No. 200300007

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

University of Idaho

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED DISTINCT VARIETY OF SEXUALLY 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 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 CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE PURPOSE , OR CONDITIONING IT [illegible] PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE PURPOSE, OR USING IT IN PRODUCING A HYBRID OR [illegible]ENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. IN [illegible]TED STATES SEED OF THIS VARIETY (1) SHALL BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SE[illegible] SHALL CONFORM TO THE NUMBER OF GENERATIONS SPECIFIED BY THE OWNER OF THE RIGHTS. (84 STAT. 1542, A[illegible]ED, 7 U.S.C. 2321 ET SEQ.)

WHEAT, COMMON

'Hubbard'

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 thirteenth day of April, in the year two thousand and four.

Attest:

Commissioner
Plant Variety Protection [illegible]
Agricultural Marketing [illegible]

[illegible]ecretary of Agriculture

REPRODUCE LOCALLY. *Include form number and date on all reproductions*

Form Approved - OMB No. 0581-0055

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY - PLANT VARIETY PROTECTION OFFICE

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE

(Instructions and information collection burden statement on reverse)

The following statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. 552a) and the Paperwork Reduction Act (PRA) of 1995.

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF OWNER: University of Idaho

2. TEMPORARY DESIGNATION OR EXPERIMENTAL NAME: ID86-10420A

3. VARIETY NAME: Hubbard

4. ADDRESS *(Street and No., or R.F.D. No., City, State, and ZIP Code, and Country)*:
Idaho Agricultural Experiment Station
College of Agriculture
University of Idaho
Moscow, ID 83844-2331

5. TELEPHONE *(include area code)*: 208-885-7173

6. FAX *(include area code)*: 208-885-6654

FOR OFFICIAL USE ONLY

PVPO NUMBER: 200300007

FILING DATE: October 11, 2002

7. IF THE OWNER NAMED IS NOT A "PERSON", GIVE FORM OF ORGANIZATION *(corporation, partnership, association, etc.)*: Land Grant College

8. IF INCORPORATED, GIVE STATE OF INCORPORATION:

9. DATE OF INCORPORATION:

10. NAME AND ADDRESS OF OWNER REPRESENTATIVE(S) TO SERVE IN THIS APPLICATION. *(First person listed will receive all papers)*

Richard Heimsch
Idaho Agricultural Experiment Station
University of Idaho
Moscow, ID 83844-2331

Robert S. Zemetra
PSES
University of Idaho
Moscow, ID 83844-2339

FEES RECEIVED

FILING AND EXAMINATION FEES: $ 2705.00 DATE 10/11/02

CERTIFICATION FEE: $ 432.00 DATE 3/26/04

11. TELEPHONE *(Include area code)*: 208-885-7173

12. FAX *(Include area code)*: 208-885-6654

13. E-MAIL: rzemetra@uidaho.edu

14. CROP KIND *(Common Name)*: wheat

15. GENUS AND SPECIES NAME OF CROP: Triticum aestivum

16. FAMILY NAME *(Botanical)*:

17. IS THE VARIETY A FIRST GENERATION HYBRID? [X] YES [ ] NO

18. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED (Follow instructions on reverse)

a. [X] Exhibit A. Origin and Breeding History of the Variety
b. [X] Exhibit B. Statement of Distinctness
c. [X] Exhibit C. Objective Description of Variety
d. [X] Exhibit D. Additional Description of the Variety *(Optional)*
e. [X] Exhibit E. Statement of the Basis of the Owner's Ownership
f. [X] Voucher Sample *(2,500 viable untreated seeds or, for tuber propagated varieties, verification that tissue culture will be deposited and maintained in an approved public repository)*
g. [X] Filing and Examination Fee ($2,705), made payable to "Treasurer of the United States" *(Mail to the Plant Variety Protection Office)*

19. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE SOLD AS A CLASS OF CERTIFIED SEED? *See Section 83(a) of the Plant Variety Protection Act)*
[X] YES *(If "yes", answer items 20 and 21 below)* [ ] NO *(If "no", go to item 22)*

20. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF CLASSES? [X] YES [ ] NO
IF YES, WHICH CLASSES? [X] FOUNDATION [X] REGISTERED [X] CERTIFIED

21. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS? [ ] YES [X] NO
IF YES, SPECIFY THE NUMBER 1,2,3, *etc.* [ ] FOUNDATION [ ] REGISTERED [ ] CERTIFIED
(If additional explanation is necessary, please use the space indicated on the reverse.)

22. 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?
[X] YES [ ] NO
IF YES, YOU MUST PROVIDE THE DATE OF FIRST SALE, DISPOSITION, TRANSFER, OR USE FOR EACH COUNTRY AND THE CIRCUMSTANCES. *(Please use space indicated on reverse.)*

23. IS THE VARIETY OR ANY COMPONENT OF THE VARIETY PROTECTED BY INTELLECTUAL PROPERTY RIGHT *(PLANT BREEDER'S RIGHT OR PATENT)*?
[ ] YES [X] NO
IF YES, PLEASE GIVE COUNTRY, DATE OF FILING OR ISSUANCE AND ASSIGNED REFERENCE NUMBER. *(Please use space indicated on reverse.)*

24. The owners declare that a viable sample of basic seed of the variety will be furnished with application and will be replenished upon request in accordance with such regulations as may be applicable, or for a tuber propagated variety a tissue culture will be deposited in a public repository and maintained for the duration of the certificate.

The undersigned owner(s) is(are) the owner of this sexually reproduced or tuber propagated plant variety, and believe(s) that the variety is new, distinct, uniform, and stable as required in Section 42, and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act.

Owner(s) is(are) informed that false representation herein can jeopardize protection and result in penalties.

SIGNATURE OF OWNER		SIGNATURE OF OWNER	
Richard C. Heimsch		Robert S. Zemetra	
NAME *(Please print or type)*		NAME *(Please print or type)*	
Richard C. Heimsch		Robert S. Zemetra	
CAPACITY OR TITLE	DATE	CAPACITY OR TITLE	DATE
IAES Director	10/2/02	Professor	9/27/02

S&T-470 (07-01) designed by the Plant Variety Protection Office with WordPerfect 9.0. Replaces STD-470 (04-01) which is obsolete. *(See reverse for instructions and information collection burden statement)*

INSTRUCTIONS

GENERAL: To be effectively filed with the Plant Variety Protection Office (PVPO), **ALL** of the following items must be **received** in the PVPO: (1) Completed application form signed by the owner; (2) completed exhibits A, B, C, E; (3) for a seed reproduced variety at least 2,500 viable untreated seeds, for a hybrid variety at least 2,500 untreated seeds of each line necessary to **reproduce** the variety, or for tuber reproduced varieties verification that a viable *(in the sense that it will reproduce an entire plant)* tissue culture will be deposited and maintained in an approved public repository; (4) check drawn on a U.S. bank for $2,705 ($320 filing fee and $2,385 examination fee), payable to "Treasurer of the United States" *(See Section 97.6 of the Regulations and Rules of Practice.)* Partial applications will be held in the PVPO for not more than 90 days, then returned to the applicant as unfiled. Mail application and other requirements to Plant Variety Protection Office, AMS, USDA, Room 401, NAL Building, 10301 Baltimore Avenue, Beltsville, MD 20705-2351. Retain one copy for your files. All items on the face of the application are self explanatory unless noted below. Corrections on the application form and exhibits must be initialed and dated. **DO NOT** use masking materials to make corrections. If a certificate is allowed, you will be requested to send a check payable to "Treasurer of the United States" in the amount of $320 for issuance of the certificate. Certificates will be issued to owner, not licensee or agent.

Plant Variety Protection Office
Telephone: (301) 504-5518
FAX: (301) 504-5291
Homepage: http://www.ams.usda.gov/science/pvpo/pvp.htm

ITEM

18a. Give:
(1) the genealogy, including public and commercial varieties, lines, or clones used, and the breeding method;
(2) the details of subsequent stages of selection and multiplication;
(3) evidence of uniformity and stability; and
(4) the type and frequency of variants during reproduction and multiplication and state how these variants may be identified

18b. Give a summary of the variety's distinctness. Clearly state how this application variety may be distinguished from all other varieties in the same crop. If the new variety is most similar to one variety or a group of related varieties:

(1) identify these varieties and state all differences objectively;
(2) attach statistical data for characters expressed numerically and demonstrate that these are clear differences; and
(3) submit, if helpful, seed and plant specimens or photographs (prints) of seed and plant comparisons which clearly indicate distinctness.

18c. Exhibit C forms are available from the PVPO Office for most crops; specify crop kind. Fill in Exhibit C (Objective Description of Variety) form as completely as possible to describe your variety.

18d. Optional additional characteristics and/or photographs. Describe any additional characteristics that cannot be accurately conveyed in Exhibit C. Use comparative varieties as is necessary to reveal more accurately the characteristics that are difficult to describe, such as plant habit, plant color, disease resistance, *etc.*

18e. Section 52(5) of the Act requires applicants to furnish a statement of the basis of the applicant's ownership. An Exhibit E form is available from the PVPO.

19. If "Yes" is specified *(seed of this variety be sold by variety name only, as a class of certified seed)*, the applicant **MAY NOT** reverse this affirmative decision after the variety has been sold and so labeled, the decision published, or the certificate issued. However, if "No" has been specified, the applicant may change the choice. *(See Regulations and Rules of Practice, Section 97.103).*

22. *See Sections 41, 42, and 43 of the Act and Section 97.5 of the regulations for eligibility requirements.*

23. *See Section 55 of the Act for instructions on claiming the benefit of an earlier filing date.*

21. CONTINUED FROM FRONT *(Please provide a statement as to the limitation and sequence of generations that may be certified.)*

~~**22. CONTINUED FROM FRONT** *(Please provide the date of first sale, disposition, transfer, or use for each country and the circumstances, if the variety*~~ *(including any harvested material) or a hybrid produced from this variety has been sold, disposed of, transferred, or used in the U.S. or other countries.)*

Sale of first foundation seed in United States, October 25, 2001

23. CONTINUED FROM FRONT *(Please give the country, date of filing or issuance, and assigned reference number, if the variety or any component of the variety is protected by intellectual property right (Plant Breeder's Right or Patent).)*

NOTES: It is the responsibility of the applicant/owner to keep the PVPO informed of any changes of address or change of ownership or assignment or owner's representative during the life of the application/certificate. There is no charge for filing a change of address. The fee for filing a change of ownership or assignment or any modification of owner's name is specified in Section 97.175 of the regulations. *(See Section 101 of the Act, and Sections 97.130, 97.131, 97.175(h) of the Regulations and Rules of Practice.)*

To avoid conflict with other variety names in use, the applicant must check the appropriate recognized authority. For example, for agricultural and vegetable crops, contact: Seed Branch, AMS, USDA, Room 213, Building 306, Beltsville Agricultural Research Center--East, Beltsville, MD 20705. Telephone: (301) 504-8089. http://www.ams.usda.gov/lsg/seed.htm

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0581-0055. The time required to complete this information collection is estimated to average 3.0 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, sex, religion, age, disability, political beliefs, sexual orientation, or marital or family status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at 202-720-2600 (voice and TDD).

To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 14th and Independence Avenue, SW, Washington, DC 20250-9410 or call 202-720-5964 (voice and TDD). USDA is an equal opportunity provider and employer.

EXHIBIT A. ORIGIN AND BREEDING HISTORY OF HUBBARD

Hubbard originated from a F_4 headrow from the cross 'Hill 81'/'Augusta' made in 1986. Hill 81, ('Yamhill'/'Hyslop'), is a soft white common winter wheat developed by the Oregon Agricultural Experiment Station in cooperation with the USDA-ARS (4). Augusta, ('Genesee'/'Redcoat',B2747//'Yorkstar'), is a soft white common winter wheat developed by the Michigan Agricultural Experiment Station in cooperation with the USDA-ARS (2). The Hill 81/Augusta population was bulked in the $F_1 - F_3$ generations and was observed to segregate for height in both the F_2 and F_3 generations. The selected F_4 headrow was designated ID86-10420A and selected based on stripe rust resistance, uniformity in height, percent whole grain protein and grain hardness based on NIR (near-infrared) evaluation. ID86-10420A was then evaluated for 7 years in replicated yield trials. The $F_5 - F_8$ generations were evaluated for stripe rust resistance, height, heading date, test weight, and the end-use quality parameters percent flour protein, NIR hardness, percent flour yield, percent break flour yield, sugar snap cookie diameter and percent flour ash. ID86-10420A was evaluated for all the listed traits each generation with the only difference being the number of sites the line was grown in each year. In 1994, ID86-10420A was entered in the Western Regional White Winter Wheat Nursery and evaluated for three years. ID86-10420A was entered for evaluation in the Tri-State Extension cereal testing nursery in 1996 and evaluated for four years. In 1999, ID86-10420A was evaluated by the Pacific Northwest Wheat Quality Council for its end-use quality. Heads were collected in 1998 and grown during the 1998-1999 growing season at Moscow, Idaho to produce breeder seed. Hubbard has been examined for uniformity and absence of segregation since it was placed in advanced line testing in 1998. It was

observed to be uniform and stable over three generations of seed increase (pre-breeder, breeder and foundation) from 1999 to 2001. Taller (5 to 10 cm), awned variants with head morphology similar to Hubbard have been observed in foundation seed fields of Hubbard at a frequency of 2-4% variants per acre. This variation is genetic and has been observed in Hill 81, one of the parents of Hubbard.

EXHIBIT B. NOVELTY STATEMENT

Hubbard is intended for the moderate to high rainfall areas of the Pacific Northwest and is most similar to the soft white winter wheat cultivar Lambert (6). Hubbard can be differentiated from Lambert based on peduncle length. Hubbard has an average peduncle length of 20.8 cm compared to Lambert with an average peduncle length of 14.7 cm. This difference is based on results from two locations (Moscow, ID and Tensed, ID) grown in 2002-2003 (Exhibit B, Table 1) where 100 plants for each cultivar were measured for peduncle length. Significant differences were found for peduncle length at both locations (Exhibit B, Table 2) based on a one-way analysis of variance.

Hubbard can be further differentiated from Lambert based on days to head emergence. Hubbard is 3-4 days later than Lambert in date of head emergence (Exhibit B, Table 3) based on heading date data collected over ten years in Moscow, Idaho. Date of head emergence or anthesis was taken for each plot by visually estimating when 50% of the heads had emerged on the plant tillers in the plot. Head emergence was considered to have occurred when the base of the head was visible above the collar of the flag leaf. Data for each year is based on the mean date of three replications. Date of head emergence was calculated using the Julian calendar. Heading date for the two cultivars was compared using a paired t-test and Hubbard was found to head significantly later than Lambert (T value 5.51, $P<0.001$ at 9 df).

Molecular markers can also be used to differentiate Hubbard from Lambert. Using SSR markers developed by Röder et al. (5), Hubbard can be differentiated from Lambert with the following markers: gwm95, gwm 148, gwm 190, gwm 282 and gwm

389. Approximate base pair size for the PCR products for these markers for Hubbard and Lambert are show in Exhibit B, Table 4. PCR product size was determined using an ABI 3700 DNA sequencer (Applied Biosystems, Foster City, CA).

Exhibit B, Table 1. Location data for peduncle length measurements in 2002-2003.

Location	Date planted	Date data collected	Date harvested
Moscow, ID	10/10/02	7/10/03	8/6/03
Tensed, ID	10/15/02	7/15/03	8/21/03

Exhibit B, Table 2. Statistical analysis on peduncle length differences between Hubbard and Lambert wheat grown in Moscow, ID and Tensed, ID in 2002-2003. All data based on measurement of 100 individual plants per site.

Location	mean peduncle length (cm)	range peduncle length (cm)	F test	Prob.
Moscow				
Hubbard	19.1	11 – 27	24.64	.001
Lambert	16.6	7 - 22		
Tensed				
Hubbard	21.8	14 – 30	312.05	.001
Lambert	12.8	6 – 22		

Exhibit B, Table 3. Heading date comparison between Hubbard and Lambert from data collected over ten years of Advanced Yield Testing Trials grown in Moscow, Idaho. Heading date is based on the Julian calendar and the comparison was done using a paired t-test.

	year										
cultivar	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	mean
Hubbard	166	159	162	165	165	165	166	168	172	170	165.8
Lambert	161	153	157	162	165	161	165	162	168	168	162.2

Paired t-test (T value 5.51, $P<0.001$ at 9 df)

Exhibit B, Table 4. PCR product size (approximate number of base pairs) for SSR markers used to differentiate Hubbard and Lambert wheat.

SSR marker	Hubbard	Lambert
gwm95	118	111
gwm148	163	148
gwm190	212	218
gwm282	194	208
gwm389	118	136

REPRODUCE LOCALLY. Include form number and date on all reproductions.

Form Approved - OMB No. 0581-0

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U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY
PLANT VARIETY PROTECTION OFFICE
BELTSVILLE, MD 20705

EXHIBIT C
(Wheat)

OBJECTIVE DESCRIPTION OF VARIETY
WHEAT (*Triticum* spp.)

NAME OF APPLICANT(S) University of Idaho	FOR OFFICIAL USE ONLY
ADDRESS (*Street and No. or RD No., City, State, and Zip Code*) Idaho Agricultural Experiment Station College of Agriculture University of Idaho Moscow, ID 83844-2331	PVPO NUMBER VARIETY NAME Hubbard TEMPORARY OR EXPERIMENTAL DESIGNATION ID86-10420A

PLEASE READ ALL INSTRUCTIONS CAREFULLY: Place the appropriate number that describes the varietal character of this variety in the boxes below. Place a zero in the first box (e.g. [0][9][9] or [0][9]) when number is either 99 or less or 9 or less respectively. Data for quantitative plant characters should be based on a minimum of 100 plants. Comparative data should be determined from varieties entered in the same trial. Royal Horticultural Society or any recognized color standard may be used to determine plant colors; designate system used:
Please answer all questions for your variety; lack of response may delay progress of your application.

1. KIND:

[1] 1=Common 2=Durum 3=Club 4=Other (SPECIFY) : _____

2. VERNALIZATION:

[2] 1=Spring 2=Winter 3=Other (SPECIFY) : _____

3. COLEOPTILE ANTHOCYANIN:

[1] 1=Absent 2=Present

4. JUVENILE PLANT GROWTH:

[2] 1=Prostrate 2=Semi-erect 3=Erect

5. PLANT COLOR (boot stage):

[3] 1 = Yellow-Green 2 = Green 3 = Blue-Green

6. FLAG LEAF (boot stage):

[1] 1 = Erect 2 = Recurved [2] 1 = Not Twisted 2 = Twisted

7. EAR EMERGENCE:

[0][0] Number of Days Earlier Than Madsen *

[0][4] Number of Days Later Than Lambert *

8. ANTHER COLOR:

[1] 1 = Yellow 2 = Purple

9. PLANT HEIGHT (from soil to top of head, excluding awns):

[1 1] cm Taller Than Madsen *

[- -] cm Shorter Than none *

* Relative to a PVPO-Approved Commercial Variety Grown in the Same Trial

10. STEM:

A. ANTHOCYANIN

[1] 1= Absent 2=Present

B. WAXY BLOOM

[2] 1=Absent 2=Present

C. HAIRINESS (last internode of rachis)

[2] 1=Absent 2=Present

D. INTERNODE (SPECIFY NUMBER)

[1] 1= Hollow 2=Semi-solid 3=Solid

E. PEDUNCLE

2 [~~1~~] 1=Absent 2=Present

[21] cm Length

MAH 3/8/2004

11. HEAD (at Maturity):

A. DENSITY

[3] 1=Lax 2=Middense 3= Dense

B. SHAPE

[2] 1 = Tapering 2= Strap 3 = Clavate 4 = Other (SPECIFY): _____

C. CURVATURE

[2] 1 = Erect 2 = Inclined 3 = Recurved

D. AWNEDNESS

[4] 1 = Awnless 2 = Apically Awnletted 3 = Awnletted 4 = Awned

12. GLUMES (at Maturity):

A. COLOR

[1] 1 = White 2 = Tan 3 = Other (SPECIFY) : _____

B. SHOULDER

[1] 1 = Wanting 2 = Oblique 3 = Rounded 4 = Square 5 = Elevated 6 = Apiculate

C. BEAK

[3] 1 = Obtuse 2 = Acute 3 =Acuminate

D. LENGTH

[3] 1 = Short (ca. 7mm) 2 = Medium (ca. 8mm) 3 = Long (ca. 9mm)

10

12. GLUMES (at Maturity) *Continued*:

200300007

E. WIDTH

[3] 1 = Narrow (ca. 3mm) 2 = Medium (ca. 3.5mm)
3 = Wide (ca. 4mm)

13. SEED:

A. SHAPE

[1] 1 = Ovate 2 = Oval 3 = Elliptical

B. CHEEK

[1] 1=Rounded 2=Angular

E. Color

[1] 1=White 2= Amber 3= Red
4= OTHER (Specify)

F. TEXTURE

[2] 1=Hard 2=Soft

C. BRUSH

[2] 1=Short 2=Medium 3=Long

[1] 1 = Not Collared 2 = Collared

D. CREASE

[1] 1 = Width 60% or less of Kernel
2 = Width 80% or less of Kernel
3 = Width Nearly as Wide as Kernel

[2] 1 = Depth 20% or less of Kernel
2 = Depth 35% or less of Kernel
3 = Depth 50% or less of Kernel

G. PHENOL REACTION *(see instructions)*:

[4] 1 = Ivory 2 = Fawn
3 = Light Brown 4 = Dark Brown
5 = Black

14. DISEASE: (0=Not Tested; 1=Susceptible; 2=Resistant; 3=Intermediate; 4=Tolerant)

PLEASE INDICATE THE SPECIFIC RACE OR STRAIN TESTED

[1] Stem Rust *(Puccinia graminis* f. sp. *tritici)*

[2] Stripe Rust *(Puccinia striiformis)*

[0] Tan Spot *(Pyrenophora tritici-repentis)*

[0] Halo Spot *(Selenophoma donacis)*

[0] *Septoria nodorum* (Glume Blotch)

[0] *Septoria avenae* (Speckled Leaf Disease)

[0] *Septoria tritici* (Speckled Leaf Blotch)

[0] Scab (*Fusarium* spp.)

[1] Leaf Rust *(Puccinia recondita* f. sp. *tritici)*

[0] Loose Smut *(Ustilago tritici)*

[0] Flag Smut *(Urocystis agropyri)*

[1] Common Bunt *(Tilletia tritici* or *T. laevis)*

[1] Dwarf Bunt *(Tilletia controversa)*

[0] Karnal Bunt *(Tilletia indica)*

[0] Powdery Mildew *(Erysiphe graminis* f. sp. *tritici)*

[0] "Snow Molds"

11

14. Disease *(Continued)* (0=Not Tested; 1=Susceptible; 2=Resistant; 3=Intermediate; 4=Tolerant)

PLEASE INDICATE THE SPECIFIC RACE OR STRAIN TESTED

0	"Black Point" (Kernel Smudge)	0	Common Root Rot *(Fusarium, Cochliobolus* and *Bipolaris* spp.*)*
0	Barley Yellow Dwarf Virus (BYDV)	0	Rhizoctonia Root Rot *(Rhizoctonia solani)*
0	Soilborne Mosaic Virus (SBMV)	0	Black Chaff *(Xanthomonas campestris* pv. *translucens)*
0	Wheat Yellow (Spindle Streak) Mosaic Virus	0	Bacterial Leaf Blight *(Pseudomonas syringae* pv. *syringae)*
1	Wheat Streak Mosaic Virus (WSMV)	0	Other (SPECIFY)
1	Other (SPECIFY) Pseudocercosporella foot rot	0	Other (SPECIFY)
0	Other (SPECIFY)	0	Other (SPECIFY)
0	Other (SPECIFY)	0	Other (SPECIFY)

15. INSECT: (0=Not Tested; 1=Susceptible; 2=Resistant; 3=Intermediate; 4=Tolerant)

PLEASE SPECIFY BIOTYPE (where needed)

1	Hessian Fly *(Mayetiola destructor)*	0	Other (SPECIFY)
0	Stem Sawfly *(Cephus* spp.)	0	Other (SPECIFY)
1	Cereal Leaf Beetle *(Oulema melanopa)*	0	Other (SPECIFY)
1	Russian Aphid *(Diuraphis noxia*	0	Other (SPECIFY)
0	Greenbug *(Schizaphis graminum)*	0	Other (SPECIFY)
1	Aphids	0	Other (SPECIFY)

16. ADDITIONAL INFORMATION ON ANY ITEM ABOVE, OR GENERAL COMMENTS

EXHIBIT D. ADDITIONAL DESCRIPTION OF HUBBARD

Hubbard is a tall semi-dwarf wheat that averages 6 cm taller than Lambert and 11 cm taller than Madsen. Hubbard is blue-green in color (Munsell 7.5GY 4/2) with an erect flag leaf with a slight twist that tends to lay perpendicular to the stem after full extension of the spike It can have some height variation with 2-4% tall variants each year, similar to its parent Hill 81. Heading date for Hubbard is intermediate (168 day of year DOY) similar to that observed with Madsen (168 DOY) and later than Lambert (164 DOY) (Exhibit B, Table 3; Exhibit D, Table 1). Hubbard has good to excellent straw strength showing little or no lodging under both rainfed and irrigated conditions. It has a moderate level of winter hardiness, similar to that observed in its parent Hill 81. Glumes of Hubbard are awned and seed is intermediate in size, white, soft with a mid-deep crease. Hubbard was tested as ID86-10420A in the Western Regional White Winter Wheat Nursery for three years (1995-1998).

Hubbard is adapted to the intermediate to high rainfall areas of the Pacific Northwest. It is high yielding under both rainfed and irrigated conditions equaling or exceeding the yield of Stephens (3), Madsen and Lambert in advanced yield testing with a 7 year (39 site/years) average of 6786 kg ha^{-1} rainfed yield and a 7 year (20 site/year) average yield of 9877 kg ha^{-1} irrigated (Exhibit D, Table 2). This is in comparison to the rainfed and irrigated yields of Stephens (6383, 9944 kg ha^{-1}), Madsen (6652, 9339 kg ha^{-1}) and Lambert (6786, 9608 kg ha^{-1}) respectively. In the Western Regional White Winter Wheat Nursery, Hubbard (6988 kg ha^{-1}) matched the yield of Madsen (6988 kg ha^{-1}) and was slightly greater in yield than Stephens (6719 kg ha^{-1}) over 3 years of testing (28 site/years (Exhibit D, Table 4). In extension testing in northern Idaho, Hubbard was the

highest yielding line over 4 years (18 site/years) with a yield of 6249 kg ha^{-1} compared to 5778 kg ha^{-1} for Stephens, 5980 kg ha^{-1} for Madsen, and 6114 kg ha^{-1} for Lambert. Hubbard had an equal to slightly higher test weight under both rainfed and irrigated conditions than Stephens, Madsen, and Lambert. In 7 years (38 site/years) of advanced testing, Hubbard had an average test weight of 770 kg m^{-3} rainfed and 770 kg m^{-3} irrigated compared to Stephens (753, 750 kg m^{-3}), Madsen (764, 753 kg m^{-3}) and Lambert (762, 753 kg m^{-3}) (Exhibit D, Table 3). In the Western Regional White Winter Wheat Nursery, Hubbard had a slightly higher average test weight (790 kg m^{-3}) compared to Madsen (786 kg m^{-3}) and Stephens (779 kg m^{-3}) (Exhibit D, Table 4).

Hubbard has good to excellent end-use quality for a soft white winter wheat. The percent flour protein for Hubbard (8.1% rainfed, 9.2% irrigated) is similar to that found for Stephens (8.1% rainfed, 9.3% irrigated) for 31 site/years of rainfed and 18 site/years for irrigated advanced line testing (Exhibit D, Table 5). For near-infrared (NIR) kernel hardness, Hubbard (19.8) was most similar to Stephens (20.0) and lower than both Madsen (23.8) and Lambert (24.3) over 30 site/years of advanced line rainfed testing in Idaho. Under irrigated conditions in Idaho (14 site/years), similar differences for NIR hardness were observed with Hubbard (20.2) and Stephens (20.3) being lower than Madsen (25.2) and Lambert (26.2). Percent break flour yield for Hubbard is favorable under both rainfed and irrigated conditions averaging 42.4% rainfed and 39.2% irrigated compared to Stephens (38.0%, 36.3%), Madsen (38.7%, 37.3%) and Lambert (41.0%, 39.2%) in 3 years (22 rainfed site/years and 11 irrigated site years) of advanced line testing. In regional testing, Hubbard (24.4%) was slightly greater than both Stephens (22.8%) and Madsen (23.6%) for percent break flour yield (Exhibit D, Table 6). Average

percent flour ash was similar for Hubbard (.37%), Stephens (.37%) and Madsen (.36%) over three years of regional testing (Exhibit D, Table 6). For baking quality, Hubbard performs well in both the sugar snap cookie test and the sponge cake test. Hubbard was similar to Stephens and Lambert for cookie diameter (8.7 cm, 8.8 cm and 8.6 cm respectively) and exceeded Madsen (8.5 cm) in 29 site/years of advanced line testing under rainfed conditions (Exhibit D, Table 5). Under irrigated conditions (19 site/years), Hubbard had a greater average cookie diameter (8.9 cm) than Stephens (8.7 cm), Madsen (8.6 cm) or Lambert (8.4 cm) (Exhibit D, Table 5). In regional testing, Hubbard had a greater cookie diameter (8.9 cm) and sponge cake volume (1258 cm^3) than both Stephens (8.7 cm, 1213 cm^3) and Madsen (8.6 cm, 1217 cm^3) (Exhibit D, Table 6). In Pacific Northwest Wheat Quality Council testing, Hubbard was found to have favorable end-use quality for a soft white winter wheat.

Hubbard has moderate resistance to stripe rust based on three years of regional testing (1995-1997). In the Western Regional Soft Winter Wheat Nursery disease trial at Mt. Vernon, Washington at growth stages 5-7 (depending on the year), Hubbard's percent stripe rust infection ranged from 0% to 2% with infection type either 2 or 2*5 while Stephens' percent infection ranged from 5% to 20% with an infection type of 2=5 and Madsen's percent infection ranged from 0% to 5% with an infection type of 2 (Exhibit D, Table 7). Hubbard is susceptible to cephalosporium stripe (caused by *Hymenula cerealis* Ellis & Everh.), strawbreaker footrot (caused by *Pseudocercosporella herpotrichoides* (Fron) Deighton), septoria tritici blotch (caused by *Septoria tritici* Roberge in Dsmaz.) common bunt (caused by *Tilletia tritici* (Bjerk.) G. Wint. In

Rabenh.), and dwarf bunt (caused by *Tilletia controversa* Kühn in Rabenh.). Hubbard will show little or no physiological leaf spot under cool, wet spring field conditions.

References

1. Allan, R.E., C.J. Peterson, Jr., G.L. Rubenthaler, R.F. Line, and D.E. Roberts. 1989. Registration of 'Madsen' wheat. Crop Sci. 29: 1575.
2. Everson, E.H., R.D. Freed, P.K. Zwer, L.W. Morrison, B.L. Marchetti, J.L. Clayton, and W.T. Yamazaki. 1986. Registration on 'Augusta' wheat. Crop Sci. 26: 201-202.
3. Kronstad, W.E., C.R. Rhode, M.F. Kolding, and R.J. Metzger. 1978. Registration of 'Stephens' wheat. Crop Sci. 18:1097
4. Kronstad, W.E., R.J. Metzger, W.L. McCuistion, N.H. Scott, C.R. Rohde, and M.F. Kolding. 1982. Registration of 'Hill 81' wheat. Crop Sci. 22: 1266.
5. Röder, M.S., V. Korzum, K. Wendehake, J. Plaschke, T.-H. Tixier, P. Levoy, and M.W. Ganal. 1998. A microsatellite map of wheat. Genetics 149: 2007-2023.
6. Zemetra, R.S., C.T. Liu, W.E. Kronstad, M. Lauver, and N. Haugerud. 1995. Registration of 'Lambert' wheat. Crop Sci. 35: 1222.

Exhibit D, Table 1. Mean height and heading date for Hubbard from the advanced yield trials in Idaho (1995-2001) in comparison to the cultivars Madsen and Lambert. Height is divided into rainfed northern Idaho sites and irrigated southern Idaho sites. Heading date is just for the Moscow site.

	height (cm) rainfed	height (cm) irrigated	heading date rainfed (Julian)	heading date irrigated (Julian)
site/years	39	19	4	4
cultivars				
Stephens	84	94	165	165
Madsen	84	94	168	168
Lambert	91	99	164	164
Hubbard	99	107	168	167

Exhibit D, Table 2. Mean yield (kg ha^{-1}) of Hubbard over six years of advanced line testing (1995-2001) under rainfed and irrigated conditions in Idaho in comparison to Stephens, Madsen and Lambert.

Year	1995	1996	1997	1998	1999	2000	2001	mean
rainfed								
site/years	5	5	5	6	6	6	6	39
cultivars								
Stephens	6181	6383	7122	6786	5241	7525	5711	6383
Madsen	6181	6047	7458	7928	5980	7727	5577	6652
Lambert	6517	6719	7660	7189	5711	7996	5778	6786
Hubbard	7256	5980	7458	7122	6316	7592	5980	6786
irrigated								
site/years	3	3	3	2	3	3	3	20
cultivars								
Stephens	9608	10280	9474	9406	10347	11557	8667	9944
Madsen	9205	9272	9406	8735	10011	10817	7928	9339
Lambert	9742	10280	9877	8197	9205	11086	8600	9608
Hubbard	10078	9944	10750	9406	8600	11691	8667	9877

Exhibit D, Table 3. Mean test weight (kg m^{-3}) of Hubbard over six years of advanced line testing (1995-2001) under rainfed and irrigated conditions in Idaho in comparison to Stephens, Madsen and Lambert.

Year	1995	1996	1997	1998	1999	2000		mean
rainfed								
site/years	5	4	5	6	6	6	6	38
cultivars								
Stephens	782	741	761	715	736	770	768	753
Madsen	782	752	772	752	748	779	766	764
Lambert	790	757	771	730	748	772	771	762
Hubbard	797	757	779	734	759	781	786	770
irrigated								
site/years	3	3	3	2	3	3	3	17
cultivars								
Stephens	771	736	692	762	759	775	761	750
Madsen	763	748	700	764	761	773	761	753
Lambert	769	740	685	781	761	779	758	753
Hubbard	771	766	731	794	766	785	780	770

Exhibit D, Table 4. Mean yield (kg ha^{-1}) and test weight (kg m^{-3}) of Hubbard in the Western Regional White Winter Wheat Nursery (1995-1997) in comparison to Stephens and Madsen.

Year	1995		1996		1997		mean	
	yield	test wt.	yield	test wt.	yield	test wt.	yield	test wt.
site/years	8		9		11		28	
cultivars								
Stephens	7122	793	5644	762	7324	779	6719	779
Madsen	7324	794	6249	771	7391	793	6988	786
Hubbard	7458	798	5845	777	7592	790	6988	790

Exhibit D, Table 5. Mean milling and baking quality of Hubbard in advanced line testing under rainfed and irrigated conditions (1995-2001) in comparison to Stephens, Madsen and Lambert. Quality characteristics being compared include percent flour protein, near infra-red hardness, percent break flour and cookie diameter (cm).

Trait	% protein	hardness	% break flour	cookie dia. (cm)
site/years	31	30	22	29
rainfed				
cultivars				
Stephens	8.4	21.8	37.9	8.8
Madsen	9.0	25.9	38.8	8.5
Lambert	7.8	26.6	41.8	8.7
Hubbard	8.4	21.9	42.4	8.8
irrigated				
site/years	18	14	11	19
cultivars				
Stephens	9.6	22.0	36.8	8.6
Madsen	9.5	29.8	39.6	8.6
Lambert	9.4	27.9	41.8	8.5
Hubbard	9.3	20.5	41.3	8.9

Exhibit D, Table 6. Mean milling and baking quality of Hubbard in the Western Regional White Winter Nursery (1995-1997) in comparison to Stephens and Madsen. Quality characteristics being compared include percent flour protein (%fpro), near infra-red hardness, percent break flour (%brfl), percent flour ash (FASH), cookie diameter (Ck dia) (cm) and sponge cake volume (Spc vol) (cm^3).

Trait	% fpro	hard.	%brfl	FASH	Ck dia (cm)	Spc vol (cm^3)
cultivars						
Stephens	9.6	14	22.8	.37	8.7	1213
Madsen	10.3	16	23.6	.36	8.6	1217
Hubbard	9.6	16	24.4	.37	8.9	1258

Exhibit D, Table 7. Stripe rust ratings for Hubbard in the Western Regional White Winter Wheat Nursery (1995-1997) in comparison to Stephens and Madsen. Stripe rust ratings are given as percent of foliage covered by rust (%) and by infection types (T) with a range of 0-9 from the Mt. Vernon, Washington nursery.

year	1995		1996		1997	
	(%)	(T)	(%)	(T)	(%)	(T)
cultivars						
Stephens	5	2=5	20	2=3	10	2=5
Madsen	5	2	0	0	1	2
Hubbard	2	2	5	2*5	0	0

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Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF APPLICANT(S)
University of Idaho

2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER
ID86-10420A

3. VARIETY NAME
Hubbard

4. ADDRESS *(Street and No., or R.F.D. No., City, State, and ZIP, and Country)*
Idaho Agricultural Experiment Station
College of Agriculture
University of Idaho
Moscow, ID 83844-2331

5. TELEPHONE *(include area code)*
208-885-7173

6. FAX *(include area code)*
208-885-6654

7. PVPO NUMBER
200300007

8. Does the applicant own all rights to the variety? *Mark an "X" in appropriate block.* **If no, please explain.** [X] YES [ ] NO

9. Is the applicant (individual or company) a U.S. national or U.S. based company? [X] YES [ ] NO
If no, give name of country

10. Is the applicant the original owner? [X] YES [ ] NO *If no, please answer one of the following:*

a. If original rights to variety were owned by individual(s), is (are) the original owner(s) a U.S. national(s)?
[ ] YES [ ] NO **If no, give name of country**

b. If original rights to variety were owned by a company(ies), is(are) the original owner(s) a U.S. based company?
[ ] YES [ ] NO **If no, give name of country**

11. Additional explanation on ownership *(if needed, use reverse for extra space)*:

PLEASE NOTE:

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1. 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.

2. 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.

3. 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.

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