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United States Patent [19]
Niebur[11] **Patent Number:** **5,567,861**[45] **Date of Patent:** **Oct. 22, 1996**[54] **INBRED CORN LINE PHN46**[75] **Inventor:** **William S. Niebur**, Victor, France[73] **Assignee:** **Pioneer Hi-Bred International, Inc.**,
Des Moines, Iowa[21] **Appl. No.:** **101,808**[22] **Filed:** **Aug. 3, 1993****Related U.S. Application Data**

[63] Continuation of Ser. No. 542,353, Jun. 20, 1990, abandoned.

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C12N 5/04[52] **U.S. Cl.** **800/200**; 800/250; 800/DIG. 56;
47/58; 47/DIG. 1; 435/240.4; 435/240.45;
435/240.5[58] **Field of Search** 800/200, 250,
800/DIG. 56; 435/240.4, 240.45, 240.49,
240.5; 47/58.03, 58.05[56] **References Cited****PUBLICATIONS**Hallauer et al. *Corn Breeding* In Corn & Corn Improvement
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publication #187 3rd Edition. Sprague et al. editor p. 358.**Primary Examiner**—Gary Benzion**Attorney, Agent, or Firm**—Pioneer Hi-Bred International,
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[57]

ABSTRACT

According to the invention, there is provided an inbred corn line, designated PHN46. This invention thus relates to the plants and seeds of inbred corn line PHN46 and to methods for producing a corn plant produced by crossing the inbred line PHN46 with itself or with another corn plant. This invention further relates to hybrid corn seeds and plants produced by crossing the inbred line PHN46 with another corn line or plant and to crosses with related species.

8 Claims, No Drawings

INBRED CORN LINE PHN46

This is a continuation of application Ser. No. 07/542,353 filed on Jun. 20, 1990, now abandoned.

FIELD OF THE INVENTION

This invention is in the field of corn breeding, specifically relating to an inbred corn line designated PHN46.

BACKGROUND OF THE INVENTION

The goal of plant breeding is to combine in a single variety/hybrid various desirable traits. For field crops, these traits may include resistance to diseases and insects, tolerance to heat and drought, reducing the time to crop maturity, greater yield, and better agronomic quality. With mechanical harvesting of many crops, uniformity of plant characteristics such as germination and stand establishment, growth rate, maturity, and fruit size, is important.

Field crops are bred through techniques that take advantage of the plant's method of pollination. A plant is self-pollinated if pollen from one flower is transferred to the same or another flower of the same plant. A plant is cross-pollinated if the pollen comes from a flower on a different plant.

Plants that have been self-pollinated and selected for type for many generations become homozygous at almost all gene loci and produce a uniform population of true breeding progeny. A cross between two homozygous lines produce a uniform population of hybrid plants that may be heterozygous for many gene loci. A cross of two plants each heterozygous at a number of gene loci will produce a population of hybrid plants that differ genetically and will not be uniform.

Corn plants (*Zea mays* L.) can be bred by both self-pollination and cross-pollination techniques. Corn has separate male and female flowers on the same plant, located on the tassel and the ear, respectively. Natural pollination occurs in corn when wind blows pollen from the tassels to the silks that protrude from the tops of the incipient ears.

The development of corn hybrids requires the development of homozygous inbred lines, the crossing of these lines, and the evaluation of the crosses. Pedigree breeding and recurrent selection breeding methods are used to develop inbred lines from breeding populations. Breeding programs combine the genetic backgrounds from two or more inbred lines or various other broad-based sources into breeding pools from which new inbred lines are developed by selfing and selection of desired phenotypes. The new inbreds are crossed with other inbred lines and the hybrids from these crosses are evaluated to determine which of those have commercial potential.

Pedigree breeding starts with the crossing of two genotypes, each of which may have one or more desirable characteristics that is lacking in the other or which complement the other. If the two original parents do not provide all of the desired characteristics, other sources can be included in the breeding population. In the pedigree method, superior plants are selfed and selected in successive generations. In the succeeding generations the heterozygous condition gives way to homogeneous lines as a result of self-pollination and selection. Typically in the pedigree method of breeding five or more generations of selfing and selection is practiced: $F_1 \rightarrow F_2$; $F_2 \rightarrow F_3$; $F_3 \rightarrow F_4$; $F_4 \rightarrow F_5$, etc.

Backcrossing can be used to improve an inbred line. Backcrossing transfers a specific desirable trait from one inbred or source to an inbred that lacks that trait. This can be accomplished for example by first crossing a superior inbred (A) (recurrent parent) to a donor inbred (non-recurrent parent), which carries the appropriate gene(s) for the trait in question. The progeny of this cross is then mated back to the superior recurrent parent (A) followed by selection in the resultant progeny for the desired trait to be transferred from the non-recurrent parent. After five or more backcross generations with selection for the desired trait, the progeny will be heterozygous for loci controlling the characteristic being transferred, but will be like the superior parent for most or almost all other genes. The last backcross generation would be selfed to give pure breeding progeny for the gene(s) being transferred.

A single cross hybrid corn variety is the cross of two inbred lines, each of which has a genotype which complements the genotype of the other. The hybrid progeny of the first generation is designated F_1 . In the development of hybrids only the F_1 hybrid plants are sought. Preferred F_1 hybrids are more vigorous than their inbred parents. This hybrid vigor, or heterosis, can be manifested in many polygenic traits, including increased vegetative growth and increased yield.

The development of a hybrid corn variety involves three steps: (1) the selection of plants from various germplasm pools; (2) the selfing of the selected plants for several generations to produce a series of inbred lines, which, although different from each other, each breed true and are highly uniform; and (3) crossing the selected inbred lines with unrelated inbred lines to produce the hybrid progeny (F_1). During the inbreeding process in corn, the vigor of the lines decreases. Vigor is restored when two unrelated inbred lines are crossed to produce the hybrid progeny (F_1). An important consequence of the homozygosity and homogeneity of the inbred lines is that the hybrid between any two inbreds will always be the same. Once the inbreds that give a superior hybrid have been identified, the hybrid seed can be reproduced indefinitely as long as the homogeneity of the inbred parents is maintained.

A single cross hybrid is produced when two inbred lines are crossed to produce the F_1 progeny. A double cross hybrid is produced from four inbred lines crossed in pairs ($A \times B$ and $C \times D$) and then the two F_1 hybrids are crossed again ($A \times B$) $\times$ ($C \times D$). Much of the hybrid vigor exhibited by F_1 hybrids is lost in the next generation (F_2). Consequently, seed from hybrid varieties is not used for planting stock.

Corn is an important and valuable field crop. Thus, a continuing goal of plant breeders is to develop high-yielding corn hybrids that are agronomically sound based on stable inbred lines. The reasons for this goal are obvious: to maximize the amount of grain produced with the inputs used and minimize susceptibility to environmental stresses. To accomplish this goal, the corn breeder must select and develop superior inbred parental lines for producing hybrids. This requires identification and selection of genetically unique individuals which in a segregating population occur as the result of a combination of crossover events plus the independent assortment of specific combinations of alleles at many gene loci which results in specific genotypes. Based on the number of segregating genes, the frequency of occurrence of an individual with a specific genotype is less than 1 in 10,000. Thus, even if the entire genotype of the parents has been characterized and the desired genotype is known, only a few if any individuals having the desired genotype may be found in a large F_2 or S_0 population.

Typically, however, the genotype of neither the parents nor the desired genotype is known in any detail.

SUMMARY OF THE INVENTION

According to the invention, there is provided a novel inbred corn line, designated PHN46. This invention thus relates to the seeds of inbred corn line PHN46, to the plants of inbred corn line PHN46, and to methods for producing a corn plant produced by crossing the inbred line PHN46 with itself or another corn line. This invention further relates to hybrid corn seeds and plants produced by crossing the inbred line PHN46 with another corn line or a related species.

DEFINITIONS

In the description and examples that follow, a number of terms are used herein. 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:

ABS=absolute measurement and % MN is percentage of mean of the experiments in which inbred or hybrid was grown unless otherwise defined.

BAR PLT=BARREN PLANTS. This is the percent of plants per plot that were not barren (lack ears).

BRT STK=BRITTLE STALKS. This is a measure of the stalk breakage near the time of pollination, and is an indication of whether a hybrid or inbred would snap or break near the time of flowering under severe winds. Data are presented as percentage of plants that did not snap.

BU ACR=YIELD (BUSHEL/ACRE). Actual yield of the grain at harvest adjusted to 15.5% moisture. ABS is in absolute terms and % MN is percent of the mean for the experiments in which the inbred or hybrid was grown.

CLD TST=COLD TEST. This is the percentage of kernels that germinate under cold soil conditions.

COB SC=COB SCORE. The cob score is a rating of how well the grain is shelled off the cob and how badly the cob is broken up going through the combine. This is given as a 1 to 9 score with 9 being very good. A high score indicates that the grain shells off of the cob well, and the cob does not break.

DRP EAR=DROPPED EARS. This is a measure of the number of dropped ears per plot and represents the percentage of plants that did not drop ears prior to harvest.

EAR HT=EAR HEIGHT. The ear height is a measure from the ground to the top developed ear node attachment and is measured in inches.

EAR SZ=EAR SIZE. A 1 to 9 visual rating of ear size. The higher the rating the larger the ear size.

EST CNT=EARLY STAND COUNT. This is a measure of the stand establishment in the spring and represents the number of plants that emerge on a per plot basis for the inbred or hybrid.

GDU SHD=GDU TO SHED. The number of growing degree units (GDUs) or heat units required for an inbred line or hybrid to have approximately 50 percent of the plants shedding pollen and is measured from the time of planting. Growing degree units are calculated by the Barger Method, where the heat units for a 24-hour period are:

$$GDU = \frac{(\text{Max. temp.} + \text{Min. temp.})}{2} - 50$$

The highest maximum temperature used is 86° F. and the lowest minimum temperature used is 50° F. For each inbred or hybrid it takes a certain number of GDUs to reach various stages of plant development.

GDU SLK=GDU TO SILK. The number of growing degree units required for an inbred line or hybrid to have approximately 50 percent of the plants with silk emergence from time of planting. Growing degree units are calculated by the Barger Method as given in GDU SHD definition.

GRN QUL=GRAIN QUALITY. This is a 1 to 9 rating for the general quality of the shelled grain as it is harvested based on such factors as the color of the harvested grain, any mold on the grain, and any cracked grain. High scores indicate good grain quality.

MST=HARVEST MOISTURE. The moisture is the actual percentage moisture of the grain at harvest.

PLT HT=PLANT HEIGHT. This is a measure of the height of the plant from the ground to the tip of the tassel in inches.

POL SC=POLLEN SCORE. A 1 to 9 visual rating indicating the amount of pollen shed. The higher the score the more pollen shed.

PRM=PREDICTED RM. This trait, predicted relative maturity (RM), is based on the harvest moisture of the grain. The relative maturity rating is based on a known set of checks and utilizes standard linear regression analyses and is referred to as the Minnesota Relative Maturity Rating System.

RTL DG=ROOT LODGING. Root lodging is the percentage of plants that do not root lodge; plants that lean from the vertical axis at an approximately 30° angle or greater would be counted as root lodged.

SCT GRN=SCATTER GRAIN. A 1 to 9 visual rating indicating the amount of scatter grain (lack of pollination or kernel abortion) on the ear. The higher the score the less scatter grain.

SDG VGR=SEEDLING VIGOR. This is the visual rating (1 to 9) of the amount of vegetative growth after emergence at the seedling stage (approximately five leaves). A higher score indicates better vigor.

SEL IND=SELECTION INDEX. The selection index gives a single measure of the hybrid's worth based on information for up to five traits. A corn breeder may utilize his or her own set of traits for the selection index. One of the traits that is almost always included is yield. The selection index data presented in the tables represent the mean value averaged across testing stations.

STA GRN=STAY GREEN. Stay green is the measure of plant health near the time of black layer formation (physiological maturity). A high score indicates better late-season plant health.

STK CNT=NUMBER OF PLANTS. This is the final stand or number of plants per plot.

STK LDG=STALK LODGING. This is the percentage of plants that did not stalk lodge (stalk breakage) as measured by either natural lodging or pushing the stalks and determining the percentage of plants that break below the ear.

TAS BLS=TASSEL BLAST. A 1 to 9 visual rating was used to measure the degree of blasting (necrosis due to heat stress) of the tassel at time of flowering. A 1 would indicate a very high level of blasting at time of flowering, while a 9 would have no tassel blasting.

TAS SZ=TASSEL SIZE. A 1 to 9 visual rating was used to indicate the relative size of the tassel. The higher the rating the larger the tassel.

TAS WT=TASSEL WEIGHT. This is the average weight of a tassel (grams) just prior to pollen shed.

TEX EAR=EAR TEXTURE. A 1 to 9 visual rating was used to indicate the relative hardness (smoothness of crown) of mature grain. A 1 would be very soft (extreme dent) while a 9 would be very hard (flinty or very smooth crown).

TILLER=TILLERS. A count of the number of tillers per plot that could possibly shed pollen was taken. Data is given as percentage of tillers: number of tillers per plot divided by number of plants per plot.

TST WT=TEST WEIGHT UNADJUSTED. The measure of the weight of the grain in pounds for a given volume (bushel).

TST WTA=TEST WEIGHT ADJUSTED. The measure of the weight of the grain in pounds for a given volume (bushel) adjusted for percent moisture.

YLD=YIELD. It is the same as BU ACR ABS.

YLD SC=YIELD SCORE. A 1 to 9 visual rating was used to give a relative rating for yield based on plot ear piles. The higher the rating the greater visual yield appearance.

MDM CPX=Maize Dwarf Mosaic Complex (MDMV=Maize Dwarf Mosaic Virus & MCDV=Maize Chlorotic Dwarf Virus): Visual rating (1-9 score) where a "1" is very susceptible and a "9" is very resistant.

COM SMT=Common Smut (*Ustilago maydis*): Percentage of plants that did not have infection.

SLF BLT=Southern Leaf Blight (*Bipolaris maydis*, *Helminthosporium maydis*): Visual rating (1-9 score) where a "1" is very susceptible and a "9" is very resistant.

NLF BLT=Northern Leaf Blight (*Exserohilum turcicum*, *H. turcicum*): Visual rating (1-9 score) where a "1" is very susceptible and a "9" is very resistant.

COM RST=Common Rust (*Puccinia sorghi*): Visual rating (1-9 score) where a "1" is very susceptible and a "9" is very resistant.

EYE SPT=Eyespot (*Kabatiella zeae*): Visual rating (1-9 score) where a "1" is very susceptible and a "9" is very resistant.

GLF SPT=Gray Leaf Spot (*Cercospora zeae-maydis*): Visual rating (1-9 score) where a "1" is very susceptible and a "9" is very resistant.

STW WLT=Stewart's Wilt (*Erwinia stewartii*): Visual rating (1-9 score) where a "1" is very susceptible and a "9" is very resistant.

HD SMT=Head Smut (*Sphacelotheca reiliana*): Percentage of plants that did not have infection.

EAR MLD=General Ear Mold: Visual rating (1-9 score) where a "1" is very susceptible and a "9" is very resistant. This is based on overall rating for ear mold of mature ears without determining specific mold organism, and may not be predictive for a specific ear mold.

ECB DPE=Dropped ears due to European Corn Borer (*Ostrinia nubilalis*): Percentage of plants that did not drop ears under second brood corn borer infestation.

ECB 2SC=European Corn Borer Second Brood (*Ostrinia nubilalis*): Visual rating (1-9 score) of post flowering damage due to infestation by European Corn Borer. A "1" is very susceptible and a "9" is very resistant.

ECB 1LF=European Corn Borer First Brood (*Ostrinia nubilalis*): Visual rating (1-9 score) of pre-flowering leaf

feeding by European Corn Borer. A "1" is very susceptible and a "9" is very resistant.

DETAILED DESCRIPTION OF THE INVENTION

Inbred corn line PHN46 is a yellow, dent corn inbred that provides an acceptable male parental line in crosses for producing first generation F1 corn hybrids. PHN46 is best adapted to the Central Corn Belt of the United States. The inbred can be used to produce hybrids from approximately 110-122 relative maturity based on the Minnesota Relative Maturity Rating System for harvest moisture of grain. PHN46 should make an excellent male since it has high pollen yield. The inbred in hybrid combination has good yield, stay green, stalks, and roots.

The inbred has shown uniformity and stability within the limits of environmental influence for all the traits as described in the Variety Description Information (Table 1) that follows. Most of the data in the Variety Description Information was collected at Johnston, Iowa. The inbred has been self-pollinated and ear-rowed a sufficient number of generations with careful attention paid to uniformity of plant type to ensure homozygosity and phenotypic stability. The line has been increased both by hand and in isolated fields with continued observation for uniformity. No variant traits have been observed or are expected in PHN46.

Inbred corn line PHN46, being substantially homozygous, can be reproduced by planting seeds of the line, growing the resulting corn plants under self-pollinating or sib-pollinating conditions with adequate isolations, and harvesting the resulting seed, using techniques familiar to the agricultural arts.

TABLE

VARIETY DESCRIPTION INFORMATION INBRED = PHN46	
Type: Dent	Region Best Adapted: Central Corn Belt
A. Maturity: Average across maturity zones. Zone: 0	
Heat Unit Shed: 1510	
Heat Unit Silk: 1520	
No. Reps: 40	
$\text{HEAT UNITS} = \frac{[\text{Max. Temp. } (< 86^\circ \text{ F.}) + \text{Min. Temp. } (> 50^\circ \text{ F.})] *}{2} - 50$	
*If maximum is greater than 86 degrees fahrenheit, then 86 is used and if minimum is less than 50, then 50 is used. Heat units accumulated daily and can not be less than 0.	
B. Plant Characteristics:	
Plant height (to tassel tip): 198 cm	
Length of top ear internode: 12 cm	
Number of ears per stalk: Slight Two-ear Tendency	
Ear height (to base of top ear): 77 cm	
Number of tillers: None	
Cytoplasm type: Normal	
C. Leaf:	
Color: (WF9) Medium Green	
Angle from Stalk: 30-60 degrees	
Marginal Waves: (WF9) Few	
Number of Leaves (mature plants): 18	
Sheath Pubescence: (W22) Light	
Longitudinal Creases: (OH56A) Few	
Length (Ear node leaf): 65 cm	
Width (widest point, ear node leaf): 10 cm	

TABLE-continued

VARIETY DESCRIPTION INFORMATION INBRED = PHN46	
Type: Dent	Region Best Adapted: Central Corn Belt
D. <u>Tassel:</u>	
Number lateral branches: 4	
Branch Angle from central spike: >45 degrees	
Pollen Shed: Heavy based on Pollen Yield Test (107% of experiment means)	
Peduncle Length (top leaf to basal branches): 20 cm	
Anther Color: Pink	
Glume Color: Green	
E. <u>Ear (Husked Ear Data Except When Stated Otherwise):</u>	
Length: 15 cm	
Weight: 103 gm	
Mid-point Diameter: 44 mm	
Silk Color: Yellow	
Husk Extension (Harvest stage): Long (8–10 cm)	
Husk Leaf: Short (<8 cm)	
Taper of Ear: Slight	
Position of Shank (dry husks): Upright	
Kernel Rows: Straight, Distinct Number = 14	
Husk Color (fresh): Light Green	
Husk Color (dry): Buff	
Shank Length: 13 cm	
Shank (No. of internodes): 8	
F. <u>Kernel (Dried):</u>	
Size (from ear mid-point)	
Length: 10 mm	
Width: 8 mm	
Thick: 4 mm	
Shape Grade (% rounds): <20 (16% medium round based on Parent Test Data)	
Pericarp Color: Colorless	
Aleurone Color: Homozygous Yellow	
Endosperm Color: Yellow	
Endosperm Type: Normal Starch	
Gm Wt/100 Seeds (unsized): 33 gm	
G. <u>Cob:</u>	
Diameter at mid-point: 24 mm	
Strength: Strong	
Color: Red	
H. <u>Diseases:</u>	
Corn Lethal Necrosis (MCMV = Maize Chlorotic Mottle Virus and MDMV = Maize Dwarf Mosaic Virus): Intermediate	
Maize Dwarf Mosaic Complex (MDMV & MCDV = Maize Dwarf Virus): Intermediate	
Anthracnose Stalk Rot (<i>C. graminicola</i>): Intermediate	
S. Leaf Blight (<i>H. maydis</i>): Intermediate	
N. Leaf Blight (<i>H. turcicum</i>): Intermediate	
Eye Spot (<i>K. zeae</i>): Intermediate	
Gray Leaf Spot (<i>C. zeae</i>): Susceptible	
Stewart's Wilt (<i>E. stewartii</i>): Resistant	
Goss's Wilt (<i>C. nebraskense</i>): Highly Resistant	
Common Smut (<i>U. maydis</i>): Highly Resistant	
Head Smut (<i>S. reiliana</i>): Resistant	
Fusarium Ear Mold (<i>F. moniliforme</i>): Resistant	
I. <u>Insects:</u>	
European Corn Borer-1 Leaf Damage (Pre-flowering): Susceptible	
European Corn Borer-2 (Post-flowering): Intermediate	
The above descriptions are based on a scale of 1–9, 1 being highly susceptible, 9 being highly resistant.	
S (Susceptible): Would generally represent a score of 1–3.	
I (Intermediate): Would generally represent a score of 4–5.	
R (Resistant): Would generally represent a score of 6–7.	
H (Highly Resistant): would generally represent a score of	

TABLE-continued

VARIETY DESCRIPTION INFORMATION INBRED = PHN46	
Type: Dent	Region Best Adapted: Central Corn Belt
8–9. Highly resistant does not imply the inbred is immune	
J. <u>Variety Most Closely Resembling:</u>	
Character	Inbred
Maturity	PHZ51
Usage	PHV78
Data for Items B, C, D, E, F, and G is based primarily on a maximum of two reps from Johnston, Iowa grown in 1989, plus description information from the maintaining station.	

ELECTROPHORESIS RESULTS

Isozyme Genotypes for PHN46

Isozyme data were generated for inbred corn line PHN46 according to the procedures described in Stuber, C. W., Wendel, J. F., Goodman, M. M., and Smith, J. S. C., "Techniques and Scoring Procedures for Starch Gel Electrophoresis of Enzymes from Maize (*Zea mays* L.)", Technical Bulletin No. 286, North Carolina Agricultural Research Service, North Carolina State University, Raleigh, N.C. (1988).

The data in Table 2 compares PHN46 with its parents, PHZ51 and PHV78.

TABLE 2

ELECTROPHORESIS RESULTS FOR PHN46 AND ITS PARENTS PHZ51 AND PHV78				
Loci	PHN46	PARENTS		
		PHZ51	PHV78	
ACP1	3	3	2	
ADH1	4	4	4	
CAT3	9	9	9	
DIA1	8	8	8	
GOT1	4	4	4	
GOT2	4	4	4	
GOT3	4	4	4	
IDH1	4	4	4	
IDH2	6	6	6	
MDH1	6	6	1	
MDH2	3.5	3.5	3.5	
MDH3	18	18	16	
MDH4	12	12	12	
MDH5	12	12	12	
MMM	4	4	4	
PGM1	9	9	9	
PGM2	4	4	3	
PGD1	2	2	3.8	
PGD2	5	5	5	
PHI1	4	4	4	

INDUSTRIAL APPLICABILITY

This invention also is directed to methods for producing a corn plant by crossing a first parent corn plant with a second parent corn plant wherein the first or second parent corn plant is an inbred corn plant from the line PHN46. Further, both first and second parent corn plants can come

from the inbred corn line PHN46. Thus, any such methods using the inbred corn line PHN46 are part of this invention: selfing, backcrosses, hybrid production, crosses to populations, and the like. All plants produced using inbred corn line PHN46 as a parent are within the scope of this invention. Advantageously, the inbred corn line is used in crosses with other, different, corn inbreds to produce first generation (F₁) corn hybrid seeds and plants with superior characteristics.

As used herein, the terms "plant and plant parts" include plant cells, plant protoplasts, plant cell tissue culture from which corn plants can be regenerated, plant calli, plant clumps, and plant cells that are intact in plants or parts of plants, such as embryos, pollen, flowers, kernels, ears, cobs, leaves, husks, stalks, roots, root tips, anthers, silk and the like.

Tissue culture of corn is described in European Patent Application, publication 160,390, incorporated herein by reference. Corn tissue culture procedures are also described in Green and Rhodes, "Plant Regeneration in Tissue Culture of Maize," *Maize for Biological Research* (Plant Molecular Biology Association, Charlottesville, Va. 1982, at 367-372). Thus, another aspect of this invention is to provide cells which upon growth and differentiation produce the inbred line PHN46.

The utility of inbred line PHN46 also extends to crosses with other species. Commonly, suitable species will be of the family Gramineae, and especially of the genera *Zea*, *Tripsacum*, *Coix*, *Schlerachne*, *Polytoca*, *Chionachne*, and *Trilobachne*, of the tribe Maydeae. Of these, *Zea* and *Tripsacum*, are most preferred. Potentially suitable for crosses with PHN46 may be the various varieties of grain sorghum, *Sorghum bicolor* (L.) Moench.

Corn is used as human food, livestock feed, and as raw material in industry. The food uses of corn, in addition to human consumption of corn kernels, include both products of dry- and wet-milling industries. The principal products of corn dry milling are grits, meal and flour. The corn wet-milling industry can provide corn starch, corn syrups, and dextrose for food use. Corn oil is recovered from corn germ, which is a by-product of both dry- and wet-milling industries.

Corn, including both grain and non-grain portions of the plant, is also used extensively as livestock feed, primarily for beef cattle, dairy cattle, hogs, and poultry.

Industrial uses of corn are mainly from corn starch from the wet-milling industry and corn flour from the dry-milling industry. The industrial applications of corn starch and flour are based on functional properties, such as viscosity, film formation, adhesive properties, and ability to suspend particles. The corn starch and flour have application in the paper and textile industries. Other industrial uses include applications in adhesives, building materials, foundry binders, laundry starches, explosives, oil-well muds, and other mining applications.

Plant parts other than the grain of corn are also used in industry. Stalks and husks are made into paper and wall-board and cobs are used for fuel and to make charcoal.

The seed of inbred corn line PHN46, the plant produced from the inbred seed, the hybrid corn plant produced from the crossing of the inbred, hybrid seed, and various parts of the hybrid corn plant can be utilized for human food, livestock feed, and as a raw material in industry.

EXAMPLE

Inbred and Hybrid Performance of PHN46

In the examples that follow the traits and characteristics of inbred corn line PHN46 are given as a line and in hybrid

combination. The data collected on inbred corn line PHN46 is presented for the key characteristics and traits.

The results in Table 3A compare PHN46 to its PHZ51 parent. PHN46 yields significantly more, is shorter, and sheds (GDU SHD) pollen later but silks (GDU SLK) earlier than PHZ51. PHN46 and PHZ51 have similar pollen yield and tassel size. PHN46 has better common smut resistance but is more susceptible to root lodging and first and second brood European corn borer than PHZ51.

Table 3B compares PHN46 to its other parent, PHV78. PHN46 yields more, has higher test weight, and less grain moisture at maturity than PHV78. PHN46 is a shorter inbred with lower ear placement and flowers (GDU SHD and GDU SLK) earlier than PHV78. PHN46 has significantly better seedling vigor and early stand establishment than PHV78. PHN46 has less pollen yield and its tassel is smaller than PHV78. The PHN46 inbred is more resistant to common smut, ear mold, and Stewart's wilt but less resistant to first and second brood European corn borer than PHV78.

The results in Table 3C show that PHN46 has higher yield, slightly lower test weight, and higher grain harvest moisture than PHR62. PHN46 is shorter with lower ear placement and flowers (GDU SHD and GDU SLK) earlier than PHR62. PHN46 has better seedling vigor and early stand count, similar pollen yield, and a smaller tassel than PHR62. Common rust and Stewart's wilt resistance is better for PHN46 but it is more susceptible to stalk and root lodging, ear mold, and first and second brood European corn borer than PHR62.

Table 3D shows that PHN46 is lower yielding, has higher test weight, and lower grain moisture at maturity than PHN82. PHN46 is taller with higher ear placement, sheds pollen (GDU SHD) later, and silks (GDU SLK) similarly compared to PHN82. PHN46 has better seedling vigor, similar early stand establishment, greater pollen yield, and a bigger tassel than PHN82. Southern corn leaf blight and Stewart's wilt are slightly more resistant in PHN46 but it is more susceptible to stalk and root lodging, common smut, and first and second brood European corn borer than PHN82.

The results in Table 4A compare PHN46 to PHZ51 crossed to the same inbred testers. The hybrids are similar for yield and test weight but PHN46 has higher grain harvest moisture. PHN46 hybrids are shorter but have slightly higher ear height and flower (GDU SHD) later than PHZ51 hybrids. The PHN46 hybrids have less stay green, similar stalks, and are less prone to root lodge than PHZ51 hybrids.

Table 4B compares PHN46 to PHR62 crossed to the same inbred testers. The PHN46 hybrids have higher yield, similar test weight, and more grain harvest moisture compared to PHR62 hybrids. The hybrids have similar plant and ear height and flowering (GDU SHD) is similar. PHN46 hybrids have better stay green, stalks, and roots than PHR62 hybrids.

The results in Table 4C compare PHN46 to PHN82 crossed to the same inbred testers. The PHN46 hybrids have lower yield, test weight, and grain moisture at maturity than PHN82 hybrids. The hybrids have similar height but the PHN46 hybrids have higher ear placement. The PHN46 hybrids have significantly better cob scores and slightly better stalks than the PHN82 hybrids.

The results in Table 4D compare PHN46 to PHV78 crossed to the same inbred testers. The PHN46 hybrids have higher yield, similar test weight, and less grain moisture at harvest than the PHV78 hybrids. The PHN46 hybrids are slightly shorter but have higher ear placement and flower (GDU SHD) earlier than the PHV78 hybrids. PHN46

hybrids have better stay green and root lodging resistance and have similar stalks compared to the PHV78 hybrids.

Tables 5-10 compare PHN46 hybrids to Pioneer Brand Hybrids 3374, 3504, 3527, 3362, 3180, and 3344, respectively. Each hybrid has a parent in common with the PHN46 hybrid other than PHN46. The hybrids are adapted to much of the same area as the PHN46 hybrids. Table 5 compares a PHN46 hybrid with 3374. The PHN46 hybrid has higher yield, lower test weight, and more grain moisture at maturity than 3374. The PHN46 hybrid is shorter and flowers (GDU SHD) later than 3374. The PHN46 hybrid has better roots but poorer stalks than 3374.

Table 6 results show the PHN46 hybrid has similar yield and test weight but higher grain moisture at maturity than 3504. The PHN46 hybrid is shorter with higher ear placement and flowers (GDU SHD) later than 3504. The PHN46 hybrid has slightly better stay green, better root lodging resistance, and slightly less stalk lodging resistance than 3504.

The results in Table 7 show the PHN46 hybrid yields more, has lower test weight, and contains more grain moisture at maturity than 3527. The PHN46 hybrid is shorter and flowers (GDU SHD) later than 3527. Stay green is better for the PHN46 hybrid and it has similar stalks but better roots compared to 3527.

Table 8 compares a PHN46 hybrid to 3362. The PHN46 hybrid has higher yield and lower test weight and grain harvest moisture than 3362. The PHN46 hybrid is taller with

higher ear placement and flowers (GDU SHD) later than 3362. The PHN46 hybrid has slightly lower seedling vigor but has better early stand establishment than 3362. The PHN46 hybrid has slightly better stay green and has better stalk and root lodging resistance than 3362.

The results in Table 9 show a PHN46 hybrid has significantly higher yield, better test weight, and lower grain moisture at maturity than 3180. The PHN46 hybrid is shorter with lower ear placement and flowers (GDU SHD) earlier than 3180. The PHN46 hybrid has slightly lower vigor but has significantly higher early stand count and has better stalk and root lodging resistance than 3180.

Table 10 results compare a PHN46 hybrid to 3344. The PHN46 hybrid yields significantly more, has higher test weight, and contains less grain moisture at maturity than 3344. The PHN46 hybrid is shorter but ear height is similar and it flowers (GDU SHD) earlier than 3344. The seedling vigor is less but early stand count is greater for the PHN46 hybrid than 3344. The PHN46 hybrid has better stalk and root lodging resistance than 3344.

The results above show that PHN46 is a good inbred and does well in hybrid combination. This inbred will have an impact in the region it is adapted.

TABLE 3A

PAIRED INBRED COMPARISON DATA													
VARIETY #1 - PHN46													
VARIETY #2 - PHZ51													
YEAR	REGION	VAR #	YLD SC ABS	EAR SZ ABS	BAR PLT HT ABS	PLT HT ABS	EAR HT ABS	SDG VGR ABS	EST CNT ABS	TIL LER ABS	GDU SHD ABS	GDU SLK ABS	POL SC ABS
TOTAL SUM		1	5.7	5.6	97.1	72.6	27.8	6.1	26.9	2.3	146.7	149.3	5.8
		2	4.3	5.0	86.4	83.6	29.6	5.4	28.6	0.4	145.2	150.5	6.0
		LOCS	15	9	3	8	8	21	25	11	31	32	11
		DIFF	1.4	0.6	10.7	11.0	1.9	0.7	1.7	1.9	1.4	1.2	0.2
		PROB	.002#	.179	.506	.000#	.613	.012+	.051*	.242	.123	.174	.714
YEAR	REGION	VAR #	TAS SZ ABS	TEX EAR ABS	SCT GRN ABS	STA GRN ABS	RT LDG ABS	COM RST ABS	EAR MLD ABS	STW WLT ABS	ECB 1LF ABS	ECB 2SC ABS	
TOTAL SUM		1	4.9	5.7	6.4	4.1	40	8.0	7.6	7.0	5.2	4.4	
		2	5.5	5.9	6.3	4.4	90.1	6.0	7.1	7.0	6.8	6.2	
		LOCS	15	7	14	7	1	1	13	1	19	5	
		DIFF	0.5	0.1	0.1	0.3	50.0	2.0	0.5	0.0	1.6	1.8	
		PROB	.164	.805	.729	.689			.151		.000#	.105	

*= 10% SIG

+ = 5% SIG

= 1% SIG

TABLE 3B

PAIRED INBRED COMPARISON DATA															
VARIETY #1 - PHN46															
VARIETY #2 - PHV78															
YEAR	REGION	VAR #	BU ACR ABS	BU ACR % MN	YLD SC ABS	MST ABS	EAR SZ ABS	BAR PLT ABS	PLT HT ABS	EAR HT ABS	SDG VGR ABS	EST CNT ABS	TIL LER ABS	GDU SHD ABS	GDU SLK ABS
TOTAL SUM		1	64.8	140	5.9	29.5	5.4	95.6	72.1	27.6	6.2	29.2	2.0	146.8	148.8
		2	40.5	88	6.9	31.9	6.9	91.6	84.6	30.5	4.9	25.3	2.4	153.8	158.4

TABLE 3B-continued

PAIRED INBRED COMPARISON DATA															
VARIETY #1 - PHN46															
VARIETY #2 - PHV78															
YEAR	REGION	VAR #	POL SC ABS	TAS SZ ABS	TEX EAR ABS	TST WT ABS	SCT GRN ABS	STA GRN ABS	BRT STK ABS	COM RST ABS	EAR MLD ABS	SLF BLT ABS	STW WLT ABS	ECB 1LF ABS	ECB 2SC ABS
TOTAL		1	5.8	5.0	5.3	49.1	6.5	2.4	100.0	8.0	7.5	5.0	7.0	4.9	4.4
SUM		2	7.4	7.4	4.3	47.1	5.9	5.0	100.0	6.0	6.5	5.0	6.0	6.1	4.4
		LOCS	13	15	6	1	13	8	1	1	11	1	1	17	5
		DIFF	1.6	2.4	1.0	2.0	0.6	2.6	0.0	2.0	1.1	0.0	1.0	1.2	0.0
		PROB	.032+	.000#	.296		.104	.005#			.031+			.001#	.000#

* = 10% SIG

+ = 5% SIG

= 1% SIG

TABLE 3C

PAIRED INBRED COMPARISON DATA															
VARIETY #1 - PHN46															
VARIETY #2 - PHR62															
YEAR	REGION	VAR #	BU ACR ABS	BU ACR % MN	YLD SC ABS	MST ABS	EAR SZ ABS	BAR PLT ABS	PLT HT ABS	EAR HT ABS	SDG VGR ABS	EST CNT ABS	DRP EAR ABS	TIL LER ABS	
TOTAL SUM			54.6	124	5.8	20.8	5.6	84.0	70.0	27.7	6.0	32.2	100.0	2.0	
		2	42.9	92	5.4	19.4	5.8	85.5	80.8	32.9	4.4	29.1	99.2	2.4	
		LOCS	4	4	16	4	9	6	12	12	22	31	3	13	
		DIFF	11.8	32	0.4	1.5	0.2	1.5	10.8	5.2	1.6	3.1	0.8	0.4	
		PROB	.008#	.104	.456	.355	.559	.887	.003#	.030+	.000#	.001#	.423	.714	
YEAR	REGION	VAR #	GDU SHD ABS	GDU SLK ABS	POL SC ABS	TAS SZ ABS	TEX EAR ABS	TST WT ABS	GRN QUL ABS	SCT GRN ABS	STA GRN ABS	STK LDG ABS	RT LDG ABS	BRT STK ABS	
TOTAL SUM		1	147.4	149.9	5.8	4.9	5.7	54.3	6.2	6.4	3.8	90.8	60.8	100.0	
		2	148.6	154.0	5.8	6.2	7.7	55.1	6.0	6.4	5.8	99.3	78.6	100.0	
		LOCS	39	36	12	15	7	4	3	14	10	3	4	1	
		DIFF	1.2	4.1	0.0	1.3	2.0	0.8	0.2	0.1	2.1	8.5	17.9	0.0	
		PROB	.261	.000#	.000#	.000#	.010+	.373	.899	.895	.021+	.333	.518		

TABLE 3D-continued

PAIRED INBRED COMPARISON DATA															
VARIETY #1 - PHN46															
VARIETY #2 - PHN82															
YEAR	REGION	#	ABS	% MN	ABS	ABS	ABS	ABS	ABS	ABS	ABS	ABS	ABS	ABS	
TOTAL SUM		1	51.8	122	5.9	19.1	5.4	88.2	70.5	27.9	6.1	34.2	100.0	1.6	
		2	70.7	173	6.9	24.3	6.2	97.7	65.0	25.0	4.5	34.4	100.0	0.9	
	LOCS	9	9	15	9	10	8	15	15	30	35	6	16		
	DIFF	18.8	51	0.9	5.2	0.8	9.5	5.5	2.9	1.6	0.2	0.0	0.7		
	PROB	.001#	.002#	.014+	.001#	.053*	.031+	.001#	.039+	.000#	.806	1.00	.598		
YEAR	REGION	VAR	GDU	GDU	POL	TAS	TEX	TST	GRN	SCT	STA	STK	RT	BRT	
		SHD	SLK	SC	SZ	EAR	WT	QUL	GRN	GRN	LDG	LDG	STK		
		#	ABS	ABS	ABS	ABS	ABS	ABS	ABS	ABS	ABS	ABS	ABS	ABS	ABS
		1	147.7	149.3	5.8	5.1	5.6	55.8	6.6	6.5	2.8	95.3	73.1	100.0	
		2	143.9	149.4	4.7	4.5	5.4	54.6	6.1	7.1	6.5	99.5	95.5	100.0	
	LOCS	42	39	13	17	7	9	5	14	13	6	6	1		
	DIFF	3.8	0.1	1.1	0.6	0.1	1.2	0.5	0.6	3.7	4.2	22.4	0.0		
	PROB	.000#	.962	.028+	.181	.838	.070*	.611	.071*	.000#	.319	.154			
			YEAR	REGION	VAR	COM	EAR	SLF	STW	ECB	ECB	ECB			
					#	RST	MLD	BLT	WLT	DPE	1LF	2SC			
						ABS	ABS	ABS	ABS	ABS	ABS	ABS			
			TOTAL		1	8.0	7.7	5.0	7.0	100.0	4.9	4.6			
			SUM		2	9.0	7.2	4.0	6.0	100.0	5.1	5.9			
			LOCS		1	12	1	1	2	18	7				
			DIFF		1.0	0.5	1.0	1.0	0.0	0.1	1.3				
			PROB			.293			1.00	.808	.382				

* = 10% SIG

+ = 5% SIG

= 1% SIG

TABLE 4A

AVERAGE INBRED BY TESTER PERFORMANCE COMPARING PHN46 TO PHZ51 CROSSED TO THE SAME INBRED TESTERS AND GROWN IN THE SAME EXPERIMENTS. ALL VALUES ARE EXPRESSED AS PERCENT OF THE EXPERIMENT MEAN EXCEPT PREDICTED RM, SELECTION INDEX, AND YIELD (BU/AC).											
INBRED	PRM	SEL IND	BU ACR	YLD	MST	GDU SRD	PRM SHD	STK LDG	RT LDG	BAR PLT	
TOTAL	REPLIC.	53	57	57	57	18	65	49	28	4	
MEAN WTS	PHN46	115	104	151	101	101	122	103	108	100	
MEAN WTS	PHZ51	112	106	152	101	97	116	104	101	101	
	DIFF.	3	2	1	0	4	6	1	7	1	
INBRED	STA GRN	TST WTA	GRN QUL	SDG VGR	EST CNT	STK CNT	PLT HT	EAR HT	DRP EAR	BRT STK	
TOTAL	REPLIC.	32	57	45	37	40	62	30	39	8	
MEAN WTS	PHN46	105	99	97	92	94	98	98	107	101	
MEAN WTS	PHZ51	109	100	102	96	100	99	103	105	99	
	DIFF.	4	1	5	5	5	2	5	2	1	

TABLE 4B

AVERAGE INBRED BY TESTER PERFORMANCE COMPARING PHN46 TO PHR62 CROSSED TO THE SAME INBRED TESTERS AND GROWN IN THE SAME EXPERIMENTS. ALL VALUES ARE EXPRESSED AS PERCENT OF THE EXPERIMENT MEAN EXCEPT PREDICTED RM, SELECTION INDEX, AND YIELD (BU/AC).											
INBRED	PRM	SEL IND	BU ACR	YLD	MST	GDU SHD	PRM SHD	STK LDG	RT LDG	BAR PLT	STA GRN

TABLE 4B-continued

AVERAGE INBRED BY TESTER PERFORMANCE COMPARING PHN46 TO PHR62 CROSSED TO THE SAME INBRED TESTERS AND GROWN IN THE SAME EXPERIMENTS. ALL VALUES ARE EXPRESSED AS PERCENT OF THE EXPERIMENT MEAN EXCEPT PREDICTED RM, SELECTION INDEX, AND YIELD (BU/AC).												
TOTAL	REPLIC.	130	130	136	136	136	39	142	115	69	12	69
MEAN WTS	PHN46	116	107	162	104	100	102	123	104	106	100	117
MEAN WTS	PHR62	111	100	155	99	93	100	120	100	94	100	93
	DIFF.	5	7	8	6	7	2	3	4	12	0	24
	INBRED	TST WTA	COB SC	GRN QUL	SDG VGR	EST CNT	STK CNT	PLT HT	EAR HT	DRP EAR	BRT STK	
TOTAL	REPLIC.	136	4	107	60	83	138	65	65	75	22	
MEAN WTS	PHN46	99	90	95	100	98	100	99	102	100	98	
MEAN WTS	PHR62	100	120	106	106	100	100	101	103	100	96	
	DIFF.	1	31	11	5	1	0	2	2	0	2	

TABLE 4C

AVERAGE INBRED BY TESTER PERFORMANCE COMPARING PHN46 TO PHN82 CROSSED TO THE SAME INBRED TESTERS AND GROWN IN THE SAME EXPERIMENTS. ALL VALUES ARE EXPRESSED AS PERCENT OF THE EXPERIMENT MEAN EXCEPT PREDICTED RM, SELECTION INDEX, AND YIELD (BU/AC).												
	INBRED	PRM	SEL IND	BU ACR	YLD	MST	GDU SHD	PRM SHD	STK LDG	RT LDG	BAR PLT	STA GRN
TOTAL	REPLIC.	72	72	72	72	72	21	76	62	38	8	38
MEAN WTS	PHN46	115	105	158	102	96	100	121	102	109	99	103
MEAN WTS	PHN82	119	109	164	105	103	99	120	99	110	99	116
	DIFF.	4	4	6	3	7	1	2	3	1	0	13
	INBRED	TST WTA	COB SC	GRN QUL	SDG VGR	EST CNT	STK CNT	PLT HT	EAR HT	DRP EAR	BRT STK	
TOTAL	REPLIC.	72	2	36	30	38	74	38	38	50	22	
MEAN WTS	PHN46	98	97	99	95	100	100	98	103	100	100	
MEAN WTS	PHN82	100	58	104	95	101	101	97	93	100	99	
	DIFF.	2	39	5	1	1	1	1	9	0	1	

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TABLE 4D

AVERAGE INBRED BY TESTER PERFORMANCE COMPARING PHN46 TO PHV78 CROSSED TO THE SAME INBRED TESTERS AND GROWN IN THE SAME EXPERIMENTS. ALL VALUES ARE EXPRESSED AS PERCENT OF THE EXPERIMENT MEAN EXCEPT PREDICTED RM, SELECTION INDEX, AND YIELD (BU/AC).											
	INBRED	PRM	SEL IND	BU ACR	YLD	MST	GDU SHD	PRM SHD	STK LDG	RT LDG	BAR PLT
TOTAL	REPLIC.	19	19	19	19	19	5	17	18	5	2
MEAN WTS	PHN46	119	109	152	107	98	101	124	99	106	101
MEAN WTS	PHV78	123	99	143	101	108	104	129	100	76	100
	DIFF.	4	10	8	6	10	3	5	0	30	1
	INBRED	STA GRN	TST WTA	GRN QUL	SDG VGR	EST CNT	STK CNT	PLT HT	EAR HT	DRP EAR	BRT STK
TOTAL	REPLIC.	4	19	19	4	11	19	4	4	14	2
MEAN WTS	PHN46	88	98	94	99	103	100	102	110	101	101
MEAN WTS	PHV78	83	97	88	104	103	100	104	105	99	101
	DIFF.	6	1	6	5	0	0	2	5	2	

TABLE 5

PHN46 HYBRID COMPARED TO PIONEER HYBRID 3374											
VARIETY #1 - PHN46 HYBRID											
VARIETY #2 - 3374											
YEAR	REGION	VAR #	PRM	SEL IND	BU ACR ABS	BU ACR % MN	MST ABS	GDU SHD ABS	STK LDG ABS	RT LDG ABS	BAR PLT ABS
TOTAL SUM		1	118	114	152.2	109	17.1	132.0	90.4	97.2	100.0
		2	115	110	146.7	105	16.7	129.3	93.3	91.3	94.8
		LOCS	1	1	6	6	6	2	5	3	1
		DIFF	2	4	5.5	4	0.4	2.8	2.9	5.9	5.2
		PROB			.493	.466	.080*	.361	.228	.425	
YEAR	REGION	VAR #	STA GRN ABS	TST WTA ABS	COB SC ABS	GRN QUL ABS	SDG VGR ABS	EST CNT ABS	PLT HT ABS	EAR HT ABS	DRP EAR ABS
TOTAL SUM		1	5.5	58.3	4.5	5.8	4.6	59.5	109.3	49.8	100.0
		2	6.0	59.1	5.5	6.2	4.4	55.7	113.5	51.5	97.9
		LOCS	2	6	1	6	4	7	2	2	5
		DIFF	0.5	0.8	1.0	0.4	0.3	3.8	4.3	1.8	2.1
		PROB	.000#	.152		.695	.731	.001#	.416	.395	.075*

*= 10% SIG

+= 5% SIG

#= 1% SIG

25

TABLE 6

PHN46 HYBRID COMPARED TO PIONEER HYBRID 3504											
VARIETY #1 - PHN46 HYBRID											
VARIETY #2 - 3504											
YEAR	REGION	VAR #	PRM	SEL IND	BU ACR ABS	BU ACR % MN	MST ABS	GDU SHD ABS	STK LDG ABS	RT LDG ABS	BAR PLT ABS
TOTAL SUM		1	114	112	151.3	102	20.2	130.7	94.9	86.7	99.0
		2	113	107	152.3	101	19.7	127.7	95.8	78.5	100.0
		LOCS	2	2	14	14	14	4	10	8	1
		DIFF	1	5	1.0	1	0.5	3.0	0.9	8.2	1.0
		PROB	.580	.795	.858	.882	.040+	.173	.550	.154	
YEAR	REGION	VAR #	STA GRN ABS	TST WTA ABS	GRN QUL ABS	SDG VGR ABS	EST CNT ABS	PLT HT ABS	EAR HT ABS	DRP EAR ABS	BRT STK ABS
TOTAL SUM		1	5.8	56.6	6.8	4.8	53.6	111.3	55.9	99.6	99.2
		2	5.4	57.0	7.2	5.3	60.3	118.6	54.7	98.7	99.7
		LOCS	8	14	14	8	9	5	5	8	4
		DIFF	0.4	0.4	0.4	0.5	6.7	7.3	1.2	0.9	0.5
		PROB	.483	.335	.151	.563	.090*	.077*	.411	.114	.202

*= 10% SIG

+= 5% SIG

#= 1% SIG

TABLE 7

PHN47 HYBRID COMPARED TO PIONEER HYBRID 3527											
VARIETY #1 - PHN46 HYBRID											
VARIETY #2 - 3527											
YEAR	REGION	VAR #	PRM	SEL IND	BU ACR ABS	BU ACR % MN	MST ABS	GDU SHD ABS	STK LDG ABS	RT LDG ABS	BAR PLT ABS
TOTAL SUM		1	117	113	163.1	109	18.6	137.8	89.6	94.4	100.0
		2	112	108	152.6	102	17.5	133.5	88.8	77.1	94.8

TABLE 9-continued

PHN46 HYBRID COMPARED TO PIONEER HYBRID 3180											
VARIETY #1 - PHN46 HYBRID											
VARIETY #2 - 3180											
YEAR	REGION	#	ABS	ABS	ABS	ABS	ABS	ABS	ABS	ABS	ABS
TOTAL SUM		1	5.5	58.3	4.5	5.8	4.6	59.5	109.3	49.8	100.0
		2	4.8	57.9	3.5	6.3	5.0	56.4	116.0	53.5	99.0
	LOCS	2	6	1	6	4	7	2	2	5	
	DIFF	0.8	0.4	1.0	0.6	0.4	3.1	6.8	3.8	1.0	
	PROB	.500	.342		.509	.689	.079*	.246	.344	.089*	

* = 10% SIG

+ = 5% SIG

= 1% SIG

TABLE 10

PHN46 HYBRID COMPARED TO PIONEER HYBRID 3344											
VARIETY #1 - PHN46											
VARIETY #2 - 3344											
YEAR	REGION	VAR #	PRM	SEL IND	BU ACR ABS	BU ACR % MN	MST ABS	GDU SHD ABS	STK LDG ABS	RT LDG ABS	BAR PLT ABS
TOTAL SUM		1	113	115	153.3	110	16.2	130.8	87.9	90.9	100.0
		2	119	95	138.5	99	17.4	134.5	81.6	75.1	100.0
	LOCS	1	1	6	6	6	6	2	5	3	1
	DIFF	6	21	14.8	12	1.2	3.8	6.2	15.9	0.0	
	PROB				.063*	.066*	.093*	.126	.318	.369	
YEAR	REGION	VAR #	STA GRN ABS	TST WTA ABS	COB SC ABS	GRN QUL ABS	SDG VGR ABS	EST CNT ABS	PLT HT ABS	EAR HT ABS	DRP EAR ABS
TOTAL SUM		1	4.3	58.3	6.0	5.3	4.5	60.5	113.8	52.5	98.5
		2	4.0	56.8	2.0	4.8	5.3	57.0	118.3	52.8	96.0
	LOCS	2	6	1	6	4	7	2	2	5	
	DIFF	0.3	1.5	4.0	0.4	0.8	3.6	4.5	0.3	2.5	
	PROB	.500	.006#		.497	.375	.003#	.205	.942	.070*	

* = 10% SIG

+ = 5% SIG

= 1% SIG

DEPOSITS

Applicant has made a deposit of at least 2500 seeds of Inbred Corn Line PHN46 with the American Type Culture Collection (ATCC), Rockville, Md. 20852 U.S.A. ATCC Deposit No. 97133. The seeds deposited with the ATCC on May 1, 1995 were taken from the deposit maintained by Pioneer Hi-Bred International, Inc., 700 Capital Square, 400 Locust Street, Des Moines, Iowa 50309-2340 since prior to the filing date of this application. This deposit of the Inbred Corn Line PHN48 will be maintained in the ATCC depository, which is a public depositor, for a period of 30 years or 5 years after the most recent request, or for the effective life of the patent, whichever is longer, and will be replaced if it becomes non-viable during that period. Additionally, Applicant has satisfied all the requirements of 37 C.F.R. §§1.801-1.809, including providing an indication of the viability of the sample. Applicant imposes no restrictions on the availability of the deposited material from the ATCC; however, Applicant has no authority to waive any restrictions imposed by law on the transfer of biological material or its transportation in commerce. Applicant does not waive any infringement of its rights granted under this patent or under the Plant Variety Protection Act (7 USC 2321 et seq.). PHN46 is a U.S. Protected Variety under Plant Variety

Protection Certificate No. 9000249.

What is claimed is:

1. Inbred corn seed designated PHN46, having the ATCC Accession No. 97133.

2. A corn plant and its parts produced by the seed of claim 1.

3. An inbred corn plant having all the physiological and morphological characteristics of the plant of claim 2.

4. A corn plant regenerated from the regenerable cells of a tissue culture of inbred corn plant PHN46 and having ATCC accession No. 91733, the regenerated plant being capable of expressing all the physiological and morphological characteristics of inbred corn plant PHN46 deposited under ATCC accession No. 91733.

5. A tissue culture of regenerable cells of corn plant PHN46 having ATCC accession No. 91733.

6. Tissue culture according to claim 4 comprising regenerable cells of a plant part selected from meristematic tissue, anthers, leaves, embryos, and pollen, and protoplasts thereof.

7. A process to produce a hybrid corn seed which gives rise to a hybrid corn plant having alleles which, when expressed, contribute to hybrids which are adapted to the central corn belt and which exhibit improvement in the traits

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of: yield, stay green, stalks and roots, compared to similarly adapted hybrids, comprising the steps of:

- (a) planting, in pollinating proximity, seed of corn inbred line PHN46 having ATCC accession No. 91733 and another inbred line, not PHN46;
- (b) cultivating corn plants resulting from said planting, said corn plants having a male and female reproductive system;
- (c) inactivating the male reproductive system prior to pollination of the plants of either the female inbred line;

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(d) allowing natural cross pollinating to occur between the inbred lines; and

(e) harvesting seeds produced on said inactivated plants of the inbred line.

5 **8.** F₁ hybrid corn seed produced by crossing the inbred corn plant PHN46, having ATCC No. 91733, with another corn plant that is not PHN46, and plants and parts thereof produced from the F₁ hybrid seed.

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