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Lindeman et al.

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(54) **PEPPER PLANT NAMED ‘E20B3752’**

(50) Latin Name: *Capsicum annuum*
Varietal Denomination: **E20B3752**

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USPC Plt./258
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

PP28,123 P3 6/2017 Lindeman et al.
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OTHER PUBLICATIONS

Lindeman et al., Unpublished U.S. Appl. No. 15/732,241, filed Oct. 11, 2017, titled “Pepper Plant Named ‘YY5’”.

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(57) **ABSTRACT**

A new and distinctive variety of pepper (*Capsicum annuum*) plant named ‘E20B3752’ that is distinguished by its red and yellow striped color and square shape.

4 Drawing Sheets

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Latin name:
Botanical classification: *Capsicum annuum*.
Varietal denomination: The varietal denomination of the claimed pepper variety is ‘E20B3752’.

BACKGROUND OF THE INVENTION

The bell pepper (*Capsicum annuum*) originated in Mexico and the neighboring areas of Central America. Soon after Columbus’ discovery of this plant, it was grown worldwide and used as a spice and a medicine. Today, pepper plants can be found growing wild in tropical areas around the world. Many countries grow it as a crop. Many of the hot peppers can be found in Latin America and China, but the United States prefers bell peppers. Peppers are used for fresh consumption, and they are processed into powders, sauces, and salsas. Many of the new cultivars grown today can be traced back to the early plants.

The genus *Capsicum* and species *annuum* includes most of the peppers grown in the United States. These can be further grouped into two broad categories: chile peppers which are pungent (hot) and sweet peppers which are non-pungent (mild). The United States produces four percent of the world’s *capsicum* peppers (sweet and hot), ranking sixth behind China, Mexico, Turkey, Spain and Nigeria. Bell peppers are the most common sweet pepper and are found in virtually every retail produce department. Grown commercially in most states, the U.S. industry is largely concentrated in California and Florida, which

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together accounted for 78% of output in 2000. New Jersey, Georgia, and North Carolina round out the top five producing states (Economic Research Service, USDA, Vegetables and Melons Outlook/VGS-288/Dec. 14, 2001).

5 Bell peppers are eaten raw, cooked, immature and mature. Often nutritional content is altered by the changes in the way they are consumed. Per capita consumption of bell peppers in 1995 was 6.2 pounds. They are an excellent source of Vitamin C, Vitamin A, and Calcium. Red peppers have more of these qualities than the immature green peppers.

10 Peppers grown in temperate regions are herbaceous annuals, but are herbaceous perennials where temperatures do not drop below freezing. Pepper plants’ growth habit may be prostrate, compact, or erect, but it is determinate in that after it produces nine to eleven leaves a single stem terminates in flowers. These plants are grown for the edible fleshy fruit produced by this dichotomous growth. Peppers are non-climacteric which means they do not produce ethylene. They need to stay on the vine to continue the ripening process. A deep taproot will form if the plant root system is uninjured during transplanting. The spindle root will develop fibrous secondary root systems spreading laterally and downward. On the soil surface the stem will produce adventitious roots, but not as easily as tomatoes. The leaves of the pepper plant arise singly and are simple, entire, and asymmetrical. Typical of all Solanaceous plants, the leaves are arranged alternately on the stem. They are shiny and glabrous and vary in shape from broadly ovate to ovate lanceolate. The flowers

develop singly or in twos or threes continuously as the upper structure of the plant proliferates. The corolla is white and five lobed while the anthers are bluish or yellowish in color. The flowers have an open anther formation and will indefinitely self-pollinate. They are also pollinated by insects, which increases the chances of cross-pollination. Unlike tomatoes, whose pollen becomes nonviable in high temperatures, the pepper flowers' pollen is not extremely heat sensitive and it remains viable up to 100° Fahrenheit producing fruit throughout the season.

The fruit of a pepper plant is classified as a berry with colors from green, yellow, red, purple, black, brown, white, and orange. Green is an immature fruit, yet commonly eaten this way, and as the fruit matures it changes color. In most commercial cultivars color changes are from green to red, green to yellow or green to orange. Usually, fruits of the purple and white varieties have these colors as they develop, and therefore do not have a green stage. For fruit to set, the ovaries need to be fertilized. Auxin is then produced by the seeds, which determine fruit cell elongation. The number of seeds fertilized will determine the size and shape of the fruit. The seed develop on the interior and attach to the veins. Fully developed seed is kidney shaped. There are about 4,500 seeds per ounce.

Pepper is an important and valuable field crop. Thus, there is a continued need for new hybrid peppers.

SUMMARY OF THE INVENTION

In order to meet these needs, the present invention is directed to a new pepper (*Capsicum annuum*) plant variety named 'E20B3752'. This new pepper plant variety is distinguished by its dark yellow and red striped color and square shape.

'E20B3752' was discovered in a commercial crop of pepper variety 'Maranello' (not patented) conducted at Steenberg, Netherlands. The mutant 'E20B3752' was selected based on its vertical red and yellow stripes color and propagated vegetatively (i.e., asexually). Pepper plant variety 'E20B3752' is distinguished from parental variety 'Maranello' in that the color of fruit of 'E20B3752' has vertical red and yellow stripes, while the fruit of 'Maranello' is solid red in color.

The pepper plant variety 'E20B3752' has been asexually reproduced by cuttings at Enza Zaden, Enkhuizen, Netherlands. Pepper plant variety 'E20B3752' is distinguished from all existing pepper plant varieties by the red and yellow striped fruit of the variety. Moreover, fruit of pepper plant variety 'E20B3752' has yellow stripes that are darker in color than yellow stripes of fruit of pepper plant variety 'E20B3751'. The distinctive characteristics of pepper plant variety 'E20B3752' are transmitted to new pepper plants when asexually propagated.

In addition to the exemplary aspects and embodiments described above, further aspects and embodiments will become apparent by reference to the following descriptions.

BRIEF DESCRIPTION OF THE DRAWINGS

This new pepper plant is illustrated by the accompanying photographs, which show fruit of the plant, as well as leaves and flower buds. The colors shown are as true as can be reasonably obtained by conventional photographic procedures.

FIG. 1 shows a comparison of fruit of hybrid pepper plant 'E20B3751' (U.S. Plant Pat. No. 28,123) and hybrid pepper plant 'E20B3752'.

FIGS. 2A and 2B show both the upper surface (FIG. 2A) and the lower surface (FIG. 2B) of leaves of hybrid pepper plant 'E20B3752'.

FIG. 3 shows flower buds at different developmental stages of hybrid pepper plant 'E20B3752'.

BOTANICAL DESCRIPTION OF THE PLANT

The following botanical description is from fruit grown from plants vegetatively propagated from the original mutant 'E20B3752' pepper plant. Color references are primarily to The R.H.S. Colour Chart of The Royal Horticultural Society of London (R.H.S.) (2007 edition and 2005 Mini Colour Chart edition). Descriptive terminology follows the *Plant Identification Terminology, An Illustrated Glossary*, 2nd edition by James G. Harris and Melinda Woolf Harris, unless where otherwise defined.

Hybrid pepper plant variety 'E20B3752' has the following morphologic and other characteristics:

General:

Usage.—Fresh market.

Type of culture.—Covered cultivation (e.g., in greenhouse).

Plant:

Seedling (anthocyanin coloration of hypocotyl).—Present.

Shortened internode.—Absent.

Internode length.—6 to 12 cm.

Color of stem.—RHS 137C.

Leaf shape.—Elliptic.

Leaf length.—15 cm.

Leaf width.—8 cm.

Leaf shape of apex.—Pointed.

Leaf shape of base.—Rounded.

Leaf margin.—Slightly wrinkled.

Leaf venation pattern.—Pinnate.

Leaf vein color.—RHS 137A and RHS 137C.

Color of upper leaf surface.—RHS 137A.

Color of lower leaf surface.—RHS 137C.

Flower:

Flower bud size.—6 mm×7 mm just before flower opening.

Flower bud shape.—Rectangular.

Flower bud color.—RHS N999D.

Flower length.—15 to 20 mm.

Flower width.—15 to 20 mm.

Flower diameter.—3 cm.

Flower depth.—0.5 cm.

Flower margin.—Smooth.

Flower texture.—Smooth.

Average number of flowers per plant.—4 to 12, depending on the number of stems per plant.

Average number of petals per flower.—5 or 6.

Anthocyanin coloration in anther.—Present.

Color of upper and lower surface of flower.—RHS N999D.

Peduncle length.—10 mm.

Peduncle diameter.—1 to 2 mm.

Color of peduncle.—RHS 145A.

Fruit:

Color before maturity.—Green (RHS 144A).

Intensity of color before maturity.—Medium.

Length.—Medium (9 cm).
Diameter.—Broad (8.5 cm).
Weight of fruit.—225 grams.
Shape in longitudinal section.—Square.
Shape of apex and base of fruit.—Moderate depressed.
Stalk cavity.—Present.
Peduncle length.—5.5 cm.
Peduncle diameter.—1 cm.
Color of peduncle.—RHS 145A.
Color of skin of fruit at maturity.—Yellow (RHS 23A) and red (RHS 44A) striped.
Color of flesh of fruit at maturity.—Yellow (RHS 23A) and red (RHS 44A) striped.
Intensity of color at maturity.—Dark.
Texture of fruit.—Comparable to all other pepper fruit.
Number of locules.—Equally three and four.
Capsaicin in placenta.—Absent.
Seed length.—4 mm.
Seed width.—4 mm.
Color of seed.—RHS 155A.
Average amount of seed per fruit.—200 to 250.
Time of maturity.—Very early (comparable with 'Maranello').
Fruit storage.—Fruits are firm for 10 to 15 days when stored at 17° C. and 75% relative humidity.
Fruit yield.—20 to 25 kg/m² when grown in a heated greenhouse.
 Disease/pest resistance:
Tobamovirus pathotype P₀.—Resistant.
Tobamovirus pathotype P₁₋₂.—Resistant.
Tobamovirus pathotype P₁₋₂₋₃.—Susceptible.
Tobamovirus pathotype P₁.—Resistant.
Potato virus Y pathotype P₀.—Susceptible.
Tomato spotted wilt virus P₀.—Susceptible.

COMPARISONS TO MOST SIMILAR VARIETY

Table 1 below compares the characteristic of hybrid pepper plant variety 'E20B3752' with the most similar variety, 'E20B3751'. Column 1 lists the characteristic, column 2 shows the characteristics for hybrid pepper plant variety 'E20B3752', and column 3 shows the characteristics for most similar pepper plant variety 'E20B3751'.

TABLE 1

Characteristic	'E20B3752'	'E20B3751'
Intensity of fruit color at maturity	Yellow color is dark (RHS 23A)	Yellow color is medium (RHS 14A)
Plant height	Compact/medium	Medium (slightly longer 5 cm to 10 cm)
Texture of fruit skin	Somewhat rough	Slightly smoother
Fruit setting	Easy setting	Medium to easy setting

DETAILED DESCRIPTION OF THE INVENTION

There are numerous steps in the development of any novel, desirable plant germplasm. Plant breeding begins with the analysis and definition of problems and weaknesses of the current germplasm, the establishment of program goals, and the definition of specific breeding objectives. The next step is selection of germplasm that possess the traits to meet the program goals. The selected germplasm is crossed

in order to recombine the desired traits and through selection varieties or parent lines are developed. The goal is to combine in a single variety or hybrid an improved combination of desirable traits from the parental germplasm. These important traits may include higher yield, field performance, fruit and agronomic quality such as fruit shape and length, resistance to diseases and insects, and tolerance to drought and heat.

Choice of breeding or selection methods depends on the mode of plant reproduction, the heritability of the trait(s) being improved, and the type of cultivar used commercially (e.g., F₁ hybrid cultivar, pureline cultivar, etc.). For highly heritable traits, a choice of superior individual plants evaluated at a single location will be effective, whereas for traits with low heritability, selection should be based on mean values obtained from replicated evaluations of families of related plants. Popular selection methods commonly include pedigree selection, modified pedigree selection, mass selection, and recurrent selection.

The complexity of inheritance influences choice of the breeding method. Backcross breeding is used to transfer one or a few favorable genes for a highly heritable trait into a desirable cultivar. This approach has been used extensively for breeding disease-resistant cultivars. Various recurrent selection techniques are used to improve quantitatively inherited traits controlled by numerous genes. The use of recurrent selection in self-pollinating crops depends on the ease of pollination, the frequency of successful hybrids from each pollination, and the number of hybrid offspring from each successful cross.

Each breeding program should include a periodic, objective evaluation of the efficiency of the breeding procedure. Evaluation criteria vary depending on the goal and objectives, but should include gain from selection per year based on comparisons to an appropriate standard, overall value of the advanced breeding lines, and number of successful cultivars produced per unit of input (e.g., per year, per dollar expended, etc.).

Promising advanced breeding lines are thoroughly tested and compared to appropriate standards in environments representative of the commercial target area(s) for three years at least. The best lines are candidates for new commercial cultivars; those still deficient in a few traits are used as parents to produce new populations for further selection. These processes, which lead to the final step of marketing and distribution, usually take from five to ten years from the time the first cross or selection is made.

One goal of pepper plant breeding is to develop new, unique and superior pepper cultivars. A breeder can initially select and cross two or more parental lines, followed by repeated selfing and selection, producing many new genetic combinations. Moreover, a breeder can generate multiple different genetic combinations by crossing, selfing, and mutations. A plant breeder can then select which germplasms to advance to the next generation. These germplasms may then be grown under different geographical, climatic, and soil conditions, and further selections can be made during, and at the end of, the growing season.

The development of commercial pepper cultivars thus requires the development of pepper parental lines, the crossing of these lines, and the evaluation of the crosses. Pedigree breeding and recurrent selection breeding methods are used to develop cultivars from breeding populations. Breeding programs combine desirable traits from two or more varieties or various broad-based sources into breeding pools

from which lines are developed by selfing and selection of desired phenotypes. The new lines are crossed with other lines and the hybrids from these crosses are evaluated to determine which have commercial potential.

Pedigree breeding is used commonly for the improvement of self-pollinating crops or inbred lines of cross-pollinating crops. Two parents which possess favorable, complementary traits are crossed to produce an F_1 . An F_2 population is produced by selfing one or several F_1 s or by intercrossing two F_1 s (sib mating). Selection of the best individuals is usually begun in the F_2 population; then, beginning in the F_3 , the best individuals in the best families are selected. Replicated testing of families, or hybrid combinations involving individuals of these families, often follows in the F_4 generation to improve the effectiveness of selection for traits with low heritability. At an advanced stage of inbreeding (i.e., F_6 and F_7), the best lines or mixtures of phenotypically similar lines are tested for potential release as new cultivars.

Mass and recurrent selections can be used to improve populations of either self- or cross-pollinating crops. A genetically variable population of heterozygous individuals is either identified or created by intercrossing several different parents. The best plants are selected based on individual superiority, outstanding progeny, or excellent combining ability. The selected plants are intercrossed to produce a new population in which further cycles of selection are continued.

Backcross breeding may be used to transfer genes for a simply inherited, highly heritable trait into a desirable homozygous cultivar or line that is the recurrent parent. The source of the trait to be transferred is called the donor parent. The resulting plant is expected to have the attributes of the recurrent parent (e.g., cultivar) and the desirable trait transferred from the donor parent. After the initial cross, individuals possessing the phenotype of the donor parent are selected and repeatedly crossed (backcrossed) to the recurrent parent. The resulting plant is expected to have the attributes of the recurrent parent (e.g., cultivar) and the desirable trait transferred from the donor parent.

The single-seed descent procedure in the strict sense refers to planting a segregating population, harvesting a sample of one seed per plant, and using the one-seed sample to plant the next generation. When the population has been advanced from the F_2 to the desired level of inbreeding, the plants from which lines are derived will each trace to different F_2 individuals. The number of plants in a population declines each generation due to failure of some seeds to germinate or some plants to produce at least one seed. As a result, not all of the F_2 plants originally sampled in the population will be represented by a progeny when generation advance is completed.

In addition to phenotypic observations, the genotype of a plant can also be examined. There are many laboratory-based techniques available for the analysis, comparison and characterization of plant genotype; among these are Isozyme Electrophoresis, Restriction Fragment Length Polymorphisms (RFLPs), Randomly Amplified Polymorphic DNAs (RAPDs), Arbitrarily Primed Polymerase Chain Reaction (AP-PCR), DNA Amplification Fingerprinting (DAF), Sequence Characterized Amplified Regions (SCARs), Amplified Fragment Length polymorphisms (AFLPs), Simple Sequence Repeats (SSRs—which are also referred to as Microsatellites), and Single Nucleotide Polymorphisms (SNPs).

Molecular markers can also be used during the breeding process for the selection of qualitative traits. For example, markers closely linked to alleles or markers containing sequences within the actual alleles of interest can be used to select plants that contain the alleles of interest during a backcrossing breeding program. The markers can also be used to select toward the genome of the recurrent parent and against the markers of the donor parent. This procedure attempts to minimize the amount of genome from the donor parent that remains in the selected plants. It can also be used to reduce the number of crosses back to the recurrent parent needed in a backcrossing program. The use of molecular markers in the selection process is often called genetic marker enhanced selection or marker-assisted selection. Molecular markers may also be used to identify and exclude certain sources of germplasm as parental varieties or ancestors of a plant by providing a means of tracking genetic profiles through crosses.

Mutation breeding may also be used introducing new traits into pepper varieties. Mutations that occur spontaneously or are artificially induced can be useful sources of variability for a plant breeder. The goal of artificial mutagenesis is to increase the rate of mutation for a desired characteristic. Mutation rates can be increased by many different means including temperature, long-term seed storage, tissue culture conditions, radiation (such as X-rays, Gamma rays, neutrons, Beta radiation, or ultraviolet radiation), chemical mutagens (such as base analogs like 5-bromo-uracil), antibiotics, alkylating agents (such as sulfur mustards, nitrogen mustards, epoxides, ethyleneamines, sulfates, sulfonates, sulfones, or lactones), azide, hydroxylamine, nitrous acid or acridines. Once a desired trait is observed through mutagenesis the trait may then be incorporated into existing germplasm by traditional breeding techniques. Details of mutation breeding can be found in *Principles of Cultivar Development* by Fehr, Macmillan Publishing Company, 1993.

The production of double haploids can also be used for the development of homozygous lines in a breeding program. Double haploids are produced by the doubling of a set of chromosomes from a heterozygous plant to produce a completely homozygous individual. For example, see Wan, et al., *Theor. Appl. Genet.*, 77:889-892, 1989.

Additional non-limiting examples of breeding methods that may be used include, without limitation, those found in *Principles of Plant Breeding*, John Wiley and Son, pp. 115-161, 1960; Allard, 1960; Simmonds, 1979; Snee et al., 1979; Fehr, 1987; "Carrots and Related Vegetable *Umbelliferae*", Rubatzky, V. E., et al., 1999.

Definitions

In the description and tables that follow, a number of terms are used. In order to provide a clear and consistent understanding of the specification and claims, including the scope to be given such terms, the following definitions are provided:

Allele. The allele is any of one or more alternative forms of a gene, all of which relate to one trait or characteristic. In a diploid cell or organism, the two alleles of a given gene occupy corresponding loci on a pair of homologous chromosomes.

Backcrossing. Backcrossing is a process in which a breeder repeatedly crosses hybrid progeny back to one of the

parents, for example, a first generation hybrid F_1 with one of the parental genotype of the F_1 hybrid.

Covered cultivation. Any type of cultivation where the plants are not exposed to direct sunlight. The covering includes but is not limited to greenhouses, glasshouses, net-houses, plastic houses and tunnels.

Essentially all the physiological and morphological characteristics. A plant having essentially all the physiological and morphological characteristics means a plant having the physiological and morphological characteristics of the recurrent parent, except for the characteristics derived from the converted gene.

Fructose content. As used herein, "fructose content" refers to the quantity of fructose in a green pepper fruit in mg/kg of fresh weight.

Glucose content. As used herein, "glucose content" refers to the quantity of glucose in a green pepper fruit in mg/kg of fresh weight.

Green pepper plant. As used herein, a "green pepper plant" is a plant that is developed for the harvest of green pepper fruits.

Internode. An "internode" refers to the stem segment between nodes.

Pepper fruit. As used herein, a "pepper fruit" is a fruit produced by a *Capsicum annuum* plant and is commonly referred to as a bell pepper. The color of a pepper fruit can be green, red, yellow, orange and, more rarely, white, black, and brown, depending on when they are harvested and the specific cultivar. Green peppers are unripe bell peppers, while the others are all ripe, with the color variation based on cultivar selection.

Propagate. To "propagate" a plant means to reproduce the plant by means including, but not limited to, seeds, cuttings, divisions, tissue culture, embryo culture or other in vitro method.

Quantitative Trait Loci (QTL). As used herein, "quantitative trait loci" refers to genetic loci that control to some degree numerically representable traits that are usually continuously distributed.

Regeneration. As used herein, "regeneration" refers to the development of a plant from tissue culture.

Single gene converted. As used herein, "single gene converted" or "conversion plant" refers to plants which are developed by a plant breeding technique called backcrossing wherein essentially all of the desired morphological and physiological characteristics of an inbred are recovered in addition to the single gene transferred into the inbred via the backcrossing technique or via genetic engineering.

Further Embodiments

This invention is also directed to methods for producing a pepper plant by crossing a first parent pepper plant with a second parent pepper plant, wherein the first or second pepper plant is the pepper plant 'E20B3752'. Further, both first and second parent pepper plants may be 'E20B3752'. Therefore, any methods using pepper hybrid 'E20B3752' are part of this invention: selfing, backcrosses, hybrid breeding, and crosses to populations. Any plants produced using pepper hybrid 'E20B3752' as at least one parent are within the scope of this invention.

As used herein, the term plant includes plant cells, plant protoplasts, plant cell tissue cultures from which pepper plants can be regenerated, plant calli, plant clumps and plant

cells that are intact in plants or parts of plants, such as embryos, pollen, ovules, flowers, leaves, stems, and the like.

Gene Conversions

When the terms pepper plant, hybrid, cultivar or pepper line are used in the context of the present invention, this also includes any single gene conversions. The term "single gene converted plant" as used herein refers to those pepper plants which are developed by a plant breeding technique called backcrossing wherein essentially all of the desired morphological and physiological characteristics of a cultivar are recovered in addition to the single gene transferred into the line via the backcrossing technique. Backcrossing methods can be used with the present invention to improve or introduce a characteristic into the line. The term "backcrossing" as used herein refers to the repeated crossing of a hybrid progeny back to one of the parental pepper plants for that line, backcrossing 1, 2, 3, 4, 5, 6, 7, 8, or more times to the recurrent parent. The parental pepper plant which contributes the gene for the desired characteristic is termed the nonrecurrent or donor parent. This terminology refers to the fact that the nonrecurrent parent is used one time in the backcross protocol and therefore does not recur. The parental pepper plant to which the gene or genes from the nonrecurrent parent are transferred is known as the recurrent parent as it is used for several rounds in the backcrossing protocol (Poehlman & Sleper, 1994; Fehr, 1987). In a typical backcross protocol, the original cultivar of interest (recurrent parent) is crossed to a second line (nonrecurrent parent) that carries the single gene of interest to be transferred. The resulting progeny from this cross are then crossed again to the recurrent parent and the process is repeated until a pepper plant is obtained wherein essentially all of the desired morphological and physiological characteristics of the recurrent parent are recovered in the converted plant, in addition to the single transferred gene from the nonrecurrent parent.

The selection of a suitable recurrent parent is an important step for a successful backcrossing procedure. The goal of a backcross protocol is to alter or substitute a single trait or characteristic in the original line. To accomplish this, a single gene of the recurrent cultivar is modified or substituted with the desired gene from the nonrecurrent parent, while retaining essentially all of the rest of the desired genetic, and therefore the desired physiological and morphological, constitution of the original line. The choice of the particular nonrecurrent parent will depend on the purpose of the backcross, one of the major purposes is to add some commercially desirable, agronomically important trait to the plant. The exact backcrossing protocol will depend on the characteristic or trait being altered to determine an appropriate testing protocol. Although backcrossing methods are simplified when the characteristic being transferred is a dominant allele, a recessive allele may also be transferred. In this instance it may be necessary to introduce a test of the progeny to determine if the desired characteristic has been successfully transferred.

Many single gene traits have been identified that are not regularly selected for in the development of a new line but that can be improved by backcrossing techniques. Single gene traits may or may not be transgenic, examples of these traits include but are not limited to, male sterility, modified fatty acid metabolism, modified carbohydrate metabolism, herbicide resistance, nematode resistance, resistance for

bacterial, fungal, or viral disease, insect resistance, enhanced nutritional quality, industrial usage, yield stability and yield enhancement. These genes are generally inherited through the nucleus. Several of these single gene traits are described in U.S. Pat. Nos. 5,777,196, 5,948,957 and 5,969,212, the disclosures of which are specifically hereby incorporated by reference.

Tissue Culture

Further reproduction of the variety can occur by tissue culture and regeneration. Tissue culture of various tissues of pepper and regeneration of plants therefrom is well known and widely published. For example, reference may be had to Teng, et al., *HortScience*. 1992, 27: 9, 1030-1032 Teng, et al., *HortScience*. 1993, 28: 6, 669-1671, Zhang, et al., *Journal of Genetics and Breeding*. 1992, 46: 3, 287-290, Webb, et al., *Plant Cell Tissue and Organ Culture*. 1994, 38: 1, 77-79, Curtis, et al., *Journal of Experimental Botany*. 1994, 45: 279, 1441-1449, Nagata, et al., *Journal for the American Society for Horticultural Science*. 2000, 125: 6, 669-672, and Ibrahim, et al., *Plant Cell, Tissue and Organ Culture*. (1992), 28(2): 139-145. It is clear from the literature that the state of the art is such that these methods of obtaining plants are routinely used and have a very high rate of success. Thus, another aspect of this invention is to provide cells which upon growth and differentiation produce pepper plants having the physiological and morphological characteristics of the hybrid 'E20B3752'.

As used herein, the term "tissue culture" indicates a composition comprising isolated cells of the same or a different type or a collection of such cells organized into parts of a plant. Exemplary types of tissue cultures are protoplasts, calli, meristematic cells, and plant cells that can generate tissue culture that are intact in plants or parts of plants, such as leaves, pollen, embryos, roots, root tips, anthers, pistils, flowers, seeds, petioles, and the like. Means for preparing and maintaining plant tissue culture are well known in the art. By way of example, a tissue culture comprising organs has been used to produce regenerated plants. U.S. Pat. Nos. 5,959,185; 5,973,234 and 5,977,445 describe certain techniques, the disclosures of which are incorporated herein by reference.

Additional Breeding Methods

This invention also is directed to methods for producing a pepper plant by crossing a first parent pepper plant with a second parent pepper plant wherein the first or second parent pepper plant is a pepper plant of hybrid 'E20B3752'. Further, both first and second parent pepper plants can come from pepper hybrid 'E20B3752'. Thus, any such methods using pepper hybrid 'E20B3752' are part of this invention: selfing, backcrosses, hybrid production, crosses to populations, and the like. All plants produced using pepper hybrid 'E20B3752' as at least one parent are within the scope of this invention, including those developed from cultivars derived from pepper hybrid 'E20B3752'. Advantageously, this pepper cultivar could be used in crosses with other, different, pepper plants to produce the first generation (F_1) pepper hybrid seeds and plants with superior characteristics. The cultivar of the invention can also be used for transformation where exogenous genes are introduced and expressed by the cultivar of the invention. Genetic variants created either through traditional breeding methods using pepper hybrid 'E20B3752' or through transformation of hybrid

'E20B3752' by any of a number of protocols known to those of skill in the art are intended to be within the scope of this invention.

The following describes breeding methods that may be used with pepper hybrid 'E20B3752' in the development of further pepper plants. One such embodiment is a method for developing progeny pepper plants in a pepper plant breeding program comprising: obtaining the pepper plant, or a part thereof, of hybrid 'E20B3752', utilizing said plant or plant part as a source of breeding material, and selecting a pepper hybrid 'E20B3752' progeny plant with molecular markers in common with hybrid 'E20B3752' and/or with morphological and/or physiological characteristics selected from the characteristics listed above. Breeding steps that may be used in the pepper plant breeding program include pedigree breeding, backcrossing, mutation breeding, and recurrent selection. In conjunction with these steps, techniques such as RFLP-enhanced selection, genetic marker enhanced selection (for example, SSR markers) and the making of double haploids may be utilized.

Another method involves producing a population of pepper hybrid 'E20B3752' progeny pepper plants, by crossing hybrid 'E20B3752' with another pepper plant, thereby producing a population of pepper plants, which, on average, derive 50% of their alleles from pepper hybrid 'E20B3752'. A plant of this population may be selected and repeatedly selfed or sibbed with a pepper plant resulting from these successive filial generations. One embodiment of this invention is the pepper cultivar produced by this method and that has obtained at least 50% of its alleles from pepper hybrid 'E20B3752'.

Additional methods include, without limitation, chasing selfs. Chasing selfs involves identifying inbred plants among pepper plants that have been grown from hybrid pepper seed. Once the seed is planted, the inbred plants may be identified and selected due to their decreased vigor relative to the hybrid plants that grow from the hybrid seed. By locating the inbred plants, isolating them from the rest of the plants, and self-pollinating them (i.e., "chasing selfs"), a breeder can obtain an inbred line that is identical to an inbred parent used to produce the hybrid.

Accordingly, another aspect of the present invention relates a method for producing an inbred pepper variety by: planting seed of the pepper variety 'E20B3752'; growing plants from the seed; identifying one or more inbred pepper plants; controlling pollination in a manner which preserves homozygosity of the one or more inbred plants; and harvesting resultant seed from the one or more inbred plants. The step of identifying the one or more inbred pepper plants may further include identifying plants with decreased vigor, i.e., plants that appear less robust than plants of the pepper variety 'E20B3752'. Pepper plants capable of expressing substantially all of the physiological and morphological characteristics of the parental inbred lines of pepper variety 'E20B3752' include pepper plants obtained by chasing selfs from seed of pepper variety 'E20B3752'.

One of ordinary skill in the art will recognize that once a breeder has obtained inbred pepper plants by chasing selfs from seed of pepper variety 'E20B3752', the breeder can then produce new inbred plants such as by sib-pollinating, or by crossing one of the identified inbred pepper plant with a plant of the pepper variety 'E20B3752'.

One of ordinary skill in the art of plant breeding would know how to evaluate the traits of two plant varieties to determine if there is no significant difference between the

two traits expressed by those varieties. For example, see Fehr and Walt, *Principles of Cultivar Development*, pp. 261-286 (1987). Thus the invention includes pepper hybrid 'E20B3752' progeny pepper plants comprising a combination of at least two hybrid 'E20B3752' traits selected from the group consisting of those listed above or the hybrid 'E20B3752' combination of traits listed in the Summary of the Invention, so that said progeny pepper plant is not significantly different for said traits than pepper hybrid 'E20B3752' as determined at the 5% significance level when grown in the same environmental conditions. Using techniques described herein, molecular markers may be used to identify said progeny plant as a pepper hybrid 'E20B3752' progeny plant. Mean trait values may be used to determine whether trait differences are significant, and preferably the traits are measured on plants grown under the same environmental conditions. Once such a variety is developed its value is substantial since it is important to advance the germplasm base as a whole in order to maintain or improve traits such as yield, disease resistance, pest resistance, and plant performance in extreme environmental conditions.

Progeny of pepper hybrid 'E20B3752' may also be characterized through their filial relationship with pepper hybrid 'E20B3752', as for example, being within a certain number of breeding crosses of pepper hybrid 'E20B3752'. A breeding cross is a cross made to introduce new genetics into the progeny, and is distinguished from a cross, such as a self or a sib cross, made to select among existing genetic alleles. The lower the number of breeding crosses in the pedigree, the closer the relationship between pepper hybrid 'E20B3752' and its progeny. For example, progeny produced by the methods described herein may be within 1, 2, 3, 4, or 5 breeding crosses of pepper hybrid 'E20B3752'.

The use of the terms "a," "an," and "the," and similar referents in the context of describing the invention (especially in the context of the following claims) are to be

construed to cover both the singular and the plural, unless otherwise indicated herein or clearly contradicted by context. The terms "comprising," "having," "including," and "containing" are to be construed as open-ended terms (i.e., meaning "including, but not limited to,") unless otherwise noted. Recitation of ranges of values herein are merely intended to serve as a shorthand method of referring individually to each separate value falling within the range, unless otherwise indicated herein, and each separate value is incorporated into the specification as if it were individually recited herein. For example, if the range 10-15 is disclosed, then 11, 12, 13, and 14 are also disclosed. All methods described herein can be performed in any suitable order unless otherwise indicated herein or otherwise clearly contradicted by context. The use of any and all examples, or exemplary language (e.g., "such as") provided herein, is intended merely to better illuminate the invention and does not pose a limitation on the scope of the invention unless otherwise claimed. No language in the specification should be construed as indicating any non-claimed element as essential to the practice of the invention.

While a number of exemplary aspects and embodiments have been discussed above, those of skill in the art will recognize certain modifications, permutations, additions, and sub-combinations thereof. It is therefore intended that the following appended claims and claims hereafter introduced are interpreted to include all such modifications, permutations, additions, and sub-combinations as are within their true spirit and scope.

What is claimed:

1. A new and distinct pepper plant variety named 'E20B3752', as herein shown and described.

* * * * *



FIG. 1

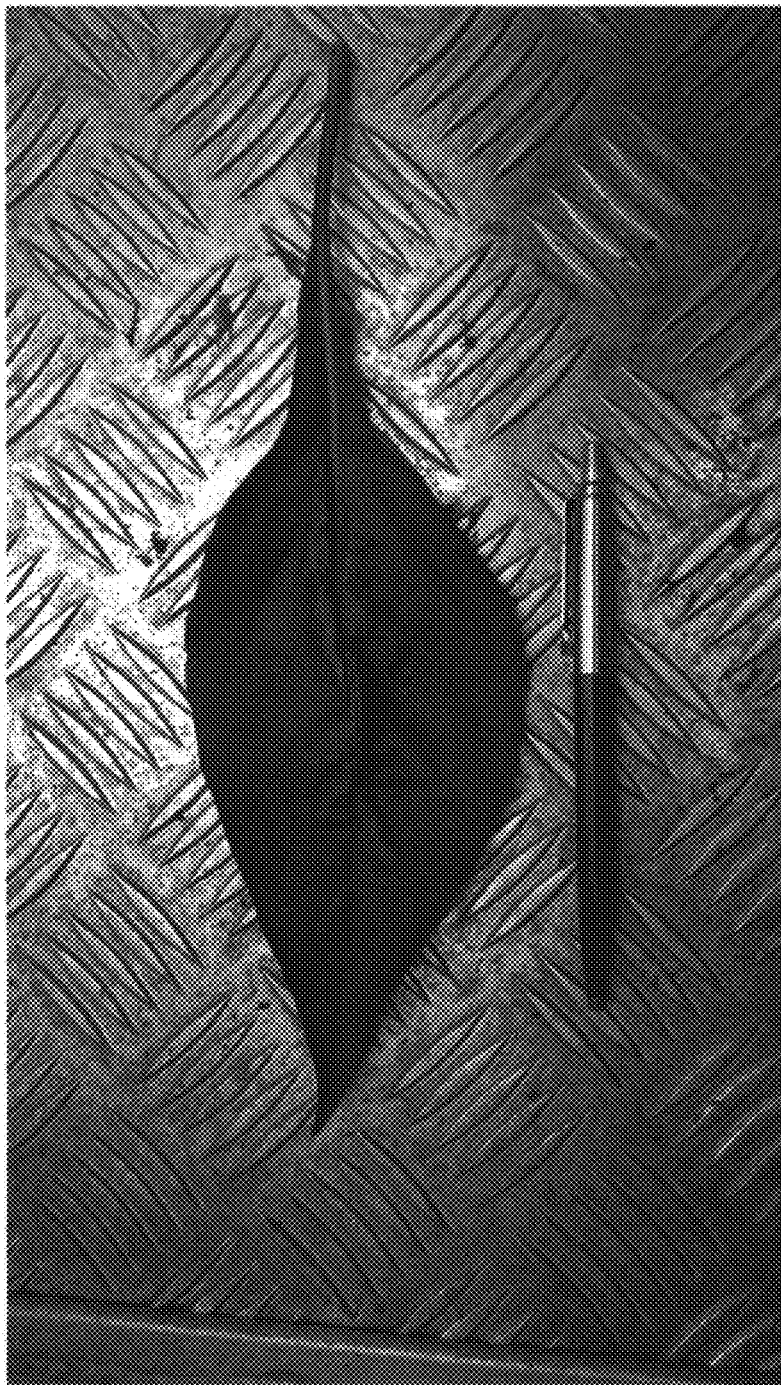


FIG. 2A



FIG. 2B



FIG. 3