No. 72103

# THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

## Purdue University Agricultural Experiment Station and A.R.S., U.S.D.A.

Whereas, THERE HAS BEEN PRESENTED TO THE

**Secretary of Agriculture**

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED NOVEL VARIETY OF SEXUALLY REPRODUCED 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 seventeen YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED 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 USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM,] TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. IN THE UNITED STATES SEED OF THIS VARIETY (1) SHALL BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED AND (2) SHALL CONFORM TO THE NUMBER OF GENERATIONS CERTIFIED BY THE OWNER OF THE RIGHTS. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

* [Waived]

BARLEY

'Paoli'

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 *this* 18th *day of* November *in the year of our Lord one thousand nine hundred and* seventy-six

*Attest:*

R. F. Rollin

*Commissioner*
*Plant Variety Protection Office*
*Grain Division*
*Agricultural Marketing Service*

John I. Thompson

*Acting Secretary of Agriculture*

FORM GR-470
(2-12-71)

UNITED STATES DEPARTMENT OF AGRICULTURE
CONSUMER AND MARKETING SERVICE
GRAIN DIVISION
HYATTSVILLE, MARYLAND 20782

FORM APPROVED
OMB NO. 40-R3712

# APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE

INSTRUCTIONS: *See Reverse.*

| | | |
|---|---|---|
| 1. VARIETY NAME OR TEMPORARY DESIGNATION<br>Paoli | 2. KIND NAME<br>Barley | FOR OFFICIAL USE ONLY<br>PVPO NUMBER<br>72103 |
| 3. GENUS AND SPECIES NAME<br>Hordeum vulgare | 4. FAMILY NAME *(Botanical)*<br>Gramineae | FILING DATE 3/15/72 — TIME 12:30 A.M. (P.M.) |
| | 5. DATE OF DETERMINATION<br>April 23, 1971 | FEE RECEIVED $ 50.00 — CHARGES |
| 6. NAME OF APPLICANT(S)<br>Purdue University<br>Agricultural Experiment Station and ARS., U.S.D.A. | 7. ADDRESS *(Street and No. or R.F.D. No., City, State, and ZIP Code)*<br>Agricultural Experiment Station<br>Purdue University<br>Lafayette, Indiana 47907 | 8. TELEPHONE AREA CODE AND NUMBER<br>317-749-2461 |
| 9. IF THE NAMED APPLICANT IS NOT A PERSON, FORM OF ORGANIZATION: *(Corporation, partnership, association, etc.)*<br>Land Grant University | 10. STATE OF INCORPORATION<br>Established by Indiana Statute 1869 | 11. DATE OF INCORPORATION<br>May 6, 1869 |

6.16.76

12. Name and mailing address of applicant representative(s), if any, to serve in this application and receive all papers:
B. J. LISKA ~~Dr. H. H. Kramer~~, Director
Agricultural Experiment
Purdue University
Lafayette, Indiana 47907

7/15/76

13. CHECK BOX BELOW FOR EACH ATTACHMENT SUBMITTED:

[X] 12A. Exhibit A, Origin and Breeding History of the Variety *(See Section 52, P.L. 91-577)*

[X] 12B. Exhibit B, Botanical Description of the Variety

11/2/74
[X] 12C. Exhibit C, Objective Description of the Variety

[X] 12D. Exhibit D, Data Indicative of Novelty

[X] 12E. Exhibit E, Statement of the Basis of Applicant's Ownership

The applicant declares that a viable sample of basic seed of this variety will be deposited upon request before issuance of a certificate and will be replenished periodically in accordance with such regulations as may be applicable. *(See Section 52, P.L. 91-577).*

14A. Does the applicant(s) specify that seed of this variety be sold by variety name only as a class of certified seed? *(See Section 83(a), P.L. 91-577) (If "Yes," answer 14B and 14C below.)* [X] YES [ ] NO

14B. Does the applicant(s) specify that this variety be limited as to number of generations? [X] YES [ ] NO

14C. If "Yes," to 14B, how many generations of production beyond breeder seed? Three

Applicant is informed that false representation herein can jeopardize protection and result in penalties.

*The undersigned applicant(s) of this sexually-reproduced novel plant variety believes that the variety is distinct, uniform, and stable as required in Section 41 and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act (P.L. 91-577).*

2/21/72 (DATE) — H H Kramer (SIGNATURE OF APPLICANT)

(DATE) — (SIGNATURE OF APPLICANT)

12A. Exhibit A. Origin and Breeding History of the Variety

Paoli Winter Barley was developed at the Purdue University Agricultural Experiment Station in cooperation with the Plant Science Research Division, Agricultural Research Division, U.S. Department of Agriculture.

The parentage of Paoli and order of crossing is: Kearney/6/ Kenbar/5/Ky. 1/4/Comfort/Purdue 1101/3/Ped. 38/Chevron/2/Bolivia/7/ Harrison. The final cross (seventh) to Harrison was made in 1959. Plant selections were made in the $F_1$, $F_2$ and $F_3$ generations. The selected 100 plants in $F_4$ were bulked and grown to $F_{10}$ to produce breeders' seed of Paoli.

Winter barley is recognized as being almost 100 percent self pollinated. Paoli has appeared uniform in breeders seed development by selfing in isolation from other barley.

Paoli winter barley resulted from a breeding program to develop a more winter-hardy variety for the northern edge of the winter barley production area. It derives excellent winter hardiness from Kearney. Paoli also has the ability to tiller well and produce a good crop after considerable stand thinning by winter killing. Paoli is early in maturity, making it desirable for the barley-soybean two crop per year program.

The performance of Paoli has been evaluated in nursery and drill plot trials in Indiana and summarized in Research Progress Report 400, 1972, attached.

Paoli has also been evaluated (as Purdue 5924A7-14-1) in the Regional Winter Barley Nursery (hardy varieties) 1967 to 1972.

12B. Exhibit B. Botanical Description of the Variety

Paoli is a six-rowed, rough-awned winter variety with excellent winterhardiness and high tillering ability.

The coleoptile color is green. Young plants show an intermediate habit of growth as opposed to prostrate or to upright growth in the fall or early spring. Leaves are a medium green and show a moderate level of non-parasitic purple spotting lower leaf sheaths are pubescent. Flag leaves are medium in size, generally horizontal and not twisted.

Paoli is relatively early in flowering in Indiana, averaging the same as Barsoy and three days earlier than Harrison. Flowering occurs about 230 days after emergence from September 25 seeding at Lafayette, Indiana. It is recognized that temperature and day length differences influence varieties differentially. Flowering lasts about 10 days at Lafayette, Indiana, under average temperatures.

Paoli has been the shortest variety in Indiana trials, averaging about 75 cm in height which is about 10 cm less than for Harrison.

The neck is straight. The collar has almost continuous variation plant to plant from closed to v-shaped to open. The basal rachis internode is short and straight (Figure 1). Spikes are very dense and kernels fill well to the base of the spike giving a "square" spike base appearance. (Figure 1). The spike is held erect and exerts several inches from the flag leaf sheath. Lemma awns are long and rough. The rachis is tough and has long dense marginal pubescence. The awns are not deciduous. The spike is parallel in shape and very dense (Figure 2). Tweaking is absent.

Outer glumes are about one half the length of the kernels. Glume awns are about twice the length of the glumes (Figure 3) and are prominent in appearance (Figures 1 and 2). Glume awnes are barbed. Glume hairs usually form a wide band on the glume and infrequently completely cover the glume.

Anthers are yellow. The stigma is very hairy.

The kernels are covered, average about 9 mm in length, and weigh about 26 to 29 g per 1000. The aleurone has appeared generally as light blue under Indiana conditions where aleurone color is not expressed well consistently. Rachillas are long with many long rachillas hairs. The central lemma nerve is free of teeth. Teeth on the lateral lemma nerves are few to several and on marginal nerves few to several. The lemma (kernel) base is generally depressed infrequently tending to crease (Figure 4). Lemmas are generally slightly wrinkled.

Paoli derived excellent winterhardiness from Kearney, and also has the ability to tiller well and to recover from moderate winter damage (Purdue University Agricultural Experiment Station Research Progress Report 400. 1972. Attached). Paoli has been similar to Kearney in excellence of winterhardiness in Indiana (Table 1) but not as hardy as Kearney over Eastern United States in Uniform Cooperative Barley Winterhardiness nurseries (1966-1971). Research on winterhardiness of barley (Canad. Jour. Genet and Cytol. 4:356-376. 1962) has shown that fewer genetic factors may be required for providing good winterhardiness for limited regions than for more extensive regions.

Paoli has the ability to tiller well and to recover from moderate winter damage and to yield well.

The straw strength of Paoli is good but not as great as that of the Harrison parent, generally unexcelled in strength. Paoli is resistant to "node bending" described in Agronomy Journal 49:518-519. 1957.

Paoli is considered a feed barley. Kernel size is too small and ununiform for consideration for malting.

Disease reactions are presented in Table 2. Paoli has been moderately resistant to susceptible to leaf rust occurring at Lafayette, Indiana. It does not possess the excellent resistance of Harrison. Paoli has been moderately resistant to powdery mildew at Lafayette, Indiana but intermediate to susceptible in some regional tests. Paoli has been highly resistant to loose smut in Indiana and elsewhere. Paoli has been resistant to the Rhynchosporium scald disease in Indiana.

# Paoli Winter Barley

F. L. Patterson, J. F. Schafer, R. M. Caldwell and J. J. Roberts,
Departments of Agronomy and Botany and Plant Pathology,
Purdue University; in cooperation with the Plant Science Research
Division, Agricultural Research Service, U.S. Department of Agriculture

Paoli winter barley resulted from a breeding program to develop a more winter-hardy variety for the northern edge of the winter barley production area. Paoli possesses good hardiness for Indiana and also has the ability to tiller well and produce a good crop after considerable stand thinning by winter killing. Paoli is early in maturity, making it desirable for the barley-soybean two crop per year program.

The parentage of Paoli is : Kearney/6/Kenbar/5/Ky. 1/4/Comfort/Purdue 1101/3/Ped. 38/Chevron/2/Bolivia/7/Harrison.

## PLANT TYPE

Paoli is a short variety, averaging 4 inches shorter than Harrison and 6 inches shorter than Jefferson. Heads are 6-rowed, short, dense and have rough awns. Kernels are medium to small with a test weight similar to Barsoy and Jefferson (Table 1). The straw is moderately strong, but breaks more than Harrison and Jefferson if harvest is delayed.

## WINTERHARDINESS

Paoli derived winterhardiness from Kearney, and also has the ability to tiller well and to recover from moderate winter damage.

## PERFORMANCE

Paoli has yielded more than other winter barley varieties when winter damage occurred (Table 1), and has yielded as high as Harrison and Jefferson where little winter damage occurred (Table 2). Paoli has the ability to recover and perform well after considerable winter damage.

## DISEASE RESISTANCE

Observations at Lafayette, Indiana, indicate that Paoli is moderately susceptible to leaf rust, stem rust and powdery mildew, and moderately resistant to scald and loose smut.

Table 1.

Comparative survivals of winter barleys at Lafayette, Indiana

| | Percent survival | | | | | |
|---|---|---|---|---|---|---|
| | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 |
| Paoli | 95 | 55 | 11 | 70 | 88 | 25 |
| Harrison | 90 | 35 | 18 | 50 | 57 | Tr |
| Kearney | 90 | 15 | 1 | 68 | 75 | 15 |
| Kentucky 1 | 85 | 35 | 25 | 60 | 68 | 4 |
| Reno | 53 | 35 | 9 | 68 | 72 | 3 |

Table 2.

Reaction to diseases of winter barley varieties at Lafayette, Indiana

| | Leaf Rust Percent and reaction | | | Percent Mildew | Loose Smut % | | |
|---|---|---|---|---|---|---|---|
| | 1965 | 1966 | 1969 | 1965 | 1965 | 1966 | Innoc % 1966 |
| Paoli | 25S | 15S | 5MR | 10 | 0 | 0 | 0 |
| Harrison | 5R | 2R | 0 | 0 | 1 | 9 | 30 |
| Kearney | 30S | 50S | 20S | 25 | 5 | 2 | 26 |
| Kentucky No. 1 | 15MR | 20S | 10MR | 15 | 6 | 6 | - |
| Decatur | 5R | 10MR | TrR | 60 | 9 | 12 | 16 |

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## WINTERHARDINESS

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## DISEASE RESISTANCE

Observations at Lafayette, Indiana, indicate that Paoli is moderately susceptible to leaf rust, stem rust and powdery mildew, and moderately resistant to scald and loose smut.

FORM GR-470-5
(11-1-72)

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
GRAIN DIVISION
HYATTSVILLE, MARYLAND 20782

EXHIBIT C
*(Barley)*

# OBJECTIVE DESCRIPTION OF VARIETY
## BARLEY *(HORDEUM VULGARE)*

INSTRUCTIONS: *See Reverse.*

FOR OFFICIAL USE ONLY
PVPO NUMBER 72103
VARIETY NAME OR TEMPORARY DESIGNATION PAOli

NAME OF APPLICANT(S)
Purdue University Agricultural Experiment Station

ADDRESS *(Street and No. or R.F.D. No., City, State, and ZIP Code)*
West Lafayette, Indiana 47907

Place the appropriate number that describes the varietal character of this variety in the boxes below.
Place a zero in first box (i.e. [0][8][9] or [0][9]) when number is either 99 or less or 9 or less.

**1. GROWTH HABIT:**
[3] 1 = SPRING 2 = FACULTATIVE WINTER 3 = WINTER
[2] Early Growth: 1 = PROSTRATE 2 = SEMIPROSTRATE 3 = ERECT

**2. MATURITY (50% Flowering):**
[1] 1 = EARLY (California Mariout) 2 = MIDSEASON (Betzes) 3 = LATE (Frontier)
[ ] No. of days *Earlier* than . . . . .
[ ] No. of days *Later* than . . . . . .
[ ] [ ] } 1 = BETZES 2 = CALIFORNIA MARIOUT 3 = CONQUEST 4 = DICKSON 5 = PIROLINE 6 = PRIMUS 7 = UNITAN

**3. PLANT HEIGHT (From soil level to top of head):**
[2] 1 = SEMIDWARF 2 = SHORT (California Mariout) 3 = MEDIUM TALL (Betzes) 4 = TALL (Conquest)
[ ][ ] Cm. *Shorter* than . . . . .
[ ][ ] Cm. *Taller* than . . . . . .
[ ] [ ] } 1 = BETZES 2 = CALIFORNIA MARIOUT 3 = CONQUEST 4 = DICKSON 5 = PIROLINE 6 = PRIMUS 7 = UNITAN

**4. STEM:**
[3] Exertion *(Flag to spike at maturity)*: 1 = 0 - 3 cm. 2 = 3 - 10 cm. 3 = 10 - 15 cm.
[2] Anthocyanin: 1 = ABSENT 2 = PRESENT
[0][4] NO. OF NODES (Originating from node above ground)
[ ] Collar Shape: 1 = CLOSED 2 = V-SHAPED 3 = OPEN 4 = MODIFIED CLOSED OR OPEN
[1] Shape of Neck: 1 = STRAIGHT 2 = SNAKY 3 = OTHER (Specify) _____

**5. LEAF:**
[2] Basal leaf sheath *(seedling)*: 1 = GLABROUS 2 = PUBESCENT
[2] Position of flag leaf *(at boot stage)*: 1 = DROOPING 2 = UPRIGHT
[2] Waxiness: 1 = ABSENT (Glossy) 2 = SLIGHTLY WAXY 3 = WAXY
[1][7] MM. WIDTH (First leaf below flag leaf)
[1][8] CM. LENGTH (First leaf below flag leaf)
[2] Anthocyanin in leaf sheath: 1 = ABSENT 2 = PRESENT

**6. HEAD:**
[2] Type: 1 = TWO-ROWED 2 = SIX-ROWED
[3] Density: 1 = LAX 2 = ERECT (Not dense) 3 = ERECT (Dense)
2 [~~3~~] Shape: 1 = TAPERING 2 = STRAP 3 = CLAVATE 4 = OTHER (Specify) _____
Ect 11/17/75
[2] Waxiness: 1 = ABSENT (Glossy) 2 = SLIGHTLY WAXY 3 = WAXY
[3] Lateral Kernels Overlap: 1 = NONE 2 = AT TIP 3 = 1/4 - 1/2 OF HEAD
[3] Rachis *(Hair on edge)*: 1 = LACKING 2 = FEW 3 = COVERED

**7. GLUME:**
[2] Length: 1 = 1/3 OF LEMMA 2 = 1/2 OF LEMMA 3 = MORE THAN 1/2 OF LEMMA
[2] Hairs: 1 = NONE 2 = SHORT 3 = LONG
[3] Hair covering: 1 = NONE 2 = RESTRICTED TO MIDDLE 3 = CONFINED TO BAND 4 = COMPLETELY COVERED
[3] Awns: 1 = LESS THAN EQUAL TO LENGTH OF GLUMES 2 = EQUAL TO LENGTH OF GLUMES 3 = MORE THAN EQUAL TO LENGTH OF GLUMES
[3] Awn Surface: 1 = SMOOTH 2 = SEMISMOOTH 3 = ROUGH



Per letter dt'd 11/14/75

Explanation of form C.

2. Maturity

Paoli is an early winter barley but is not comparable to spring varieties listed on form C. None of these springs are adapted to growing at Lafayette, Indiana where Paoli was classified.

Paoli is about the same maturity as Barsoy and three days earlier than Harrison and Jefferson at Lafayette, Indiana (see our Research Progress Report 400, 1972).

3. Plant height

Paoli is a short variety about 10 cm shorter than Harrison. It is not directly comparable to spring varieties listed in form C.

4. Stem

Heads generally exert well out of the boot. Distance varies with temperature and is generally greater for early than for later tillers.

Anthocyanin may develop especially near nodal areas.

The collar has almost continuous variation plant to plant from closed to v-shaped to open.

7. Glume

Glume hairs were considered short but literature specifying length of the "short" and "long" categories was not found.

10. Seed

Aleurone color generally appears as a very pale blue at Lafayette, Indiana where aleurone color is not expressed well consistently.

12. Insect

Reactions are indicated to races of Hessian fly of wheat. We know of no literature that has shown there are races on barley.

References:

We find the references listed are inadequate to define the options listed under the different categories in form C. They are inadequate also completing category 14.

# Paoli Winter Barley

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## WINTERHARDINESS

Paoli derived winterhardiness from Kearney, and also has the ability to tiller well and to recover from moderate winter damage.

## PERFORMANCE

Paoli has yielded more than other winter barley varieties when winter damage occurred (Table 1), and has yielded as high as Harrison and Jefferson where little winter damage occurred (Table 2). Paoli has the ability to recover and perform well after considerable winter damage.

## DISEASE RESISTANCE

Observations at Lafayette, Indiana, indicate that Paoli is moderately susceptible to leaf rust, stem rust and powdery mildew, and moderately resistant to scald and loose smut.

12D. Exhibit D. Data Indicative of Novelty (Revised 10-30-75)

The novelty of Paoli results from the combination of outstanding winter hardiness (Table 1), early maturity and short height (Research Progress Report 400), and a very dense spike, Figure 2, Exhibit B.

Paoli is most like 'Pike' (Application No. 7600002) in most characters. The two are similar in plant tillering, leaf size, leaf color, leaf carriage and in winter hardiness. Both are short in height and early in maturity.

Paoli is distinct from Pike in being 4 days later in flowering than Pike (Table 3). Paoli is resistant to Rhynchosporium scald and to loose smut whereas Pike is susceptible to both diseases (Table 3). The neck of Paoli is straight whereas that of Pike is snakey.

Paoli is similar to Kearney in winter hardiness (in Indiana, Table 1), similar in leaf size, and similar in seed size.

Paoli is distinct from Kearney. Paoli has a more dense spike, shorter height, greater tillering, and much greater straw strength than Kearney. Paoli is more resistant to leaf rust, powdery mildew, and loose smut than is Kearney (Table 2).

Paoli is similar to Harrison in leaf color, leaf carriage, coleoptile elongation, seedling color, and resistance to Rhynchosporium scald.

Paoli is distinct from Harrison. Paoli is earlier in flowering, shorter in height (Research Progress Report 400), and more winter hardy (Table 1) than Harrison. Paoli is resistant to loose smut whereas Harrison is susceptible. Paoli has been moderately resistant to susceptible to leaf rust occurring naturally in Indiana whereas Harrison has been highly resistant.

Paoli is similar to Barsoy in maturity, height, and winter hardiness.

Paoli is distinct from Barsoy in having a straight neck versus the very snakey neck of Barsoy. Paoli is resistant to loose smut whereas Barsoy is susceptible.

Table 1.

Comparative survivals of winter barleys at Lafayette, Indiana

| | Percent survival | | | | | |
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| | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 |
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Reaction to diseases of winter barley varieties at Lafayette, Indiana

| | Leaf Rust Percent and reaction | | | Percent Mildew | Loose Smut | | |
|---|---|---|---|---|---|---|---|
| | 1965 | 1966 | 1969 | 1965 | 1965 | 1966 | Innoc % 1966 |
| Paoli | 25S | 15S | 5MR | 10 | 0 | 0 | 0 |
| Harrison | 5R | 2R | 0 | 0 | 1 | 9 | 30 |
| Kearney | 30S | 50S | 20S | 25 | 5 | 2 | 26 |
| Kentucky No. 1 | 15MR | 20S | 10MR | 15 | 6 | 6 | - |
| Decatur | 5R | 10MR | TrR | 60 | 9 | 12 | 16 |

Table 3. Comparison of winter barley varieties for reaction to diseases and for heading at Lafayette, IN.

| Variety | Rhynchosporium scald | Leaf rust[1] 1969 | Leaf rust[1] 1972 | Loose smut | Days later than Pike |
|---|---|---|---|---|---|
| Pike | S | 5R | 10MS | S | 0 |
| Paoli | R | 5MR | 80S | R | 4 |
| Harrison | R | 0I | 40S | S | 6 |
| Barsoy | - | 50S | 80S | S | 4 |

[1] At Lafayette, IN, natural epidemics.

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The parentage of Paoli is : Kearney/6/Kenbar/5/Ky. 1/4/Comfort/Purdue 1101/3/Ped. 38/Chevron/2/Bolivia/7/Harrison.

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## WINTERHARDINESS

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## PERFORMANCE

Paoli has yielded more than other winter barley varieties when winter damage occurred (Table 1), and has yielded as high as Harrison and Jefferson where little winter damage occurred (Table 2). Paoli has the ability to recover and perform well after considerable winter damage.

## DISEASE RESISTANCE

Observations at Lafayette, Indiana, indicate that Paoli is moderately susceptible to leaf rust, stem rust and powdery mildew, and moderately resistant to scald and loose smut.

REVISED EXHIBIT E: STATEMENT OF THE BASIS OF APPLICANT'S OWNERSHIP

Purdue University Agricultural Experiment Station and the Agricultural Research Service, United States Department of Agriculture, are joint owners of 'Paoli' barley.

9/15/76
Date

B. J. Liska, Director
Purdue University Agricultural Experiment Station

EXHIBIT "E"

PURDUE UNIVERSITY
AGRICULTURAL EXPERIMENT STATION
Lafayette, Indiana

and

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
Plant Science Research Division
Beltsville, Maryland

AGREEMENT TO INCREASE AND RELEASE "PAOLI"
A NEW WINTER BARLEY

The Purdue University Agricultural Experiment Station and the Agricultural Research Service, U. S. Department of Agriculture, agree to release Purdue 5924A7-14-1 winter barley under the name "Paoli". Breeder's seed was shared with Experiment Stations in Illinois and Kansas in 1970 to produce foundation seed stocks for distribution in these states as well as in Indiana in 1971.

Paoli was developed cooperatively by the Purdue University Agricultural Experiment Station and the Plant Science Research Division, ARS, United States Department of Agriculture.

Paoli was selected by the modified pedigree method from the following parentage: Kearney/6/Kenbar/5/Kentucky No. 1/4/Comfort/Purdue 1101/3/ Wisconsin Pedigree 38/Chevron/2/Bolivia/7/Harrison. Paoli has been evaluated in the Uniform Winter Barley Yield Nursery during the period 1967 to 1971. It has been superior at Lafayette, Indiana, and elsewhere for winter hardiness, short, stiff straw, and yield. It is much earlier in maturity than the current commercial varieties Harrison and Jefferson. Observations and tests at Lafayette, Indiana, indicate it is moderately susceptible to leaf rust and powdery mildew.

Paoli is intended for use where the additional winter hardiness is important and where early maturity is needed for two crops per year sequences. Breeder's seed will be maintained by the Purdue University Agricultural Experiment Station. The U. S. Department of Agriculture will have no seed for distribution.

~~Application for variety protection under the New Plant Variety Protection Act, Public Law 91-577, is anticipated~~.

Announcement of release is scheduled for after 6:00 a.m. E.S.T. June 1, 1971.

H. H. Kramer — 23 April 71

H. H. Kramer, Director
Purdue University
Agricultural Experiment Station
Lafayette, Indiana

Date

Hugo O. Graumann — May 28, 1971

H. O. Graumann, Director
Plant Science Research Division
ARS-U. S. Department of Agriculture
Beltsville, Maryland

Date

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
14th and Independence Avenue, Rm. 1634

WASHINGTON, D.C. 20250

PLANT VARIETY PROTECTION OFFICE

Gentlemen:

Subject: Application No. 72103
Variety and Kind - 'Paoli' - - Barley

As provided in section 83(a) of the Plant Variety Protection Act, 7 U.S.C. 2321, we request that the Certificate on the above variety be issued with a notation on each Certificate that the right to exclude others from selling, offering for sale, reproducing, importing or exporting the variety covered by this Certificate, or using it in producing a hybrid or different variety is waived.*

It has been agreed that the certificate should be issued in the name(s) of:

The Purdue University Agricultural Experiment Station and ARS-USDA

6/2/76
(Date)

B. Shelton - Director
(Signature)

*except that this waiver shall not apply to (a) breeder seed, (b) foundation seed, (c) labeling requirements, and (d) blending limitations.

FORM GR-470-5 (Reverse)

**8. LEMMA:**

[5] Awn: 1 = AWNLESS 2 = AWNLETS ON CENTRAL ROWS, AWNLESS ON LATERAL ROWS 3 = SHORT ON CENTRAL ROWS, AWNLETS ON LATERAL ROWS 4 = SHORT (less than equal to length of spike) 5 = LONG (longer than spike) 6 = HOODED

[3] Awn Surface: 0 = AWNLESS 1 = SMOOTH 2 = SEMISMOOTH 3 = ROUGH

[3] Teeth: 1 = ABSENT 2 = FEW 3 = NUMEROUS

[1] Hair: 1 = ABSENT 2 = PRESENT

[2] Shape of base: 1 = DEPRESSION 2 = SLIGHT CREASE 3 = TRANSVERSE CREASE

[2] Rachilla Hairs: 1 = SHORT 2 = LONG

**9. STIGMA:**

[2] Hairs: 1 = FEW 2 = MANY

**10. SEED:**

[2] Type: 1 = NAKED 2 = COVERED

[1] Hairs on Ventral Furrow: 1 = ABSENT 2 = PRESENT

[3] Length: 1 = SHORT (8.0 mm.) 2 = SHORT TO MIDLONG (7.5 - 9.0 mm.) 3 = MIDLONG (8.5 - 9.5 mm.) 4 = MIDLONG TO LONG (9.0 - 10.5 mm.) 5 = LONG (10.0 mm.)

[2] Wrinkling of hull: 1 = NAKED 2 = SLIGHTLY WRINKLED 3 = SEMIWRINKLED 4 = WRINKLED

[2] Aleurone Color: 1 = COLORLESS (White or Yellow) 2 = BLUE

[ ][0] PERCENT ABORTIVE

[2][8] GMS. PER 1000 SEEDS

**11. DISEASE: (0 = Not Tested, 1 = Susceptible, 2 = Resistant)**

| | | | |
|---|---|---|---|
| [0] SEPTORIA | [0] NET BLOTCH | [0] SPOT BLOTCH | 1 ECS 4/12/76* [2] POWDERY MILDEW |
| [2] LOOSE SMUT | [0] BACTERIAL BLIGHT | [0] COVERED SMUT | [0] FALSE LOOSE SMUT |
| [1] STEM RUST | 1 ECS 4/12/76* [2] LEAF RUST | [1] SCAB | [2] SCALD |
| [0] AY | [0] BSMV | [1] BYDV | [0] OTHER (Specify) |

**12. INSECT: (0 = Not tested, 1 = Susceptible 2 = Resistant)**

| | | | |
|---|---|---|---|
| [0] GREEN BUG | [0] ENGLISH GRAIN APHID | [0] CHINCH BUG | [0] ARMYWORM |
| [0] GRASS HOPPERS | [1] CERIAL LEAF BETTLE | [0] OTHER (Specify) | |

HESSIAN FLY RACES: [1] GP [0] A [1] B [1] C [1] D [0] E [0] F [0] G

**13. CHEMICAL (0 = Not Tested, 1 = Susceptible, 2 = Resistant)**

[2] DDT [ ] OTHER (Specify)

**14. INDICATE WHICH VARIETY MOST CLOSELY RESEMBLES THAT SUBMITTED:**

| CHARACTER | NAME OF VARIETY | CHARACTER | NAME OF VARIETY |
|---|---|---|---|
| Plant tillering | Harrison | Seed size | Kearney |
| Leaf size | Kearney | Coleoptile elongation | Harrison |
| Leaf color | Harrison | Seedling pigmentation | Harrison |
| Leaf carriage | Harrison | | |

**REFERENCES:** The following publications may be used as a reference aid for the standardization of character descriptions and terms used in this form:


1. Wiebe, G. A., and D. A. Reid, 1961, Classification of Barley Varieties Grown in the United States and Cana in 1958, Technical Bulletin No. 1224, U.S. Dept. of Agriculture.
2. Reid, D. A., and G. A. Wiebe, 1968, Barley: Origin, Botany, Culture, Winter Hardiness, Genetics, Utilizatio Pests, Agriculture Handbook No. 338, U.S. Dept. of Agriculture. pp. 61 - 84.
3. Malting Barley Improvement Association, Milwaukee, Wisconsin, 1971, Barley Variety Dictionary.


**COLOR:** Nickerson's or any recognized color fan may be used to determine color of the described variety.

10

* as per letter from B. J. Lisker dt'd 3/3/

Table 1. Performance of Winter Barley Varieties in Nursery Trials at Lafayette, Indiana.

| Item | Paoli | Barsoy | Harrison | Jefferson |
|---|---|---|---|---|
| Yield (bushels per acre) | | | | |
| 1970 | 122 | 87 | 106 | 93 |
| 1969 | 106 | 118 | 74 | 82 |
| 1968 | 92 | 82 | 67 | 67 |
| 3-year average | 107 | 96 | 81 | 81 |
| Survival (percent) | | | | |
| 1971 | 44 | 37 | 7 | 6 |
| 1970 | 88 | 88 | 57 | 67 |
| 1969 | 70 | 83 | 50 | 63 |
| 1968 | 57 | 48 | 32 | 43 |
| 4-year average | 65 | 64 | 37 | 45 |
| Test weight (pounds per bushel) | | | | |
| 3-year average* | 45 | 45 | 47 | 45 |
| Height (inches) | | | | |
| 3-year average* | 30 | -- | 34 | 36 |
| Straw Score | | | | |
| 3-year average** | 2.6 | 4.3 | 1.8 | 1.3 |
| Earliness | | | | |
| Headed* | May 21 | May 21 | May 24 | May 24 |

*Averages 1968-70.
**Straw scored 0 (erect) to 9 (lodged flat).

Table 2. Performance of Winter Barleys in Field Plot Trials in Southern Indiana, Four-Year Averages 1967-70*

| Variety | Yield | Test weight | Lodging | Height | Winter damage score** |
|---|---|---|---|---|---|
| | bu./A | lb./bu. | pct. | in. | |
| Paoli | 93.3 | 41.0 | 31 | 31 | 5 |
| Harrison | 95.3 | 44.0 | 10 | 39 | 7 |
| Jefferson | 85.4 | 42.5 | 4 | 41 | 6 |

*Data of K. M. Day, Purdue University
**Scored from 0 (least) to 9 (most).

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| 1969 | 106 | 118 | 74 | 82 |
| 1968 | 92 | 82 | 67 | 67 |
| 3-year average | 107 | 96 | 81 | 81 |
| Survival (percent) | | | | |
| 1971 | 44 | 37 | 7 | 6 |
| 1970 | 88 | 88 | 57 | 67 |
| 1969 | 70 | 83 | 50 | 63 |
| 1968 | 57 | 48 | 32 | 43 |
| 4-year average | 65 | 64 | 37 | 45 |
| Test weight (pounds per bushel) | | | | |
| 3-year average* | 45 | 45 | 47 | 45 |
| Height (inches) | | | | |
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