

Transgenic Maize With Enhanced Phenotype

Related Applications

This application claims priority to provisional application 60/337,358 filed December 4, 2001, the specification and sequence listing of which is incorporated herein by reference.

5 Incorporation of Sequence Listing

The sequence listing is contained in the file named "pa_00431.rpt" which is 3,661 kilobytes (measured in MS-Windows) and was created on 26 November 2002 and is located on a CD-ROM, which is filed herewith and herein incorporated by reference.

Field of the Invention

10 Disclosed herein is maize with enhanced phenotype, and methods of producing such maize.

Background of the invention

Maize (also known as *Zea mays* and corn) is one of the major crops grown worldwide as a primary source for animal feed, human food and industrial resource. Maize plants with
15 improved agronomic traits such as yield, pest resistance, herbicide resistance, higher seed component, and the like are desired by both farmers and consumers of maize. Considerable effort in breeding maize, e.g. to produce hybrids, has provided significant gains in desired phenotypes.

The ability to introduce specific transgenic DNA into the genome of corn has been used
20 to enhance transgenic maize plants with a desired trait. Researchers have utilized the genetic transformation technology to test and prove the preconceived effects of a gene for plant phenotype enhancement. In many cases, much effort has been placed on the selection of the gene to introduce into the plant as a means to increase the overall success of the experiment to produce a more desirable plant. Nonetheless, the frequency of success of enhancing the
25 transgenic plant is low due to a number of factors including the low predictability of the effects of a specific gene on the plant's growth, development and environmental response, the low frequency of maize transformation, the lack of highly predictable control of the gene once introduced into the genome, and other undesirable effects of the transformation event and tissue culture process. Even with all these problems, transformation is still practiced with persistence
30 and diligence to identify those transgenic plants with the expected, predetermined phenotype. Occasionally the unexpected phenotype is observed. See U.S. Patent 6, 395,966 which discloses

transgenic maize with enhanced yield resulting unexpectedly from the introduction of a gene intended to confer herbicide resistance. Other enhanced traits have been achieved by mutation, e.g. induced by a transposon or chemical or physical mutagen. See for instance, U.S. Patent 6,410,831 which discloses the production of sunflower seed with enhanced stearic acid content
5 by random mutagenesis.

Summary of the Invention

This invention relates to the discovery that transformation by random insertion into the corn genome of genes, for the transcription of which there is no known phenotype in corn, can be used as a reliable generator of modification of the corn genome to produce unexpected but yet
10 desired phenotypes. One aspect of the invention provides transgenic maize seed for a maize line which exhibits enhanced yield as compared to yield for a parental maize line; in another aspect the invention provide transgenic maize seed for a maize line characterized by enhanced yield under stress conditions. In another aspect the invention provides transgenic maize seed for
15 maize lines characterized by other enhanced traits, e.g. an enhanced quality in a plant morphology, plant physiology or seed component phenotype as compared to a corresponding phenotype of a parental maize line.

Such transgenic maize seed characterized by enhanced phenotype is produced by introducing into the genome of parental maize a transgenic DNA construct comprising a promoter operably linked to heterologous DNA, where the heterologous DNA encodes a protein
20 having an amino acid sequence with at least 60% identity to a sequence selected from the group consisting of SEQ ID NO:369 through SEQ ID NO:736. In a preferred aspect of the invention the transgenic maize is produced by introducing a transgenic DNA construct where the heterologous DNA comprises a protein coding segment of DNA having at least 60% identity to a sequence selected from the group consisting of SEQ ID NO:1 through SEQ ID NO: 368.

Other aspects of the invention provide transgenic maize seed for a maize line
25 characterized by unique enhanced phenotype resulting from introduction of a specific heterologous DNA, e.g. shorter plants from decreased internode length, taller plants from increased internode length, early leaf senescence, sterility and elongated tassel central axis. Transgenic maize seed for shorter plants from decreased internode length can result from
30 insertion of heterologous DNA coding for: