and inoculated at 2,5 cm from the center of the petri dish. The petri dish is incubated at 28°C overnight. Thereafter, the center of the petri dish is inoculated with 15 µl of a liquid culture incubated with *Fusarium* and incubated at 21°C for at least three days.

- 5 The petri dish is scored with score A, B, C or no effect depending on the fungal growth, wherein score A is given when fungal growth is limited to 1 cm from the fungal plug, score B is given when fungal growth is observed up to 2 cm from the fungal plug, score C is given when the fungal pathogen reaches the bacterial growth line, and no effect is scored when the fungal pathogen outcompetes the bacterial growth.
- 10 The bacterial strain with Deposit ID B/00191 effectively inhibits the growth of the *Fusarium* and is given a score A, as the edges of the *Fusarium* growth is far from the bacterial growth line, more specific *Fusarium* growth was only seen at less than 0,5 cm of the inoculated center.

Example 5: Increased wet biomass per plant in wheat

- 15 Per treatment, 5 x 24 wheat seeds are treated with a formulation containing a bacterial strain with Deposit ID B/00178. Five planter boxes are filled with potting soil mix and saturated with water. As a control, 10 x 24 wheat seeds are treated with a formulation without the bacterial strain to compare (mock treatment). Seeds are sown in three rows of 8 seeds per planter box. Nutrients are being added to the
- 20 planter boxes at two and three weeks after sowing. At 6 weeks after sowing the wheat plants obtained from seeds treated with said the bacterial strain or mock, all shoots are cut off and fresh biomass is weighed per planter box (i.e. all 24 shoots together). The wet biomass (in mg) is determined per planter box. The wet biomass of the wheat plants shows an increase of 6,9% in reference to the wheat plants
- 25 obtained from mock treated seeds, as visualized in Figure 5.

Example 6: Increased grain yield in wheat in the field

- Per treatment, 1,5 kg spring wheat seeds are coated with a formulation containing a purified bacterial strain and a colorant. Seeds are sown on 4 replicate plots (15 m² plot size) per field location using standard agricultural practices. Sowing density
- 30 is 400 seeds m². Sowing was done around April 5th and harvest happened around August 15th. Fertilization was calculated based on soil analysis. 50 kg of phosphorus (P₂O₅) and 50 kg of potassium (K₂O) fertilizers were applied at sowing time. Nitrogen fertilizer was applied at two moments: 35 kg ha⁻¹ of at tillering stage and 55 kg ha⁻¹ at plant heading. Harvest was done with the Delta plot combine (Wintersteiger AG,
- 35 Ried, Austria) and grain yield (kg/ha) was calculated based on the grain yield

harvested at each individual plot and considering a seed moisture of 15 %. Grain yield was compared with a mock treatment. Mock treated seeds are seeds coated with the same formulation and colorant but without a bacterial strain. The results of the treatments are visualized in Figure 6. The graphs visualize the estimates of the grain yield with 95% confidence intervals for coated seeds and mock coated seeds. The dashed line in the graphs represents the mock treatment. Wheats treated with the formulation containing the purified bacterial strain B/00196 and colorant showed an increased yield of 4,7 %. Also wheats treated with the formulation containing the purified bacterial strain B/00206 and colorant showed an increased yield of 3,8 %. The purified bacterial strains B/00196 and B/00206 improve the plant growth and yield.

Also for wheat seeds treated with a formulation, as indicated above, containing one of the purified bacterial strains B/00182, B/00184, B/00195, B/00197, B/00202, B/00203, B/00205, B/00213, B/00207, B/00192, or B/00178, first results show that the yield of the wheat plants is greater than the mock treated seeds. An increased yield of about 5 % is observed, which is in line with the results of the treatments with B/00196 and B/00206. (data not shown)

Example 7: Increased grain yield in wheat in the field in multiple, different locations

An experimental analysis as disclosed in Example 6 is executed in 6 different locations in Europe. The results of the treatments are visualized in Figure 7. The graphs visualize the estimates of the grain yield with 95% confidence intervals for coated seeds and mock coated seeds in the 6 different locations. The dashed line in the graphs represents the mock treatment. Wheats treated with the formulation containing the purified bacterial strain B/00196 and colorant showed an increased yield of approximately 5 %. Also wheats treated with the formulation containing the purified bacterial strain B/00202 and colorant showed an increased yield of approximately 5 %. The purified bacterial strains B/00196 and B/00202 improve the plant yield. In addition, the purified bacterial strains show a significant increased yield in different locations, i.e. climate conditions, further substantiating their role as a beneficial strain in plant growth and yield.

Also for wheat seeds treated with a formulation, as indicated above, containing one of the purified bacterial strains B/00182, B/00184, B/00195, B/00197, B/00203, B/00205, B/00206, B/00213, B/00207, B/00192, or B/00178, first results show that the yield of the wheat plants is greater than the mock treated seeds. An increased

yield of about 5 % is observed, which is in line with the results of the treatments with B/00196 and B/00202. (data not shown)

SEQUENCE DEPOSIT

The bacterial strains of current invention are deposited with the Polish Collection of
5 Microorganisms, under the terms of the Budapest Treaty with Deposit ID: B/00182, B/00183, B/00184, B/00195, B/00196, B/00197, B/00199, B/00200, B/00201, B/00202, B/00203, B/00204, B/00205, B/00206, B/00213, B/00175, B/00194, B/00198, B/00207, B/00191, B/00192, B/00193, B/00177, B/00180, B/00185, B/00189, B/00190, B/00179, B/00178, and B/00223.

SEQUENCE LISTING

Current application contains a Sequence Listing with 30 sequences and which are hereby incorporated by reference in its entirety. The 30 sequences are listed in Table 1. The full-length 16S nucleotide sequences of the purified bacterial strains of current invention are listed below and marked with a SEQ ID NO. Also the Deposit ID of each purified bacterial strain is noted in Table 1 with its corresponding 16S nucleotide sequence.

Table 1

Deposit ID	SEQ ID NO	Organism (Genus species)	16S nucleotide sequence (5' - 3')
B/0018 2	1	<i>Pseudoxanthomonas mexicana</i>	AGTGAACGCTGGCGGTAGGCCCTAACACATGCAAGTCGAACGGCAGCACAGGAGAGCTTGCTCTG GGTGGCAGTGGCGGACGGGTGAGGAATACATCGGAATACCTTGCTGCGTGGGGATACCGTAGGG AACTTACGCTAATACCGCATACGACCTTCGGTGAAAGTGGGGACCGCAAGCCTCACGCGATT GATGAGCCGATGTCGGATTAGCTAGTTGGGGGTATGCCCCACCAAGCGCAGCATCCGTAGCTG GTCTGAGAGGATGATCAGCCACACTGGAACCTGAGACACGGTCCAGCTCTACGGGAGGCAGCAGT GGGAATATTGGACAATGGCGCAAGCTGTATCCAGCCATACCGCTGGGTGAAGAAGCCTTCGG GTTGTAAGCCCTTTGTTGGGAAAGAAATCCTATCGATTAACTACGTTGGGTGGGATGACGGTACCCAA AGAAAGCAACCGGCTAACTTCGTGCCAGCAGCCGGTAATACGAAGGTGCAAGCGTTACTCGG AATTACTGGCGTAAAGCGTGCAGTGGTGTAAAGTCTGTTGAAAGCCCTGGGCTCAACCT GGGAATTGCAGTGGATCTGGCGACTAGAGTGTGGTGAAGGATAGTGAATTTCCGTGTAGCAG TGAATGCGTAGAGATCGGAAGGAACATCTGTGGCAGGCGACTATCTGGGCCAACACTGACACT GAGGCAGAAAGCGTGGGAGCAACAGGATTAGATACCTGGTAGTCCAGCCCTAACGATGCG AACTGGATGTTGGTGCAACTTGGCACCCAGTATCGAAGTAAAGCGTTAAGTTCGCCCTGGGGA GTACGGTCGCAAGACTGAAACTCAAAGGAAATTGACGGGGCCCCGACAAAGCGGTGGAGTATGTGT TTAATTCGATGCAACGCGAAGAACCTTACCTGGCTTGACATCCACGGAACCTTCCAGAGATGGATTG GTGCTTCGGGAACCGTGAGACAGGTGCTGCATGGCTGTGTCAGCTCGTGTGAGATGTTGGG TTAAGTCCCGCAACGAGCGCAACCCCTTGCTCTAGTTGCCAGCACGTAATGGTGGGAACCTAAAGGA GACCGCCGGTGACAAACCGGAGGAAGGTGGGATGACGTCAAGTCAATCATGATGGCCCTACGACCCAGG GCTACACACGTACTACAAATGTTAGGACAGAGGGCTGCAAAACCCGAGGGTGAGCCCAATCCAGAG AACCTAATCTCAGTCCGGATTGGAGTCTGCAACTCGACTCCATGAAGTCGGAATCGCTAGTAATCGCA

B/0018 3	2	<i>Sphingomonas asaccharolytica</i>	GATCAGCATTGCTGCGGTGAATACGTTCCCGGCCCTTGTACACACCGCCCGTCACACCATGGAGTT TGTTGCACCAGACGAGGTAGCTTAACCTTCGGAGGGCGCTTGCCACGGTGTGGCCGATGACTGG GGTGA CCATGCAAGTCGAACGAGACCTTCGGGTCTAGTGGCGCACGGGTGCGTAACGCGTGGGAATCTGCC CTTGGTTCGGAATAACAGTGAGAAATTAAGTCTAATACCGAATGATGACGTAAAGTCCAAAGATTTAT CGCCAGGATGAGCCCGTAGGATTAGTAGTTGGTAGGTAAGAGTCAAGCTACCAAGCGACGATC CTTAGTGGTCTGAGAGGATGATCAGCCACACTGGACTGAGACAGGCCAGACTCTACGGGAG GCAGCAGTGGGAATATTGGACAATGGCGAAAGCCTGATCCAGCAATGCCGCTGAGTGATGAAG GCCTTAGGGTTGTAAGCTCTTTACCCGGGATGATAATGACAGTACCGGAGAAATAAGCTCCGGCT AACTCCGTGCCAGCAGCCGGTAATACGGAGGGAGTAGCGTTATTCGGAATTAAGTGGCGTAAA GCGCAGTAGCGGCTTTGTAAGTTAGAGTGAAGCCTGGAGCTCAACTCAGAACTGCCTTTAAG ACTGCATCGCTTGAATCCAGGAGAGGTAGTGGAATCCGAGTGTAGAGGTGAAATTCGTAGATATT CGAAGAACACCAGTGGCGAAGGGCTCACTGGACTGGTATTGACGCTGAGGTGCGAAAGCGTGG GGAGCAACAGGATTAGATACCTGGTAGTCCAGCCGTAAACGATGATAACTAGTGTCCGGGCAC TTAGTGCTTGGTGGCGCAGCTAACGCAATTAAGTTATCCGCTGGGAGTACGGCCGCAAGGTTAAA ACTCAATGAATTGACGGGGCTGCACAAGCGTGGAGCATGTGGTTAAATTCGAAGCAACGCGCA GAACTTACCAGCGTTTGACATGTCCGGACGATTCAGAGATGGATCTCTTCCCTTCGGGACTGG AACACAGGTGCTGCATGGCTGCTGCTCAGCTCGTGTGAGATGTTGGTTAAGTCCCGCAACGAGC GCAACCTCGCCTTAGTTACCATCATTTAGTTGGTACTCTAAAGGAACCGCGGTGATAAGCCGGA GGAAGGTGGGATGACGTCAAGTCTCATGGCCCTTACGCGTGGGCTACACACGTGCTACAATGG CGACTACAGTGGCAGCAATCTCGCGAGGGTGAGCTAATCTCCAAAAGTCTCAGTTCGGATTGC ACTCTGCAACTCGAGTGCATGAAGGCGGAATCGCTAGTAATCGCGGATCAGCATGCCGCGGTGAATA CGTTCCAGGCCTTGACACACCGCCCGTCAACCATGGAGTTGGATTACCCCGAAGCGCTTGCGC TAAC
B/0018 4	3	<i>Leifsonia shinshuensis</i>	ATGTACCTGGAGCTTGCTTAGGGGATTAGTGGCGAACGGGTGAGTAACACGTGAGTAACCTGCCCT TGACTCTGGGATAACCTCCGGAACGGAAGCTAATACCGGATATGACGTACGGAGGCATCTCCTGTA CGTGGAAAGAACTTCGGTCAAGGATGAGTCTCGGGCTATCAGGTAGTTGGTGAAGTAACGGCCCA CCAAGCCTACGACGGGTAGCCGGCTGAGAGGGTGACCGCCACACTGGGACTGAGACACGGCCCC AGACTCCTACGGGAGGACAGTGGGAAATTTGCACATGGCGCAAGCCTGATGCAGCAACGCC GCGTGAGGGATGACGGCTTCGGGTTGTAACCTCTTTAGTAGGGAAGAAAGCGAAAGTACGGTA CCTGCAGAAAAGCACCGGCTAACTACGTGCCAGACCGCGGTAACTAGTAGGTCGAGCGCTTG TCCGGAATTAATTGGCGTAAAGAGCTCGTAGCGGCTGTCTCGCTGTGTGAAAACCCGAGGCTC AACCTCGGCGCTGCAGTGGGTACGGGCAGACTAGAGTCGGTAGGGGAGAAATTCCTGGTGT AGCGGTGAATGCGCAGATATCAGGAGGAACACCGATGGCGAAGGCAGTTCTCTGGCCGCTAAGT

			ACGCTGAGGAGCGAAGCGTGGGAGCGAACAGGATTAGATACCCCTGGTAGTCCACGCCGTAAACG TTGGCGCTAGATGTGGGACCAATCCACGGTTCCGTGTCGAGCTAACGCATTAAAGCCGCCGCC TGGGAGTACGGCCGCAAGGCTAAACTCAAAGGAATTGACGGGGCCCGCACAAAGCGCGGAGC ATCGGATTAAATCGATGCAACGCGAAGAACCTTACCAAGGCTTGACATATACGAGAACGGGCCAGA AATGGTCAACTCTTTGGACACTCGTAAACAGGTGGTGATGTTGTCGTCAGCTCGTCTGTGAGAT GTTGGTTAAGTCCCGCAACGAGCGCAACCTCGTTCTATGTTGCCAGCACGTAATGTTGGAACTC ATAGGAGACTGCCGGGTCAACTCGGAGGAAGTGGGATGACGTCAATCATCATGCCCTTATGT CTTGGCTTACGCATGCTACAAATGGCCGGTACAAAGGGTGCAATACCGTAAGTGGAGCGAATCC CAAAAGCCGCTCAGTTCGGATTGAGGTCTGCAACTCGACCTCATGAATCGGAGTCGTAGTAA TCGAGATCAGCAACGCTGCGGTGAATACGTTCCCGGCCCTGTACACACCCGCCCTCAAGTCATGA AAGTCGGTAACACCCGAAGCCGTGGCCCAACCTTGTGGAGGGAGCCGTCGAAGGT
B/0019 5	4	<i>Microbacterium foliorum</i>	TACCTGCAGTCGAACGGTGAACACGGAGCTTGCTCTGTGGATCAGTGGCGAACGGTGAGTAACA CGTGAGCAACCTGCCCTGACTCTGGGATAAGCGTGGAAACGGCTCTAATACTGGATACGAGTAG CGATCGCATGGTCAGCTACTGGAAGATTTTTGTTGGGATGGCTCGGCCCTATCAGCTTGT GGTAGGTAATGGCTACCAAGCGCTGACGGTAGCCGGCTGAGAGGTGACCGCCACACTG GGACTGAGACACGGCCAGACTCTACGGAGCGACAGTGGGGAATATTGCACAAATGGCGGAAG CCTGATGCAGCAACGCCGCTGAGGATGACGGCTTCGGTTGTAACCTCTTTTAGCAGGGAAGA AGCGAAAGTGACGTACCTGCAGAAAGCGCCGGTAACTACGTGCCAGACGCCGCGTAATACG TAGGGCGCAAGCGTTATCCGGAATTTATGGCGTAAAGAGCTCGTAGCGGTTTGTCTGCTGTG TGAAATCCGAGGCTCAACCTCGGCCTGACGTGGTACGGCAGACTAGAGTGGGTAGGGGAGA TTGGAATTCCTGGTGTAGCGGTGGAATGCGCAGATATCAGGAGGAACACCGATGGCGAAGGCAGAT CTCTGGGCCGTAACTGACGCTGAGGAGCGAAAGGTGGGAGCATACAGGCTTAGATACCCCTGTA GTCCACCCGCTATACGTTGGGAAGTGTGAGTCCATTCCACGGATTCCGTGACGCAGCTAACG CATTAAAGTCCCCGCTGGGAGTACGGCCGCAAGGCTAAACTCAAAGGAATTGACGGGACCCG CACAAGCGCGGAGCATGCGGATTAATTCGATGCAACGCGAAGAACCTTACCAAGGCTTGACATATA CGAGAACGGGCCAAATGGTCAACTCTTTGGACACTC
B/0019 6	5	<i>Rhizobium lusitanum</i>	AAGGGAGCGGCAGACGGGTGAGTAACGCTGGGAATCTACCTTTTCTACGGAATAACCGAGGA AACTTGTGCTAATACCGTATGTCTCTCGGGAAGAAAGATTATCGGAAAGGATGAGCCCGCTTG GATTAGCTAGTTGGTGGGTAAAGCCCTACCAAGCGCAGATCCATAGTGTCTGAGAGGATGATC AGCCACATTGGGACTGAGACACGGCCCAACTCTACGGAGGACGAGTGGGGAATATTGGACAA TGGGCGCAAGCCTGATCCAGCCATCCCGCTGAGTGAAGGCCCTAGGTTGTAAAGCTCTTTCA CCGGAGAAGATAATGACGGTATCCGGAGAAAGAGCCCGGCTAACTTCGTGCCAGCAGCCGCGTA ATACGAAAGGGGTAGCGTTGTCGGAAATTAAGTGGCGTAAAGCGCACGTAGCGGATCGATCAGT CAGGGGTGAATCCAGGGCTCAACCCCTGGAACTGCCTTTGATACTGTCGATCTGGAGTATGGAAGA

			GGT GAG TGA ATTCG GAG TGA GAG TGA AATTCG TAG ATATTCG GAG GAA CAC CAG TGG CGA AGG CGG TCA CTGGT CCA TTA CTG AC GCTGAG TCG AAAGCGTGGG GAG CAA CAG ATTAG ATAC CCT GGT AGTCCAC GCGTAA CAG ATGATG TTAG CCGTGGG CAG TACTG TTCGGTGGC GAGTAA C GCATTAAC ATTCG CCGTGGG GAGTAC GGTG CCAAGATTAA AACTCAA AGGAATTGAC GGGGCGCCG CACAAGCGGTGGAGCATGTGTTTAA TTCGAAGCAACGCGCAGAACCTTACCAGCCCTTGACATCCT GTGTTACCCGTAGAGATATGGGTCCACTTCGGTGGCGCAGAGACAGGTGCTGCATGGCTGTCGTC AGCTCGTGTGAGATGTTGGTTAAGTCCCGCAACGAGCGCAACCCCTCGCCCTTAGTTGCCAGCA TTTAGTTGGCACTCTAA
B/0019 7	6	<i>Agromyces iriomotensis</i>	TAC TGA AGTCGAACGATGA ACTCAGCTTGCTGGGGGATTAGTGGCAACGGGTGAGTAACAC GTGAGTAACCTGCCCTGGACTCTGGGATAACCCGAGAAATCGGAGCTAATACCGGATAGGACCCCTG TACCGCATGGTGTGGGTGGAAGTTTTTCGGTCTGGGATGGACTCGGCGCTATCAGCTTGTGG TGAGGTAATGGCTACCAAGGCGTCGACGGGTAGCCGGCTGAGAGGGTGACCGGCCACACTGGG ACTGAGACACGGCCAGACTCCTACGGGAGGCGAGCAGTGGGGAATATTGCACAATGGGCGCAAGCC TGATGCAGCAACGCCGCGTGGGATGACGGCTTCGGGTTGTAACCCGCTTTTAGTAAGGAAGAA GGGAGCTTGCTCCTTGACGGTACTTGCAAGAAAAGGACCGGCTAACTACGTGCCAGACGCCGCGG TAATACGTAGGTCCGAGCGTTGTCGGAAATATTGGCGTAAAGAGCTCGTAGCGGTTTGTGCGG TCTGCTGTGAATCCCGAGGCTCAACCTCGGCGCTGACGTGGTACGGCAGACTGGAGTGCGGTA GGGAGAAATGGAATTCCTGTTAGCGGTGGAATCGCAGATATCAGGAGGAACACCGATGGCGAA GGCAGTTCTCTGGGCCGTAACTGACCTGAGGAGCGAAAGCGTGGGAGCGCAACAGGATTAGATAC CCTGTAGTCCACGCCGTAAACGTTGGCGCTAGATGTGGGACCTTCCACGGTTCCGTGTCGTA GCTAACGCATTAAAGCCCCCGCTGGGAGTACGGCCGCAAGGCTAAACTCAAAGGAATTGACGG GGCCCCGACAAGCGCGGAGCATGCGGATTAAATTCGATGCAACGCGAAGAACCTTACCAAGGCTT GACATACCGAGAACGCCGAGAAATGTGGAACCTTTGGACACTC
B/00199	7	<i>Herbaspirillum lusitanum</i>	TTACCTGCAGTCGAACGGCAGCACGGGAGCTTGCTCCTGGTGGCGAGTGGCGAAACGGGTGAGTAAT ATATCGGAACGTGCCCTAGAGTGGGGATACTAGTCGAAAGATTAGCTAATACCGCATACGATCTA CGGATGAAAGTGGGGATCGCAAGACCTCATGCTCATGGAGCGCCGATATCTGATTAGCTAGTTGG TGGGTAAAAGCTCACCAAGGCGACGATCAGTAGCTGGTCTGAGAGGACACCAAGCCACACTGGAA CTGAGACACGTCAGACTCCTACGGGAGGCGAGTGGGAAATTTGGACAATGGGCGCAAGCCT GATCCAGCAATGCCGCTGAGTGAAGAAAGGCTTCGGGTTGTAAAGCTCTTTGTGAGGGAAGAAC GGTCTTGGTTAATACCTGGGGCTAATGACGGTACCTGAAGAAATAGCACCGGCTAACTACGTGCCAG CAGCCGCGGTAATACGTAGGTGCAAGCGTTAATCGGAAATTACTGGCGGTAAAGCGTGCGCAGGCG GTTGTGCAAGACAGATGTGAAATCCCGGGCTCAACCTGGGAATTGCAATTTGTGACTGCACGGCTAG AGTGTGTCAGAGGGGTAGAAATCCACGTGTAGCAGTGAATGCGTAGATATGTGGAGGAATACC GATGGCGAAGGCGAGCCCCCTGGGATAACACTGACGCTCATGCAGAAAGCGTGGGAGCAACAGG

B/0020 0	8	<i>Variovorax paradoxus</i>	ATTAGATACCCTGGTAGTCCACGCCCTAAACGATGTCTACTAGTTGTGCGGTCTTAATTGACTTGGTA ACGCAGCTAACGCGTGAAGTAGACCGCTGGGAGTACGGTCGCAAGATTAAACTCAAAGGAATTG ACGGGACCCGCACAAGCGGTGGATGTGGATTAAATTCGATGCAACGCGAAACCTTACCTACCC TTGACTGTACGGAA ACCATGCAAGTCGAACGGCAGCGGGAGCAATCCTGGCGGAGTGGCGAACGGGTGAGTAATAC ATCGGAACGTGCCCCAATCGTGGGGATAACGCAGCGAAAGCTGTCTAATACCGCATACGATCAGG GATGAAGCAGGGGATCGCAAGACCTTGCAGATGGAGCGCCGATGGCAGATTAGGTAGTTGGT GAGTAAGGCTCACCAAGCCTTCGATCTGTAGTGTCTGAGAGACGACCAGCCACACTGGGACT GAGACAGGCCCAAGACTCTACGGGAGGAGCAGTGGGAAATTTGGACAATGGGCGAAAGCCTGA TCCAGCCATGCCCGTGCAGGATGAAGCCCTTCGGTTGTAACCTGCTTTGTACGGAACGAAACGG CCTTTCTAATAAGAGGGCTAATGACGGTACCGTAAGAAATAGCACCGCTAAGTACGTGCCAGCA GCCGCGTAATACGTAGGTGCAAGCGTTAATCGGAATTAAGTGGCGTAAGCGTGCAGGCGGT AATGTAAGACAGTTGTGAATCCCGGGCTCAACCTGGGAAGTCACTGTGACTGCTGCTGGAG TACGGCAGAGGGGATGGAATCCCGCTGTACTGACGTGAGCAATGCGTAGATATGCGGAGGAACACCGA TGCGAAGGCAATCCCTGGCCTGTACTGACGTGATGCAAGCGTGGGAGCAAAACAGGAT TAGATACCTGTGTAGTCCACGCCCTAAACGATGTCAACTGTTGTTGGTCTTCACTGACTCAGTAAC GAAGCTAACGCGTGAAGTTGACCGCTGGGAGTACGGCGCAAGGTTGAAACTCAAAGGAATTGA CGGGACCCGCACAAGCGGTGGATGTGGTTTAATTCGATGCAACGCGAAACCTTACCCACCT TTGACATGTACGGAATTCGCCAGAGA
B/0020 1	9	<i>Dyella koreensis</i>	ATTGAACGCTGGCGGCATGCCTAACACATGCAAGTCGAACGGCAGCACAGCAGTAGCAATACTGTGG GTGGCAGTGGCGGACGGGTAGTAATGATCGGGACCTGCCAGACGTGGGGATAACGTAGGG AAACTTACGCTAATACCGCATACGTCTACGGGAGAAAGCGGGGATCGAAAGACCTCGCGCGGT GGATGGACCGATGTTTCGATTAGCTAGTTGGTAGGTAATGGCTCACCAAGCGCAGCATCGATAGCTG GTCTGAGAGGATGATCAGCCACACTGGGACTGAGACACGGCCACACTCTACGGGAGGCAGCAGT GGGGAATATTGGACAATGGCGCAAGCCTGATCCAGCAATGCCGCTGTGTGAAGAAGCCTTCGG GTTGTAAGCACCTTTATCAGGAGCGAAATACCAAGGTTAATACCTATGGGGTGACGGTACCTG AGGAATAAGCACCGCTAATTCGTGCCAGCAGCCGCGTAACTACGAAGGTTGCAAGCGTTAATCG GAATTAAGTGGCGTAAGGGTGCCTAGCGGTTTCGTTAAGTGTGTGAATCCCGGGGTCAACC TGGAATGGCAATGGATGCTGGCAGTAGAGTGTATAGAGGATGGTGGAAATCCCGGTGTAGCG GTGAAATGCTAGAGATCGGAGGAAACATCAGTGGCGAAGCGGCCATCTGGATCAACACTGACGC TGAAAGCAGAAAGCGTGGGAGCAACAGGATTAGATACCTGGTAGTCCAGCCCTAAACGATGC GAACTGGATGTTGGTCTCAACTCGGAGATCAGTGTGCAAGCTAACGCGTTAAGTTCGCCCGCTGGG AGTACGGTCGCAAGACTGAAACTCAAAGGAATGACGGGGCGCCGCAAGCGGTGGAGTATGTGG TTTAATTGATGCAACGCGAAGAACCTTACCTGGCCTTGACATGTCTGGAAATCCTGCAGAGATGCGG

B/0020	10	<i>Leifsonia poae</i> 2 GAGTGCCTTCGGGAATCAGAACACAGGTGCTGTCATGGCTGTCAGCTCGTCTGAGATGTTGG GTTAAGTCCGCAACGAGCGCAACCTTGTCCTTAGTTGCCAGCACGTAATGTGGGAACCTAAAGG AGACTGCCGGTGACAAACCGAGGAAGTGGGATGACGTCAAGTCAATCATATGATGGCCCTACGGCCAG GGCTACACACGTACTACAAATGGTCGGTACAGAGGGTTGCAATACCGGAGGTGGAGCTAATCCCAGA AAGCCGATCCAGTCCGATTGGAGTCTGCAACTCGACTCCATGAAGTCGGAATCGTAGTAATCGC AGATCAGCTATGCTGCGGTGAATACGTTCCCGGGCTTGATACACACCGCCGTCACACCATGGGAGT GAGTTGCTCCAGAGCCGTTAGTCTAACCCGAAGGGGACGACGACACCGGAGTGGTTTCATGACTG GGGTGA GCAGTCAACATGTAGTGAATCAGGTACAGAGTTTGATCCTGGCTCAGGACGAAACGCTGGCGGC GTGCTTAACACATGCAAGTCGAACGATGAACCTGGAGCTTGCTCTGGGGATTAGTGCGCAACGGGT GAGTAACACGTGAGTAACCTGCCCTTGACTCTGGATAACCTCCGGAACGGAAGCTAATACCGGAT ATGACGTACGGAGGCATCTCCTGTGCGTGGAAGAAATTCGGTCAAGGATGAGCTCGCGGCCTATCA GGTAGTTGGTGAGGTAAACGGCTCACCAAGCCTACGACGGGTAGCCGGCTGAGAGGTTGACCGGCC ACACTGGGACTGAGACACGGCCAGACTCTACGGGAGGCAGCAGTGGGGAATATTGCACAAATGGG CGCAAGCCTGATGCAGCAACGCCGCTGAGGACGACGGCTTCGGGTTGTAACCTCTTTTAGTAG GGAAGAACGAAAGTGACGGTACCTGCAGAAAAGCACCGCTAACTACGTGCCAGCAGCCGCGGT AATACGTAGGGTGCAAGCGTTGTCCGGAATATTGGGCGTAAAGAGCTCGTAGGCGGTTTGTGCGGT CTGCTGTGAAAACCCGAGGCTCAACCTCGGCCCTGCAGTGGTACGGGCAGACTAGAGTGCGGTAG GGGAGAAATGGAATTCCTGGTAGCGGTGGAATGCGCAGATATCAGGAGGAACACCGATGGCGAAG GCAGTTCTCTGGGCCGTAACTGACGCTGAGGAGCGAAAGCGTGGGAGCGAACAGGATTAGATACC CTGGTAGTCCACGCCGTAAACGTTGGCGCTAGATGTGGGACCATTCCACGGTTTCGTGTCGACG CTAACGCATTAAAGCGCCCGCTGGGAGTACGGCCGCAAGGCTAAACTCAAGGAATTGACGGG GGCCCGCACAAAGCGGCGGAGCATGCGGATTAAATTCGATGCAACGCGGAAGACCTTACCAAGGCTTG ACATATACGAGAACGGCCAGAAATGGTCAACTCTTTGGACACTCGTAAACAGGTGGTGATGTTG TCGTGAGCTCGTGTGAGATGTTGGTTAAGTCCCGCAACGAGCGCAACCTCGTTCTATGTTGC CAGCACGTAATGGTGGAACTCATAGGAGACTCCGGGTCAACTCGGAGGAAGTGGGATGACG TCAAATCATATGCCCTTATGCTTTGGCTTACGCATGCTACAATGGCCGGTACAAAGGGCTGCAA TACCGTAAAGGTGGAGCGAATCCAAAAGCCGGTCTCAGTTGCGATTGAGGTCTGCAACTCGACCTC ATGAAGTCGGATCGTAGTAATCGCAGATCAGCAACGCTGCGGTGAATACGTTCCCGGCCCTTGT CACACCGCCGTCGAAGTCATGAAAGTCGGTAACACCCGAAGCCGGTGGCCTAACCTTGTGGAAGGA GCCGTCGAAGGTGGATCGGTATTAGGACTAAGTCGTAACAAGGTAAACCTACGATGTGATGCTTG CACAAGTGATCCA
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B/0020 3	11	<i>Acidovorax temperans</i>	ATTGAACGCTGGCGCATGCCTTACACATGCAAGTCGAACGGTAACAGGTCTTCGGATGCTGACGAG TGCGAAACGGGTGAGTAATACATCGAAACGTGCCGAGAGTGGGGATAACGAAGCGAAAGCTTTTG CTAATACCGCATACGATCTCAGATGAAAGCAGGGGACCGCAAGGCTTCGCTCACGAGCGGCC GATGCAGATTAGTAGTTGGTGGGATAAAGCTTACCAAGCCGACGATCTGTAGCTGGTCTGAGAG GACGACCGCACACTGGGACTGAGACACGGCCAGACTCTACGGGAGGCAGCAGTGGGGAATTT TGGACAATGGCGCAAGCCTGATCCAGCCATGCCGCTGCAAGGTAAGGCCCTTCGGGTTGTAAAC TGCTTTGTACGGAACGAAAGACTCTGGATAATACCTGGGTTTCATGACGTTACCGTAAGATAAG CACCGGTAACACTCGTGCCAGCAGCCGCGTAATACGTAGGTGCGAGCGTTAATCGGAATTACTGG GCGTAAGCGTGCAGCGGCTTATATAAGACAGATGTGAATCCCGGGCTCAACCTGGGAACGTG CATTGTGACTGTATAGTAGTACGGCAGAGGGGATGGAATCCGCTGTAGCAGTGAATGCG TAGATATCGGAGGAACACCGATGCGGAAGGCAATCCCTGGCTGTACTGACGCTCATGCACGA AAGCGTGGGAGCAAAACAGGATTAGATACCCTGGTAGTCCAGCCCTAAACGATGTCAACTGGTTGT TGGGTCTTACTGACTCAGTAACGAAGCTAACCGTGAAGTTGACCGCTGGGAGTACGGCCGCAA GGTTGAAACTCAAAGGAATTACGGGGACCGCACAAAGCGTGGATGATGTGTTAATTCGATGCA ACGCGAAACCTTACCCACCTTTGACATGTACGGAATCCTTTAAAGATAGAGGAGTGCTCGAAAGA GAGCCGTAAACACAGGTGTGCATGGCTGTCTCAGCTGTCTGTGAGATGTTGGGTTAAGTCCCGC AACGAGCGCAACCTTGCCATTAGTTGCTACGAAAGGCCACTCTAATGGGACTGCCGGTGACAAACC GGAGGAAGGTGGGATGACGTCAAGTCCCTCATGGCCCTTATAGGTGGGCTACACAGTCCATACAAT GGCTGTTACAGAGGGTTGCCAACCCGCGAGGGGAGCCAATCCCATAAAGCCAGTCGTAGTCCGGA TCGCAGTCTGCAACTCGACTGCGTGAAGTCGGAATCGTAGTAATCGCGGATCAGAATGTCGCGGTG AATACGTTCCCGGGTCTTGTAACACACCGCCGCTACACCATGGGAGCGGGTCTGCCAGAAAGTAGTT AGCCTAACCGCAAGGAGGGCGATTACCAACGGCAGGGTTCGTGACTGGGGTGA
	12	<i>Paraburkholderia soli</i>	ATTGAACGCTGGCGCATGCCTTACACATGCAAGTCGAACGGCAGCACGGGGCAACCCCTGGTGGC GAGTGGCGAAACGGGTGAGTAATACATCGGAACGTGTCTAGAGTGGGGATAGCCCGCGAAAGCC GGATTAATACCGCATACGCTCGAGAGAGGAACGGGGGATCTTCGACCTCGCGCTCAAGGGCGG GCCGATGGCGGATTAGTAGTTGGTAGGTAAGGCCCTACCAAGCGCAGCATCCGTAGCTGTTCTG AGAGGACGACCAACCTGGGACTGAGACACGGCCAGACTCTACGGGAGGCAGCAGTGGGG AATTTTGACAATGGGGCAACCTGATCCAGCAATGCCGCTGTGTGAAGAAGGCCCTTCGGGTTGT AAAGCACTTTTGCCGGAAGAAATCCTCTGCCCTAATACGGCGGGGGATGACGGTACCGGAAGAA TAAGCACCGGTAACACTACGTGCCAGCAGCCGCGTATACGTAGGGTGCAAGCGTTAATCGGAATTA CTGGCGGTAAGCGTGCGCAGCGGTTCTGCTAAGACCGATGTGAATCCCCGGGCTTAACCTGGGA ACTGCATTGTGACTGGCAGCTAGAGTGTGGCAGAGGGGGTAGAATCCACGTGTAGCAGTGAA ATGCGTAGAGATGTGGAGGAATACCGATGCGGAAGGACGCCCTCGGGCTAACACTGACGCTCATG CACGAAAGCGTGGGAGCAAAACAGGATTAGATACCCTGGTAGTCCACGCCCTAAACCGATGTCAACTA
	B/0020 4		

			GTTGTGGGATTCAATTTCTTAGTAACGAAGCTAACGCGTGAAGTTGACCGCTGGGAGTACGGT CGAAGATTAAAACTCAAAGGAATTGACGGGACCCGCACAAGCGGTGGATGATGTGGATTAATTCG ATGCAACGCGAAAACCTTACCTACCTTGACATGACGGAACTCGCTGAGAGGTGGAGTGTCTCG AAAGAGAACCGTCGCACAGGTGCTGCATGGCTGCTCAGCTCGTGTGAGATGTTGGGTTAAGT CCGCAACGAGCGCAACCTTGCTCTAGTTGCTACGAAAGGCACTCTAGAGAGACTGCCGGTGAC AAACCGAGGAAGGTGGGATGACGTCAAGTCTCATGGCCCTATGGTAGGGCTTCACACGTGAT ACAATGGTCGGAACAGAGGGTTGCCAAGCCGAGGTGGAGCCAATCCAGAAAACCGATCGTAGT CCGGATTGCACTCTGCAACTCGAGTGAAGCTGGAATCGTAGTATCGCGGATCAGCATGCCG CGGTGAATACGTTCCCGGCTTTGTACACACCCCGCTCACACCTGGAGTGGGTTTTACCAGAA TGGTAGTCAACCGAAGGAGCGGTACCAACGGTAGGATTCATGACTGGGGTGA
B/0020	13	<i>Mycolicibacterium hodleri</i>	AGTCGAAACGGAAGGCCCTTCGGGGTACTCGAGTGGCAACGGTGAGTAACACGTGGGTGATCTG CCCTGCACCTCGGGATAAGCCTGGAAACTGGGTCTAATACCGGATATGACCTTGGGATGCATGTCC TTTGGTGAAAGCTTTTCGGGTGGGATGGCCCCGCGCTATCAGCTTGTGGTGGGTTAAGG CCTACCAAGCGACGACGGGTAGCCGGCTGAGAGGTGACCGGCCACACTGGGACTGAGATACG GCCCAGACTCTACGGGAGGCAGTGGGAATATTGCACAATGGCGCAAGCCTGATGCAGCGA CGCCGCTGAGGGACGACGCCCTTCGGGTTGTAACCTCTTTAGCACAGACGAAGCGCGAGTGAC GGTATGTCAGAAAGGACCGGCCAACTACGTGCCAGCAGCCGCGGTAATACGTAGGGTCCGAGC GTTGTCGGAACTACTGGCGTAAAGAGCTCGTAGGTGTTGTGCGGTTGTTCTGTAACACTCACA GCTCAACTGTGGCGTGCGGCGATACGGGCAGACTAGAGTACTGCAGGGGAGACTGGAATTCCTG GTGTAGCGGTGGAAATGCGCAGATATCAGGAGGAACACCCGTGGCGAAGCGGGTCTCTGGGCAGT AACTGACGCTGAGGAGCGAAAGCGTGGGAGCGCAACAGGATTAGATACCCCTGGTAGTCCACGCCGT AAACGGTGGTACTAGGTGTGGTTTCCTTCCTTGGATCCGTGCCGTAGCTAACGCATTAAAGTACC CCGCTGGGAGTACGGCCGCAAGGCTAAAACTCAAAGAAATTGACGGGGCCCGCACAAAGCGCG GAGCATGTGGATTAAATTCGATGCAACGCGAAACCTTACCTGGGTTTGACATGCACAGGACGCTGG TAGAGATATCAGTTCCTTGTGGCCTGTGTGCAGTGGTGCAATGGCTGCTGCAGTCTGTCGTGA GATGTGGGTTAAGTCCCGCAACGACGCAACCCCTATCTTATGTTGCCAGCGCTCATGGCGGGGA CTCGTAAGAGACTGCCGGGTCAACTCGGAGGAAGTGGGATGACGTCAAGTCATCATGCCCTT ATGTCAGGGCTTCACACATGCTACAATGGCCGGTACAAGGGCTGCGATGCCGTGAGTGGAGCG AATCCTTTAAGCCGTCTCAGTTCGGATCGGGTCTGCAACTCGACCCCTGAAGTCGGAGTCGCT AGTAATCGCAGATCAGCAACGCTGCGGTGAATACGTTCCCGGCCCTGTACACACCCGCCCTCACGT CATGAAAGTCGGTAACCCGAAGCCGGTGGCCTAACCTTGTGGAGGGAGCCGTCGAAGGTGGGA TCCGCGATTGGACGAAGTCGTAAACAAGTAACCCCTACGATGTGATGCTTGCAAAAGTGATCCA
B/00206	14	<i>Rhizobacter dauci</i>	ATTGAACGCTGGCGCATGCCTTACACATGCAAGTCGAACGGCAGCACGGGAGCAATCCTGGTGCG GAGTGGCGAACGGGTGAGTAATATATCGGAACGTGCCAGTTGTGGGGATAGCCCGGCGAAAGCC

		GGATTAATACCGCATACGACCTGAGGGTGAAAGCGGGGGATCGCAAGACCTCGCGCAATTGGAGCG GCCGATATCAGATTAGTAGTTGGGTAAAGGCCTACCAAGCGACGATCTGTAGCTGGTCTGA GAGGACGACCACACATGGGACTGAGACACGGCCAGACTCTACGGGAGCAGCAGTGGGA ATTTGGACAATGGCGCAAGCCTGATCCAGCCTGCGCGTGGGAAAGAGCCTTCGGGTGT AAACCGCTTTTGTACGGGAAGAACGGTCTGATCTAATAATTGGACTAATGACGGTACCTGAAGAAT AAGCACCGGCTAACTACGTGCCAGCAGCCGGTAAACGTAGGGTCAAGCGTTAATCGGAATTAC TGGCGTAAAGCGTGCAGAGCGGCTATGCAAGACAGATGTGAATCCCGGGCTCAACCTGGAA CTGCATTTGTACTGCTAGCTAGAGTACGGTAGAGGGGATGGAATCCCGCTGTAGCAGTGAAAT GCGTAGATATGCGGAGGAACACCGATGGCGAAGGCAATCCCTGGACCTGTACTGACGCTCATGCA CGAAGCGTGGGAGCAACAGGATTAGATACCTGTGTAGTCCACGCCCTAAACGATGTCAACTGGT TGTTGGACGGCTTGCTGTTTCAGTAACGAAGCTAACGCGTGAAGTTGACCGCCTGGGAGTACGGCC GCAAGGTTGAAACTCAAAGGAATTGACGGGACCCGACAGCGGTGATGATGTGTTTAATTGGA TGCAACGCGAAAAACCTTACCTACCTTACATGCTGCGCTGCTAGAGTTACAGAGATGTTTCGTCTCGAA AGAGAGCTAGAACACAGGTGCTGATGGCGTCTGTCAGCTCGTGTGATGTTGGTTAAGTCC CGCAACGAGCGCAACCTTATCATTTAGTTGCTACGCAAGGCACCTAATGAGACTGCCGTTGACAA ACCGGAGGAAGTGGGATGACGTGAGTCAATGATGCTTATGGTATGGGTACACACGTCATA CAATGGCCGTTACAGAGGCTGCCAACCCGAGGGGAGCTAATCTCAGAAACCGTCTGATGTC CGGATCGCAGTCTGCAACTGACTCGTGAAGTCGGAATCGTAGTAATCGCGGATCAGCTTGCCGC GGTGAATACGTTCCCGGCTTGTACACACCCCGCTCACACCATGGGAGCGGTTCTGCCAGAAGT AGTTAGCCTAACCGCAAGGGGGCGATTACACGGCAGGTTCTGTACTGGGTGA
B/00213	15	<i>Pedobacter ginsenosidimutans</i> TATACATGCAGTCGAACGATAGTAGAGGCTTGCTTCTATCGAAAGTGGCGACGGGTGCGTAACGC GTATGCAACCTACCTTAATCAGGGGGATAGCCCGGAGAAATCCGGATTAAATACCGCATAAATCACA GTCCACCTGGGACATGATCAACATTTATGGATTGAGATGGGCATGCGTGTCAATAGCTAGTTG GCGGGTAACGGCCCAACGAGCGATGACTAGGGATCTGAGAGGATGGCCCCCAGCACTGGT ACTGAGACACGGACAGACTCTACGGGAGCAGCAGTAAGGAATATTGTCAATGAGGCAACTC TGAACCAACCATGCCGCTGCAGGAAGACTGCCCTATGGTTGTAACTGCTTTTATCCGGGAATAA ACCTCTTTACGTGTAAGAGCTGAATGTACCGGAAGATAAGGATCGGTAACCTCGTGCACGAGC CGGGTAATACGGAGGATCAAGCGTTATCCGGATTTATGGGTTAAAGGGTGTAGCGGCTG TTAAGTCAGGGTGAAGACGGTAGCTCAACTATCGCAGTGCCCTTGATACTGATGGCTTGAATGG ACTAGAGGTAGGCGGAATGAGACAAAGTAGCGGTGAATGCATAGATATGCTCAGAACACCGATTGC GAAGGCAGCTTACTATGGTCTTATTGACGCTGAGGCACGAAAGCGTGGGATCAAAACAGGATTAGAT ACCTGGTAGTCCACGCCCTAAACGATGAACACTCGCTGTGGCGATACACAGTCAGCGGCTAAGCG AAAGCGTTAAGTGTCCACCTGGGAGTACGCTCGCAAGAGTGAAACTCAAAGGAATTGACGGGG CCCGCACAAGCGGAGGAGCATGTGTTTAAATTCGATGATACGCGAGGAACCTTACCCGGGCTTGAAA

B/00175	16	<i>Leifsonia shinshuensis</i>	GTTAGTGAATCATTTAGAGATAAATGAGTGAGCAATCACACGAACTAGGTGCTGTCATGGCTGTCGTC AGCTCGTGCCGTGAGGTGTTGGGTTAAGTCCCGCAACGAGCGCAACCCCTATGTTAGTTGCCAGCA CGTTATGGTGGGACTTAAACAGACTGCCTGTGCAACAGAGAGAAAGGAGGGACGACGTCAAG TCATCATGGCCCTTACGTCGGGGCTACACACGTCTACAAATGGATGTACAGAGGGCAGCTACATA GCAATATGATGCGAATCTACAAAGCCATTACAGTTCGGATTGGGCTGCAACTCGACCCCATGAA GTTGGATTGCTAGTAATCGGTATCAGCAATGACGCGGTGAATACGTTCCCGGGCTTGTACACAC CGCCCGTCAAGCCATGGAAGTTGGGGTACCTAAGTATGTACCGAAGGAGCGTCTCTAGTA AACCCGGAGCTTGCTCTGGGGATTAGTGGCAACGGGTGAGTAACACGTGAGTAACCTGCCCTTG ACTCTGGGATAACCTCCGGAAACGGAAAGCTAATACCGGATACGACGTACGGAGGCATCTCCTGTACG TGAAAGAACTTCGGTCAAGGATGAGTCCGGCCTATCAGGTAGTTGGTAGGTAAACGGCTCACCA AGCTACGACGGGTAGCCGGCTGAGAGGTGACCGGCACACTGGGACTGAGACACGGCCCGA CTCCTACGGGAGGACGAGTGGGAAATTGCACAAATGGCGCAAGCCTGATGCAGCAACGCCCGG TGAGGGATGACGGCCTTCGGGTTGTAACCTCTTTAGTAGGAAGAAAGCCTGACGAAAGTACGGTACCTG CAGAAAAGACCCGCTAAGTACGTGCCAGCAGCCGGTAACTACGTAGGTGCGAGCGTTGTCCG GAATTATTGGCGTAAAGAGCTCGTAGCGGTCTGTCGCTCTGCTGTGAAACCCGAGGCTCAACC TCGGCCTGCAGTGGTACGGGACACTAGGTGCGGTAGGGAGAAATGGAATTCCTGGTGTAGCG GTGGAATGCGCAGATATCAGGAGGAACACCGATGGCAAGCGAGTTCTCTGGGCCGTAACTGACGC TGAGGAGCGAAAGCGTGGGAGCGAAACAGGATTAGATACCTGCTGTTAGTCCACGCCGTAAACGTTGG GCGCTAGATGTGGGACCATCCACGGTTCCGTGTCGACGTAAACGCATTAAAGCCCGCCCTGGG GAGTACGGCCCAAGGCTAAGACTCAAGGAATTGACGGGGCCCGCACAAAGCGCGGAGCATGC GGATTAATTCGATGCAACGCGAAGAACCTTACCAAGGCTTGACATACACGAGAACGGCCAGAAATG GTCAACTCTTTGGACACTCGTGAACAGGTGGTGCATGGTTGTCGTCAGCTCGTGTGAGATGTTG GGTTAAGTCCCGCAACGAGCGCAACCCCTCGTTCTATGTTGCCAGCGCTAATGGCGGAACTCATAG GAGACTGCCGGGTCAACTCGAGGAAGTGGGATGACGTCAATCATATGCCCCCTTATGTCCTTG GGCTTCACGCATGCTACAAATGGCCGGTACAAAGGGCTGCAATACCGTAAGGTGGAGCGAAATCCCAA AAGCCGGTCTCAGTTCGGATTGAGGTGCAACTCGACCTCATGAAGTCGGAGTCGCTAGTAATCGC AGATCAGCAACGCTGCGGTGAATACGTTCCCGGGCTTGTACACACCGCCCTCAAGTCATGAAAGT CGGTAACACCCGAAGCCGTGGCCCAACCTTGTGGAGGAGCGTCTGAAAG
B/00194	17	<i>Microbacterium foliorum</i>	ATGCAGTCGAACGGTGAACACGGAGCTTGCTGTGGGATCAGTGGCAACGGGTGAGTAACACGT GAGCAACCTGCCCTGACTCTGGGATAAGCGCTGGAAACGGCTCTAATACTGGATACGAGTAGCGA TCGCATGGTCAGTACTGGAAAGATTTTGTGGGATGGGCTCGCGGCTATCAGCTTGTGTT GAGGTAATGGCTACCAAGCGCTCGACGGGTAGCCGGCTGAGAGGTGACCGCCACACTGGGA CTGAGACACGGCCAGACTCTACGGGAGGACGAGTGGGAAATATGCACAAATGGGCGGAAGCCT GATGCAGCAACGCCGCTGAGGGATGACGGCCTTCGGGTTGTAAACCTCTTTTAGCAGGGGAAG

B/00198	18	<i>Luteibacter yeojuensis</i>	CGAAAGTGACGGTACCTGCAGAAAAAGCGCCGGCTAACTACGTGCCAGCAGCCGCGGTAATACGTA GGGCGCAAGCGTTATCCGGAATTATTGGCGTAAAGAGCTCGTAGGCGTTTGTGCGCTGCTGTG AAATCCCGAGGCTCAACCTCGGCTCAGTGGTACGGCAGACTAGAGTGGGTAGGGGAGATT GGAAATCTGCTGAGCGGTGAATGCGCAGATATCAGGAGGAACACCCGATGGCGAAGGCAGATCT CTGGCCGTAACTGACGCTGAGGAGCGAAAGGTGGGAGCAACAGGCTTAGATACCCCTGGTAGT CCACCCCGTAAACGTTGGAACTAGTTGTGGGTCCATTCCACGGATTCCGTGACGCAGCTAACGCA TTAAGTTCCCGCTGGGAGTACGGCCGCAAGGCTAAACTCAAAGGAATTGACGGGACCCGCA CAAGCGCGGAGCATGCGGATTAAATCGATCAACGCGAAGAACTTACCAAGGCTTGACATATACG AGAACGGCCAGAAATGGTCAACTCTTTGGACACTCGTAAACAGGTGGTGCATGTTGTCGTCACT CGTGTCTGAGATGTTGGTTAAGTCCCGCAACGAGCGCAACCTCGTTCTATGTTGCCAGCACGTA ATGTTGGAACTCATGGGATACCTGCCGGGTCAACTCGGAGGAAGTGGGATGACGTCAATCAT CATGCCCTTATGTCTTGGCTTCACGCATGCTACATGATGCGCGGTACAAGGGCTGCAATACCGTGA GGTGAGCGGAATCCCAAAAGCCGGTCCAGTTCGGATTGAGGTCTGCAACTCGACCTCATGAAGTC GGAGTCGCTAGTAATCGCAGATCAGCAACGCTGCGTGAATACGTTCCCGGGTCTTGTACACACCCG CCGTCAAGTCATGAAAGTCGTTAACACCTGAAGCCGGTGGCCTAACCTTGTGGAGGGAGCCGTCG AAGGATC TGGCTACCAAGCGACATCGATAGCTGCTGAGAGGATGATCAGCCACACTGGGACTGAGACA CGGCCAGACTCTACGGAGGCAGCAGTGGGAATATTGGACAATGGCGCAAGCCTGATCCAGC AATGCCGCGTGTGTGAAGAAGGCCCTCGGGTTGTAAAGCACTTTTATCAGGAGCGAAATCTGCCCGG TTAATACCTGGGTAGTCTGACGGTACCTGAGGAATAAGCACCCGCTAATCCGTGCCAGCAGCCGCG GTAATACGGAGGGTGCAAGCGTTAATCGGAATTACTGGCGTAAAGGGTGCCTAGGCGGTTGTTTAA GTCTGTTGTGAAATCCCGGGCTCAACCTGGGAATGGCAATGGATACCTGACAGCTAGAGTGTGTC GAGGATGGTGGAATCCCGGTGTAGCGGTGAAATGCGTAGAGATCGGGAGGAACATCAGTGGCGAA GGCGGCCATCTGGGACAACACTGACGCTGAAGCACGAAGCGTGGGAGCAACAGGATTAGATAC CCTGGTAGTCCACGCCCTAAACGATGCGAACTGGATGTTGGTCTCAACTCGGAGATCAGTGTGGAAG CTAACGCGTTAAGTTCGCCGCTGGGAGTACGGTCGCAAGACTGAAACTCAAAGGAATTGACGGG GGCCGCAACAAGCGGTGGAGTATGTGTTTAAATCGATCAACGCGAAGAACTTACCTGGCCTTGA CATGTCCGGAATCTGCAGAGATGCGGAGTGCCTTCGGGAATCGGAACACAGGTGCTGCATGGCT GTCGTACGTCGTGAGATGTTGGTTAAGTCCCGCAACGAGCGCAACCTTGTCTTAGTTG CCAGCACGTAATGTTGGAACTCTAAGGAGACTGCCGTTGACAAACCGGAGGAAGTGGGGATGAC GTCAAGTCATCATGGCCCTACGGCCAGGGTACACAGTACTACATGTTGTCGTACAGAGGTTGC GAGACCGGAGGTGAGCCCAATCCAGAAAGCCGATCCAGTCCGGATTGGAGTCTGCAACTCGAC TCCATGAAGTCGGAATCGCTAGTAATCGCGGATCAGCTATGCCGCGGTGAATACGTTCCCCGGCCTT
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B/00207	19	<i>Acidovorax radialis</i>	GTACACACGCGGTACACCATGGGAGTGAGCTGCTCCAGAAAGCCGTTAGTCTAACCCGAAGGGG GACGACGACCACGGTGT TGGATCACTTGTGCAAGCATCACATCGTAGGGTTACCTTGTTACGACTTCACCCAGTCACGAACCCCT GCCGTGTAATCGCCCTCTTGGGTTAGGTAAGTAACTACTCTGGCAGAACCCGCTCCCATGGTGTGA CGGCGGTGTGTACAAGACCCGGGAAGTATTACCGTGACATTCTGATCAGCATTAAGCGGATT CCGACTTCACGAGTCGAGTTGCAGACTCGATCCGACTACGAATGGCTTTATGGATTGGCTCCC CCTCGGGTTGGCGACCTTTGTACCATCCATTGTATGACGTGTGAGCCCCACCTATAAGGGCCA TGAGGACTTGACGTCATCCCCACCTTCCTCGGTTTGTACCCGGCAGTCTCATTAGAGTGCCCAACTA AATGTAGCAACTAATGACAAGGGTTGCGCTCGTTGCGGACTTAACCCAACATCTCACGACACGAGC TGACGACAGCCATGCAGCACCTGTGTTACGGTCTCTTCGAGCACCTCTATCTCTAAAGGATTCC GTACATGTCAAAGGTGGTAAGGTTTTTCGGTTGTCATCGAATTAACCCACATCATCCACCGCTTGTG CGGTCCTCCGTCATCTGAGTTTCAACCTTGGGCGGTACTCCCCAGGCGTCAACTTCACGC GTTAGCTTCGTTACTGAGTCAGTGAAGACCCCAACACAGTTGACATCGTTAGGGCGTGGACTACC AGGGTATCTAATCCTGTTGCTCCACGCTTTCGTGTCATGAGCTCAGTACAGGTCCAGGGGATTG CCTTCGCCATCGGTTCCTCCGCATATCTACGCATTTCACTGTACACGCGGAATTCATCCCCCTC TACCGTACTAGCTATACAGTCACAAATGCAGTCCCAGTTGAGCCCCGGGATTTACATCTGTCT TATATAACCGCTGCGACGCTTACGCCAGTAATCCGATTACCGTTGCACCTACGATTAACCG CGGCTGTGGCAGCTAGTTAGCCGGTGCTTATCTTACGGTACCGTACGTGACCCACAGTATTAACC AGAGCTTTTTCGTTCCGTACAAAGCAGTTTACAACCCGAGGCTTCATCTGCACGCGGATGGCT GGATCAGGCTTCGCCCCATTGCCAAATTCGCCACTGCTGCCCTCCGTAGGAGTCTGGGCCGTGTC TCAGTCCCAGTGTGGCTGCTCCTCTCAGACACAGCTACAGATCGTCGGCTTGGTAAGCTTTTATCC CACCAACTACCTAATCTGCCATCGGCCGCTCCGTCCGCGCAAGGCTTTCGGTCCCTGCTTTCATCC GTAGATCGTATGCGGTATTAGCAAAGCTTTCGCTCCGTTATCCCCACGATCGGCGACGTTCCGATGT ATTACTACCCGTTCCCACTCGTCAGCATCCGAAGACCTGTTACCGTTGACTTGCATGTGTAAAGGC ATGCCGCCAGCGTTCAATCTGAGCCATGATCAAACTGTGACCTGAGTCAGCTACATGTTGACTGTC GCAGTCGAACATGTAGCTGACTCAGGTACAGAGTTTGATCCTGGCTCAGATTGAACGCTGGCGGCA TGCCCTACACATGCAAGTCGAACGGCAGCAGGCTGCTTGACCTGGTGGCAGTGGCGAACCGGT GAGTAATACATCGGAACATGCTCTGTAGTGGGGATAGCCCGCGAAAGCCGATTAAATACCGCAT CGATCTACGGATGAAGCGGGGACCTTCGGGCTCGCGCTATAGGTTGGCCGATGGCTGATTAG CTAGTTGGTGGGTAAGGCCCTACCAAGGCGACGATCAGTAGTGGTCTGAGAGGACGACCAAGCCA CACTGGGACTGAGACACGGCCAGACTCCTACGGGAGGCGAGCAGTGGGAAATTTGGACAATGGGC GAAAGCCTGATCCAGCAATGCCGCTGTGTGAAGAAGGCTTCCGGTTGTAAAGCACATTTTGTCCGG AAAGAAATCCTTGGTTCTAATATAGCCGGGGATGACGGTACCGGAAGAAATAGCACCGGCTAACTA CGTGCCAGCAGCCGGTAAATACGTAGGTCGAGGCGTTAATCGGAATTACTGGCGTAAAGCGTG
B/00191	20	<i>Burkholderia ambifaria</i>	

B/00192	21	<i>Micrococcus yunnanensis</i>	CGCAGGCGTTTGCTAAGACCGGATGTGAAATCCCCGGGCTCAACCTGGGAACTGCATTGGTGACTG GCAGGCTAGAGTATGGCAGAGGGGGTAGAATTCACGTGTAGCAGTGAAATGCGTAGAGATGTGG AGGAATACCGATGGCGAAGGCAGCCCCCTGGGCCAATACTACGCTCATGCACGAAAGCGTGGGA GCAAACAGGATTAGATACCTGTGTAGTCCAGCCCTAAACGATGCAACTAGTTGTTGGGATTCAAT TCCTTAGTAACGTAGCTAACCGGTGAAGTTGACCGCTGGGAGTACGGTCGCAAGATTAAACTCA AAGGAATTGACGGGACCCGCACACAGCGTGATGTGATTAATTCGATGCAACGCGAAAC CTTACCTACCTTGACATGTCGGAATCCCGCTGAGAGTGGGAGTCTCGAAAGAACCGGCGC ACAGGTGCTGATGGCTGCTCAGCTCGTGTGAGATGTTGGTTAAGTCCCGCAACGAGCGCA ACCTTGCTCCTTAGTTGCTACGCAAGAGCACTAAGAGACTGCCGTGACAAACCGAGGAAGGT GGGATGACGTCAAGTCCTCATGGCCCTTATGGTAGGGCTTACACGTCAACAATGTCGGAACA GAGGTTGCCAACCCGAGGGGAGCTAATCCAGAAACCGATGCTAGTCCGGATTGCACTCTG CAACTCGAGTGCATGAAGCTGGAATCGTAGTAATCGCGATCAGCATGCCGCGTGAATACGTTCC CGGTCTTGTACACACGCCCCGTACACCATGGAGTGGGTTTACCAGAAAGTGGCTAGTCTAACCG CAAGGAGGACGGTCACCAACGGTAGGATTTCATGACTGGGTGAAGTCGTAAACAAGGTAACCCCTACGA TGTGATGCTTGCAAAAGTGATCCA TACCTGCAAGTCGAACGATGAAGCCACGCTTGCTGGTGGATTAGTGGCGAACGGGTGAGTAACAC GTGAGTAACCTGCCCTTAACCTCTGGATAAGCTGGAAACTGGTCTAATACCGGATAGGAGCGTC CACCGCATGTGGTGTGGAAAGATTATCGGTTTGGATGGACTCGCGGCTATCAGCTTGTGG TGAGGTAATGGCTACCAAGCGCAGCAGCGGTAGCCGCTGAGAGGTGACCGGCCACACTGGG ACTGAGACACGGCCAGACTCCTACGGGAGGCAGTGGGAATATTGCACATGGCGGAAAGCC TGATGCAGCGACCGCGTGAGGGATGACGGCTTCGGTTGTAACCTCTTCAGTAGGGAAGAA GCGAAAGTGACGGTACCTGCAGAAAGACACCGGCTAACTAGTCCAGCAGCCGCGTAAATACGT AGGTGCGAGCGTTATCCGGAATTATTGGCGTAAAGAGCTCGTAGCGGTTTGTCCGCTGTCTGT GAAAGTCCGGGCTTAACCCGGATCTCGGTGGTACGGCGAGACTAGTGCAGTAGGGGAGA CTGGAATTCCTGGTGTAGCGGTGGAATGCGCAGATATCAGGAGGAACACCGATGGCGAAGGCAGGT CTCTGGGCTGTAACTGACGTGAGGAGCGAAAGCATGGGAGCGCAACAGGATTAGATACCTGGTA GTCCATGCCGTAAACGTTGGCACTAGTGTGGGACCATTCACGGTTCCGCGCCGACGTAACG CATTAGTCCCCGCTGGGAGTACGGCCGCAAGCTAAACTCAAAGAAATTGACGGGGGCCG CACAAAGCGCGAGCATGCGGATTAAATTCGATGCAACGCGAAACCTTACCAAGGCTTGACATGTT CTCGATCGCGTAGAGATACGGTTTCCCTTTGGGCGGTTTACAGGTGTGTCATGTTGTGTCGTCA GCTCGTGTGTGAGATGTGGTTAAGTCCCGCAACGAGCGCAACCTCGTTCATGTTGCCAGCAC GTAATGGTGGGACTCATGGGAGACTGCCGGGTCAACTCGGAGGAAGGTGAGGACGACGTCAAAT CATCATGCCCTTATGTCTTGGGCTTACGCACTGTACAAATGGCCGGTACAAATGGTTGCGATACTGT GAGGTGAGCTAATCCCAAAGCCGGTCTCAGTTCGGATTGGGCTGCAACTCGACCCCATGAAG
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B/00193	22	<i>Undibacterium pigrum</i>	TCGGAGTCGTAATCGCAGATCAGCAACGCTGCGGTGAATACGTTCCCGGCCCTTGTACACACC GCCCGTCAAGTCACGAAAGTTGGTAACACCCGAGCCGGTGGCCTAACCCCTTGTTGGGGGAGCCCGT CGAAGAT TACCATGCAGTCGAACGGCAGCGCGGGCAACCTGGCGGCGAGTGGCAACGGGTGAGTAAATATCGGAACAT ACCTAGAGTGGGGATAACGTAGCGAAAGTTACGTAATACCGCATACGCACTAAGGTGGAAGTGGGGGATC GCAAGACCTCATGCTCATGGAGTGGCCGATATCTGATTAGCTAGTTGGTAGGGTAAAGCCTACCAAGGCGACGA TCAGTAGCTGTTTGAAGAACGACCAACCACTGAACTGAGACACGGTCCAGACTCTACGGGAGGCAGCAG TGGGGAATTTGGACAATGGGGCAACCTGATCCAGCAATGCCGCTGAGTGAAGAAGGCCCTCGGGTTGTAA GCTCTTTGTCAGGGAAAGAACGGTGAGTTCTAATACAGCTTGCTAATGACGGTACCTGAAGAAATAGCACCCGGCT AACTACGTGCCAGCAGCCGCGGTAATACGTAGGGTGCAAGCGTTAATCGGAATTACTGGCGTAAAGCGTGCGCA GGCGGTTTTATAAGTCTGATGTAATCCCCGGCTCAACCTGGAACTGCATTGGAGACTGTAAAGCTAGAGTGT GTCAGAGGGGGTAGAATCCACGTGTAGCAGTGAATGCGTAGATATGTGGAGGAATACCGATGGCGAAGGCA GCCCTGGGATAACACTGACGCTCATGCACGAAAGCGTGGGAGCAAAACAGGATTAGATACCCCTGGTAGTCCAC GCCCTAAACGATGTCTACTAGTTGTCGGGTCTTAATTGACTTGGTAACGCAGCTAACCGTGAAGTAGACCCGCTG GGGAGTACGGTCGCAAGATTAAACTCAAGGAATTGACGGGACCCGCAACGCGGTGGATGATGTGGATTAA TTCGATGCAACGCGAAAAACCTTACCTACCTTGACATGGAAGGAATCCCGAAGAGATTGGGAGTGCTCGAAAGA GAACCTTTACACAGGTGCTGCATGGCTGCTGCTCAGCTCGTGTGAGATGTTGGTTAAGTCCCGCAACGAGCGC AACCTTGTCTATTAGTTGCTACGAAAGGGCACTCTAATGAGACTCCCGGTGACAAACCGGAGGAAGTGGGGATG ACGTCAAGTCCCTCATGGCCCTTATGGGTAGGGCTTACACGTCATACATGATGATACAGAGGGGCCCAACCCG CGAGGGGAGCTAATCCAGAAAGTGATCGTAGTCGGATTGTAGTCTGCAACTCGACTACATGAAGTTGGAATC GCTAGTAATCGCGGATCAGCATGTCGCGGTGAATACGTTCCCGGCTTGTACACACCCGCCCTCACACCATGGGA GCGGGTTCTGCCAGAAGTAGTTAGCTTAACCGCAAGGAGGGCGGATACCGAC TTGGAATCACTGGGCGTAAAGGGCGTAGGGGACTTTTAAAGTCGGAGGTGAAAGCCAGGGCTCAACCCCTGGA ATTGCCTTCGATACTGGAGTCTTGAGTTTCGGAAGAGGTTGGTGGAACTCGAGTGTAGAGGTGAAATTCGTAGA TATTCGAAGAACAACCGGTGGCGAAAGGGCGCAACTGGTCCGATACGCTGAGGCGCGAAAGCGTGGGGAG CAACAGGATTAGATACCTGGTAGTCCAGCCGTAAACGATGAATGCCAGCCGTTGGGAGCTTGCTCTTCAGTG GCGCAGCTAACGCTTTAAGCATTCCGCTGGGGAGTACGTCGCAAGATTAAACTCAAGGAATTGACGGGGGC CCGCAACAAGCGGGGAGCATGTGGTTTAAATCGAAGCAACGCGCAGAACCTTACAGCTTTTGACATGTCCGGTTT GATCGGCAGAGATGCCTTCTTCAGTTCGGTGGCCGGAACACAGGTGCTGATGGCTGCTCAGCTCGTGTGCTGT GAGATGTTGGTTAAGTCCCGCAACGAGCGCAACCCCTGCCCCCTAGTTGCCATCATTAAGTTGGGAACCTAGGGG GACTGCCGGTGATAAGCCGCGAGGAAGGTGGGATGACGTCAAGTCTCATGGCCCTTACAGGCTGGGCTACACA
B/00177	23	<i>Bosea robiniae</i>	

B/00180	24	<i>Terrimicrobium sacchariphilum</i>	CGTGCTACAATGGCGGTGACAATGGGAGCGAAAGGGGACCTCGAGCTAATCCAAAAAGCCGTCTCAGTTCAAGATTGCACTCGAACTCGAGTGCATGAAGGTGGAATCGTAGTAATCGTGGATCAGCATGCCACGGTGAATACGTTCCGGGCCCTGTACACACCGCCCGTCACACCATGGGAGTTGGGTTACCCGAAAGGCGTCCGCGCTAACCCGCAAGGAGGCAGG AGTCGAACGGAAATTTTCTGTAGTAATACAGAGGAAAGTTTGTAGTGGCTACGGGTGCGTAACACGTGAGTAATCTGCCGAAAGTGGGGATAGCTGCCGAAAGGCAAAATTAATACCGCATATGGCCATTCTTCGATTGGAGGAAAGCTAAAGCAGCAATGCGCTTCTGTATGAACCTGCGGCCTATCAGCTAGATGGCGGGTAAAGGCCACCATGGCTATGACGGGTAGCTGGTCTGAGAGGACGACCAAGCCACACTGGAACCTGAGACACGCTCCAGACACCTACTGGTGGCAGCAGTCGAGAAATTTTCACAATGGGGAAACCCTGATGGAGCGACGCCGCTGGAGGATGAAGGCCCTCGGGTTGTAACTCCTGTATCGGGAAACAAGAAAGTAGTAGCCGAAGAGGAAGACGGCTAACTCTGTGCCAGCAGCCGCGGTAATACAGAGGTCTCAAGCGTTGTTTCGGATTCAATTGGGCGTAAAGGTGCGTAGGTGGCGATGTAAGTCTAACGTGAAATCTCGGGGCTCAACCCCGAAATTCGCTCGGATACTGCGTTGCTAGAGGATTGTAGAGGAGAGTGGAATTGATGGTGTAGCAGTGAAATGCGTAGATATCATGAGGAAGACCAGTTGCGAAGGCCGACTCTCTGGGCAATTCCTGACACTGAGGCACGAAAGGTAGGGAGCAACGGGATTAGTACCCCGTAGTCTAGCAGTAACCGTGCACGTTTGGTGGTGGTTCAGACCCCATCCGTGCCGAGCTAAAGCGTTAAACGTGCCGCTGGGAAGTACGGTCGCAAGATTGACGGGGGCGCCACAAAGCGGTGGAGTATGGCTTAATCGATGCAACGCGAAGAACCTTACCTGGTCTTGACATGCACTGTCTATCGGTGAAGCCGGTTAGTTGGTAGCAATATCAACACTTGCACAAGTGTGCTGCTGTCAGCTCGTGTGAGATGTTGGTTAAGTCCCGCAACGAGCGCAACCCCTGTGTCCAGTTGCCCGCAAGGGATCTTGACAGACTGCCCTGTGAACGGGGAGGAAGGTGGGGATGACGTCAAGTCAGTATGGCCCTACGGCCAGGGCTGCACACGTACTACAATGCTCAGTACAGAATGAACCGAATCCCGGAGGTAGAGGAATCTCAAAAACCTGAGCCAGTTCGGATTGGAGGTGCAACTGCACTCCATGAAGTCGGAATCGCTAGTAATGGCGCATCAGCTACGGCCGTGAATACGTTCCGGGGCTTGTACACACCGCCCGTCACATCATGGGAGTCGTTGTAGCCGAAGTACGTAAACCGCAAGGAGCAGCGTCTCAGCT
B/00185	25	<i>Nocardioides sp.</i>	TACCATGCAGTCGAGCGGAAGGCCACTTCGGTGGTACTCGAGCGGGCAACGGGTGAGTAACACGTGAGTAATCTGCCCTGGCTTTGGGATAGCCACCGGAAACGGTGATTAAACCGGATACGACAACCTTCTTGCATGAGATGGTTGTGAAAGTTTTTCGGCCAGGGATGTGCTCGCGGCCTATCAGCTTGATGGTGAGGTAAAGGCTACCATGGCTTCGACCGGTAGCGCGCTGAGAGGGTGACCGGCCACACTGGGACTGAGACACGCGCCAGACTCCTACGGGAGGCGACGATGGGAATATTGGACAATGGCGGAAGCCTGATCCAGCAACGCCGCTGAGGGATGACGGCCTCGGGTTGTAACCTCTTTTCAGCAGGGACGAAGCGCAAGTGACGGTACCTGCAGAAGAAGCACCGGCCAACCTAGTCCAGCAGCCGC GGTAATACGTAGGTGCGAGCGTTGTCCGGAAATTATTGGCGTAAAGGGCTCGTAGGCGGTTTGTCCGCTCGGGA GTGAAAAACCAAGGTGCTTAACACCTGGCTTGTCTTCGATACGGGCAGACTAGAGGTTATTCAGGGGAGAACGGAATT

B/00189	26	<i>Luteimonas aquatica</i>	CCTGGTGTAGCGGTGAAATGCGCAGATATCAGGAGGAACACCGGTGGCGAAGGCGGTTCTCTGCGGAATGACCTG ACGCTGAGGAGCGAAAGTGTGGGAGCGAAACAGGATTAGATACCTGGTAGTCCACACCGTAAACGTTGGGCGC TAGGTGGGTCCATCCACGGATCCGTGCCGAGTTAACGCAATTAAAGCCCCCGCTGGGAGTACGGCCGC AAGGCTAAACTCAAAGGAATTGACGGGGGCCGCAAAAGCGGGAGCATGCGGATTAAITTCGATGCAACGCG AAGAACCTTACCTGGGTTTGACATACACCTGCCGCTCCAGAGATGGGGCTCTTTTGGGGGTGTACAGGTGGTGC ATGGCTGCTCAGCTCGTGTGATGATGTTGGTTAAGTCCGCAACGAGCGCAACCTCGTTCTATGTTGCCA GCACGTAATGGTGGGACTATAGGAGACTGCCGGGTCAACTCGAGGAAGGTGGGGATGACGTCAAGTCATC ATGCCCTTATGTCCAGGGCTTCACGCATGCTACAATGGCCGTTACAAAGGGCTCGCATCCCGTAAGGGGGAGCGG AATCCCAAAAAGCCGGTCTCAGTTCGGATTGGGTCTGCAACTGACCCCATGAAGTCGGAGTCGCTAGTAATCGC AGATCAGCAACGCTGCGGTGAATACGTTCCCGGGCTTGTACACACCCGCCGTACCGTACGAAAGTCGGCAACAC CCGAAGCCGGTGGCCAAACCTTGTGGAGGGAGCCGTCGAAAGTGT
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B/00190	27	<i>Variovorax boronicumulans</i>	CATGCAGTCGAACGGCAGCGCGGAGCAATCCTGGCGCGAGTGGCGAACGGGTGAGTAATACATCAGGAAACGTG CCCAATCGTGGGGGATAACGCAGCGGAAAGCTGTCTAATACCGCATACGATCTACGGATGAAAGCAGGGGATCGC AAGACCTTGC CGGAATGGAGCGCGGATGGCAGATTAGGTAGTTGGTAGGTAAGGCTACCAAGCCTTCGATC TGTAGCTGGTCTGAGAGGACGACCAGCACACTGGGACTGAGACACGGCCAGACTCTACGGGAGGCAGCAGT GGGGAATTTTGGACAAATGGGCGAAAGCCTGATCCAGCCATGCCGCTGCAGGATGAAGGCCCTTCGGGTTGTAAAC TGCTTTTGTACGGAACGAAACGGCCTTTCTAATAAAGAGGGCTAATGACGGTACCGTAAAGATAAGCACCGGCTA ACTAGTCCAGAGCCCGGTAACTAGTGGGTGCAAGCGTTAATCGGAATTAATCGGCGTAAAGCGTGCAG GCGGTTATGTAAGACAGTTGTGAAATCCCGGGCTCAACCTGGGAACCTGCTGACTGTGACTGATAGTACGTACG GTAGAGGGGATGGAATTCGCGGTAGCAGTGAAATGCGTAGATATGCGGAGGAACACCGATGGCGAAGGCAA TCCCTGGACCTGTACTGACGCTCATGCAGAAAGCGTGGGAGCAACAGGATTAGATACCTGGTAGTCCACGC CCTAAACGATGCAACTGGTTGTTGGGTCTTCACTGACTCAGTAACGAAAGTAACGCGTGAAGTTGACCGCTGGG GAGTAGGCGCGAAGGTTGAAACTCAAGGAATTGACGGGACCCGACAAAGCGGTGGATGATGTGTTTAAATTC GATGCAACGCGAAAAACCTTACCCACCTTTGACATGTACGGAATTCGCCAGAGATGGCTTAGTCTCGAAAGAGAA CCGTAACACAGGTGCTGCATGGCTGCTGACGCTGCTGCTGAGATGTTGGGTTAAGTCCCGCAACGAGCGCAAC CTTGTCAATTAGTTGCTACATTCAGTTGGGCACTCTAATGAGACTGCTGGTGACAAACCGGAGGAAGGTGGGATG ACGTCAAGTCTCATGGCCCTTAGGTGGGGCTACACGCTACATAAATGGCTGTACAAAGGGTTGCCAACCCG CGAGGGGAGCTAATCCCATAAACCAAGTCGTAGTCCGGATCGCAGTCTGCAACTCGACTGCGTGAAGTCGGAAT CGTAGTAATCGTGGATCAGAATGTCACGGTGAATACGTTCCCGGCTTTGTACACACCGCCCGTCACACCATGGG AGCGGGTTCTGCCAGAAGTAGTTAGCTTAACCGCAAGGAGGGCGATACCCAGGCAG
B/00179	28	<i>Brevundimonas bullata</i>	GCCATGCAGTCGAACGGACCTTTTCGGGGTTAGTGGCGGACGGGTGAGTAACACGTGGGAACGTGCCTTAGGTTT GGAATAGCTCCTGGAAACGGGTGGTAATGCCGAATGTGCCCTTCGGGGAAAGATTATCGCCCTTAGAGCGGCC CGCGTCTGATTAGCTAGTTGGTTGAGGTAAACGGCTACCAAGCGCAGCATCAGTAGCTGGCTGAGAGGATGGCC AGCCACATTGGGACTGAGACACGGCCAAACTCTACGGGAGGCAGCAGTGGGGAATCTTGC GCAATGGCGAA AGCCTGACGCATCCATGCCGCTGAATGATGAAGGTTTAGGATTGTAAAAATCTTTCACCGGGGACGATAATGAC GGTACCCGAGAAAGAACCCCGCTAACTTCGTGCCAGCAGCCGCGTAATACGAAGGGGGTAGCGTTGCTCG GAATTACTGGCGTAAAGGGCGGTAGGGCGACATTAAGTCAGGGGTGAAATCCAGAGCTCAACTCTGGAAT GCCTTGATACTGGGTGCTTGTAGTGTGAGAGAGGTATGTGAACTCCGAGTGTAGAGGTGAAATCTGTAGATATT CGGAAGAACACCACTGGCGAAAGGCGACATACTGGCTATTACTGACGCTGAGGCGCAAGCGTGGGGAGCAAA CAGGATTAGATACCTGGTAGTCCACGCCGTAAACGATGATTGCTAGTTGTCGGGCTGCATGCAGTTCGGTGACGC AGCTAACGCAATTAAAGCAATCCGCTGGGGAGTACGGTCGCAAGATTAAAACTCAAAGGAATTGACGGGGGCCCCG ACAAGCGGTGGAGCATGTGGTTTAATTCGAAGCAACGCGCAGAACCTTACCACCTTTTGACATGCCTGGACCGCCA

B/00178	29	<i>Brevundimonas vesicularis</i>	GAGAGATCTGGCTTCCCTTCGGGGACTAGGACACAGGTGCTGCATGGTGTGCTCAGCTGTGCTGAGATGTT GGGTTAAGTCCCGCAACGAGCGCAACCTCGCCATTAGTTGCCATCATTTAGTTGGAACTCTAATGGGACTGCCG GTCTAAGCCGGAGGAAGGTGGGATGACGTCAAGTCCTCATGGCCCTACAGGGTGGGCTACACACGCTGCTACA ATGGCGACTACAGAGGTTAATCCTTAAAGTCGTCTCAGTTCGGATTGTCTCTGCAACTCGAGGGCATGAAGTT GGAATCGTAGTAATCGCGATCAGCATGCCGCGTGAATACGTTCCGGGCCCTGTACACACCGCCCGTACACCC ATGGAGTTGTTCTACCCGAAAGCGATGCGCTAACCCGCAAGGGAGGCAGTC AGAGCGCCCGCTGATTAGCTAGTTGGTGAGGTAAAGCTCACCAAGGCGACGATCAGTAGCTGGTCTGAGA GGATGATCAGCCACATTGGGACTGAGACACGGCCCAAACTCTACGGGAGGCGAGTGCGGAATCTTGGCGCAAT GGCGAAAGCCTGACGAGCCATGCCGCGTGAATGATGAAGGTCTTAGGATTGTAAAATCTTTACCGGGGAGG ATAATGACGGTACCCGGAGAAAGCCCGGCTAACTTCGTCCAGCAGCCCGGTAATACGAAGGGGGCTAGC GTTGCTCGGAATTACTGGCGTAAAGGGAGCGTAGCGGACATTTAAGTCAGGGGTGAATCCCGGGGCTCAACC TCGGAATTGCCTTTGATACTGGGTGCTTGAGTATGAGAGGTTGTGGAACTCCGAGTGTAGAGGTGAAATTC GTAGATATTCGGAAGAACACCAAGTGGCGAAGGGGACACACTGGCTCATTTACTGACGCTGAGGCTCGAAAGCGTGG GGAGCAACAGGATTAGATACCTGGTAGTCCACGCCGTAGACGATGATTGCTAGTTGTCGGGATGCATGCTATTC GGTGACGAGCTAACGCAATTAAAGCAATCCGCTGGGAGTACGGTCGCAAGATTAAAACCTCAAAGGAATTGACGG GGCCCGCACAAAGCGGTGGAGCATGTGTTAATTCGAAGCAACGCGCAGAACCTTACCACCTTTTGACATGCTGTG GACCGCCAGAGAGATCGCTTCCCTTCGGGGACTAGGACACAGGTGTCATGGCTGCTGCTCAGCTCGTGTGCTGT GAGATGTTGGTTAAGTCCCGCAACGAGCGCAACCTCGCCATTAGTTGCCATCATTTAGTTGGAACTCTAATGG GACTCCCGGTCTAAGCCGGAGGAAGGTGGGGATGACGTCAAGTCTCATGCCCCTTACAGGGTGGGCTACACAC GTGCTACAATGGCGACTACAGAGGGTTAATCCTTAAAGTCGTCTCAGTTCGGATTGTCTCTGCAACTCGAGGGC ATGAAGTTGGAATCGCTAGTAATCGCGGATCAGCATGCCGCGGTGAATACGTTCCCGGGCCTTGTACACACCGCCC GTCACACCATGGGAGTTGTTCTACCCGAAAGGCGCTGCGCTGACCCGCAAGGAGCGAGGGGAC CAGTGAGGAATATTGGACAATGGGCGCAAGCCTGATCCAGCCATGCCCGCTGCAGGATGACGGTCTCTATGGATTG TAACTGCTTTTATACGAGAAGAAACACTACTTCTGTAAGTAGCTTGACGGTATCGTAAGAAATAAGGATCGGCTAA CTCCGTGCCAGCAGCCGGTAATACGGAGGATCCAAGCGTTATCCGGAAATCATTTGGGTTTAAAGGGTCCGTAGG CGGTTTAAATAGTCAGTGGTGAAGCCCATCGCTCAACGGTGAACGGCCATTGATACTGTTAAACTTGAATTTAT AGGAAGTAAGTAGAATATGTAGTGTAGCGGTGAATGCTTAGAGATTACATGGAATACCAATTCGGAAGGCAGGT TACTACTAATGGATTGACGCTGATGGACGAAGCGTGGGTAGCGAACAGGATTAGATACGCTGGTAGTCCACGCC GTAAACGATGGATACTAGCTGTTGGAAGCAATTTCACTGGCTAAGCGAAAGTGATAAGTATCCACCTGGGGAGT ACGTTCCGAAGAATGAGACTCAAAGGAATTGACGGGGGCCGACAAAGCGGTGGAGCATGTGTTTAAATTCGATG ATACGCGAGGAACCTTACCAAGGCTTAAATGTAGATTGACCGGTTTGAAACAGATCTTTCGCAAGACAAATTTACA
B/00223	30	<i>Flavobacterium aquidurens</i>	

			AGGTGCTGCATGGTTGTCGTCAGCTCGTGCCGTGAGGTGTCAGGTTAAGTCCTATAACGAGCGCAACCCCTGTTGT TAGTTGCCAGCGAGTCAAGTCGGGAACTCTAACAGACTGCCAGTGCAAACCTGTGAGGAAGGTGGGGATGACGTC AAATCATCAGGGCCCTTACGCCCTTGGGCTACACACGCTGCTACAATGGCCGGTACAGAGAGCAGCCACTGGGCGACC AGGAGCGAATCTATAAAACCGGTACAGTTCGGATCGGAGTCTGCAACTCGACTCCGTGAAGCTGGAATCGCTAGT AATCGGATATCAGCCATGATCCGGTGAATACGTTCCCGGGCCTTGACACACCGCCCGTCAAGCCATGGGAAGCTGG GGTGCCTGAAGTCGGTGACCGCAAGGAGCTGCCTAGGTA
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(Original in Electronic Form)

0-1	Form PCT/RO/134 Indications Relating to Deposited Microorganism(s) or Other Biological Material (PCT Rule 13bis)	
0-1-1	Prepared Using	PCT Online Filing Version 3.51.000.265e MT/FOP 20141031/0.20.5.20
0-2	International Application No.	PCT/EP2020/053286
0-3	Applicant's or agent's file reference	APHE-008-EP-WO

1	The indications made below relate to the deposited microorganism(s) or other biological material referred to in the description on:	
1-1	Paragraph number	38
1-3	Identification of deposit	
1-3-1	Name of depositary institution	PCM Polish Collection of Microorganisms (PCM)
1-3-2	Address of depositary institution	Institute of Immunology and Experimental Therapy, Polish Academy of Sciences, Ul. Weigla 12, 53-114 Wroclaw, Poland
1-3-3	Date of deposit	18 January 2019 (18.01.2019)
1-3-4	Accession Number	PCM B/00182
1-5	Designated States for Which Indications are Made	All designations
2	The indications made below relate to the deposited microorganism(s) or other biological material referred to in the description on:	
2-1	Paragraph number	39
2-3	Identification of deposit	
2-3-1	Name of depositary institution	PCM Polish Collection of Microorganisms (PCM)
2-3-2	Address of depositary institution	Institute of Immunology and Experimental Therapy, Polish Academy of Sciences, Ul. Weigla 12, 53-114 Wroclaw, Poland
2-3-3	Date of deposit	18 January 2019 (18.01.2019)
2-3-4	Accession Number	PCM B/00183
2-5	Designated States for Which Indications are Made	All designations
3	The indications made below relate to the deposited microorganism(s) or other biological material referred to in the description on:	
3-1	Paragraph number	39
3-3	Identification of deposit	
3-3-1	Name of depositary institution	PCM Polish Collection of Microorganisms (PCM)
3-3-2	Address of depositary institution	Institute of Immunology and Experimental Therapy, Polish Academy of Sciences, Ul. Weigla 12, 53-114 Wroclaw, Poland
3-3-3	Date of deposit	18 January 2019 (18.01.2019)
3-3-4	Accession Number	PCM B/00184
3-5	Designated States for Which Indications are Made	All designations

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4	The indications made below relate to the deposited microorganism(s) or other biological material referred to in the description on:	
4-1	Paragraph number	40
4-3	Identification of deposit	
4-3-1	Name of depositary institution	PCM Polish Collection of Microorganisms (PCM)
4-3-2	Address of depositary institution	Institute of Immunology and Experimental Therapy, Polish Academy of Sciences, Ul. Weigla 12, 53-114 Wroclaw, Poland
4-3-3	Date of deposit	18 January 2019 (18.01.2019)
4-3-4	Accession Number	PCM B/00195
4-5	Designated States for Which Indications are Made	All designations
5	The indications made below relate to the deposited microorganism(s) or other biological material referred to in the description on:	
5-1	Paragraph number	40
5-3	Identification of deposit	
5-3-1	Name of depositary institution	PCM Polish Collection of Microorganisms (PCM)
5-3-2	Address of depositary institution	Institute of Immunology and Experimental Therapy, Polish Academy of Sciences, Ul. Weigla 12, 53-114 Wroclaw, Poland
5-3-3	Date of deposit	18 January 2019 (18.01.2019)
5-3-4	Accession Number	PCM B/00196
5-5	Designated States for Which Indications are Made	All designations
6	The indications made below relate to the deposited microorganism(s) or other biological material referred to in the description on:	
6-1	Paragraph number	41
6-3	Identification of deposit	
6-3-1	Name of depositary institution	PCM Polish Collection of Microorganisms (PCM)
6-3-2	Address of depositary institution	Institute of Immunology and Experimental Therapy, Polish Academy of Sciences, Ul. Weigla 12, 53-114 Wroclaw, Poland
6-3-3	Date of deposit	18 January 2019 (18.01.2019)
6-3-4	Accession Number	PCM B/00197
6-5	Designated States for Which Indications are Made	All designations

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(Original in Electronic Form)

7	The indications made below relate to the deposited microorganism(s) or other biological material referred to in the description on:	
7-1	Paragraph number	41
7-3	Identification of deposit	
7-3-1	Name of depositary institution	PCM Polish Collection of Microorganisms (PCM)
7-3-2	Address of depositary institution	Institute of Immunology and Experimental Therapy, Polish Academy of Sciences, Ul. Weigla 12, 53-114 Wroclaw, Poland
7-3-3	Date of deposit	18 January 2019 (18.01.2019)
7-3-4	Accession Number	PCM B/00199
7-5	Designated States for Which Indications are Made	All designations
8	The indications made below relate to the deposited microorganism(s) or other biological material referred to in the description on:	
8-1	Paragraph number	42
8-3	Identification of deposit	
8-3-1	Name of depositary institution	PCM Polish Collection of Microorganisms (PCM)
8-3-2	Address of depositary institution	Institute of Immunology and Experimental Therapy, Polish Academy of Sciences, Ul. Weigla 12, 53-114 Wroclaw, Poland
8-3-3	Date of deposit	18 January 2019 (18.01.2019)
8-3-4	Accession Number	PCM B/00200
8-5	Designated States for Which Indications are Made	All designations
9	The indications made below relate to the deposited microorganism(s) or other biological material referred to in the description on:	
9-1	Paragraph number	42
9-3	Identification of deposit	
9-3-1	Name of depositary institution	PCM Polish Collection of Microorganisms (PCM)
9-3-2	Address of depositary institution	Institute of Immunology and Experimental Therapy, Polish Academy of Sciences, Ul. Weigla 12, 53-114 Wroclaw, Poland
9-3-3	Date of deposit	18 January 2019 (18.01.2019)
9-3-4	Accession Number	PCM B/00201
9-5	Designated States for Which Indications are Made	All designations

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(Original in Electronic Form)

10	The indications made below relate to the deposited microorganism(s) or other biological material referred to in the description on:	
10-1	Paragraph number	43
10-3	Identification of deposit	
10-3-1	Name of depositary institution	PCM Polish Collection of Microorganisms (PCM)
10-3-2	Address of depositary institution	Institute of Immunology and Experimental Therapy, Polish Academy of Sciences, Ul. Weigla 12, 53-114 Wroclaw, Poland
10-3-3	Date of deposit	18 January 2019 (18.01.2019)
10-3-4	Accession Number	PCM B/00202
10-5	Designated States for Which Indications are Made	All designations
11	The indications made below relate to the deposited microorganism(s) or other biological material referred to in the description on:	
11-1	Paragraph number	44
11-3	Identification of deposit	
11-3-1	Name of depositary institution	PCM Polish Collection of Microorganisms (PCM)
11-3-2	Address of depositary institution	Institute of Immunology and Experimental Therapy, Polish Academy of Sciences, Ul. Weigla 12, 53-114 Wroclaw, Poland
11-3-3	Date of deposit	18 January 2019 (18.01.2019)
11-3-4	Accession Number	PCM B/00203
11-5	Designated States for Which Indications are Made	All designations
12	The indications made below relate to the deposited microorganism(s) or other biological material referred to in the description on:	
12-1	Paragraph number	44
12-3	Identification of deposit	
12-3-1	Name of depositary institution	PCM Polish Collection of Microorganisms (PCM)
12-3-2	Address of depositary institution	Institute of Immunology and Experimental Therapy, Polish Academy of Sciences, Ul. Weigla 12, 53-114 Wroclaw, Poland
12-3-3	Date of deposit	18 January 2019 (18.01.2019)
12-3-4	Accession Number	PCM B/00204
12-5	Designated States for Which Indications are Made	All designations

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(Original in Electronic Form)

13	The indications made below relate to the deposited microorganism(s) or other biological material referred to in the description on:	
13-1	Paragraph number	45
13-3	Identification of deposit	
13-3-1	Name of depositary institution	PCM Polish Collection of Microorganisms (PCM)
13-3-2	Address of depositary institution	Institute of Immunology and Experimental Therapy, Polish Academy of Sciences, Ul. Weigla 12, 53-114 Wroclaw, Poland
13-3-3	Date of deposit	18 January 2019 (18.01.2019)
13-3-4	Accession Number	PCM B/00205
13-5	Designated States for Which Indications are Made	All designations
14	The indications made below relate to the deposited microorganism(s) or other biological material referred to in the description on:	
14-1	Paragraph number	45
14-3	Identification of deposit	
14-3-1	Name of depositary institution	PCM Polish Collection of Microorganisms (PCM)
14-3-2	Address of depositary institution	Institute of Immunology and Experimental Therapy, Polish Academy of Sciences, Ul. Weigla 12, 53-114 Wroclaw, Poland
14-3-3	Date of deposit	18 January 2019 (18.01.2019)
14-3-4	Accession Number	PCM B/00206
14-5	Designated States for Which Indications are Made	All designations
15	The indications made below relate to the deposited microorganism(s) or other biological material referred to in the description on:	
15-1	Paragraph number	46
15-3	Identification of deposit	
15-3-1	Name of depositary institution	PCM Polish Collection of Microorganisms (PCM)
15-3-2	Address of depositary institution	Institute of Immunology and Experimental Therapy, Polish Academy of Sciences, Ul. Weigla 12, 53-114 Wroclaw, Poland
15-3-3	Date of deposit	18 January 2019 (18.01.2019)
15-3-4	Accession Number	PCM B/00213
15-5	Designated States for Which Indications are Made	All designations

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(Original in Electronic Form)

16	The indications made below relate to the deposited microorganism(s) or other biological material referred to in the description on:	
16-1	Paragraph number	47
16-3	Identification of deposit	
16-3-1	Name of depositary institution	PCM Polish Collection of Microorganisms (PCM)
16-3-2	Address of depositary institution	Institute of Immunology and Experimental Therapy, Polish Academy of Sciences, Ul. Weigla 12, 53-114 Wroclaw, Poland
16-3-3	Date of deposit	18 January 2019 (18.01.2019)
16-3-4	Accession Number	PCM B/00175
16-5	Designated States for Which Indications are Made	All designations
17	The indications made below relate to the deposited microorganism(s) or other biological material referred to in the description on:	
17-1	Paragraph number	47
17-3	Identification of deposit	
17-3-1	Name of depositary institution	PCM Polish Collection of Microorganisms (PCM)
17-3-2	Address of depositary institution	Institute of Immunology and Experimental Therapy, Polish Academy of Sciences, Ul. Weigla 12, 53-114 Wroclaw, Poland
17-3-3	Date of deposit	18 January 2019 (18.01.2019)
17-3-4	Accession Number	PCM B/00194
17-5	Designated States for Which Indications are Made	All designations
18	The indications made below relate to the deposited microorganism(s) or other biological material referred to in the description on:	
18-1	Paragraph number	48
18-3	Identification of deposit	
18-3-1	Name of depositary institution	PCM Polish Collection of Microorganisms (PCM)
18-3-2	Address of depositary institution	Institute of Immunology and Experimental Therapy, Polish Academy of Sciences, Ul. Weigla 12, 53-114 Wroclaw, Poland
18-3-3	Date of deposit	18 January 2019 (18.01.2019)
18-3-4	Accession Number	PCM B/00198
18-5	Designated States for Which Indications are Made	All designations

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(Original in Electronic Form)

19	The indications made below relate to the deposited microorganism(s) or other biological material referred to in the description on:	
19-1	Paragraph number	49
19-3	Identification of deposit	
19-3-1	Name of depositary institution	PCM Polish Collection of Microorganisms (PCM)
19-3-2	Address of depositary institution	Institute of Immunology and Experimental Therapy, Polish Academy of Sciences, Ul. Weigla 12, 53-114 Wroclaw, Poland
19-3-3	Date of deposit	18 January 2019 (18.01.2019)
19-3-4	Accession Number	PCM B/00207
19-5	Designated States for Which Indications are Made	All designations
20	The indications made below relate to the deposited microorganism(s) or other biological material referred to in the description on:	
20-1	Paragraph number	49
20-3	Identification of deposit	
20-3-1	Name of depositary institution	PCM Polish Collection of Microorganisms (PCM)
20-3-2	Address of depositary institution	Institute of Immunology and Experimental Therapy, Polish Academy of Sciences, Ul. Weigla 12, 53-114 Wroclaw, Poland
20-3-3	Date of deposit	18 January 2019 (18.01.2019)
20-3-4	Accession Number	PCM B/00191
20-5	Designated States for Which Indications are Made	All designations
21	The indications made below relate to the deposited microorganism(s) or other biological material referred to in the description on:	
21-1	Paragraph number	50
21-3	Identification of deposit	
21-3-1	Name of depositary institution	PCM Polish Collection of Microorganisms (PCM)
21-3-2	Address of depositary institution	Institute of Immunology and Experimental Therapy, Polish Academy of Sciences, Ul. Weigla 12, 53-114 Wroclaw, Poland
21-3-3	Date of deposit	18 January 2019 (18.01.2019)
21-3-4	Accession Number	PCM B/00192
21-5	Designated States for Which Indications are Made	All designations

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(Original in Electronic Form)

22	The indications made below relate to the deposited microorganism(s) or other biological material referred to in the description on:	
22-1	Paragraph number	51
22-3	Identification of deposit	
22-3-1	Name of depositary institution	PCM Polish Collection of Microorganisms (PCM)
22-3-2	Address of depositary institution	Institute of Immunology and Experimental Therapy, Polish Academy of Sciences, Ul. Weigla 12, 53-114 Wroclaw, Poland
22-3-3	Date of deposit	18 January 2019 (18.01.2019)
22-3-4	Accession Number	PCM B/00193
22-5	Designated States for Which Indications are Made	All designations
23	The indications made below relate to the deposited microorganism(s) or other biological material referred to in the description on:	
23-1	Paragraph number	51
23-3	Identification of deposit	
23-3-1	Name of depositary institution	PCM Polish Collection of Microorganisms (PCM)
23-3-2	Address of depositary institution	Institute of Immunology and Experimental Therapy, Polish Academy of Sciences, Ul. Weigla 12, 53-114 Wroclaw, Poland
23-3-3	Date of deposit	18 January 2019 (18.01.2019)
23-3-4	Accession Number	PCM B/00177
23-5	Designated States for Which Indications are Made	All designations
24	The indications made below relate to the deposited microorganism(s) or other biological material referred to in the description on:	
24-1	Paragraph number	52
24-3	Identification of deposit	
24-3-1	Name of depositary institution	PCM Polish Collection of Microorganisms (PCM)
24-3-2	Address of depositary institution	Institute of Immunology and Experimental Therapy, Polish Academy of Sciences, Ul. Weigla 12, 53-114 Wroclaw, Poland
24-3-3	Date of deposit	18 January 2019 (18.01.2019)
24-3-4	Accession Number	PCM B/00180
24-5	Designated States for Which Indications are Made	All designations

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(Original in Electronic Form)

25	The indications made below relate to the deposited microorganism(s) or other biological material referred to in the description on:	
25-1	Paragraph number	52
25-3	Identification of deposit	
25-3-1	Name of depositary institution	PCM Polish Collection of Microorganisms (PCM)
25-3-2	Address of depositary institution	Institute of Immunology and Experimental Therapy, Polish Academy of Sciences, Ul. Weigla 12, 53-114 Wroclaw, Poland
25-3-3	Date of deposit	18 January 2019 (18.01.2019)
25-3-4	Accession Number	PCM B/00185
25-5	Designated States for Which Indications are Made	All designations
26	The indications made below relate to the deposited microorganism(s) or other biological material referred to in the description on:	
26-1	Paragraph number	53
26-3	Identification of deposit	
26-3-1	Name of depositary institution	PCM Polish Collection of Microorganisms (PCM)
26-3-2	Address of depositary institution	Institute of Immunology and Experimental Therapy, Polish Academy of Sciences, Ul. Weigla 12, 53-114 Wroclaw, Poland
26-3-3	Date of deposit	18 January 2019 (18.01.2019)
26-3-4	Accession Number	PCM B/00189
26-5	Designated States for Which Indications are Made	All designations
27	The indications made below relate to the deposited microorganism(s) or other biological material referred to in the description on:	
27-1	Paragraph number	54
27-3	Identification of deposit	
27-3-1	Name of depositary institution	PCM Polish Collection of Microorganisms (PCM)
27-3-2	Address of depositary institution	Institute of Immunology and Experimental Therapy, Polish Academy of Sciences, Ul. Weigla 12, 53-114 Wroclaw, Poland
27-3-3	Date of deposit	18 January 2019 (18.01.2019)
27-3-4	Accession Number	PCM B/00190
27-5	Designated States for Which Indications are Made	All designations

PCT

(Original in Electronic Form)

28	The indications made below relate to the deposited microorganism(s) or other biological material referred to in the description on:	
28-1	Paragraph number	54
28-3	Identification of deposit	
28-3-1	Name of depositary institution	PCM Polish Collection of Microorganisms (PCM)
28-3-2	Address of depositary institution	Institute of Immunology and Experimental Therapy, Polish Academy of Sciences, Ul. Weigla 12, 53-114 Wroclaw, Poland
28-3-3	Date of deposit	18 January 2019 (18.01.2019)
28-3-4	Accession Number	PCM B/00179
28-5	Designated States for Which Indications are Made	All designations
29	The indications made below relate to the deposited microorganism(s) or other biological material referred to in the description on:	
29-1	Paragraph number	55
29-3	Identification of deposit	
29-3-1	Name of depositary institution	PCM Polish Collection of Microorganisms (PCM)
29-3-2	Address of depositary institution	Institute of Immunology and Experimental Therapy, Polish Academy of Sciences, Ul. Weigla 12, 53-114 Wroclaw, Poland
29-3-3	Date of deposit	18 January 2019 (18.01.2019)
29-3-4	Accession Number	PCM B/00178
29-5	Designated States for Which Indications are Made	All designations
30	The indications made below relate to the deposited microorganism(s) or other biological material referred to in the description on:	
30-1	Paragraph number	55
30-3	Identification of deposit	
30-3-1	Name of depositary institution	PCM Polish Collection of Microorganisms (PCM)
30-3-2	Address of depositary institution	Institute of Immunology and Experimental Therapy, Polish Academy of Sciences, Ul. Weigla 12, 53-114 Wroclaw, Poland
30-3-3	Date of deposit	18 January 2019 (18.01.2019)
30-3-4	Accession Number	PCM B/00223
30-5	Designated States for Which Indications are Made	All designations

FOR RECEIVING OFFICE USE ONLY

0-4	This form was received with the international application: (yes or no)	yes
0-4-1	Authorized officer	Benzler, Annemarie

PCT

(Original in Electronic Form)

FOR INTERNATIONAL BUREAU USE ONLY

0-5	This form was received by the international Bureau on:	
0-5-1	Authorized officer	

CLAIMS

1. A purified bacterial strain for improving plant growth and/or yield, **characterized in that**, said strain comprises at least one 16S nucleotide sequence that is at least 95% identical to a sequence selected from the group consisting of SEQ ID NOs: 5, 1, 3, 4, 6, 10, 11, 13, 14, 15, 19, 21, or 29.
2. Purified bacterial strain according to claim 1, characterized in that, said strain comprises at least one 16S nucleotide sequence that is identical to a sequence selected from the group consisting of SEQ ID NOs: 5, 1, 3, 4, 6, 10, 11, 13, 14, 15, 19, 21, or 29.
3. Purified bacterial strain according to claim 1 or 2, **characterized in that**, said strain is deposited with the Polish Collection of Microorganisms, under the terms of the Budapest Treaty, respectively as Deposit ID: B/00196, B/00182, B/00184, B/00195, B/00197, B/00202, B/00203, B/00205, B/00206, B/00213, B/00207, B/00192, B/00178.
4. Abacterial population for improving plant growth and/or yield, wherein said bacterial population comprises at least one bacterial strain according to any of the previous claims 1 to 3.
5. Bacterial population according to claim 4, comprising two or more bacterial strains according to any of the previous claims 1 to 3.
6. A microbial active ingredient for improving plant growth and/or yield, **characterized in that**, said ingredient comprises one or more substances isolated from a bacterial culture comprising one or more bacterial strains according to any of the previous claims 1 to 3, or the bacterial population according to claim 4 or 5.
7. An agricultural active formulation comprising an agriculturally compatible carrier and one or more purified bacterial strains according to any of the previous claims 1 to 3 or the bacterial population according to claim 4 or 5 at a concentration of at least about 10^2 CFU/ml or spore/ml when said formulation is a liquid formulation or about 10^2 CFU/mg when said formulation is a non-liquid formulation.
8. A synthetic composition for improving plant growth and/or yield, wherein said composition comprises a plant element and a purified bacterial strain according

to any of the previous claims 1 to 3 or bacterial population according to claim 4 or 5.

9. Use of the purified bacterial strain according to any of the previous claims 1 to 3, the bacterial population according to claim 4 or 5, the microbial active ingredient according to claim 6, the agricultural active formulation according to claim 7, or the synthetic composition according to claim 8 for improving plant growth and/or yield by improving a trait of agronomic importance in a plant.
10. Use of the strain, population, ingredient, formulation or composition according to claim 9 for improving plant growth and/or yield by effectively inhibiting the growth of a plant pathogen.
11. A method for conferring resistance to a plant pathogen infection in a plant, by means of treating said plant with one or more purified bacterial strains according to any of the previous claims 1 to 3, a bacterial population according to claim 4 or 5, a microbial active ingredient according to claim 6 or an agriculturally active formulation according to claim 4.
12. A method of improving plant growth and/or yield, comprising the step of treating a plant element with one or more purified bacterial strains according to any of the previous claims 1 to 3, a bacterial population according to claim 4 or 5, or a microbial active ingredient according to claim 6 in an amount effective to increase the growth and/or yield in the plant derived from the treated plant element relative to a plant derived from a reference plant element.
13. A method of improving plant growth and/or yield, comprising the step of treating a plant element with a first bacterial strain and a second bacterial strain in an amount effective to increase the growth and/or yield in the plant derived from the treated plant element relative to a plant derived from a reference plant element, **characterized in that**, said first and second bacterial strain are conform the strains as described in any of the previous claims 1 to 3.
14. A method of improving plant growth and/or yield, comprising the steps of inoculating a plant growth medium with one or more purified bacterial strains according to any of the previous claims 1 to 3, a bacterial population according to claim 5, or a microbial active ingredient according to claim 6; and growing a plant in said medium.

15. A method of treating seeds of a plant to improve plant growth and/or yield, comprising mechanically or manually inoculating a plurality of plant seeds with an agricultural active formulation comprising an agriculturally acceptable carrier and one or more purified bacterial strains according to any of the previous claims 1 to 3, **characterized in that**, the seed is inoculated with said strain in an amount effective to colonize a plant germinated from the inoculated seed and to increase seed yield of a plant germinated from the inoculated seed as compared to a plant germinated from a reference seed grown and sowed under the same conditions.
16. A method according to claim 13, **characterized in that**, the seed of a plant is coated with the strain, cultured with the strain or planted near the strain such that the strain is able to colonize the seed.
17. A method of treating a plant element with a synthetic composition to improve plant growth and/or yield, wherein said method comprises the step of treating a plant element with one or more bacterial strains according to any of the previous claims 1 to 3, **characterized in that**, the bacterial strain is present in the composition in an amount capable of modulating at least one trait of agronomic importance in a plant selected from the group consisting of transcription of a gene, level of a transcript, the expression of a protein, level of a hormone, level of a metabolite, and population of endogenous microbes; in plants grown from said plant elements, as compared to reference plants grown from plant elements not treated with said composition.
18. A plant element, such as a seed, coated with the agricultural active formulation according to claim 7.

FIGURES

Figure 1 A:

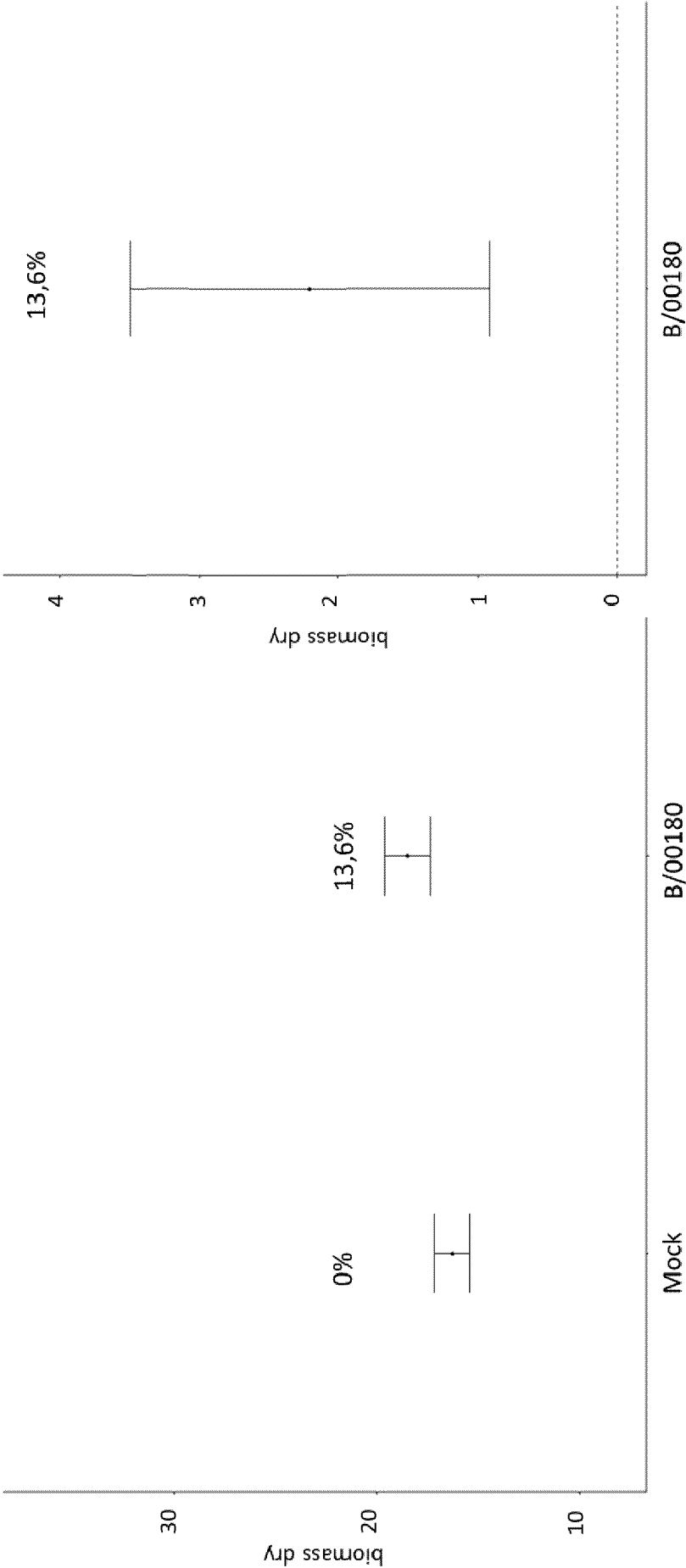
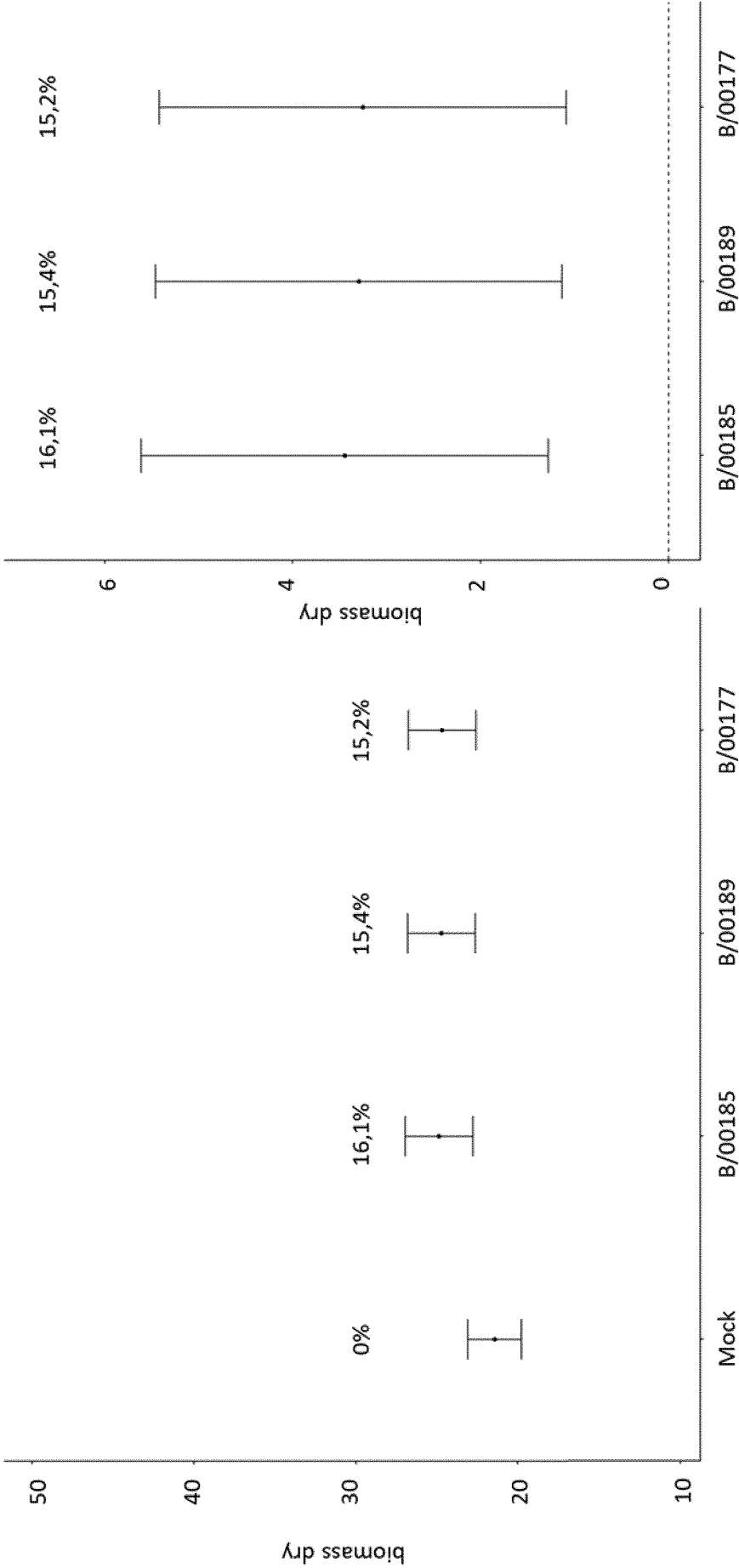


Figure 1B:



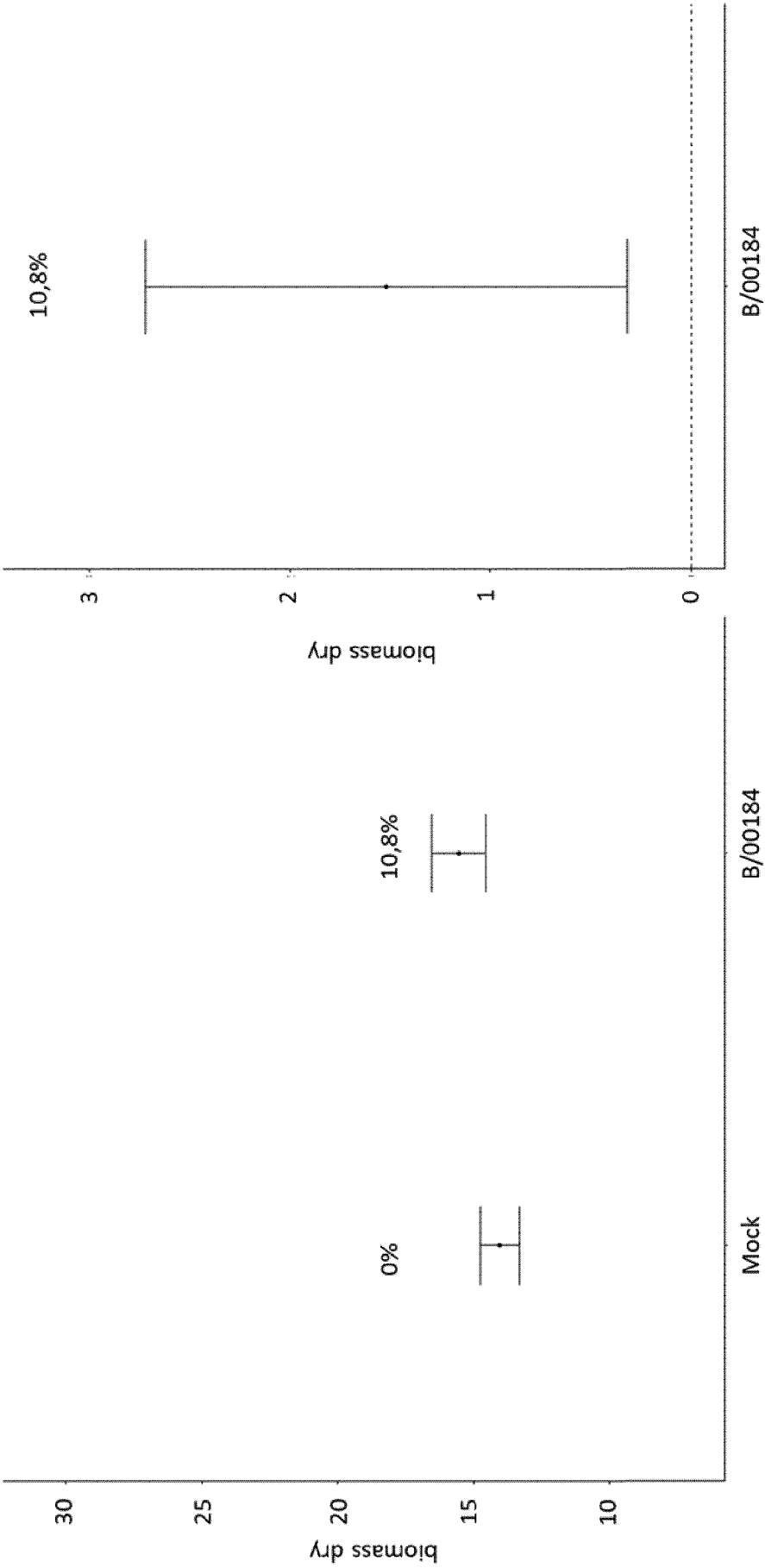


Figure 1 C:

Figure 1D:

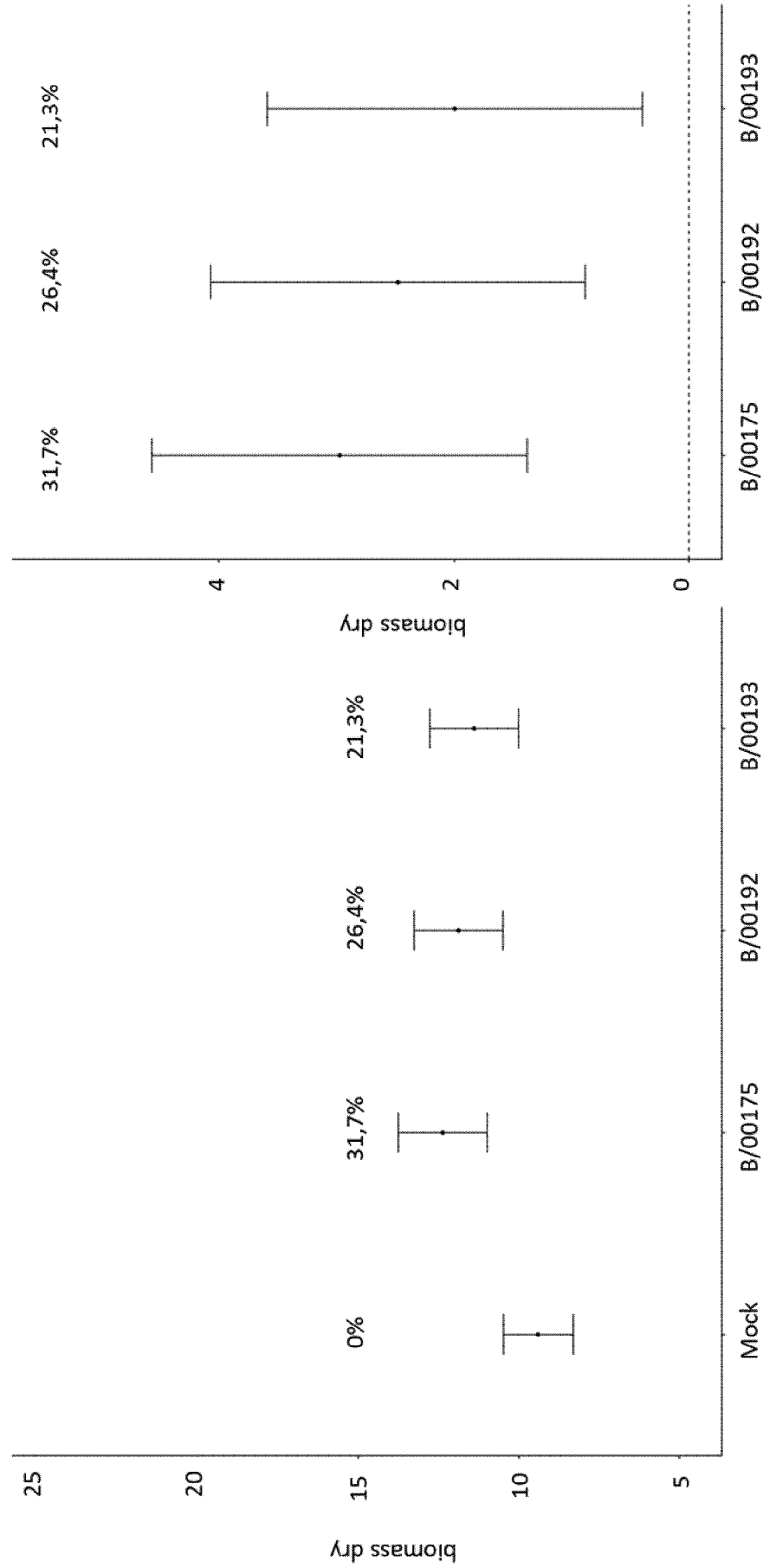
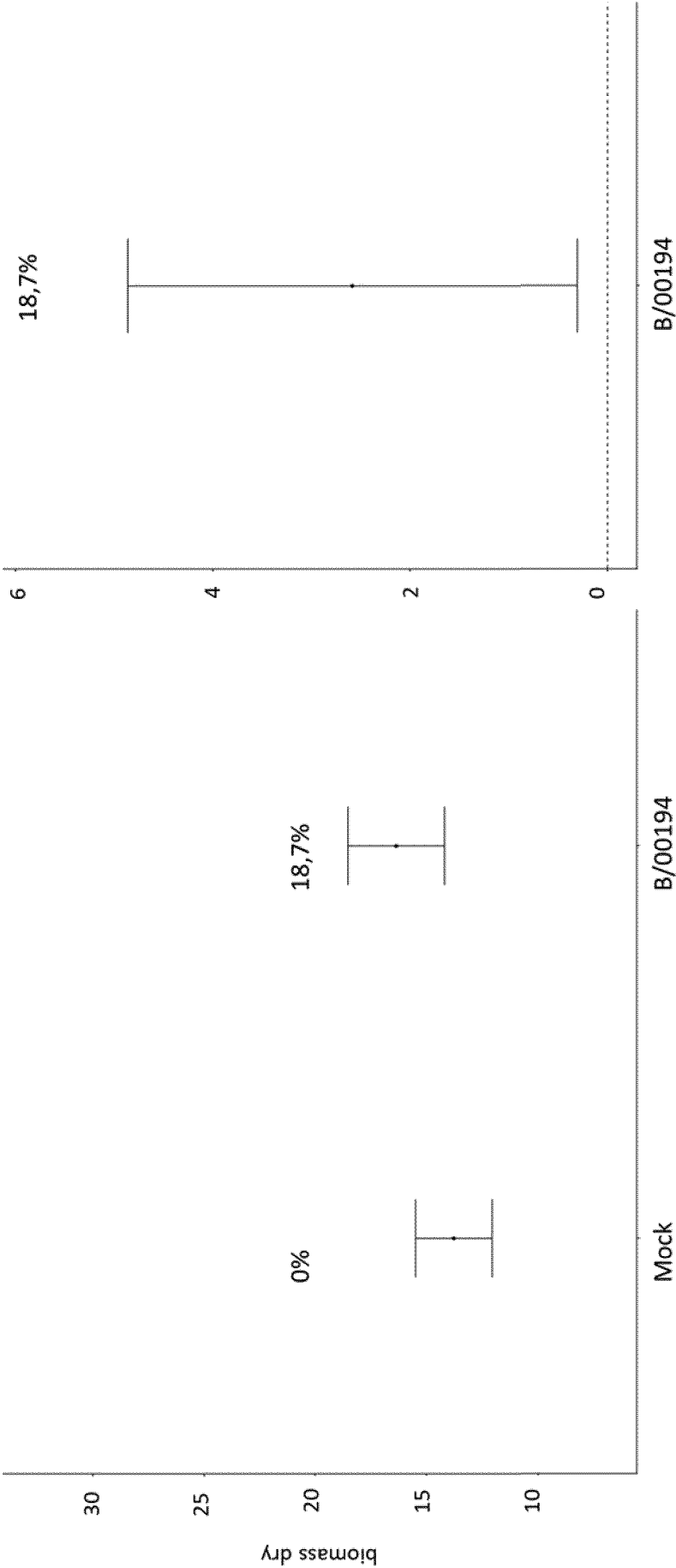


Figure 1E:



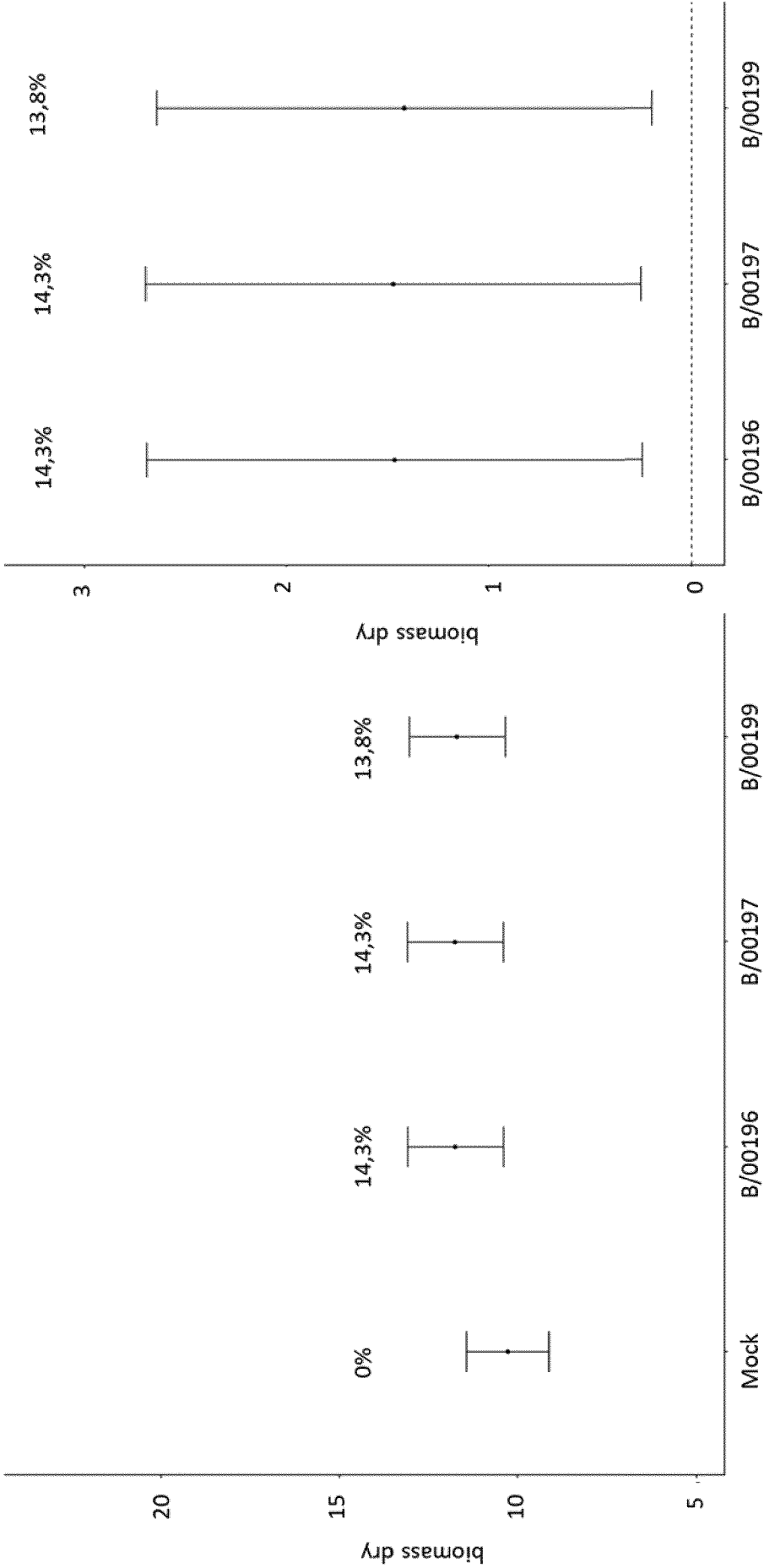


Figure 1F:

Figure 1 G:

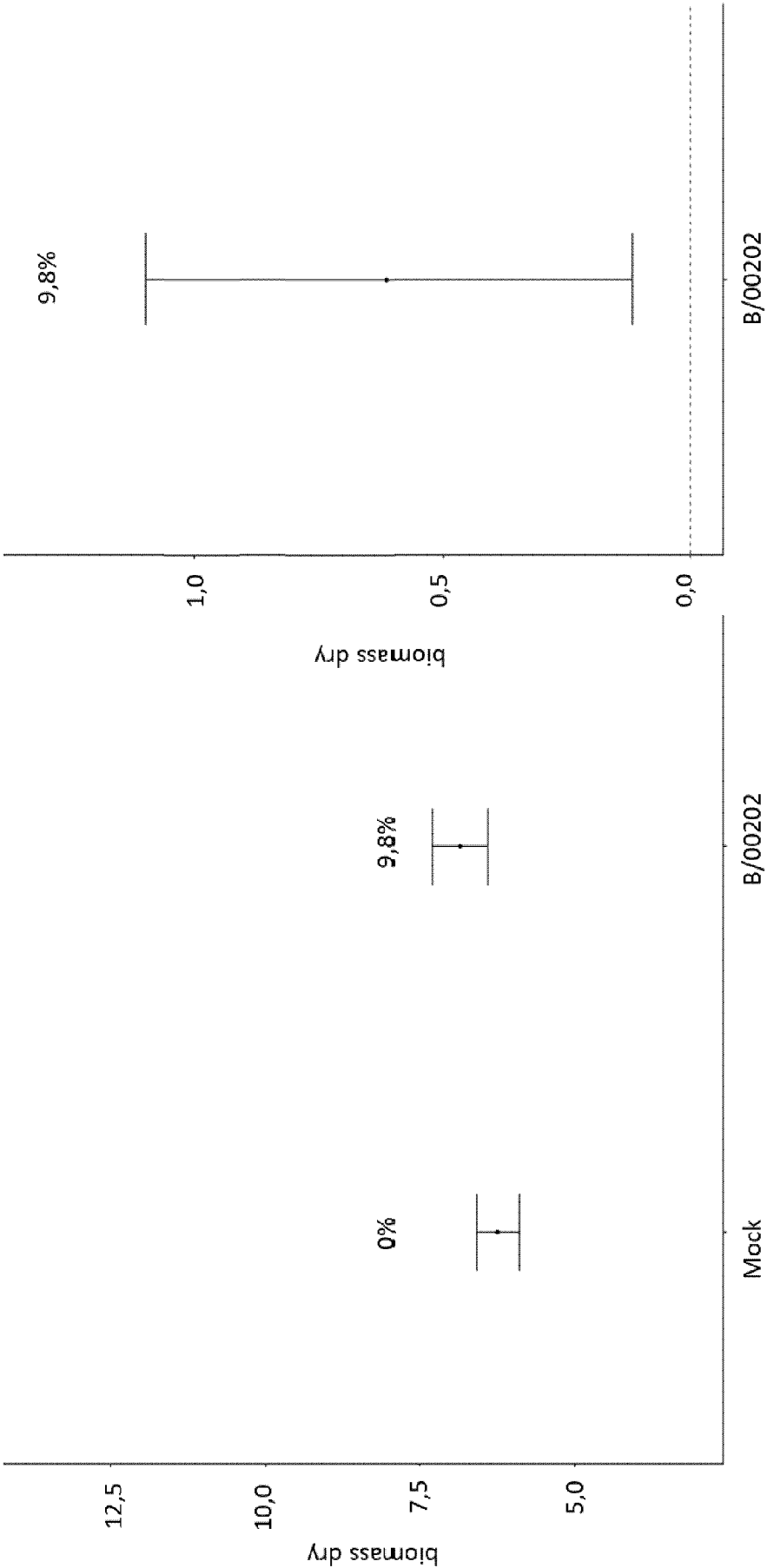


Figure 1H:

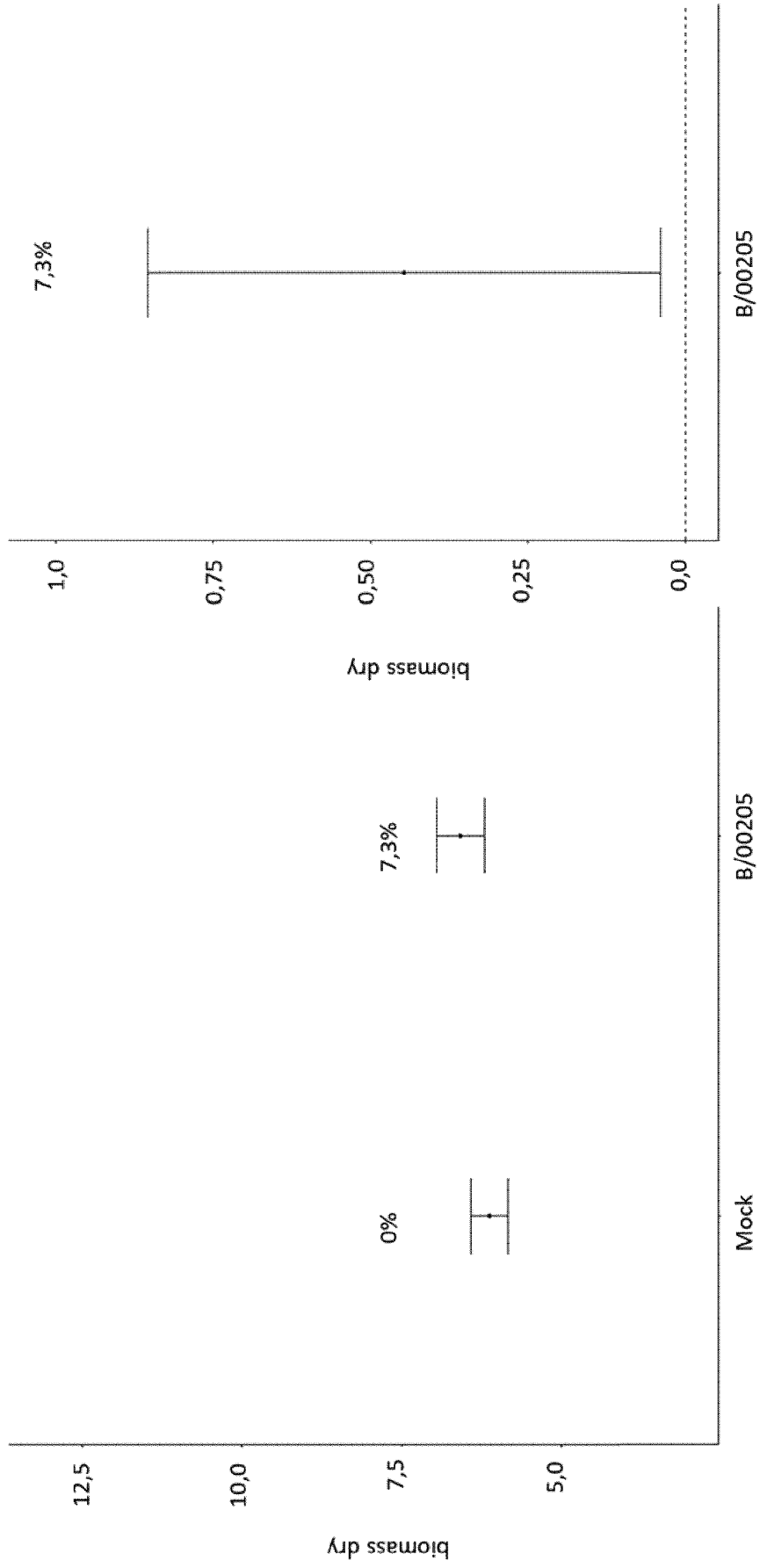


Figure 11:

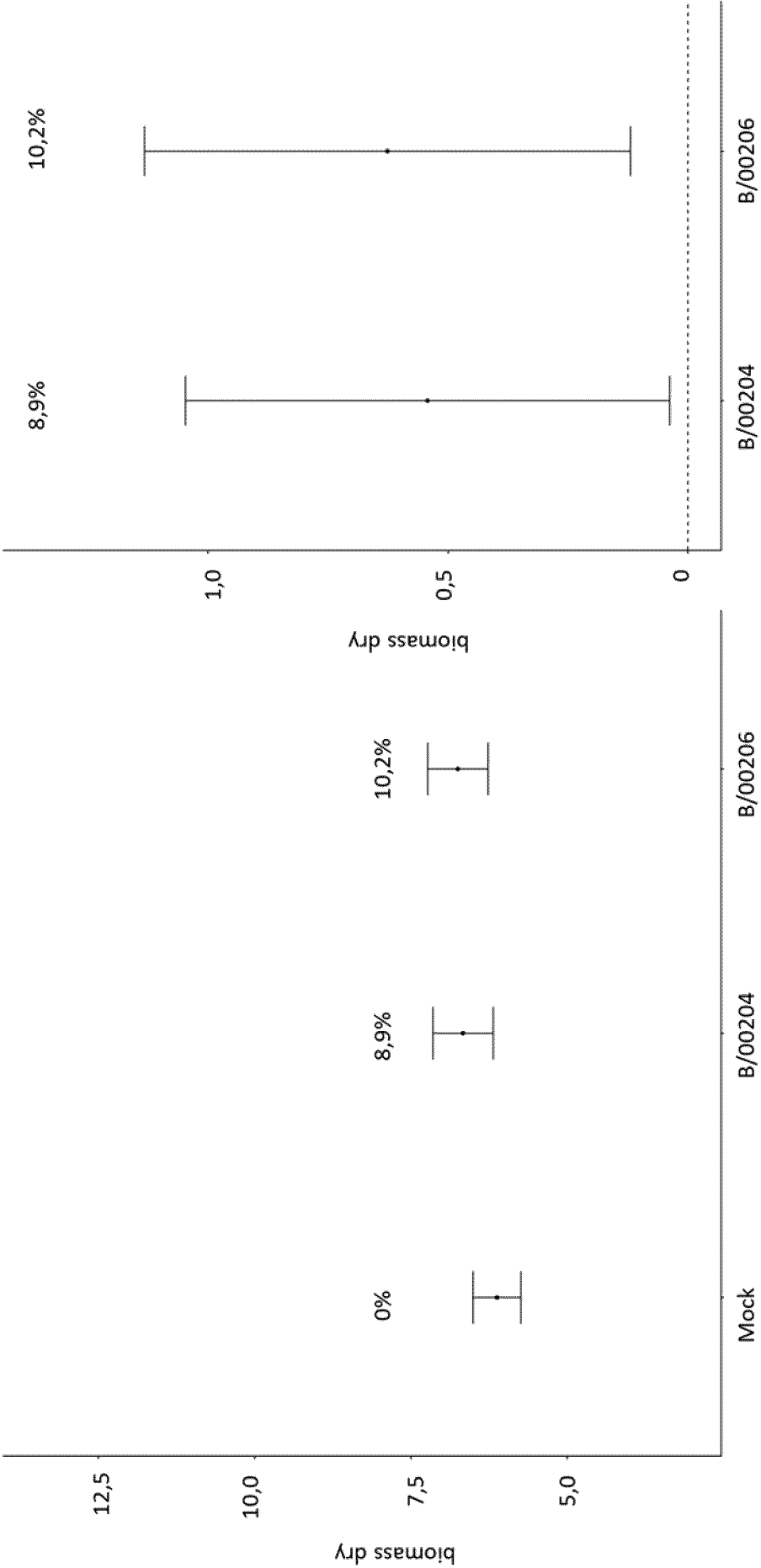


Figure 1J:

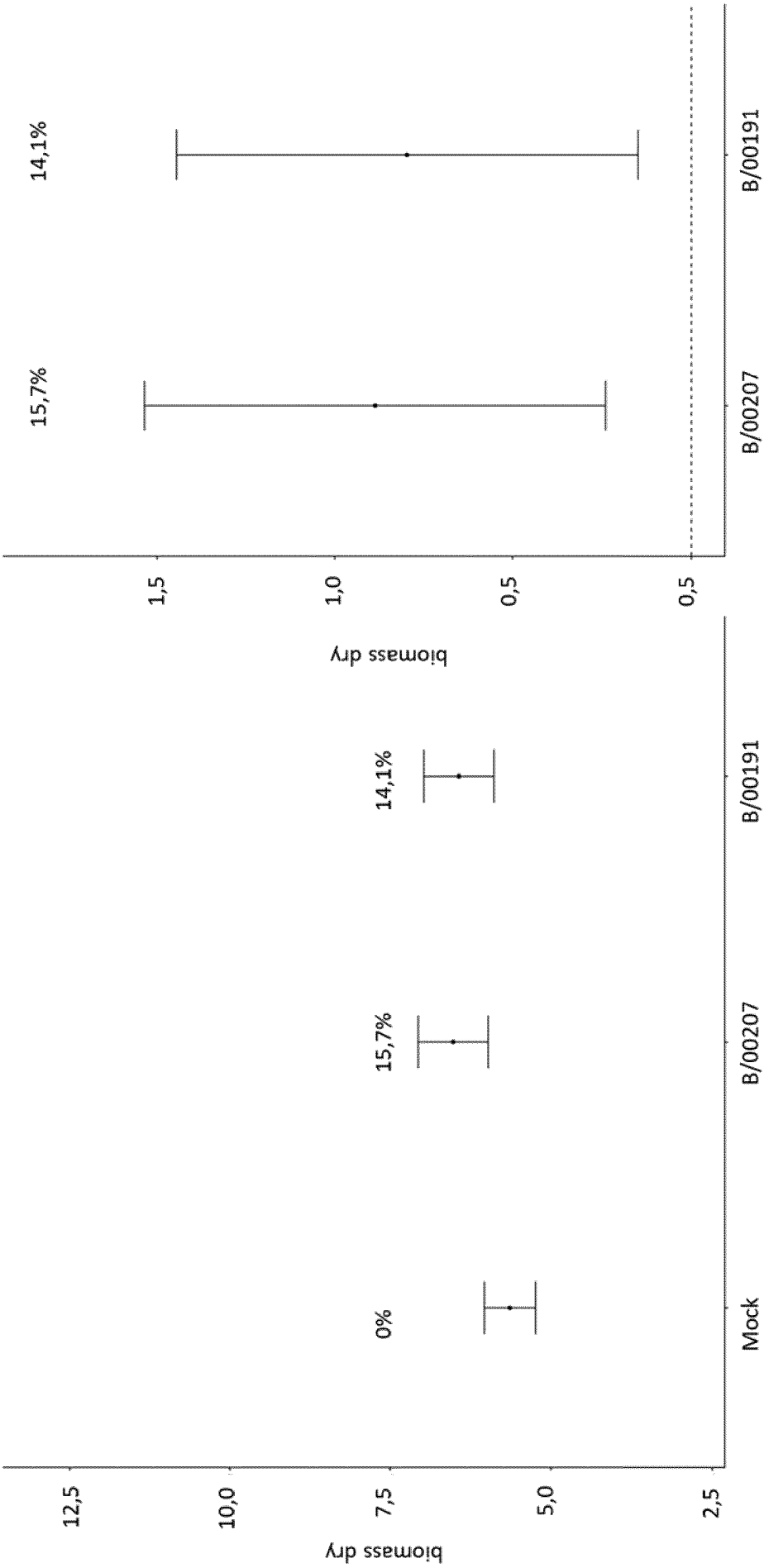


Figure 1K:

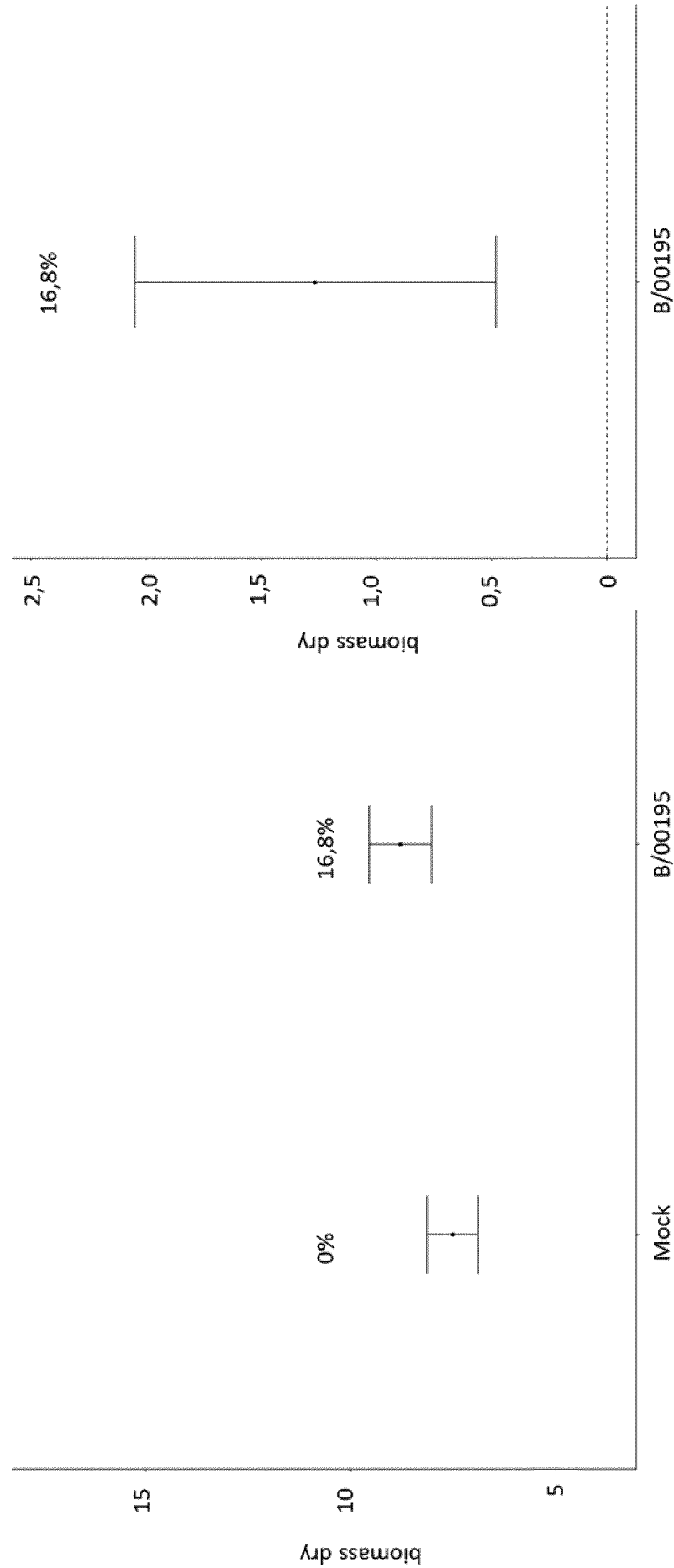


Figure 1L:

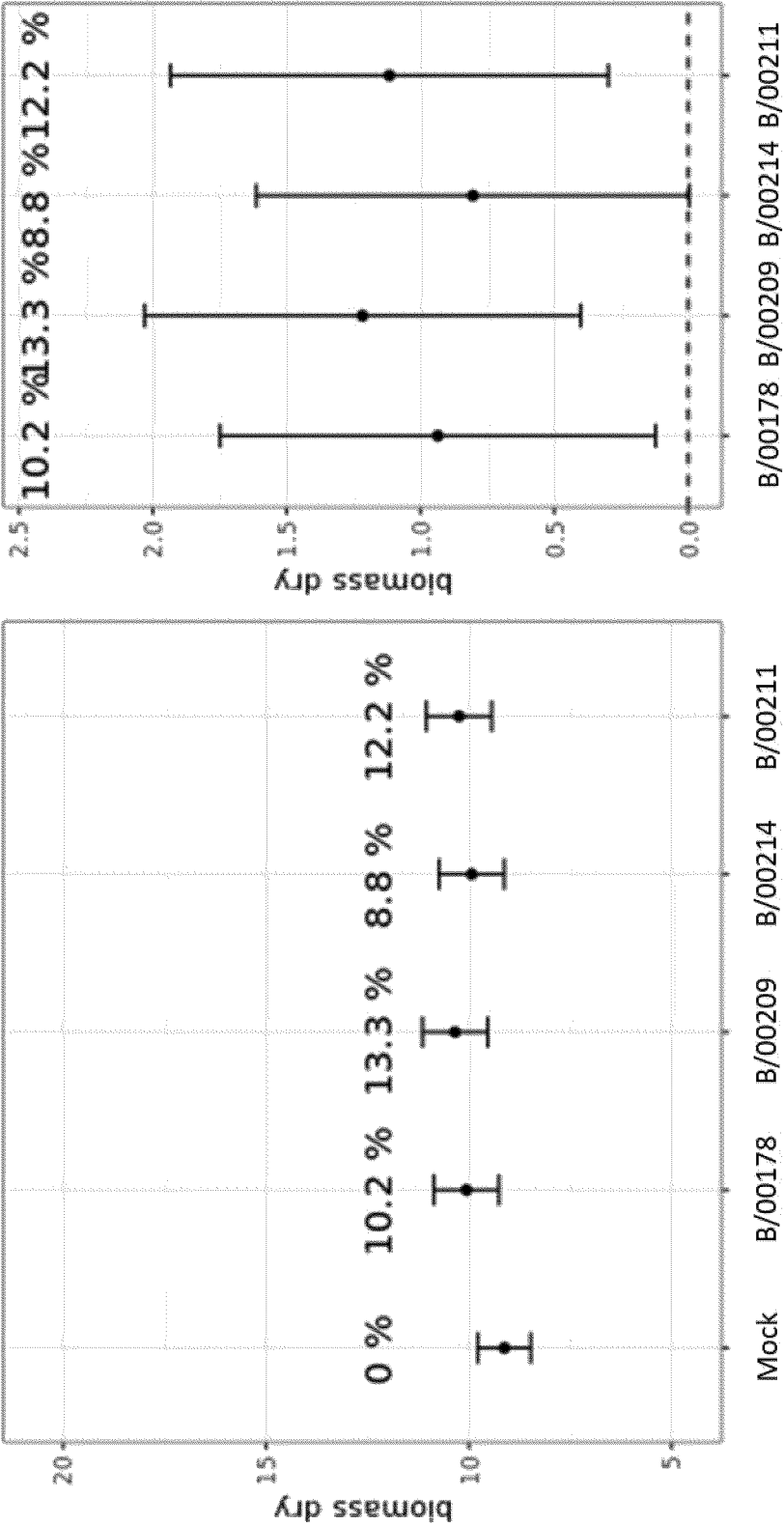


Figure 2 A:

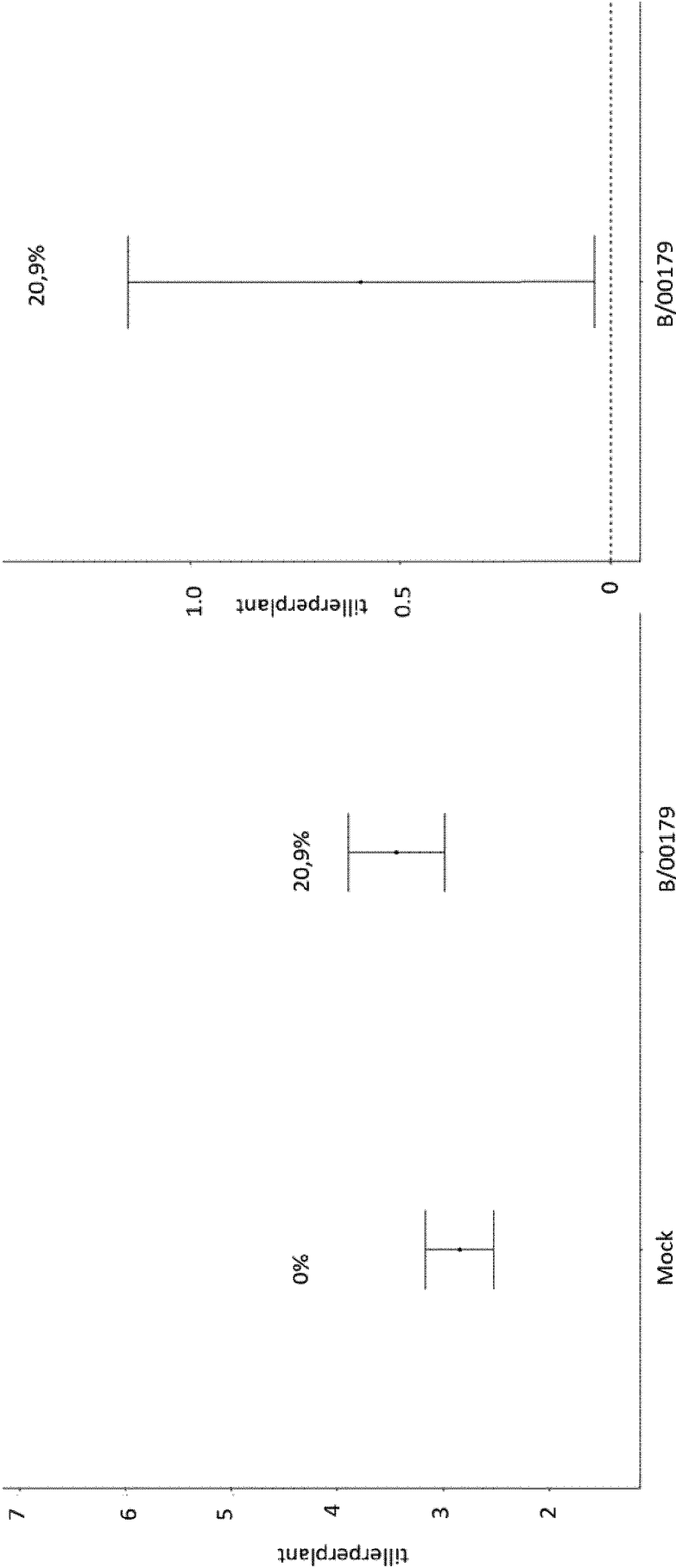
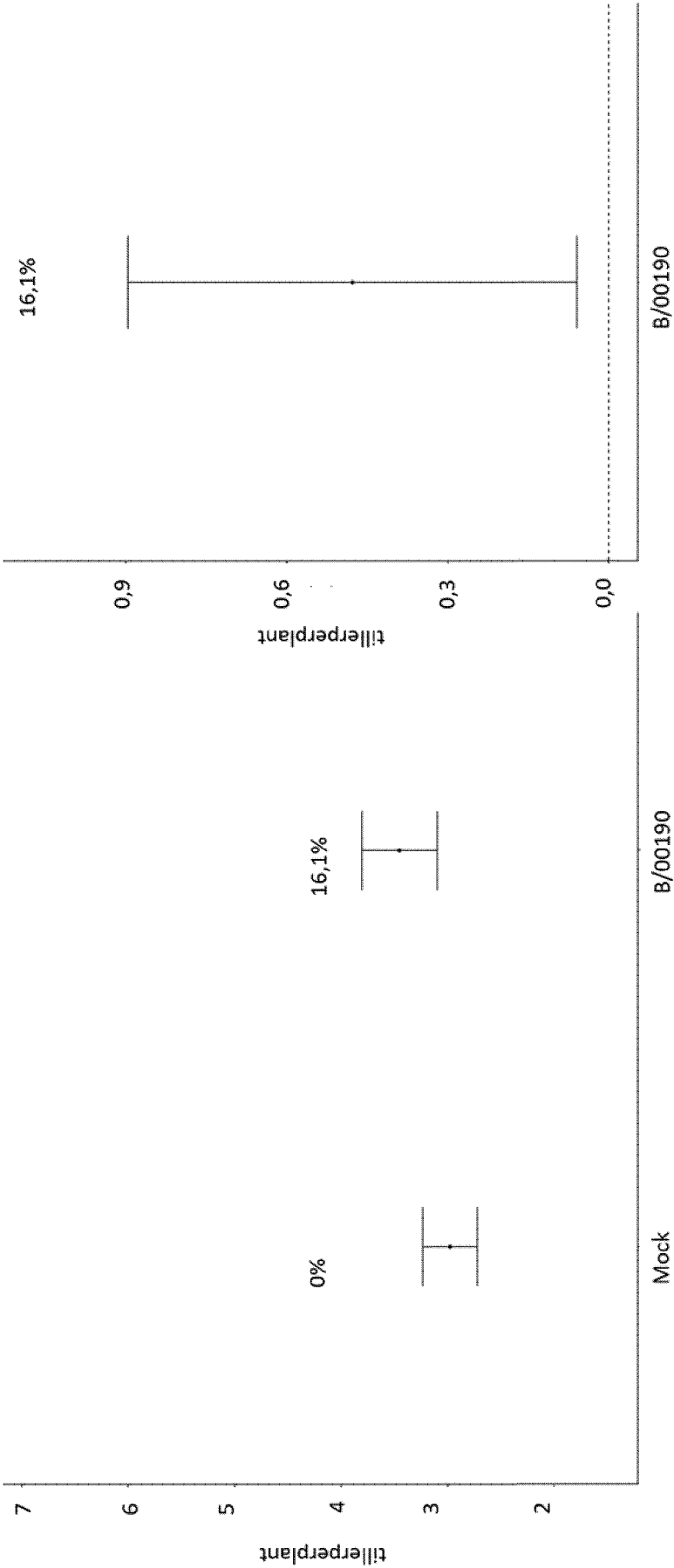


Figure 2 B:



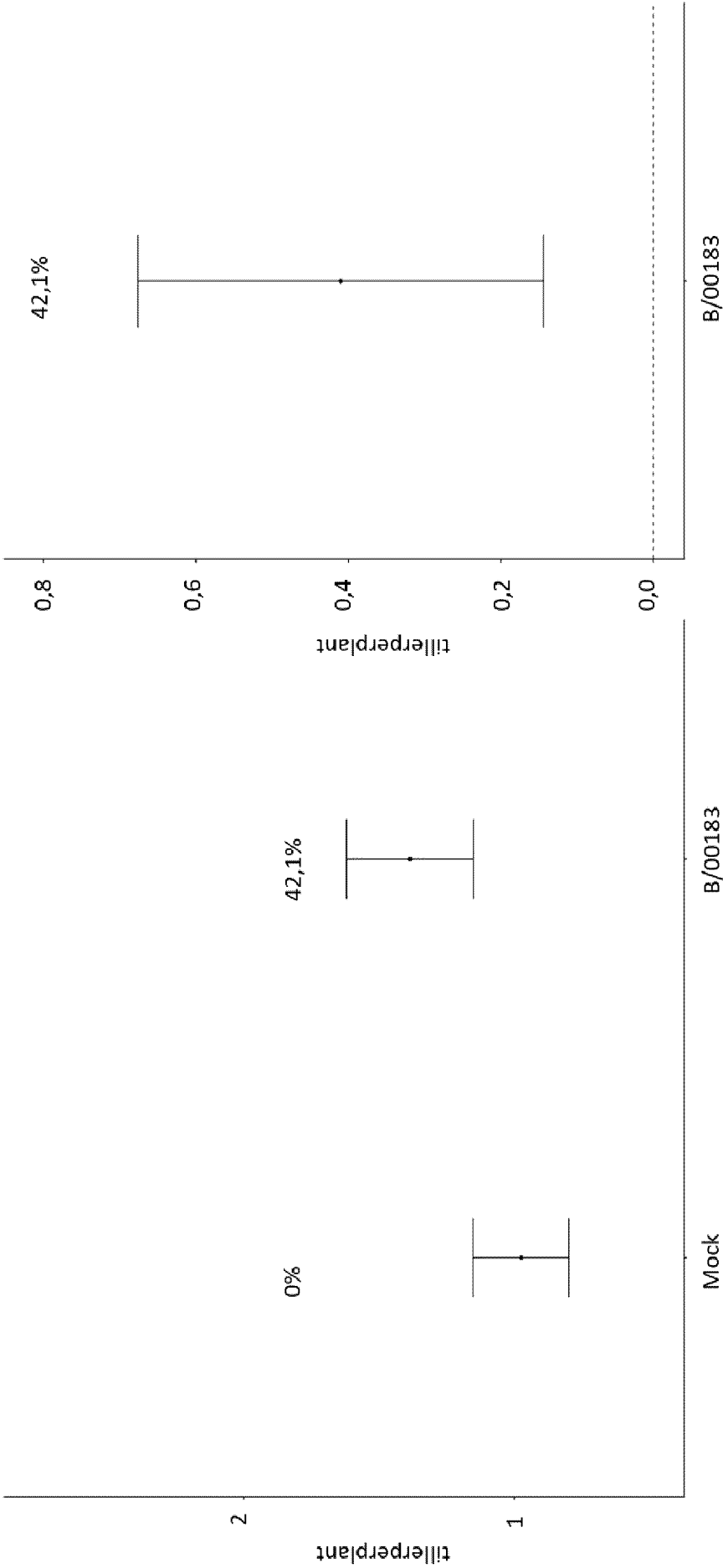


Figure 2C:

Figure 2D:

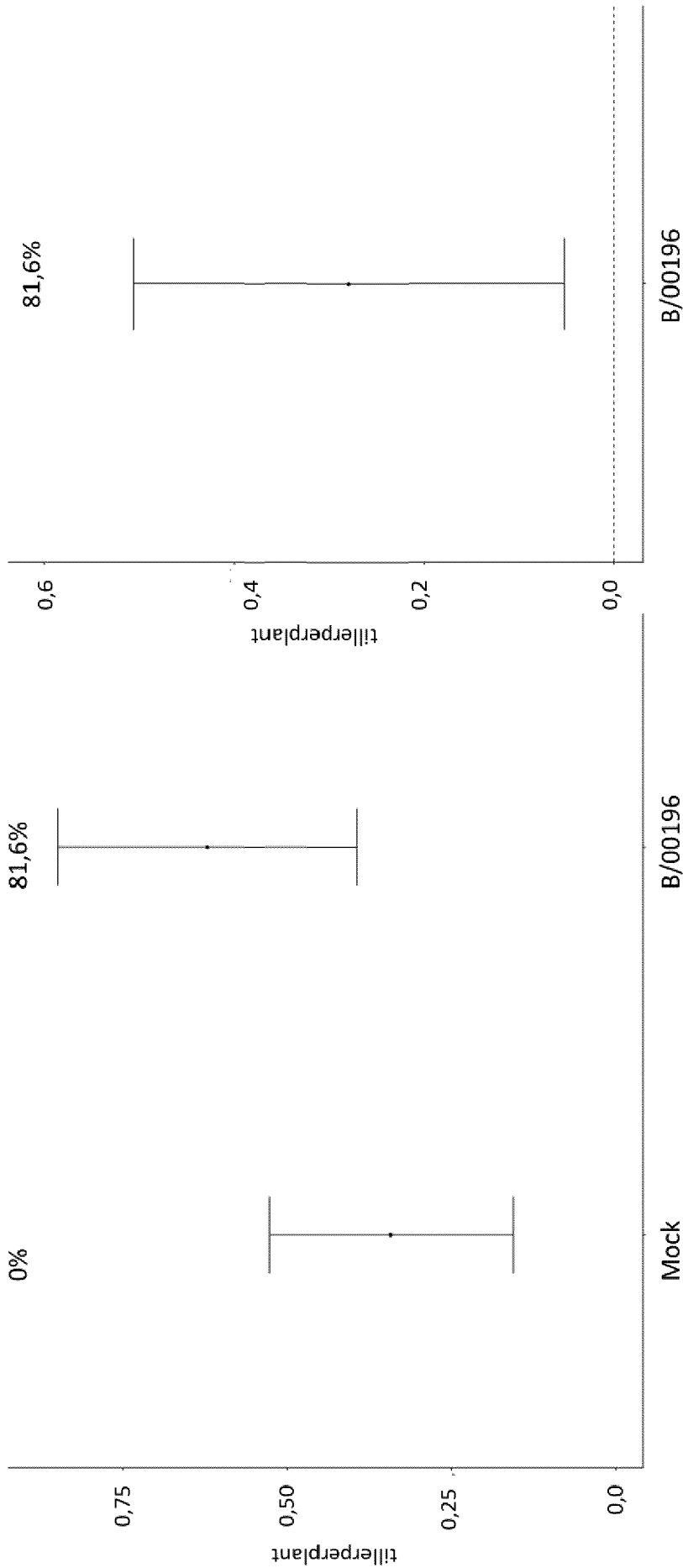


Figure 2E:

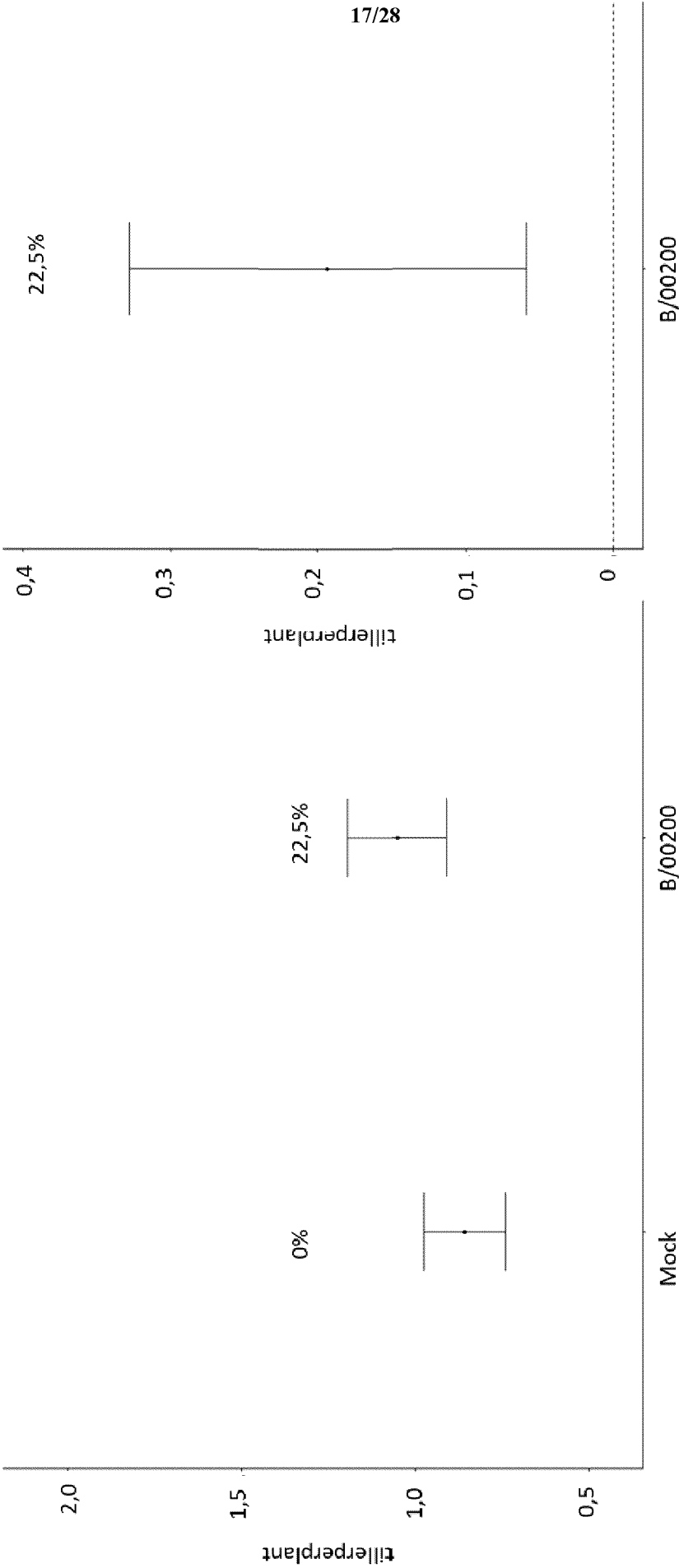


Figure 2F:

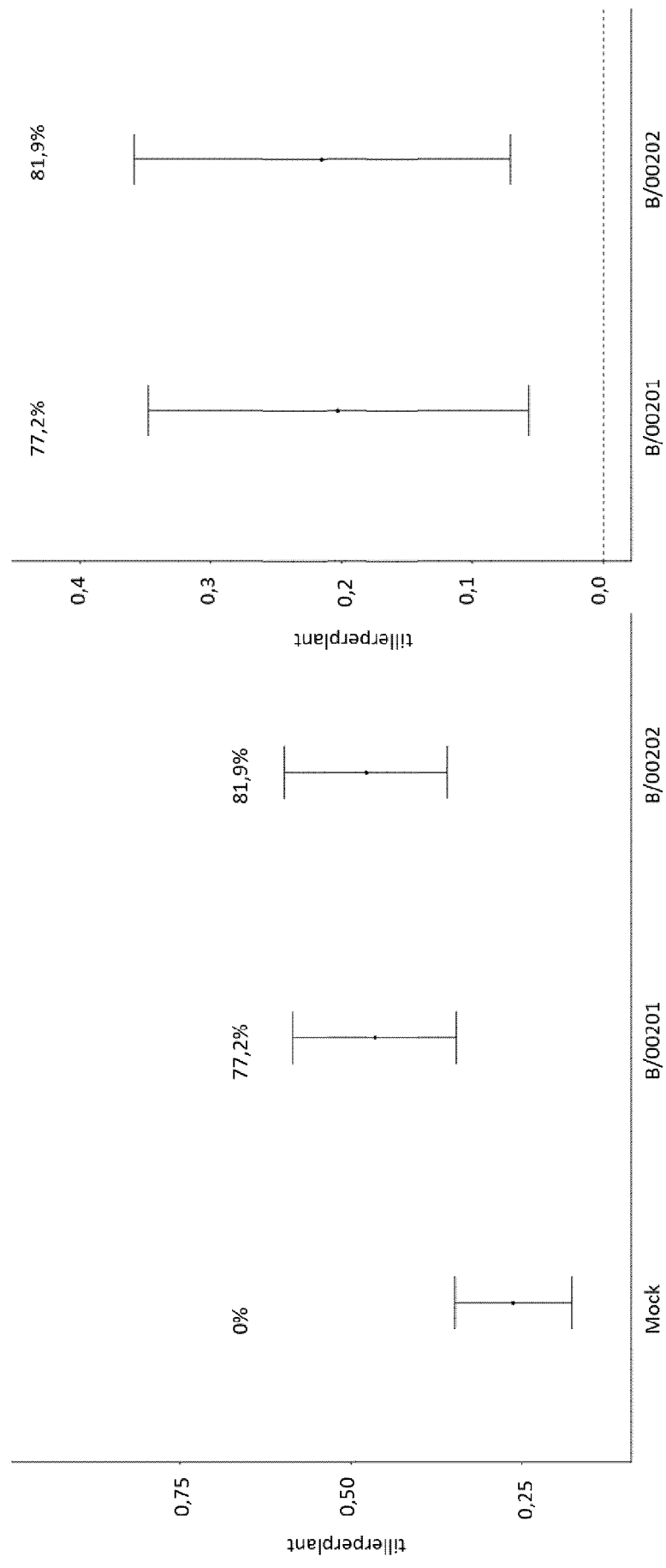


Figure 2G:

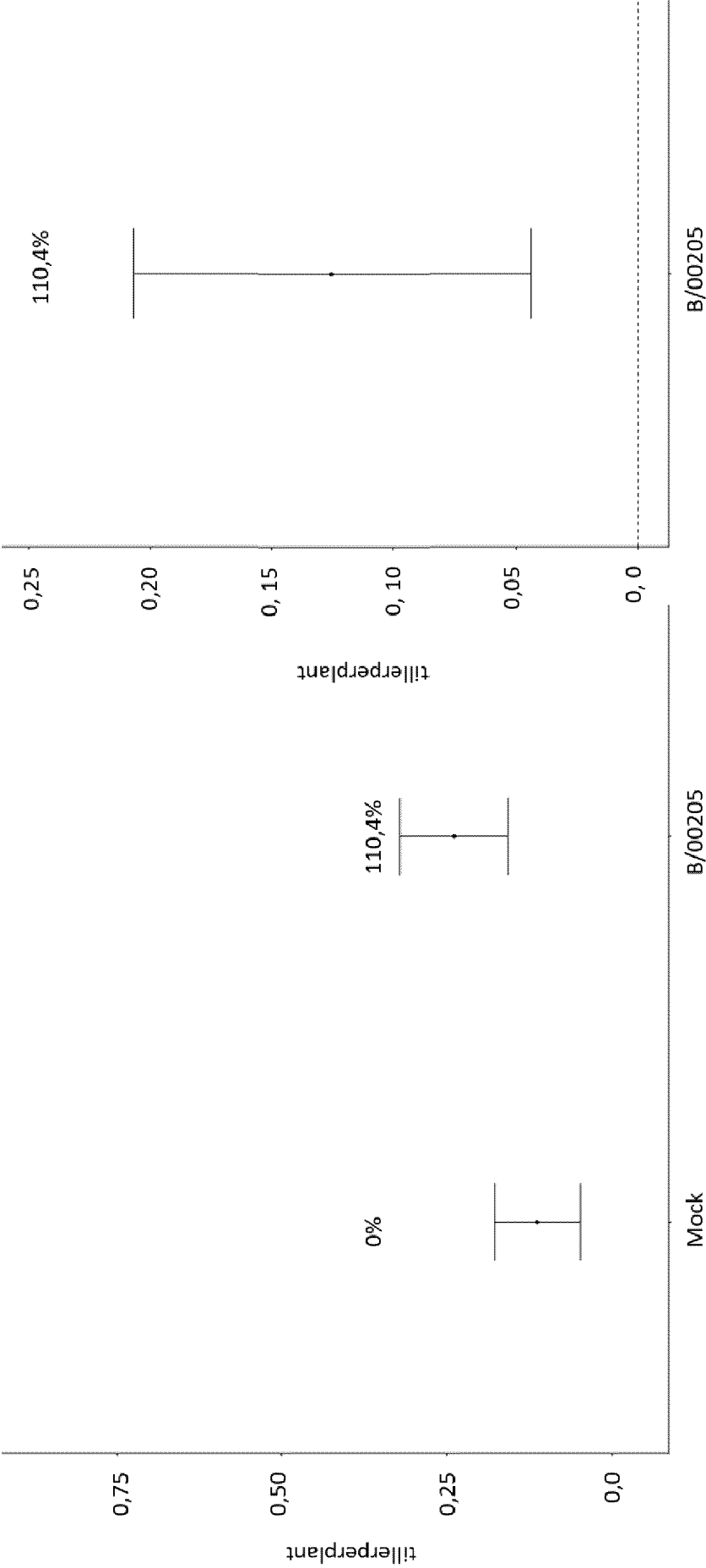


Figure 2H:

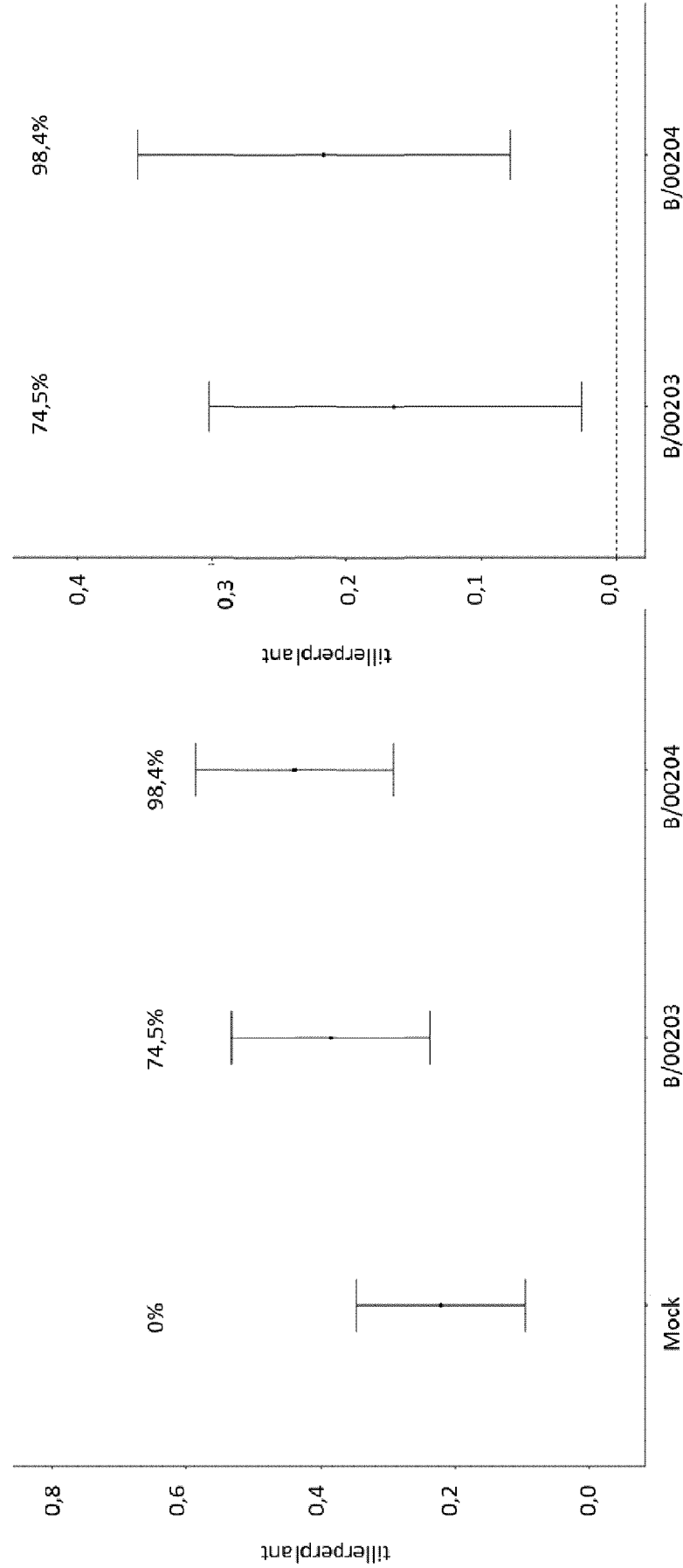


Figure 21 :

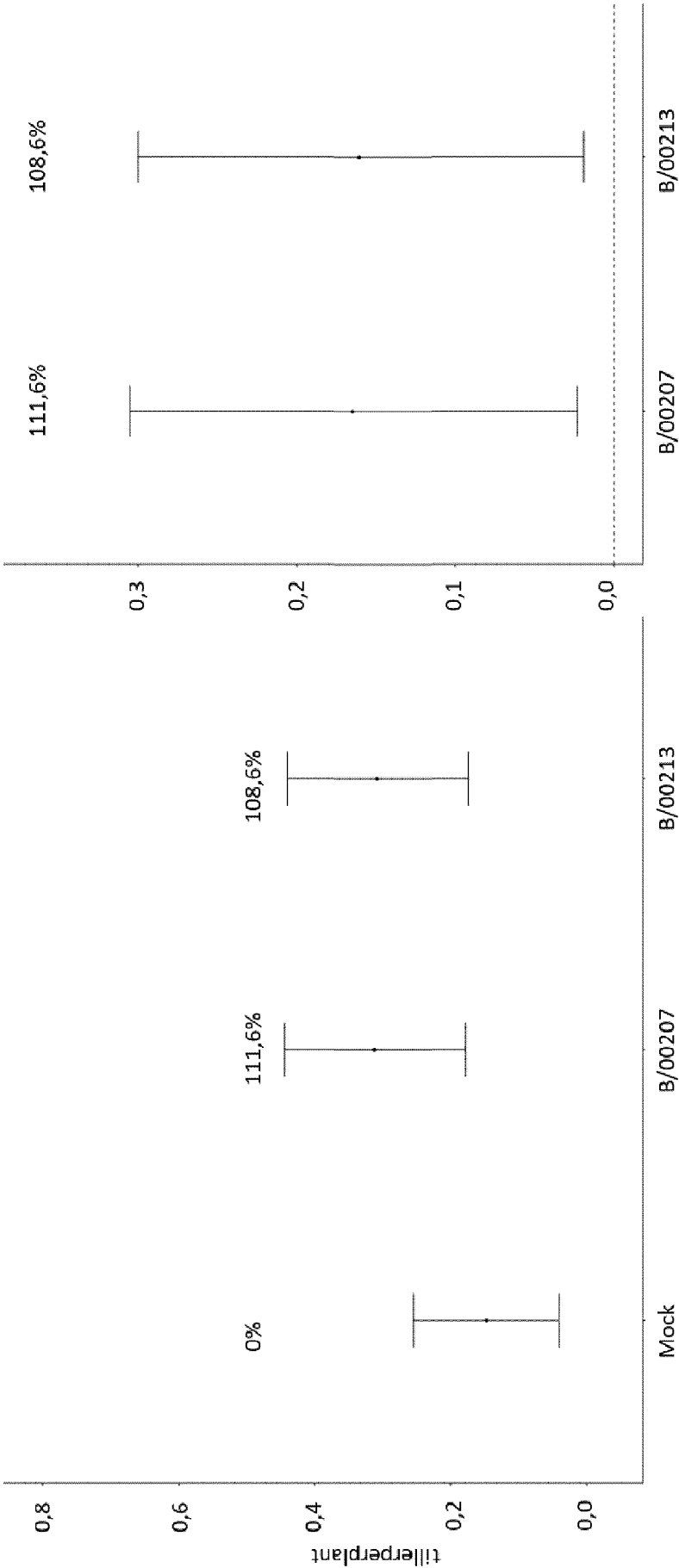


Figure 2J:

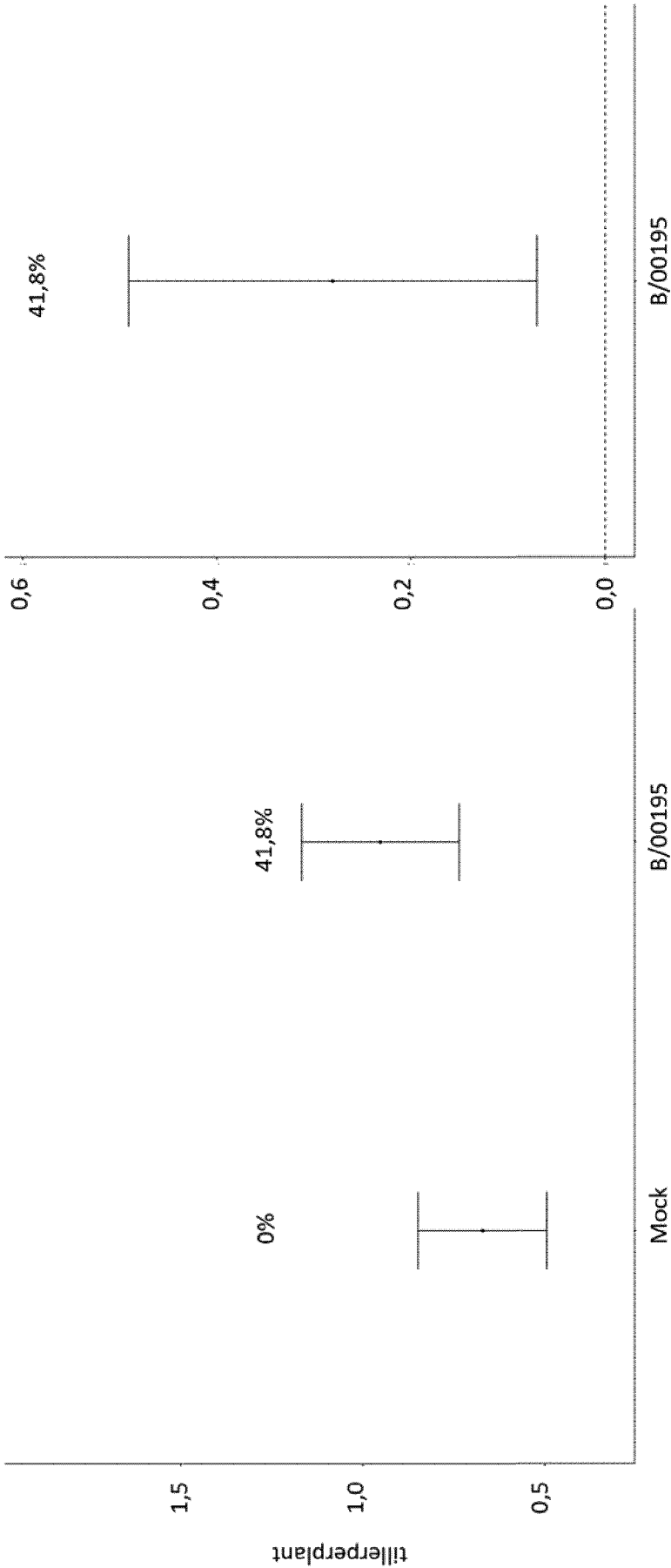
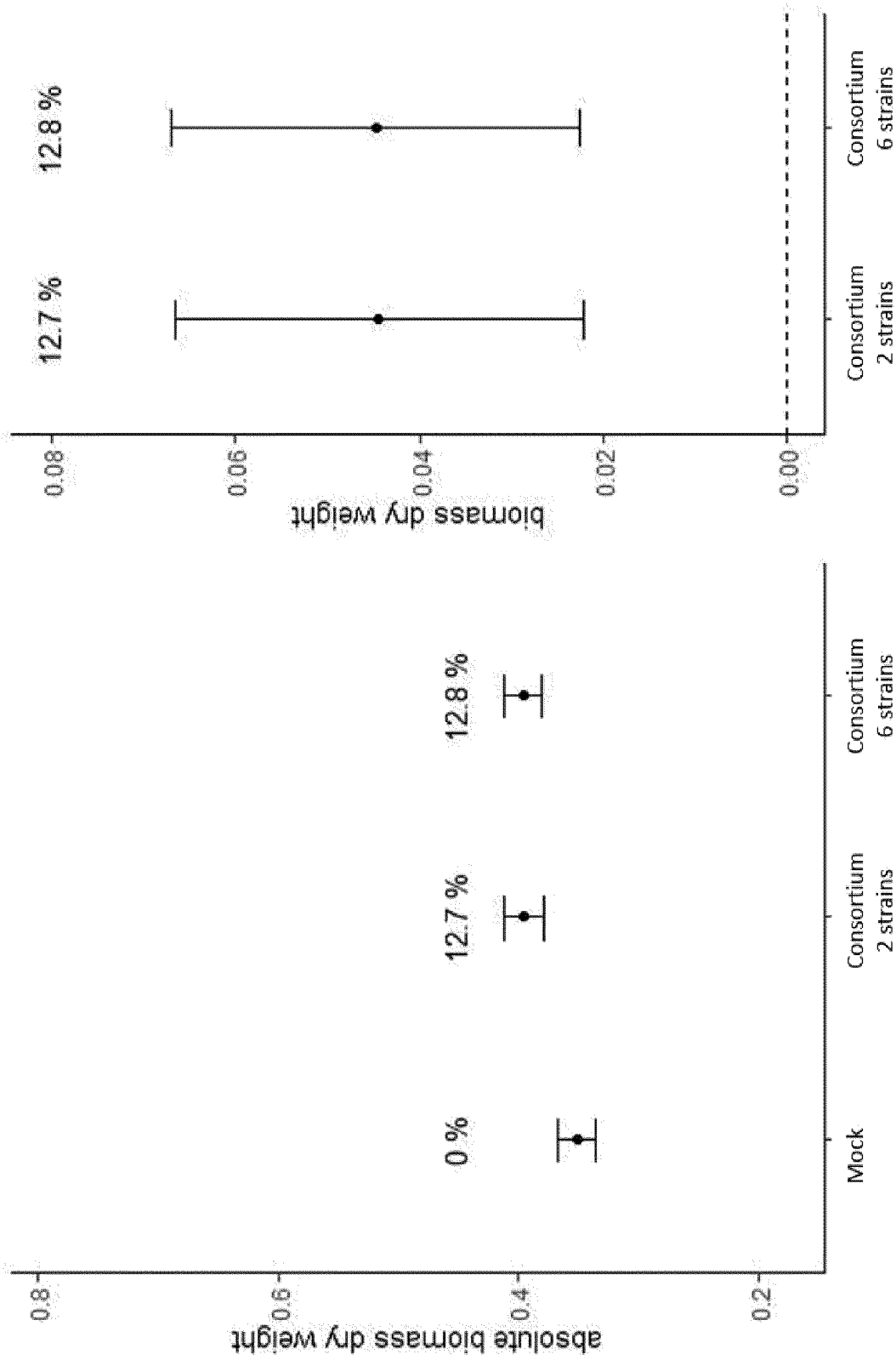


Figure 3 :



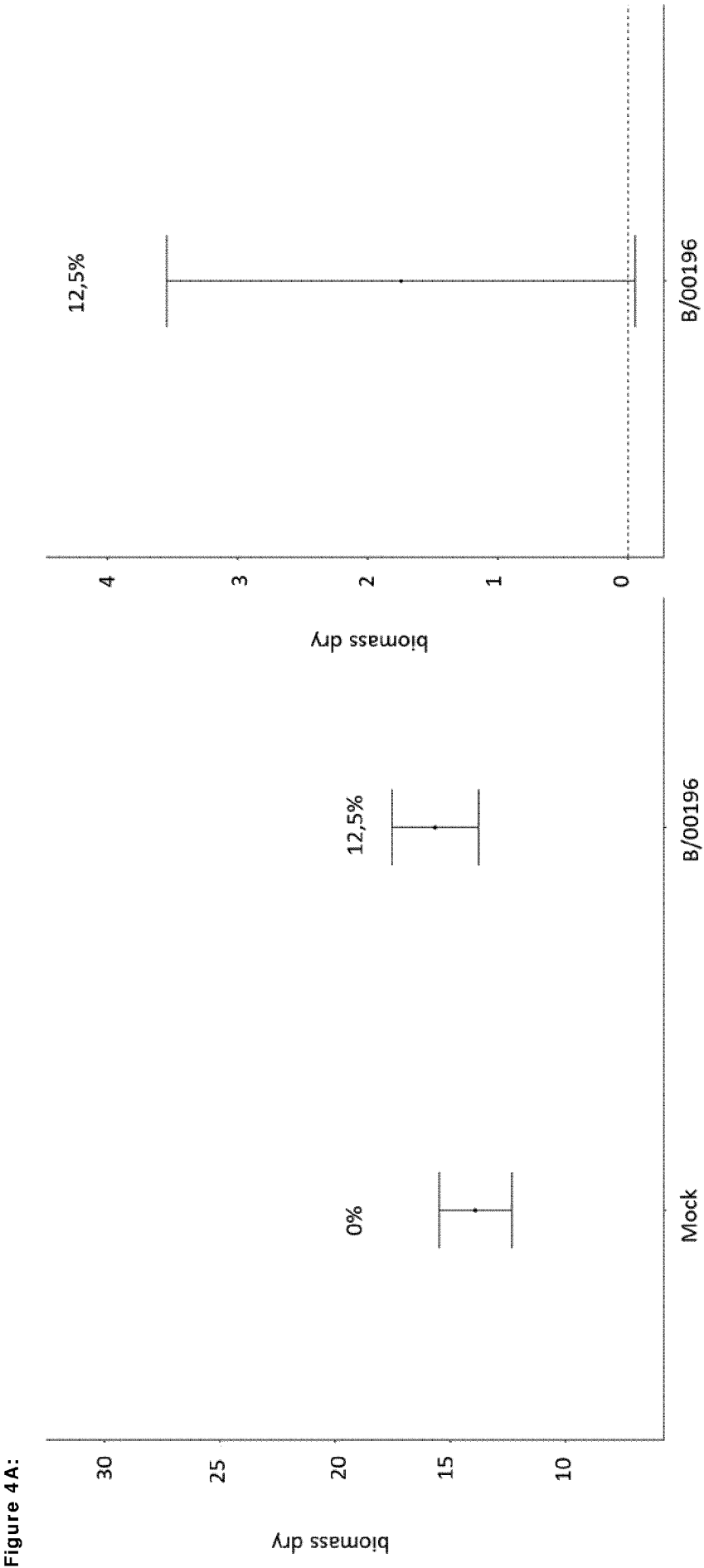


Figure 4 B:

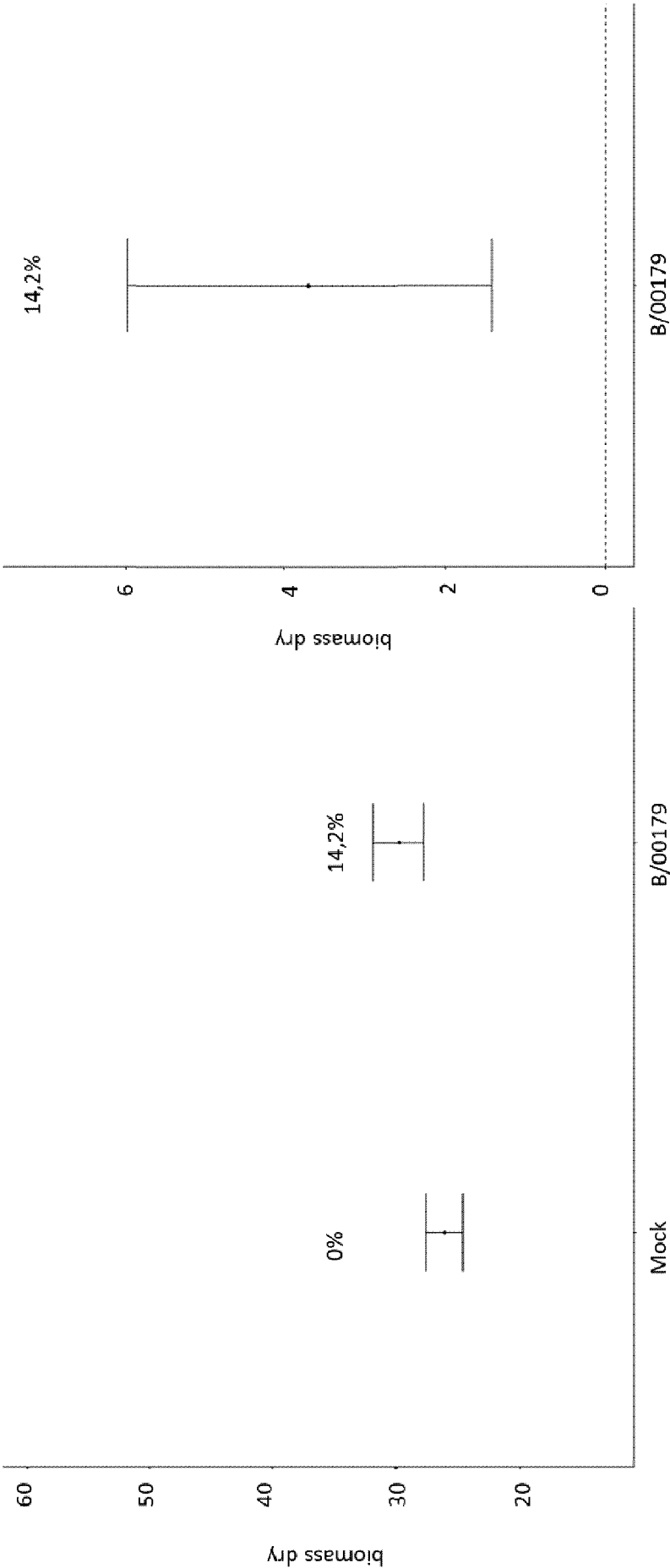


Figure 5:

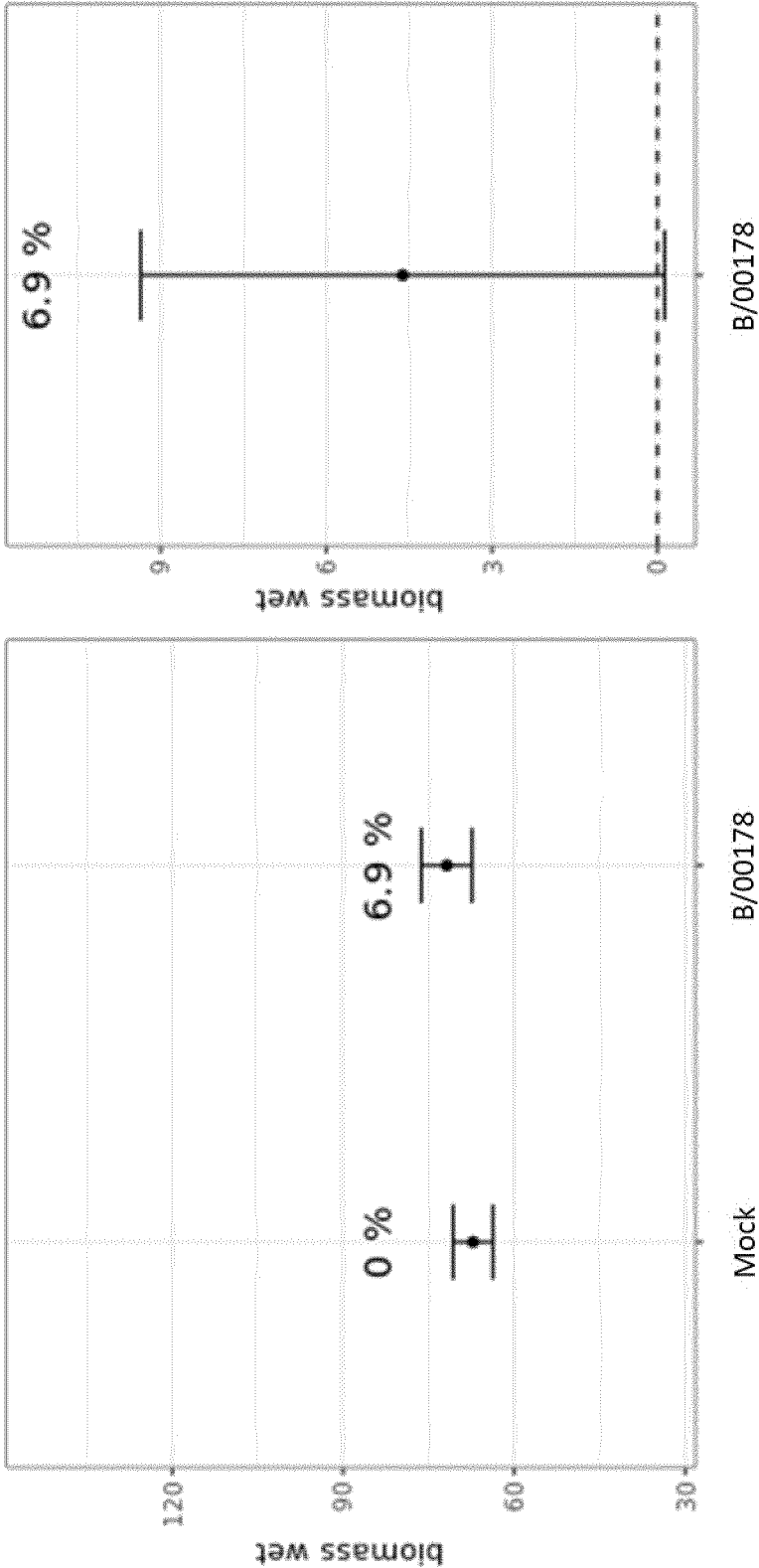


Figure 6:

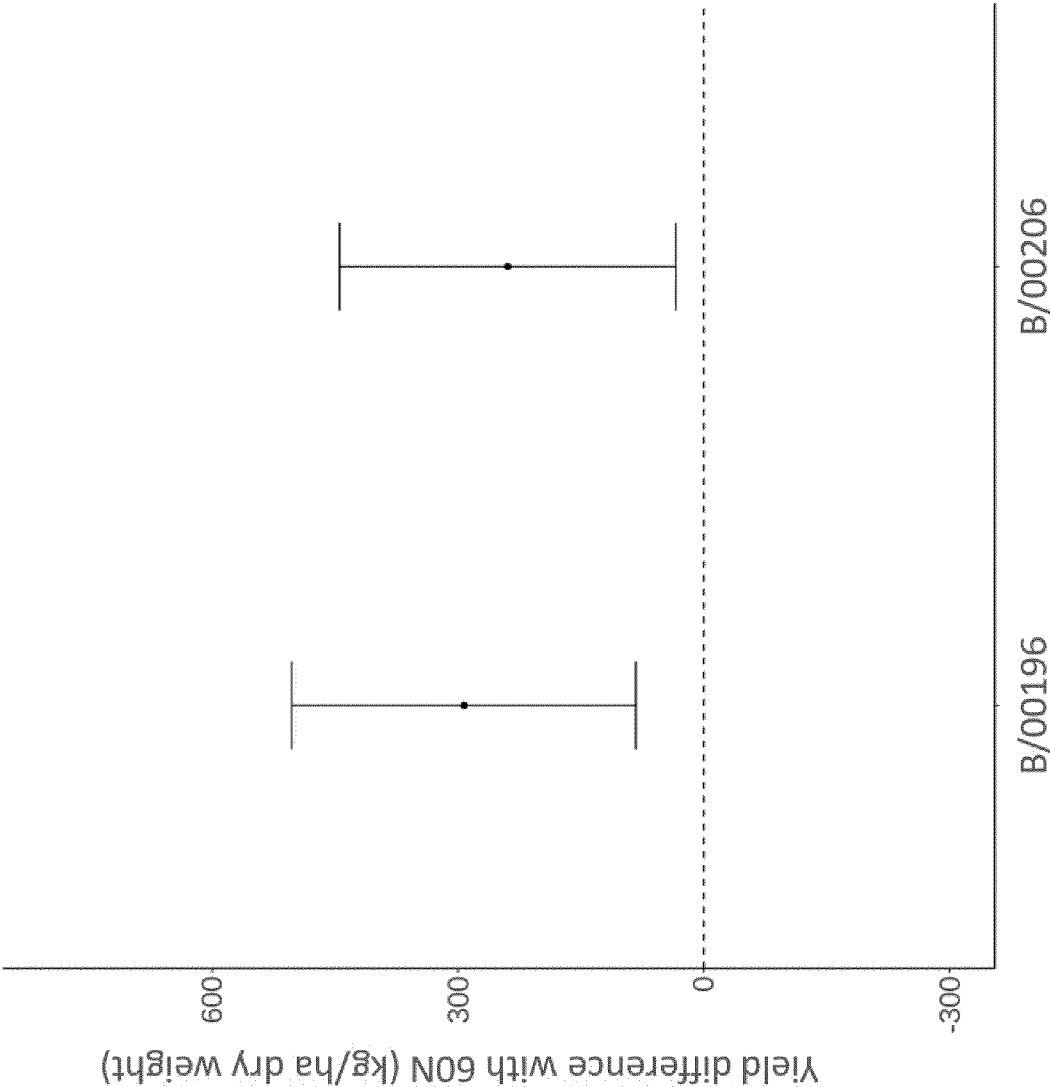
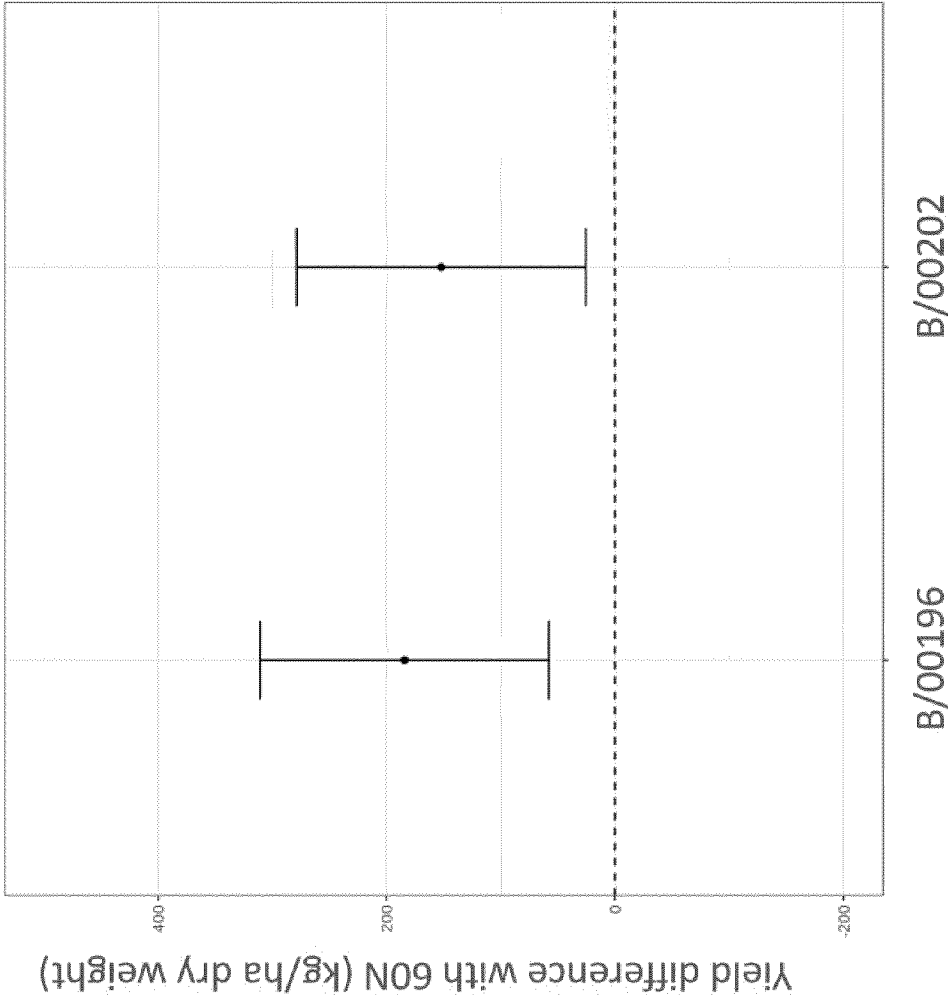


Figure 7:



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2020/053286

A. CLASSIFICATION OF SUBJECT MATTER
INV. A01N63/20 A01P21/00 C12N1/20
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A01N C12R C12N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, BIOSIS, CHEM ABS Data, EMBASE, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2017/019633 A2 (BIOCONSORTIA INC [US]) 2 February 2017 (2017-02-02) figures 5-16; examples claims example 2 claim 43 claim 15 ----- -/--	1-18



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

23 June 2020

Date of mailing of the international search report

06/07/2020

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Galley, Carl

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2020/053286

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	ANGEL VALVERDE ET AL: "Evidence of an American Origin for Symbiosis-Related Genes in <i>Rhizobium lusitanum</i> ", APPLIED AND ENVIRONMENTAL MICROBIOLOGY, vol. 77, no. 16, 24 June 2011 (2011-06-24), pages 5665-5670, XP055688204, US	1,2,4
Y	ISSN: 0099-2240, DOI: 10.1128/AEM.02017-10 the whole document table 2 <i>Rhizobium lusitanum</i> strains P3-30 (EMBL database HM852116), P2-2 (EMBL database HM852117), and P5-6 (EMBL database HM852118)	1-18
X	----- A. VALVERDE ET AL: " <i>Rhizobium lusitanum</i> sp. nov. a bacterium that nodulates <i>Phaseolus vulgaris</i> ", INTERNATIONAL JOURNAL OF SYSTEMATIC AND EVOLUTIONARY MICROBIOLOGY, vol. 56, no. 11, 1 November 2006 (2006-11-01), pages 2631-2637, XP055688212, GB	1,2,4
Y	ISSN: 1466-5026, DOI: 10.1099/ijs.0.64402-0 abstract table 1 <i>R. lusitanum</i> strain P1-7 (EMBL database AY738130)	1-18
X	----- LI JUAN WU ET AL: "Genetic diversity of nodulating and non-nodulating rhizobia associated with wild soybean (<i>Glycine soja</i> Sieb. & Zucc.) in different ecoregions of China : The comparison between <i>G. soja</i> and <i>G. max</i> rhizobia", FEMS MICROBIOLOGY ECOLOGY., vol. 76, no. 3, 1 June 2011 (2011-06-01), pages 439-450, XP055688210, NL	1,2,4
Y	ISSN: 0168-6496, DOI: 10.1111/j.1574-6941.2011.01064.x table 1 <i>R. lusitanum</i> strain CCBAU 15087 (EMBL database GU552881)	1-18
	----- -/--	

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2020/053286

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	XUE RUI YAN ET AL: "Mesorhizobium spp. are the main microsymbionts of Caragana spp. grown in Liaoning Province of China", FEMS MICROBIOLOGY LETTERS, vol. 271, no. 2, 1 June 2007 (2007-06-01), pages 265-273, XP055688321, GB ISSN: 0378-1097, DOI: 10.1111/j.1574-6968.2007.00727.x	1,2,4
Y	table 1 Rhizobium strain CCBAU 11182 (EMBL database EF149005)	1-18
X	----- CN 109 055 274 A (INST AGRI RESOURCES CAAS) 21 December 2018 (2018-12-21)	1,4,6-18
Y	R. calliandrae; example 1; sequence 1	1-18
X	----- CN 108 841 761 A (INST AGRI RESOURCES CAAS) 20 November 2018 (2018-11-20)	1,4,6-18
Y	R. trifolii strain 92-29; example 1; sequence 1	1-18
X	----- ERKO STACKEBRANDT ET AL: "Gene Sequence Phylogenies of the Family Microbacteriaceae", CURRENT MICROBIOLOGY, SPRINGER-VERLAG, NE, vol. 55, no. 1, 5 June 2007 (2007-06-05), pages 42-46, XP019514841, ISSN: 1432-0991, DOI: 10.1007/S00284-006-0569-5	1,2,4
Y	abstract page 45, right-hand column Leifsonia poae strain DSM 15202 Leifsonia strain BF55 Agreia bicolorata DSM 14575, Okibacterium fritillariae DSM 15271, Agromyces cerinus DSM 8595, and Agrococcus jenensis DSM 9580	1-18
X	----- AL-SADI A M ET AL: "Analysis of bacterial communities associated with potting media", SPRINGERPLUS, BIOMED CENTRAL LTD, LONDON, UK, vol. 5, no. 1, 26 January 2016 (2016-01-26), pages 1-5, XP021231419, DOI: 10.1186/S40064-016-1729-0	1,2,4
Y	abstract Leifsonia lichenia strain SQU P002, Genbank KU220847 table 1	1-18
	----- -/--	

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2020/053286

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	SUN-YOUNG AN ET AL: "Leifsonia lichenia sp. nov., isolated from lichen in Japan", JOURNAL OF GENERAL AND APPLIED MICROBIOLOGY, THE, vol. 55, no. 5, 1 January 2009 (2009-01-01), pages 339-343, XP055706013, JP ISSN: 0022-1260, DOI: 10.2323/jgam.55.339 abstract Leifsonia lichenia strain 2Sb -----	1,2,4
X	R. ANANDHAM ET AL: "Potential plant growth promoting traits and bioacidulation of rock phosphate by thiosulfate oxidizing bacteria isolated from crop plants", JOURNAL OF BASIC MICROBIOLOGY, vol. 48, no. 6, 1 December 2008 (2008-12-01), pages 439-447, XP055232906, BERLIN, DE ISSN: 0233-111X, DOI: 10.1002/jobm.200700380 abstract table 1 Leifsonia shinshuensis strain ATSB20 -----	1,4,6-18
Y	KRISTEN M. DEANGELIS ET AL: "Bacterial quorum sensing and nitrogen cycling in rhizosphere soil : Bacterial QS and rhizosphere nitrogen cycling", FEMS MICROBIOLOGY ECOLOGY., vol. 66, no. 2, 1 November 2008 (2008-11-01), pages 197-207, XP055707602, NL ISSN: 0168-6496, DOI: 10.1111/j.1574-6941.2008.00550.x abstract strains kmd_072 and kmd_360 -----	1-18
X	WO 2018/073454 A1 (DCM DE CEUSTER MESTSTOFFEN NV [BE] ET AL.) 26 April 2018 (2018-04-26) sequence 50 claims examples -----	1,2,4
Y		1-18

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2020/053286

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☒ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
1-18(partially)
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-18(partially)

A purified bacterial endophyte for improving plant growth and/or yield, characterized in that, said endophyte comprises at least one 16S nucleotide sequence at least 95% identical to SEQ ID NO:5.

Purified bacterial endophyte according to claim 1, characterized in that, said endophyte is deposited with the Polish Collection of Microorganisms, under the terms of the Budapest Treaty, as Deposit ID: B/00196.

2. claims: 1-18(partially)

A purified bacterial endophyte for improving plant growth and/or yield, characterized in that, said endophyte comprises at least one 16S nucleotide sequence at least 95% identical to SEQ ID NO: 1.

Purified bacterial endophyte according to claim 1, characterized in that, said endophyte is deposited with the Polish Collection of Microorganisms, under the terms of the Budapest Treaty, as Deposit ID: B/00182.

3. claims: 1-18(partially)

A purified bacterial endophyte for improving plant growth and/or yield, characterized in that, said endophyte comprises at least one 16S nucleotide sequence at least 95% identical to SEQ ID NO: 3.

Purified bacterial endophyte according to claim 1, characterized in that, said endophyte is deposited with the Polish Collection of Microorganisms, under the terms of the Budapest Treaty, as Deposit ID: B/00184.

4. claims: 1-18(partially)

A purified bacterial endophyte for improving plant growth and/or yield, characterized in that, said endophyte comprises at least one 16S nucleotide sequence at least 95% identical to SEQ ID NO:4.

Purified bacterial endophyte according to claim 1, characterized in that, said endophyte is deposited with the Polish Collection of Microorganisms, under the terms of the Budapest Treaty, as Deposit ID: B/00195.

5. claims: 1-18(partially)

A purified bacterial endophyte for improving plant growth and/or yield, characterized in that, said endophyte

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

comprises at least one 16S nucleotide sequence at least 95% identical to SEQ ID NO:6.

Purified bacterial endophyte according to claim 1, characterized in that, said endophyte is deposited with the Polish Collection of Microorganisms, under the terms of the Budapest Treaty, as Deposit ID: B/00197.

6. claims: 1-18(partially)

A purified bacterial endophyte for improving plant growth and/or yield, characterized in that, said endophyte comprises at least one 16S nucleotide sequence at least 95% identical to SEQ ID NO:10.

Purified bacterial endophyte according to claim 1, characterized in that, said endophyte is deposited with the Polish Collection of Microorganisms, under the terms of the Budapest Treaty, as Deposit ID: B/00202.

7. claims: 1-18(partially)

A purified bacterial endophyte for improving plant growth and/or yield, characterized in that, said endophyte comprises at least one 16S nucleotide sequence at least 95% identical to SEQ ID NO:11 or 19 (Acidovorax spp.).

Purified bacterial endophyte according to claim 1, characterized in that, said endophyte is deposited with the Polish Collection of Microorganisms, under the terms of the Budapest Treaty, as Deposit ID: B/00203 or B/00207.

8. claims: 1-18(partially)

A purified bacterial endophyte for improving plant growth and/or yield, characterized in that, said endophyte comprises at least one 16S nucleotide sequence at least 95% identical to SEQ ID NO:13.

Purified bacterial endophyte according to claim 1, characterized in that, said endophyte is deposited with the Polish Collection of Microorganisms, under the terms of the Budapest Treaty, as Deposit ID: B/00205.

9. claims: 1-18(partially)

A purified bacterial endophyte for improving plant growth and/or yield, characterized in that, said endophyte comprises at least one 16S nucleotide sequence at least 95% identical to SEQ ID NO:14.

Purified bacterial endophyte according to claim 1, characterized in that, said endophyte is deposited with the Polish Collection of Microorganisms, under the terms of the Budapest Treaty, as Deposit ID: B/00206.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

10. claims: 1-18(partially)

A purified bacterial endophyte for improving plant growth and/or yield, characterized in that, said endophyte comprises at least one 16S nucleotide sequence at least 95% identical to SEQ ID NO:15.

Purified bacterial endophyte according to claim 1, characterized in that, said endophyte is deposited with the Polish Collection of Microorganisms, under the terms of the Budapest Treaty, as Deposit ID: B/00213.

11. claims: 1-18(partially)

A purified bacterial endophyte for improving plant growth and/or yield, characterized in that, said endophyte comprises at least one 16S nucleotide sequence at least 95% identical to SEQ ID NO:21.

Purified bacterial endophyte according to claim 1, characterized in that, said endophyte is deposited with the Polish Collection of Microorganisms, under the terms of the Budapest Treaty, as Deposit ID: B/00192.

12. claims: 1-18(partially)

A purified bacterial endophyte for improving plant growth and/or yield, characterized in that, said endophyte comprises at least one 16S nucleotide sequence at least 95% identical to SEQ ID NO: 29.

Purified bacterial endophyte according to claim 1, characterized in that, said endophyte is deposited with the Polish Collection of Microorganisms, under the terms of the Budapest Treaty, as Deposit ID: B/00178.

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