

No. 202000332

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Pioneer Hi-Bred International, Inc.

Whereas, THERE HAS BEEN PRESENTED TO THE

Administrator of the Agricultural Marketing Service

An application requesting a certificate of protection for an alleged novel variety of sexually reproduced, asexually reproduced, or tuber propagated plant, the name and description of which are contained in the application and exhibits, a copy of which is hereunto annexed and made a part hereof, and the various requirements of law in such cases made and provided have been complied with, and the title thereto is, from the records of the PLANT VARIETY PROTECTION OFFICE, in the applicant(s) indicated in the said copy, and whereas, upon due examination made, the said applicant(s) is (are) adjudged to be entitled to a certificate of plant variety protection under the law.

Now, therefore, this certificate of plant variety protection is to grant unto the said applicant(s) and the successors, heirs or assigns of the said applicant(s) for the term of TWENTY years from the date of this grant, subject to the payment of the required fees and periodic replenishment of viable germplasm material of the variety in a public repository as provided by law, the right to exclude others from selling the variety, or offering it for sale, or reproducing it, or importing it, or exporting it, or conditioning it for propagation, or stocking it for any of the above purposes, or using it in producing a hybrid or different variety there from, to the extent provided by the PLANT VARIETY PROTECTION ACT. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

CORN

'PH47W4'

In Testimony Whereof, *I have hereunto set my hand and caused the seal of the* Plant Variety Protection Office *to be affixed at the* ***City of Washington, D.C.*** *this twentieth day of August, in the year* ***two thousand twenty-one***.

Attest:

Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

Administrator
Agricultural Marketing Service

Inari Exhibit 1009
Inari v. Pioneer

ST470 - Application for Plant Variety Protection Certificate
Application #: 202000332

Owner / Applicant / Organization

Pioneer Hi-Bred International, Inc.

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Owner Representative / Agent

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Experimental Name: Filing Date 7/21/2020

Variety Name: PH47W4

Crop Kind: Corn

ST470 Main

1. Genus and Species name of crop

Zea mays L.

2. Family name (Botanical)

Gramineae

3.Is the variety a first generation hybrid?

No

4. Does the variety contain any Transgenes?

No

5. Does the owner specify that seed of this variety be sold only as a class of certified seed? (see section 83(a) of the plant variety protection act)

No

6. Has the variety (including any harvested material) or a hybrid produced from this variety been sold, disposed of, transferred, or used in the U.S. or other countries?

Yes

Date of first sale, disposition, transfer, or use for each country and the circumstances:

A hybrid produced from this inbred variety has not been offered for sale prior to November 1, 2019.

7. Is the variety or any component of the variety protected by intellectual property right? (plant breeder's right or patent)

Yes

Country, date of filing or issuance and assigned reference number:

U.S. Patent Application date: June 14th, 2019 - Serial No. 16/441159

Exhibit A - Origin and Breeding History

1. Genealogy (back to and including public and commercial varieties, lines, or clones used) and the breeding method(s).

PH47W4 is an elite corn inbred line originated from a cross between inbred line PH1KTF (PVP Certificate No. 201200324) and inbred line PH18FC (PVP Certificate No. 201200309). The cross took place in Salinas, Puerto Rico in 2009. From this cross, ears were selected based on genetic analysis predicting disease, insect, and agronomic performance. Varieties PH1KTF and PH18FC are proprietary inbred lines of Pioneer Hi-Bred International, Inc.

2. Give the details of subsequent stages of selection and multiplication.

PH47W4 was developed by producing a doubled haploid from the F2 plants, selfing and using pedigree selection amongst the D1 lines, and selfing and bulking from the subsequent generations. Final developmental selections were made approximately the 6th generation in 2014 when the inbred line was determined to be uniform and stable.

3. Is the variety uniform?

Yes

How did you test for uniformity?

Field trials were grown and observed for uniformity and stability over a minimum of 5 generations, with one or more environments in each generation. Genetic purity testing was used in the purification process.

4. Is the variety stable?

Yes

How did you test for stability? Over how many generations?

Field trials were grown and observed for uniformity and stability over a minimum of 5 generations, with one or more environments in each generation. Genetic purity testing was used in the purification process.

5. Are genetic variants observed or expected during reproduction and multiplication?

No

Exhibit A Attached Files List

File Name	Last Modified On

Exhibit B - Statement of Distinctness

1. Based on overall morphology. Applicant's new variety PH47W4

is most similar to Comparison Variety PH18FC ,

2. Application Variety Traits

Variety PH47W4 differs from comparison variety PH18FC (PVP application no. 201200309) where variety PH47W4 has a absent anthocyanin coloration of brace roots, medium green glume color and a yellow silk color, whereas PH18FC has a dark anthocyanin coloration of brace roots, pink-orange glume color and a light red silk color.

3. Comparison Variety1 Additional Comments?

Additional supporting evidence distinguishing new variety PH47W4 from comparison variety PH18FC is provided within the attached document presenting quantitative data analysis for number of kernel rows and kernel width.

4. Comparison Variety2 Additional Comments?

5. Comparison Variety3 Additional Comments

Exhibit B Attached Files List

File Name	Last Modified On
PH47W4_Data tables - Exhibit B.pdf	7/24/2020 9:29:22 AM

Exhibit C

Corn

A . Type

1 . Type

Dent

B . Region Where Developed

.

1 . Region where developed in the U.S.A.

North Central USA

C . Maturity

1 . From emergence to 50% of plants in silk

Days

52

Heat Units

1325

2 . From emergence to 50% of plants in pollen

Days

52

Heat Units

1325

3 . From 10% to 90% pollen shed

Days

1

Heat Units

50.7

4 . From 50% silk to harvest at 25% moisture

Days

Heat Units

D . Plant

1 . cm Plant Height

211.4

2 . cm Ear Height

78

3 . cm Length of Top Ear Internode

17

4 . Average Number of Tillers

0

5 . Average Number of Ears per Stalk

6 . Anthocyanin of Brace Roots

Absent

E . Leaf

1 . cm Width of Ear Node Leaf

10.2

2 . cm Length of Ear Node Leaf

87

3 . Number of leaves above top ear

7

4 . degrees Leaf Angle (measure from 2nd leaf above ear at anthesis to stalk above leaf)

34.3

5 . Leaf Shape of apex

6 . Leaf Color

6.a. Leaf Color

Very Dark Green

6.b. Leaf Munsell Code

5GY3/4

7 . Leaf Sheath Pubescence (Rate on scale from 1 = none to 9 = like peach fuzz)

2

8 . Marginal Waves (Rate on scale from 1 = none to 9 = many)

9 . Longitudinal Creases (Rate on scale from 1 = none to 9 = many)

F . Tassel

1 . Number of Primary Lateral Branches

0.4

2 . Branch Angle from Central Spike

15

3 . cm Tassel Length (From top leaf collar to tassel tip)

33.4

4 . Pollen Shed (Rate on Scale from 0 = male sterile to 9 = heavy shed)

8

5 . Anther Color

5.a. Anther Color

Pink

5.b. Munsell Code

2.5R6/6

6 . Glume Color

6.a. Glume Color

Medium Green

6.b. Munsell Code

7.5GY5/6

7 . Bar Glumes (Glume Bands)

Absent

8 . Bar Glume Anthocyanin Color

8.a. Bar Glume Anthocyanin Color

8.b. Munsell Code

9 . cm Tassel Peduncle Length

25.7

10 . cm Tassel Spike Length

29.2

11 . Tassel Attitude

G . Ear (Unhusked)

1 . Silk Color (3 days after emergence)

1.a. Silk Color (3 days after emergence)

Yellow

1.b. Munsell code

10YR8/4

2 . Fresh Husk Color (25 days after 50% silking)

2.a. Fresh Husk Color (25 days after 50% silking)

Light Green

2.b. Munsell code

5GY7/6

3 . Dry Husk Color (65 days after 50% silking)

3.a. Dry Husk Color (65 days after 50% silking)

White

3.b. Munsell code

5Y8.5/2

4 . Position of Ear at Dry Husk Stage

Pendent

5 . Husk Tightness (Rate on scale from 1 = very loose to 9 = very tight)

4

6 . Husk Extension (at harvest)

Medium (<8 cm)

H . Ear (Husked)

1 . cm Husk Leaf length

16.9

2 . cm Ear Length

14.1

3 . mm Ear Diameter at mid-point

41.9

4 . gm Ear Weight

121.1

5 . Ear Shape

6 . Number of Kernels per Row

27

7 . Number of Kernel Rows

16.5

8 . Kernel Rows

Distinct

9 . Row Alignment

Straight

10 . cm Shank Length

9.1

11 . Ear Taper

Slight

I . Kernel (Dried)

1 . mm Kernel Length

10.4

2 . mm Kernel Width

7.2

3 . mm Kernel Thickness

4.4

4 . % Round Kernels (Shape Grade)

5 . Aleurone Color

Clear

Munsell Code

6 . Pericarp Color

6.a. Pericarp Color

Clear

6.b. Munsell Code

7 . Hard Endosperm Color

Other

Munsell Code

7.5YR7/14

Yellow-Orange

8 . Endosperm Type

Normal Starch

9 . gm Weight per 100 Kernels (unsized sample)

26.1

J . Cob

1 . mm Cob Diameter at mid-point

22.5

2 . Cob Color

White

Cob Color Other

5Y9/1

Munsell Code

5Y9/1

K . Disease Resistance

I. Leaf Blights, Wilts, and Local Infection Diseases

1 . Anthracnose Leaf Blight (Colletotrichum graminicola)

Not Tested (0)

2 . Common Rust (Puccinia sorghi)

Not Tested (0)

3 . Common Smut (Ustilago maydis)

Not Tested (0)

4 . Eyespot (Kabatiella zeae)

Not Tested (0)

5 . Goss’s Wilt (Clavibacter michiganense spp. nebraskense)

Not Tested (0)

Race

6 . Gray Leaf Spot (Cercospora zeae-maydis)

Not Tested (0)

Race

7 . Helminthosporium Leaf Spot (Bipolaris zeicola)

Not Tested (0)

Race

8 . Northern Leaf Blight (Exserohilum turcicum)

Not Tested (0)

Race

9 . Southern Leaf Blight (Bipolaris maydis)

Not Tested (0)

Race

10 . Southern Rust (Puccinia polysora)

Not Tested (0)

11 . Stewart's Wilt (Erwinia stewartii)

Not Tested (0)

12 . Other Blights

Not Tested (0)

Specify

II. Systemic Diseases

1 . Corn Lethal Necrosis (MCMV and MDMV)

Not Tested (0)

2 . Head Smut (Sphacelotheca reiliana)

Not Tested (0)

3 . Maize Chlorotic Dwarf Virus (MCDV)

Not Tested (0)

4 . Maize Chlorotic Mottle Virus (MCMV)

Not Tested (0)

5 . Maize Dwarf Mosaic Virus (MDMV)

Not Tested (0)

Strain

6 . Sorghum Downy Mildew of Corn (Peronosclerospora sorghi)

Not Tested (0)

7 . Other

Not Tested (0)

Other Systemic Diseases - Specify

III. Stalk Rots

1 . Anthracnose Stalk Rot (Colletotrichum graminicola)

Not Tested (0)

2 . Diplodia Stalk Rot (Stenocarpella maydis)

Not Tested (0)

3 . Fusarium Stalk Rot (Fusarium moniliforme)

Not Tested (0)

4 . Gibberella Stalk Rot (Gibberella zeae)

Not Tested (0)

5 . Other

Not Tested (0)

Other Stalk Rots - Specify

IV. Ear and Kernel Rots

1 . Aspergillus Ear and Kernel Rot (Aspergillus flavus)

Not Tested (0)

2 . Diplodia Ear Rot (Stenocarpella maydis)

Not Tested (0)

3 . Fusarium Ear and Kernel Rot (Fusarium moniliforme)

Not Tested (0)

4 . Gibberella Ear Rot (Gibberella zeae)

Not Tested (0)

5 . Other

Not Tested (0)

Other Ear and Kernel Rots - Specify

L . Insect Resistance

1 . Banks Grass Mite (Oligonychus pratensis)

Not Tested (0)

I. Corn Earworm (Helicoverpa zea)

1 . Leaf-Feeding

Not Tested (0)

2 . Silk Feeding

2.a. mg larval wt.

Not Tested (0)

2.b. Standard Deviation

2.c. Sample Size

2.d. Silk Feeding (mg larval wt)

3 . Ear Damage

Not Tested (0)

4 . Corn Leaf Aphid (Rhopalosiphum maidis)

Not Tested (0)

5 . Corn Sap Beetle (Carpophilus dimidiatus)

Not Tested (0)

II. European Corn Borer (Ostrinia nubilalis)

1 . 1st Generation (Typically Whorl Leaf Feeding)

Not Tested (0)

2 . 2nd Generation (Typically Leaf Sheath-Collar Feeding)

Not Tested (0)

3 . Stalk Tunneling

3.a. cm tunneled/plant

Not Tested (0)

3.b. Standard Deviation

3.c. Sample Size

3.d. Stalk Tunneling

III. Fall Armyworm (Spodoptera frugiperda)

1 . Leaf-Feeding

Not Tested (0)

2 . Silk Feeding

2.a. mg larval wt.

Not Tested (0)

2.b. Standard Deviation

2.c. Sample Size

2.d. Silk Feeding

3 . Maize Weevil (Sitophilus zeamaize)

Not Tested (0)

4 . Northern Rootworm (Diabrotica barberi)

Not Tested (0)

5 . Southern Rootworm (Diabrotica undecimpunctata)

Not Tested (0)

IV. Southwestern Corn Borer (Diatraea grandiosella)

1 . Leaf-Feeding

Not Tested (0)

2 . Stalk Tunneling

2.a. cm tunneled/plant

Not Tested (0)

2.b. Standard Deviation

2.c. Sample Size

3 . Two-spotted Spider Mite (Tetranychus urticae)

Not Tested (0)

4 . Western Rootworm (Diabrotica virgifera virgifera)

Not Tested (0)

5 . Other Insects

5.a. Other Insects

Not Tested (0)

5.b. Specify

M . Agronomic Traits

1 . Stay Green (at 65 days after anthesis)(Rate on a scale of 1 = worst to 9 = excellent)

2 . % Dropped Ears (at 65 days after anthesis)

3 . % Pre-anthesis Brittle Snapping

4 . % Pre-anthesis Root Lodging

5 . % Post-anthesis Root Lodging (at 65 days after anthesis)

N . Molecular Markers "(Any available data can be added to Exhibit B or Exhibit D as attachments)"

1 . Isozyme

Data Unavailable

2 . RFLP

Data Unavailable

3 . RAPD

Data Unavailable

4 . SSR

Data Unavailable

5 . SNP

Data Unavailable

6 . Other

6.a. Other

Data Unavailable

6.b. Specify

I. Isozyme Polymorphism

1 . ACP1

1.a. ACP1

Data Unavailable

1.b. Alleles

2 . ACP4

2.a. ACP4

Data Unavailable

2.b. Alleles

3 . ADH1

3.a. ADH1

Data Unavailable

3.b. Alleles

4 . AMP1

4.a. AMP1

Data Unavailable

4.b. Alleles

5 . AMP3

5.a. AMP3

Data Unavailable

5.b. Alleles

6 . DIA1

6.a. DIA1

Data Unavailable

6.b. Alleles

7 . GLU1

7.a. GLU1

Data Unavailable

7.b. Alleles

8 . GOT1

8.a. GOT1

Data Unavailable

8.b. Alleles

9 . GOT2

9.a. GOT2

Data Unavailable

9.b. Alleles

10 . GOT3

10.a. GOT3

Data Unavailable

10.b. Alleles

11 . HEX2

11.a. HEX2

Data Unavailable

11.b. Alleles

12 . IDH1

12.a. IDH1

Data Unavailable

12.b. Alleles

13 . IDH2

13.a. IDH2

Data Unavailable

13.b. Alleles

14 . MDH1

14.a. MDH1

Data Unavailable

14.b. Alleles

15 . MDH2

15.a. MDH2

Data Unavailable

15.b. Alleles

16 . MDH3

16.a. MDH3

Data Unavailable

16.b. Alleles

17 . MDH4

17.a. MDH4

Data Unavailable

17.b. Alleles

18 . MDH5

18.a. MDH5

Data Unavailable

18.b. Alleles

19 . Mmm

19.a. Mmm

Data Unavailable

19.b. Alleles

20 . PGD1

20.a. PGD1

Data Unavailable

20.b. Alleles

21 . PGD2

21.a. PGD2

Data Unavailable

21.b. Alleles

22 . PGM1

22.a. PGM1

Data Unavailable

22.b. Alleles

23 . PGM2

23.a. PGM2

Data Unavailable

23.b. Alleles

24 . PHI1

24.a. PHI1

Data Unavailable

24.b. Alleles

25 . PRX1

25.a. PRX1

Data Unavailable

25.b. Alleles

O . Comments

1 . Comments

Exhibit D - Additional Descriptive Information

Additional descriptive question / text:

Additional descriptive answer / information in detail:

Exhibit D Attached Files List

File Name	Last Modified On
2020 PVP Clarification of Data_ JH.pdf	7/24/2020 9:29:22 AM

Exhibit E - Statement of the Basis of Ownership

1. Does the applicant own all rights to the variety?

Yes

2. Is the applicant a U.S. national or a U.S. based entity?

Yes

3. Is the applicant the original owner?

Yes

4. Additional explanation on ownership (Trace ownership from original breeder to current owner):

PLEASE NOTE:

Plant variety protection can only be afforded to the owners (not licensees) who meet the following criteria:

If the rights to the variety are owned by the original breeder, that person must be a U.S. national, national of a UPOV member country, or national of a country which affords similar protection to nationals of the U.S. for the same genus and species.
If the rights to the variety are owned by the company which employed the original breeder(s), the company must be U.S. based, owned by nationals of a UPOV member country, or owned by nationals of a country which affords similar protection to nationals of the U.S. for the same genus and species.
If the applicant is an owner who is not the original owner, both the original owner and the applicant must meet one of the above criteria.

The original breeder/owner may be the individual or company who directed the final breeding. See Section 41(a)(2) of the Plant Variety Protection Act for definitions.