No. 201100053

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 purposes, 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 SPECIFIED BY THE OWNER OF THE RIGHTS. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

MUSTARD, INDIA

'Kodiak'

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 twenty-fifth day of June, in the year* ***two thousand and fourteen.***

PLANT VARIETY PROTECTION ACT · UNITED STATES DEPARTMENT OF AGRICULTURE

Attest:

Commissioner

Secretary 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
92.BJ.22.B.2

3. VARIETY NAME
Kodiak

4. ADDRESS *(Street and No., or R.F.D. No., City, State, and ZIP Code, and Country)*
Office of Technology Transfer
PO Box 443003
MorillHall 414
Moscow, Idaho, 83844-3003

5. TELEPHONE *(include area code)*
(208) 885 4550

6. FAX *(include area code)*
(208) 885 4551

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7. IF THE OWNER NAMED IS NOT A "PERSON", GIVE FORM OF ORGANIZATION *(corporation, partnership, association, etc.)*
University of Idaho

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)*

Jack Brown
PSES, CALS
PO Box 442339
University of Idaho
Moscow, ID, 83844-2339

Include on all communications: Gaylene Anderson
Office of Technology Transfer
PO Box 443003
Morrill Hall 414
Moscow, ID 83844-3003

FEES RECEIVED

FILING AND EXAMINATION FEE
$ 4,382.00
DATE 11/10/2010

CERTIFICATE FEE:
$
DATE

11. TELEPHONE (Include area code)
(208) 885 7078

12. FAX (Include area code)
(208) 885 7760

13. E-MAIL
jbrown@uidaho.edu & gaylene@uidaho.edu

14. CROP KIND *(Common Name)*
India mustard

16. FAMILY NAME *(Botanical)*
Brassicaceae

15. GENUS AND SPECIES NAME OF CROP
Brassica juncea L.

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

18. DOES THE VARIETY CONTAIN ANY TRANSGENES? *(OPTIONAL)*
☐ YES X NO
IF SO, PLEASE GIVE THE ASSIGNED USDA-APHIS REFERENCE NUMBER FOR THE APPROVED PETITION TO DEREGULATE THE GENETICALLY MODIFIED PLANT FOR COMMERCIALIZATION. _____

19. 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 Exhibit F. Declaration Regarding Deposit
g. X Voucher Sample *(3,000 viable untreated seeds or, for tuber propagated varieties, verification that tissue culture will be deposited and maintained in an approved public repository)*
h. X Filing and Examination Fee ($4,382), made payable to "Treasurer of the United States" *(Mail to the Plant Variety Protection Office)*
CC (Dt: 11/10/2010)

20. 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)*
X YES *(If "yes", answer items 21 and 22 below)* ☐ NO *(If "no", go to item 23)* ☐ UNDECIDED

21. 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 ☐ REGISTERED X CERTIFIED

22. 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. FOR EACH CLASS.
☐FOUNDATION ☐REGISTERED ☐CERTIFIED
(If additional explanation is necessary, please use the space indicated on the reverse.)

23. 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.)*

24. 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.)*

25. The owners declare that a viable sample of basic seed of the variety has been 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
Jack Brown

NAME *(Please print or type)*
Jack Brown

CAPACITY OR TITLE
Professor/Plant breeder

DATE
10/7/2010

SIGNATURE OF OWNER
Gaylene Anderson

NAME *(Please print or type)*
GAYLENE ANDERSON

CAPACITY OR TITLE
LICENSING ASSOCIATE

DATE
10/8/2010

(See reverse for instructions and information collection burden statement)

ST-470 (07-01-2009) designed by the Plant Variety Protection Office

2010 NOV 10 PM 6:25

GENERAL INSTRUCTIONS: 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, F; (3) for a tuber reproduced variety, 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; and (4) payment by credit card or check drawn on a U.S. bank for $4,382 ($518 filing fee and $3,864 examination fee), payable to "Treasurer of the United States" *(See Section 97.6 of the Regulations and Rules of Practice).* **NEW:** With the application for a seed reproduced variety **or by direct deposit soon after filing**, the applicant must provide at least 3,000 viable untreated seeds of the variety *per se*, and for a hybrid variety at least 3,000 untreated seeds of each line necessary to **reproduce** the variety. Partial applications will be held in the PVPO for not more than 90 days; then returned to the applicant as un-filed. 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 payment by credit card or check payable to "Treasurer of the United States" in the amount of $768 for issuance of the certificate. Certificates will be issued to owner, not licensee or agent.

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. The fees for filing a change of address; owner's representative; 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.)*

Plant Variety Protection Office
Telephone: (301) 504-5518 **FAX:** (301) 504-5291
General E-mail: PVPOmail@usda.gov
Homepage: http://www.ams.usda.gov/science/pvpo/PVPindex.htm

#201100053

SPECIFIC INSTRUCTIONS:
To avoid conflict with other variety names in use, the applicant must check the appropriate recognized authority and **provide evidence** that the permanent name of the application variety (even if it is a parental, inbred line) has been cleared by the appropriate recognized authority before the Certificate of Protection is issued. For example, for agricultural and vegetable crops, contact: U.S. Department of Agriculture, Agricultural Marketing Service, Livestock and Seed Programs, **Seed Regulatory and Testing Branch**, 801 Summit Crossing Place, Suite C, Gastonia, North Carolina 28054-2193 Telephone: (704) 810-8870. http://www.ams.usda.gov/lsg/seed.htm.

ITEM

19a. 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

19b. 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 replicated 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.

19c. 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.

19d. 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.*

19e. 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.

20. 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).*

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

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

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

23. 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.)*
Foundation seed of Kodiak was sold in April 2010 to produce certified seed.

24. 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).)*

2010 NOV 10 PM 6:36

#201100053

'Kodiak'
Condiment India Mustard
(*Brassica juncea* L.)

Exhibit A: Origin and Breeding History

'Kodiak' is a brown condiment India mustard (*Brassica juncea* L.) cultivar developed for use as a condiment spice by the Idaho Agricultural Experiment Station and officially released in March 2010. This cultivar is protected by U.S. Plant Variety Protection (PVP pending).

Kodiak is a near homozygous, pure-line condiment brown mustard cultivar that was selected for high adaptability to dry land farming regions of northern Idaho and eastern Washington. This cultivar was developed from a single plant selection made in 1993 from an F_4 population involving the cross 'Common Brown'/J.89.102. Common Brown is an old landrace cultivar of brown seed mustard that used to be grown commercially in Canada before being superseded by a single selection from the landrace called 'Blaze' in 1978 (Agriculture Canada, 1978). J.89.102 is an accession from the University of Idaho germplasm collection which originated from Agriculture and Agri-Food Canada, Saskatoon, SK, and which was identified as being highly adaptable and having high yield potential for the environmental conditions of northern Idaho.

F_1 seed from the cross Common Brown'/J.89.102,was produced in the spring of 1992 and was increased in a greenhouse in the fall of 1992 as the F_1 plant generation and spring of 1993 as the F_2 plant generation. Bulked F_3 seed (derived by open pollination of eight F_2 plants in a greenhouse) was grown in bulk progeny yield trials in 1994. At harvest, 20 single plants were selected from the bulk progeny and threshed separately for seed increase and to increase homozygosity. From the F_5 stage (1995) through the F_8 stage (1998), a modified-pedigree-bulk breeding scheme (Swanston *et al.*, 1981) was used. At each evaluation stage, 20 single plant plots were planted for seed increase and bulk progeny were evaluated in replicated yield trials. Throughout the growing season, the single plant plots were visually inspected for uniformity and homogeneity. A further 20 single plants were selected from the "best" single plant plot. Thereafter, the remainder of the single plant plot was bulk harvested, hand threshed, and the seed used to plant the following year's yield trials. This operation was repeated for three generations (F_5 to F_6, F_6 to F_7, and F_7 to F_8).

In 1999, 120 single plant selections were made from the F_9 single plant multiplication plots and each plant threshed separately. During the 1999-2000 winter season, two seeds from each plant were planted in 15 cm pots and grown to maturity in the greenhouse. Prior to flowering, each plant was bagged to minimize cross pollination. At harvest, each plant was harvested separately and evaluated for seed color. Seeds from plants with uniformly brown seed were retained and used to plant single plant plots in the spring of 2000. The growth characteristics of the single plant plots were monitored throughout the growing season and any variants discarded. At harvest, all remaining single plant plots were harvested in bulk as Breeder's seed. Foundation seed was first

planted from this Breeder Seed lot in 2007. Throughout the later stages of seed increases including pre-Breeders seed, Breeders seed, Foundation seed and Certified seed production no variants were observed over this four year period.

REFERENCES

Brown, J., J.B. Davis, D.A. Erickson, L. Seip, and T. Gosselin. 2004. Registration of 'Pacific Gold' condiment yellow mustard. *Crop Sci.* 44:2271-2272.

Swanston, J.S., R.P. Ellis, W.B.T. Thomas, and J. Brown. 1981. An opportunistic breeding scheme. *In* Proceed of the 4th International Barley Genetics Symposium, Edinburgh, Scotland, UK. pp.172-175.

#201100053

'Kodiak'
Condiment India Mustard
(*Brassica juncea* L.)

Exhibit B: Statement of Distinctness

Kodiak is most similar in plant appearance to the cultivar Pacific Gold (Brown et al., 2004), which is the only other India mustard cultivar grown in the Pacific Northwest region and the only other cultivar with a PVP submission in the US. However, Kodiak seeds are brown to dark brown in color while Pacific Gold seeds are bright yellow/orange in color (Figure 1). In addition, Kodiak plants are significantly taller than Pacific Gold plants at full bloom (Table 1).

Figure 1. Kodiak and Pacific Gold seeds.

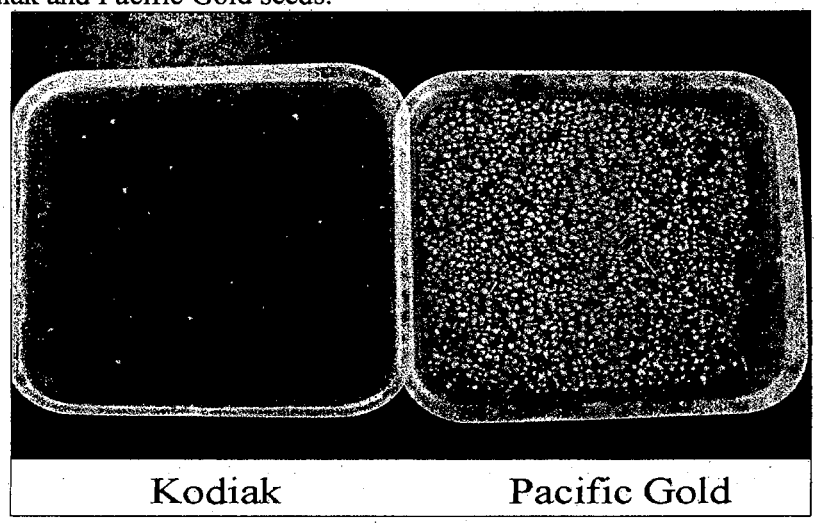

Table 1. Plant height (cm) of 'Kodiak' and 'Pacific Gold' evaluated from replicated field trials in 2007 and 2008.

	2008		2007	
Cultivar	Moscow	Genesee	Moscow	Genesee
	---------- cm ----------			
Kodiak	139.4	146.6	164.6	173.8
Pacific Gold	126.1	138.2	130.2	139.9
LSD 5%	4.23	3.76	6.01	7.93

REFERENCES

Brown, J., J.B. Davis, D.A. Erickson, L. Seip, and T. Gosselin. 2004. Registration of 'Pacific Gold' condiment yellow mustard. *Crop Sci.* 44:2271-2272.

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

OBJECTIVE DESCRIPTION OF VARIETY
INDIAN MUSTARD (*Brassica juncea*)

NAME OF APPLICANT (S)
University of Idaho
~~Idaho Agricultural Experiment Station~~

TEMPORARY OR EXPERIMENTAL DESIGNATION
92.BJ.22.B.2

VARIETY NAME
Kodiak

ADDRESS *(Street and No. or RD No., City, State, Zip Code, and Country)*
~~GALS, PO Box 44-2339~~ PO Box 443003
~~University of Idaho~~ Morrill Hall
Moscow, Idaho, 83844-~~2339~~3003
(bt: 8/12/2011)

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PVPO NUMBER
#201100053

1. SPECIES

Brassica juncea L.

2. TYPE

* _X_ Spring type ____ Winter type

3. PLANT HEIGHT (at pod maturity)

_1_ _5_ _6_ . _4_ cm Tall (compare to standard variety below)

___ ___ . ___ cm shorter than Check variety: _____ / _____

Height same as Check variety: _____ / _____

_1_ _0_ . _4_ cm taller than Check variety: _Pacific Gold_

* Height Class: _4_

1 = Short ( )
2 = Medium short ( )
3 = Medium ( )
4 = Medium tall (X)
5 = Tall ( )

4. STEM ANTHOCYANIN

_1_ 1 = Absent (1) 2 = Weak ( ) 3 = Medium ( ) 4 = Strong ( )

5. SEED COTYLEDONS (maximum width fully developed; mean of 50 graded seeds)

_3_ 1 = Narrow ( ) 2 = Medium (X) 3 = Broad ( )

6. SEEDLING GROWTH HABIT (leaf rosette)

_1_ 1 = Upright 2 = Prostrate (short photoperiod)

7. LEAVES

* 4 Margins (serration): 1 = Absent or very weak (Akela) 2 = Weak (Arvor, Jet Neuf) 3 = Medium (Primor) 4 = Strong (Candle, Kentan)

* 5 Lobing (fully developed leaf on plant or rosette)
1 = Absent or very weak ( ) 2 = Weak ( ) 3 = Medium ( )
4 = Medium Strong ( ) 5 = Strong (X)

* 3 Leaf Attachment to Stem: 1 = Fully clasping ( ) 2 = Partial clasping ( ) 3 = No Clasping (X)

* 2 Color: 1 = Light green ( ) 2 = Medium green (X) 3 = Medium dark green ( ) 4 = Dark green ( )

* 1 Glaucosity: 1 = Absent (X) 2 = Weak ( ) 3 = Weak to Medium ( ) 4 = Medium ( ) 5 = Medium to strong ( ) 6 = Strong ( )

8. FLOWERS

* 1 Flower Buds Location 1 = Buds at tip of apical meristem (X) 2 = Buds immediately below apical meristem ( )

* 2 Petal color: 1 = Pale yellow ( ) 2 = Yellow (X) 3 = Orange ( ) 4 = White ( )

1 Anther Dotting (at opening of flower; given as percentage:____)
1 = Absent (X) 2 = Few ( ) 3 = Medium ( ) 4 = Many ( )

* 4 Flowering class (Spring sown); Kodiak reaches 50% flower opening 61 days after planting, 1-2 days later than Pacific Gold
1 = Very early ()
2 = Early ()
3 = Medium early ( )
4 = Medium late (X)
5 = Late ()
6 = (Very late)

9. PODS (Slique)

* 1 Pod type: 1 = Bilateral single pod (X) 2 = Other ( )

* 2 Silique beak length: (give length: 6.2 mm) 1 = Short ( ) 2 = Medium (X) 3 = Long ( )

* 2 Pod length; (give length: 35.6 mm) 1 = Short ( ) 2 = Medium (X) 3 = Long ( )

* 2 Pod width; (give width: 4.0 mm) 1 = Narrow ( ) 2 = Medium (X) 3 = Wide ( )

* 2-3 Pod habit: 1 = Erect (Gulliver) 2 = Semi-erect to erect (X) 3 = Semi-erect (X) 4 = Horizonal to semi-erect ( ) 5 = Horizonal ( )

* 2 Pedicel length(given length: 12.1 mm): 1 = Very short ( ) 2 = Short (X) 3 = Long ( )

* 3 Ripening Class (Spring sown): 1 = Very early ( ) 2 = Early ( ) 3 = Medium (X) 4 = Late ( ) 5 = Very late ( )

* 107 Days to Maturity

* / Days earlier than Check variety: _____/_____

* Maturity same as Check variety: Lethbridge 22A

* 2 Days later than Check variety: Pacific Gold

10. SEEDS

* 2.63 g/1000 unsized seed

* / g less than Check variety: ___/___.

* Weight same as Check variety: Pacific Gold

* 0.31 g more than Check variety: Cutlass

* 4 Weight Class (grams): 1 = less than 2.0 ( ) 2 = 2.0 – 2.5 ( ) 3 = 2.5-3.0 (X) 4 = more than 3.0 ( )

* 2-3 Seeds Per Pod: (give number: 18.6 per pod): 1 = Low ( ) 2 = Medium (X) 3 = High (X)

* 1 Testa Color: 1 = Brown (X) 2 = Reddish-brown ( )
3 = Yellow ( ) 4 = Orange/yellow X)
5 = Other _____

2010 NOV 10 PM 6:36

11. CHEMICAL COMPOSITION OF SEED

* 2 Euric Acid: 1 = Low (less than 2%) 2 = Intermediate (2-50%) 3 = High (more than 50%): (given as 250 gram/kg of seed oil)

* 4 Glucosinate Content; (give: 214.6 µmol/gram defatted seed meal)
1 = Low - less than 30 µmol/gram defatted seed meal ( ) 2 = Moderatly high - 30-150 µmol/gram defatted seed meal;
3 = High – 150-200 µmol/gram defatted seed meal; 4 = Very High - more than 200 µmol/gram defatted seed meal

* 31.5 % Oil

29.1 % Protein (oil free meal)

#201100053

Fatty Acid Composition (%):

Palmitic 16:0	Stearic 18:0	Oleic 18:1	Linoleic 18:2	Linolenic 18:3	Eicosenoic 20:1	Erucic 22:1
* 3.2	1.3	18.3	22.1	11.7	11.7	25.7

12. FROST TOLERANCE (Late spring frosts)

* 4 Tolerance: 1 = Not hardy – susceptible ( ) 2 = Moderately suscesptible ( ) 3 = Moderately resistant (X) 4 = Hardy ( )

13. LODGING RESISTANCE

* 4 Resistance: 1 = Weak ( ) 2 = Moderately weak ( ) 3 = Moderately strong ( ) 4 = Strong (X)

14. HERBICIDE RESISTANCE

* 1 Atrazine: 1 = Susceptible (Jet Neuf) 2 = Resistant ( )

* ___ Other _____: 1 = Suscept) 4 = Hardy (Bridger)

* X None

15. DISEASE RESISTANCE (0 = Not tested 1 = Susceptible 2 = Low resistance 3 = Moderate resistance 4 = High resistance)

* 0 Selerotinia Stem Rot (Scerotinia sclerotiorum)

* 0 Black Let, Stem Canker (*Leptosphaeria maculans, Plenodomus lingum, Phoma lingam*)

* 0 White Rust (*Albugo candida, A. Cruciferrarum*)

* 0 Light Leaf Spot (*Pyrenopeziza brassicae*)

* 0 Downy Mildew (*Peronospora parasitica*)

* 0 Rhizoctonia Root Rot (*Rhizoctonia solani*)

* 0 Alternaria Black Spot (*Alternaria brassicicola*)

* 0 Other _____

16. COMMENTS (Please give any additional comments which characterizes the variety)

Kodiak is the first brown seed coat India mustard (*B. juncea*) (with a suitable for Dejon mustard) PVP application in the USA. The major distinguishing characteristic of this cultivar is its broan seed coat color. In addition, high plant leaf and root tissue glucosinolate (mainly allyl glucosinolate) content in the plant tissue which gives Kodiak a quality advantage over other cultivars when used as a biopesiticidal green manure. High seed meal glucosinolate content (mainly allyl glucosinolate) makes Kodiak also ideal for high quality condiment (Dejon) mustard.

Kodiak Seed Meal Glucosinolates (µmol/gram defatted seed meal)

Allyl	Butenyl	Pentenyl	Hy-Pentenyl
213.7	0.8	0.1	0.3

Kodiak & Pacific Gold Plant tissue Glucosinolates (µmol/gram defatted plant tissue)

Cultivar	Allyl	Butenyl	Pentenyl	Hy-Pentenyl
Kodiak	32.1	0.4	0.3	0.3
Pacific Gold	27.5	0.2	0.1	0.2

17. DIRECTIONS

Select the number which characterizes the variety in the features above. Those characteristics marked with an asterisk "*" should be recorded. Any others should be recorded if possible to help establish novelty or uniqueness. Characteristics described, including numerical measurements, should represent those that are typical for the variety. Give test area _____ conditions _____.

#201100053

'Kodiak'
Condiment India Mustard
(*Brassica juncea* L.)

Exhibit D: Additional Description of Variety

Kodiak seedlings emerge significantly faster than Cutlass and Duchess, but not significantly different from Pacific Gold or Common Brown (Table 1). Averaged over all years and sites, Kodiak bloomed similar to Pacific Gold and Cutlass, but was significantly later to 50% bloom than Common Brown and Duchess. Kodiak plants after flowering averaged 166 cm tall, and were significantly taller than all other control cultivars except Pacific Gold. Despite tall plants, Kodiak was highly resistant to lodging. Plants matured on average 105 d after planting and plants were highly resistant to seed shatter at maturity. Kodiak is moderately resistant to cabbage flea beetle [*Phyllotreta cruciferae* (Goeze)] and cabbage seedpod weevil [*Ceutorhynchus assimilis* Paykull], and diamondback moth [*Plutella xylostella* L.].

Kodiak seedlings have small to medium size cotyledons and a semi-upright seedling growth habit at the rosette stage. Leaves are light to mid-green in color with slight glaucosity. Leaves are pointed and leaf margins have a moderate serration (Figure 1). Fully developed leaves have lobing and leaf attachment to the main stem shows no clasping. Flower buds appear at the tip of the apical meristem. Flowers open on average 55 d after planting and plant reach 50% bloom on average 59 d after planting. Petals are bright yellow, and anther dotting is absent. Bilateral single pods (siliques) are semi-erect to erect. Pod length and width is short to medium (35.6 mm long and 4.0 mm wide) with long pedicel length (12.9 mm) and short pod beak (6.2 mm). Pods contain a low to medium number (18.6 seeds pod^{-1}) of dark brown seeds. Seed size of Kodiak (2.63 g 1000 $seeds^{-1}$) is not significantly different from Pacific Gold, (2.61 g 1000 $seeds^{-1}$) (Table 2). However, Kodiak seed weight was significantly higher than the Cutlass (2.33 g 1000 $seed^{-1}$) and the other brown seeded cultivar Common Brown (2.34 g 1000 $seeds^{-1}$).

Kodiak was evaluated in replicated field trials grown throughout the dry land agricultural regions of northern Idaho and eastern Washington between 1999 and 2006. Seed used for field trials in 1999, 2000, and 2001, were bulked samples from the seed increase plots of the previous year. After 2001, seed used for field testing originated from the 2001 Breeders' Seed lot. Performance of Kodiak was compared to Pacific Gold (Brown et al., 2004), the Canadian cultivar Cutlass (both with yellow seed), and the two brown mustard cultivars Common Brown and Duchess. Cutlass is a yellow seeded Indian mustard cultivar developed by Agriculture and Agri-Food Canada, Saskatoon, SK, and distributed by the Canadian Mustard Association. Common Brown is a brown (Indian) mustard landrace cultivar which used to be grown commercially in Canada. Pacific Gold represents the entire Indian mustard acreage in the Pacific Northwest, while Duchess is a more recent brown seeded Indian mustard developed by Colman's of Norwich and distributed by Viterra Inc. Kodiak

2010 NOV 10 PM 6:36

is the first condiment oriental mustard to be developed for the Pacific Northwest region and no local cultivars are available for direct comparison. Trial results from 1999 through 2009 were obtained from the Pacific Northwest Mustard Variety Trials.

Averaged over 129 years-sites, seed yield of Kodiak was 1,528 kg ha^{-1} (Table 3). Lowest seed yield was from trials in 2003 (962 kg ha^{-1}), with highest yield (1,881 kg ha^{-1}) from trials in 2001. Over years and sites, seed yield of Kodiak was significantly higher than Cutlass (1,432 kg ha^{-1}), and Common Brown (1,456 kg ha^{-1}) but was significantly lower in yield compared to the high yielding cultivar Pacific Gold.

Oil content of Kodiak (304 g kg^{-1}) was significantly lower than Pacific Gold (327 g kg^{-1}) and Cutlass (313 g kg^{-1}) (Table 4). Seed fatty acid profile contained 32 g kg^{-1} palmitic acid (16:0), 12 g kg^{-1} stearic acid (18:0), 183 g kg^{-1} oleic acid (18:1), 221 g kg^{-1} linolenic acid (18:2), 116 g kg^{-1} linolenic acid (18:3), 117 g kg^{-1} eicosenoic acid (20:1), and 257 g kg^{-1} erucic acid (22:1) (Table 5). Total glucosinolate content in Kodiak seed meal was 213.6 μmol g^{-1} of defatted seed meal, and was significantly higher than Pacific Gold (149.4 μmol g^{-1} of defatted seed meal). The primary glucosinolate in Kodiak was 2-propenyl glucosinolate (sin grin or ally glucosinolate), accounting for over 99% of the total glucosinolates.

References

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Swanston, J.S., R.P. Ellis, W.B.T. Thomas, and J. Brown. 1981. An opportunistic breeding scheme. *In* Proceed of the 4th International Barley Genetics Symposium, Edinburgh, Scotland, UK. pp.172-175.

2010 NOV 10 PM 6:36

Figure 1. Kodiak leaves taken from lower (largest) to upper (smallest) parts of the plant in full bloom.

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Table 1. Seedling establishment, days to 50% flower bloom, plant height after flower end, and lodging resistance of Kodiak, Pacific Gold, Cutlass, Common Brown, and Duchess Indian mustard tested in regional trials throughout the Pacific Northwest region between 1999 and 2009.

	Establishment	Days to 50% bloom	Plant Height	Lodging
# year/sites	24	24	21	13
Cultivar	-- 1 to 9 --	-- days --	-- cm --	-- 1 to 9--
Pacific Gold	6.73	58.3	156	7.81
Cutlass	4.94	58.0	152	8.32
Common Brown†	6.06	60.4	146	*
Duchess†	6.01	61.2	133	7.18
Kodiak	**6.48**	**59.0**	**166**	**7.99**
Mean	6.04	59.4	146	7.83
LSD 5%	0.33	0.47	2.14	0.26

† Common Brown data were collected 1999 to 2004 and Duchess data were collected 2007 to 2009)

2010 NOV 10 PM 6:35

Table 2. Thousand seed weight of Kodiak, Pacific Gold, Cutlass, Common Brown (1999 to 2004), and Duchess (2007 to 2009) Indian mustard tested in regional trials throughout the Pacific Northwest region between 1999 and 2009.

	Mean	Rank	2009	2008	2006	2005	2004	2003	2002	2001	2000	1999
# sites	30		4	3	3	3	2	5	4	6	4	1
Cultivar							g 1000 seeds^{-1}					
Pacific Gold	2.61	2	2.61	2.59	2.70	2.43	2.34	2.32	2.66	2.93	2.13	2.13
Cutlass	2.33	3	2.23	2.00	2.01	2.10	2.17	2.29	2.23	2.80	2.03	2.03
Common Brown	2.33	4	*	*	*	*	2.37	2.20	2.21	2.75	2.10	2.10
Kodiak	**2.63**	**1**	**2.68**	**2.61**	**2.66**	**2.55**	**2.23**	**2.52**	**2.47**	**2.96**	**2.18**	**2.18**
Mean	2.53		2.43	2.40	2.46	2.36	2.28	2.35	2.40	2.88	2.23	2.23
LSD 5%	0.21		0.18	0.21	0.19	0.15	0.21	0.27	0.28	0.16	0.22	n.s.

Table 3. Seed yield of Kodiak, Pacific Gold, Cutlass, Common Brown (1999 to 2004), and Duchess (2007 to 2009) Indian mustard tested in regional trials throughout the Pacific Northwest region between 1999 and 2009.

	Mean	Rank	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999
# sites	129		11	11	11	8	12	14	8	12	13	13	16
Cultivar								lb/acre					
Pacific Gold	1,726	1	1,804	1,518	1,721	1,896	1,638	1,868	1,071	1,412	2,022	1,803	1,934
Cutlass	1,432	3	1,543	1,352	1,390	1,546	1,495	926	876	1,130	1,816	1,622	1,813
Common Brown	1,456	*	*	*	*	*	*	1,226	967	1,142	1,863	1,586	1,699
Duchess	1,552	*	1,613	1,470	1,574	*	*	*	*	*	*	*	*
Kodiak	**1,528**	**2**	**1,631**	**1,425**	**1,646**	**1,445**	**1,477**	**1,578**	**962**	**1,187**	**1,881**	**1,507**	**1,756**
Mean	1,411		1,648	1,441	1,583	1,629	1,537	1,422	969	1,179	1,850	1,619	1,793
LSD 5%	299		308	231	264	341	398	327	198	248	265	298	366

2010 NOV 10 PM 6:36

Table 4. Seed oil content of Kodiak, Pacific Gold, Cutlass, Common Brown (2000 to 2002), and Duchess (2007 and 2008) Indian mustard tested in regional trials throughout the Pacific Northwest region between 2000 and 2008.

Cultivar	Mean	Rank	2008	2007	2002	2001	2000
# Sites	17		2	3	5	3	4
			g kg^{-1}				
Pacific Gold	327	1	256	330	296	360	375
Cutlass	313	5	247	317	289	347	346
Common Brown	306	4	*	*	279	318	332
Duchess	288		238	321	*	*	*
Kodiak	**304**	**2**	**239**	**307**	**284**	**330**	**340**
Mean	311		245	319	287	339	348
LSD 5%	1.24		1.14	1.03	0.99	0.96	1.97

Table 5. Fatty acid profile of Pacific Gold and Kodiak seed oil.

Cultivar	Fatty acid composition†						
	16:0	18:0	18:1	18:2	18:3	20:1	22:1
	g kg^{-1}						
Pacific Gold	31	13	168	219	126	119	249
Kodiak	**32**	**13**	**183**	**221**	**116**	**117**	**257**
LSD 5%	15	11	20	17	18	12	35

† 16:0=Stearic acid; 18:0=Palmitic acid; 18:1=Oleic acid; 18:2 = linoleic acid; 18:3 = linolenic acid; 20:1 = eicosenoic acid; 22:1 = erucic acid

Table 6. Seed meal glucosinolate profile and total glucosinolate content of Pacific Gold and Kodiak.

Cultivar	Glucosinolate profile† and content						
	Allyl	But	Pent	Hybut	Hypent	Phen	Total
	μmoles gram^{-1} of oil-free meal						
Pacific Gold	147.9	0.8	0.1	0.1	0.3	0.2	149.4
Kodiak	**213.7**	**1.0**	**0.1**	**0.1**	**0.2**	**0.1**	**213.6**
LSD 5%	9.75	0.56	0.00	0.00	0.01	0.05	12.34

† Allyl = 2-propenyl glucosinolate; But = 3-butenyl glucosinolate; Pent = 4-pentenyl glucosinolate; Hybut = 2-hydroxy-3-butenyl glucosinolate; Hypent = 2-hydroxy-4-pentenyl glucosinolate; Phen = 2-phenylethyl glucosinolate.

2010 NOV 10 PM 6:26

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U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE

EXHIBIT E
STATEMENT OF THE BASIS OF OWNERSHIP

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

1. NAME OF APPLICANT(S)	2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER	3. VARIETY NAME
~~Jack Brown~~ University of Idaho	92.BJ.22.B.2	Kodiak
4. ADDRESS *(Street and No., or R.F.D. No., City, State, and ZIP, and Country)*	**5. TELEPHONE** *(Include area code)*	**6. FAX** *(Include area code)*
~~PSES, CALS~~ Office of Technology Transfer ~~PO Box 442339~~ PO Box 443003 ~~University of Idaho~~ Morrill Hall 414 Moscow, ID 83844-~~2339~~ 3003 (bt: 11/10/2010)	208 885 ~~7078~~ 4550	208 885 ~~7760~~ 4551
	7. PVPO NUMBER #201100053	

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

9. Is the applicant a U.S. national or a U.S. based entity? **If no, give name of country.** [X] YES ☐ NO

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

a. If the 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 the 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 *(Trace ownership from original breeder to current owner. Use the reverse for extra space if needed)*:

PLEASE NOTE:

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

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.

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.

2010 NOV 10 PM 5:18

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

EXHIBIT F
DECLARATION REGARDING DEPOSIT

NAME OF OWNER (S)	ADDRESS (Street and No. or RD No., City, State, and Zip Code and Country)	TEMPORARY OR EXPERIMENTAL DESIGNATION
~~Jack Brown~~ University of Idaho	~~PSES, CALS, PO Box 442339~~ Office of Technology Transfer ~~University of Idaho,~~ PO Box 443003 Moscow, ID 83844-~~2339~~ Morill Hall 414 3003	92.BJ.22.B.2 **VARIETY NAME** Kodiak
NAME OF OWNER REPRESENTATIVE (S)	**ADDRESS** (Street and No. or RD No., City, State, and Zip Code and Country)	[redacted] **PVPO NUMBER**
Jack Brown (bt: 11/19/2010)	PSES, CALS, PO Box 442339 University of Idaho Moscow, ID 83844-3003	#201100053

I do hereby declare that during the life of the certificate a viable sample of propagating material of the subject variety will be deposited, and replenished as needed periodically, in a public repository in the United States in accordance with the regulations established by the Plant Variety Protection Office.

Jack Brown
Signature

10/8/2010
Date

2010 NOV 10 PM 6:18

STORAGE INFORMATION FORM

USDA-ARS
NATIONAL PLANT GERMPLASM SYSTEM #201100053

__x__Submitted for Registration in *Crop Science* ___x__Submitted for inclusion in NPGS

__x__Cultivar ____Parental Line ____Genetic Stock
____Germplasm ____Mapping Population

Name of Donor or Contact Person Jack Brown Phone No.(208) 885 7078

Institution or Company University of Idaho Email jbrown@uidaho.edu

Address PSES, Crop and Weed Division, University of Idaho, Moscow, ID 83844-2339

The policy of the National Plant Germplasm System (NPGS) is that all material deposited in the NPGS will be freely distributed to scientists for research purposes. For material registered in *Crop Science*, the donor is expected to maintain and distribute seed for a minimum of 5 years following registration. For PVP material also being registered in *Crop Science*, the owner is responsible for maintenance and distribution during the duration of the Certificate unless different arrangements are made with the curator. I agree that these materials will be managed according to these policies.

Signature (required) _____ **Date** _____

NOMENCLATURE:

Genus Brassica Species juncea L. _____Sub-species _____

Common name Brown (Dejon) mustard (India (bt:5/13/10) Name and/or Number Kodiak

Other Identifiers _____
(For Mapping Population, provide a list of identifiers for mapping lines and parents)

P.I. number (if previously assigned) 92.BJ.22.B.2

SEED REQUIREMENTS (UNTREATED SEED REQUIRED):
__x__Cross/Open Pollinated (Cultivar, Germplasm): 7500 seeds
____Self Pollinated (Cultivar, Parental Line, Germplasm, Mapping Population Parents, Genetic Stocks*): 5000 sd
____Mapping Population Lines: 500 seeds
____*Difficult Genetic Stocks (those where seeds are difficult to grow, maintain or analyze): 50-1000 seeds

PVP Applied for or Granted? YES X NO____ PVP Number Pending

Plant Patent Applied for or Granted? YES____ NO X Number_____

Percent Germination determined by Donor 90% Date of test December 2009

Year seed harvested 2005 Approximate percent self fertilization under normal field conditions: 85%

Seed provided to active collection? YES X NO____ Date provided October 7 2010

Active Site Location_____ Amount of seed supplied 50g

(Continued on Reverse Side)

#201100053

GROWTH HABIT:

Annual: Spring x Winter_____ Facultative_____

Biennial _____ Perennial_____

FORM RECEIVED:

Seed x Bud_____ Pollen_____ Tissue Culture_____

DESCRIPTIVE INFORMATION: In order for each entry to be properly identified, donors are asked to prepare a narrative and pedigree of each entry. Key features in the narrative might include agronomically important traits such as maturity, plant height (metric terms or dwarf, semi-dwarf, etc.), seed characteristics (size, oil content, milling quality, type, etc.), nutritive value, tolerance to diseases, insects, nematodes, cold, lodging, and others. Identify transgenes and the traits that they govern. Give the scientific names of pest organisms. Avoid comparisons with other cultivars or lines unless these are part of the parentage, or unless the comparisons are important for rating disease and insect resistance levels. Accessions deposited in the NPGS will be documented in the Germplasm Resources Information Network (GRIN) database of the National Plant Germplasm System, except for mapping populations.

PEDIGREE: (The pedigree should not exceed 500 characters.)

'Lethbridge 22A'/J.89.144

NARRATIVE: (The narrative can be no more than 2000 characters in length.)

Seed yield of Kodiak was high and relatively consistent over a range of environments that exist throughout the Pacific Northwest region. Averaged over 96 years-sites, seed yield Kodiak was 1,515 kg ha^{-1}. Lowest seed yield was from trials in 2003 (962 kg ha^{-1}), with highest yield (1,881 kg ha^{-1}) from trials in 2001. Seed yield of Kodiak was significantly higher than Cutlass (1,433 kg ha^{-1}), Lethbridge 22A (1,459 kg ha^{-1}), and Common Brown (1,456 kg ha^{-1}). Oil content of Kodiak (31.5%) was not significantly lower than Pacific Gold (34.8%). Aliphatic glucosinolate content of defatted seed meal was 209 μmol g^{-1}, which was not significantly different than Cutlass. The primary aliphatic glucosinolate type The primary glucosinolate in Kodiak was 2-propenyl glucosinolate (sinigrin), accounting for over 99% of the total glucosinolates. Kodiak seedlings have small to medium size cotyledons and a semi-upright seedling growth habit at the rosette stage. Leaves are light to mid-green in color with slight glaucosity. Leaves are pointed and leaf margins have a strong serration. Fully developed leaves have no lobing and leaf attachment to the main stem shows no clasping. Flower buds appear at the tip of the apical meristem. Flowers open on average 61 days after planting. Petals are bright yellow, and anther dotting is absent. Bilateral single pods (siliques) are semi-erect to erect. Pod length and width is short to medium (35.6 mm long and 4.0 mm wide) with long pedicel length (12.9 mm) and short pod beak (6.2 mm). Pods contain a low number to medium number (18.6 seeds pod^{-1}) of dark brown seeds. Seed size of Kodiak (12.20 g 1000 $seeds^{-1}$) is not significantly different from Pacific Gold, (12.01 g 1000 $seeds^{-1}$), however, and seed weight was significantly higher than Lethbridge 22A (11.05 g 1000 $seeds^{-1}$) or Common Brown (10.75 g 1000 $seeds^{-1}$).

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