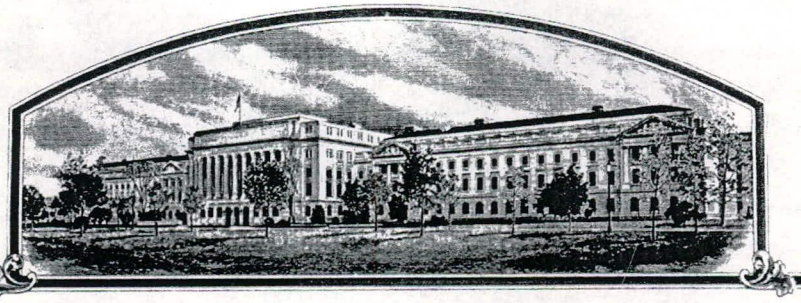

No. 201100052

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.)

RAPE

'Gem'

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.***

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
IMI.STER.74/UI.G.1.04

3. VARIETY NAME
Gem

4. ADDRESS *(Street and No., or R.F.D. No., City, State, and ZIP Code, and Country)*
~~Office of Technology Transfer~~
~~PO Box 443003~~ 875 Perimeter Drive, MS3003
~~Morrill Hall 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
Karen Stevenson
875 Perimeter Drive, MS3003
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
karens~~ibrown~~@uidaho.edu & ~~gaylene@uidaho.edu~~

14. CROP KIND *(Common Name)*
Spring rapeseed

16. FAMILY NAME *(Botanical)*
Brassicaceae

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

17. IS THE VARIETY A FIRST GENERATION HYBRID?
☐ YES ☒ 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. ☒ Filing and Examination Fee ($4,382), made payable to "Treasurer of the United States" *(Mail to the Plant Variety Protection Office)* (F&E fees remitted per cc pymnt 11/10/10) (bt: 11/10/10)

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		SIGNATURE OF OWNER	
Jack Brown		Gaylene Anderson	
NAME *(Please print or type)*		NAME *(Please print or type)*	
Jack Brown		GAYLENE ANDERSON	
CAPACITY OR TITLE	DATE	CAPACITY OR TITLE	DATE
Professor/Plant breeder	10/08/2010	LICENSING ASSOCIATE	10/8/2010

(See reverse for instructions and information collection burden statement)

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

----dbc 12/12/2013----

201100052

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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

#201100052

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.)*
Amount of seed sold November 2009 to produce Certifified seed in 2010. Non-certified seed to be sold for commodity in fall 2010.
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).)*

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 1.4 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.

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Replacement 12/16/2013

201100052

'Gem'
Spring Rapeseed
***Brassica napus* L.**

Exhibit A: Origin and Breeding History

'Gem' spring rapeseed (*Brassica napus* L. spp. *oleifera* (Metzg) Sinsk. *f. annua*) was developed for use as an industrial oil-quality cultivar by the Idaho Agricultural Experimental Station, Moscow, ID 83844. This cultivar is protected by U.S. Plant Variety Protection (PVP pending).

Gem is a near pure-line spring rapeseed cultivar which has high resistance to imidazolinone class herbicides including imazamox (2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1*H*-imidazol-2-yl]-5-(methoxymethyl)-3-pyridinecarboxylic acid). Gem produces industrial-quality seed oil high in erucic acid, and canola-quality seed meal, and was selected for adaptability to environments throughout the Pacific Northwest Region (Idaho, Oregon, Washington, and Montana). This cultivar was developed from the cross 'CFSN.39.9'/ 'Sterling'/////'Sterling'. CFSN.39.9 is a canola-quality breeding selection with low erucic acid content (less than 20 g kg^{-1}) and less than 30 μmol g^{-1} of glucosinolate in the defatted seed meal, which was selected from a segregating F_3 population derived from a cross 'Profit'/'Springfield'. Progeny from this cross were accidentally planted into soil with a high imazamox residue and CFSN.39.9 was one of 55 single plants that survived from a total of 5 acres of segregating breeding lines planted. CFSN.39.9 was later shown to have the PM_1 and PM_2 mutation genes conferring tolerance to imidazolinone class herbicides. Sterling is a canola-quality spring rapeseed cultivar developed and released by the University of Idaho in 1997 (Brown et al., 1997).

F_1 seed from the original cross CFSN.39.9/Sterling was produced in the spring of 1996. The original F_1 progeny were planted in the glasshouse that summer and backcrossed to Sterling to produce BC_1F_1 seed. In December 1996, 50 seeds of the BC_1F_1 seed were planted in seedling trays and grown in the glasshouse. When plants reached the 4-6 leaf stage (approximately three weeks later), they were sprayed with imazamox herbicide at a rate equivalent to 35 g a.i. ha^{-1}, along with non-ionic surfactant 2.5 ml l^{-1} of solution liquid urea-ammonium sulfate fertilizer 15 ml l^{-1} of solution. Seedlings that showed no visible herbicide damage symptoms were transplanted to larger pots and these plants were backcrossed to Sterling to produce BC_2F_1 seed. The procedure of spraying seedlings with imazamox herbicide, identifying highly tolerant seedlings and using these to backcross to Sterling was repeated a further three times to produce BC_5F_1 seed. In the fall of 1998, 500 BC_5F_1 seed were planted into seedling trays and sprayed with imazamox herbicide at the above rate. Seedlings expressing high tolerance (156 lines) to the herbicide spray were selected and grown to maturity in large pots to produce BC_5F_2 seed.

BC_5F_2 seed harvested from the glasshouse was used to plant unreplicated single plant plots (15 m x 2 rows 15 cm apart) in the field in the spring of 1999.

Single plant plots were sprayed at the 4 leaf stage with imazamox herbicide at described

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above, and evaluated for herbicide tolerance along with morphological adaptability characters, seedling vigor, flower date, plant height, lodging and maturity. At maturity, seed from 26 single plant plots were selected for further evaluation in 2000. Ten single plants were harvested separately from each plot while the remainder of the plots was hand threshed and used for planting yield trials. The single plants harvested in 1999 were planted in 2000 as single plant plots and used to initiate seed increases.

In 2000, 31 selected lines were evaluated in replicated yield trials at two locations in northern Idaho. Included in the trial were several commercially available spring canola and spring rapeseed cultivars. None of the yield evaluation trials were sprayed post emergence with imazamox herbicide. A range of morphological characters was recorded including seedling vigor, flower date, plant height, lodging and maturity. After harvest, a sample of seed was taken from each plot to determine oil content, fatty acid profile (Hammond, 1991; Christie, 1992) and glucosinolate content was estimated using a Tes-tape® procedure (Smith & Donald, 1988). After reviewing the performance of the 31 selections in yield trials and as single plant plots in 2000, the line code IMI.STER.74 was selected, and 200 single plant selections from this BC_5F_5 family (later coded as UI.G.1) were harvested used to initial the seed source for the Gem cultivar.

In the fall of 2000, a single seed from each of the 200 single plant selections from UI.G.1 was planted in the glasshouse. At the seedling stage, a leaf DNA extract was taken from each seedling and screened for the presence of both imazamox tolerance genes (PM_1 and PM_2). Seedlings that were homozygous for both tolerance alleles were grown to maturity, and the resulting seed was planted to initiate a pure seed source for increase in the field in 2001, 2002 and 2003. At each stage of seed increase seedlings were sprayed at the 4 leaf stage with imazamox herbicide as described above, and plots showing any susceptibility symptoms were discarded. Breeders' seed (UI.G.1.04) was produced in 2004 from 400 single plant selections made from the BC_5F_7 family. Foundation seed was produced from Breeders seed in 2005. Throughout the stages of Gem seed increases including pre-Breeders seed, Breeders seed, Foundation seed and finally Certified seed production, plants were consistently uniform and stable, and no variants were observed over this four year period.

References

Brown, J., J.B. Davis, A.P. Brown, D.A. Erickson and L. Seip, 1997. Registration of 'Sterling' spring rapeseed. *Crop Sci.* 38:542-543.

Christie, W.W., 1992. Preparation of fatty acid methyl ester. *Inform* 3:1031-1034.

Hammond, E.G., 1991. Organization of rapid analysis of lipids in many individual plants. *In*: Modern Methods of Plant Analysis. Vol: 12. Springer-Verlag, Berlin, Germany.

Smith, D.B., and C.N. Donald, 1988. The measurement of glucosinolates in oilseed rape by glucose reaction. *Plant Varieties and Seeds* 1:121-130.

201100052

'Gem'
Spring Rapeseed
***Brassica napus* L.**

Exhibit B: Statement of Distinctness

Gem is most similar in plant appearance to the spring rapeseed cultivar Sterling (Brown et al., 1997). However, Gem is high tolerant/resistance to imidazolinone class herbicides including imazamox (2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1*H*-imidazol-2-yl]-5-(methoxymethyl)-3-pyridinecarboxylic acid) while Sterling is highly susceptible to all imidazolinone class herbicides including imazamox. In field trials conducted at Moscow and Genesee in 2004 and 2005 Gem was grown in replicated field plots alongside Sterling and seedlings sprayed with a 1X rate of Beyond® (imazamox) herbicide. Stand counts were conducted on a single 1 m row from each plot before and after spraying and %survival data are presented in Table B1.

Table B1. Percentage of Gem and Sterling seedling that survival after seedlings had been sprayed with Beyond (imazamox) herbicide.

Cultivar	Average	2005		2004	
		Moscow	Genesee	Moscow	Genesee
	---------- % survival after treatment ----------				
Gem	99	97	99	100	99
Sterling	0	0	0	0	0

References

Brown, J., J.B. Davis, A.P. Brown, D.A. Erickson and L. Seip, 1997. Registration of 'Sterling' spring rapeseed. *Crop Sci.* 38:542-543.

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201100052

Replacement 04/07/2014

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

OBJECTIVE DESCRIPTION OF VARIETY
RAPESEED (*Brassica napus* and *B. campestris*)

dbc 04/22/2014

NAME OF APPLICANT (S)	TEMPORARY OR EXPERIMENTAL DESIGNATION	VARIETY NAME
University of Idaho ~~Idaho Agricultural Experiment Station~~	IMI.STER.74/UI.G.1.04	Gem

ADDRESS ***(Street and No. or RD No., City, State, Zip Code, and Country)***

University of Idaho

Moscow, Idaho, 83844-2339

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PVPO NUMBER

201100052

1. SPECIES

* _X_ Brassica napus ___ Brassica campestris

2. TYPE

* _X_ Spring ___ Winter

3. **PLANT HEIGHT** (at pod maturity)

_1_ _1_ _7_ . _6_ cm Tall (compare to standard variety below)

___ _3_ . _1_ cm shorter than Check variety: _Sterling_

Height same as Check variety: _Hero

___ __.___ cm taller than Check variety: _____

* Height class: ___ Autumn sown __2__ Spring sown

1 = Short (Candle)	1 = Short (Erglu)
2 = Medium short ( )	2 = Medium short ( )
3 = Medium (Jet Neuf)	3 = Medium (Cresus)
4 = Medium tall ( )	4 = Medium tall ( )
5 = Tall (Dwarf Essex)	5 = Tall (Petranova)

4. STEM ANTHOCYANIN

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

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

_2_ 1 = Narrow (Erglu) 2 = Medium (Primor) 3 = Broad (Expander)

6. **SEEDLING GROWTH HABIT** (leaf rosette)

_1_ 1 = Upright 2 = Prostrate (short photoperiod)

Replacement 04/07/2014

201100052

7. LEAVES

* _2_ Margins (serration): 1 = Absent or very weak (Akela) 2 = Weak (Arvor, Jet Neuf) 3 = Medium (Primor) 4 = Strong (Candle, Kentan)

* _4_ Lobing (fully developed leaf on plant or rosette)
1 = Absent or very weak (Akela) 2 = Weak (Arvor) 3 = Medium (Primor)
4 = Medium Strong (Argus) 5 = Strong (Kentan)

* _2_ Leaf Attachment to Stem: 1 = Fully clasping (Candle) 2 = Partial clasping (Jet Neuf) 3 = No Clasping ( )

* _2_ Color: 1 = Light green (Arvor) 2 = Medium green (Primor) 3 = Medium dark green (Oro) 4 = Dark green (Brunowski, Rapora)

* _1_ Glaucosity: 1 = Absent 2 = Weak (Span) 3 = Weak to Medium (Gulliver) 4 = Medium (Magnus) 5 = Medium to strong (Oro) 6 = Strong

---

8. FLOWERS

* _1_ Flower Buds Location 1 = Buds at tip of apical meristem (Jet Neuf) 2 = Buds immediately below apical meristem (Candle)

* _2_ Petal color: 1 = Pale yellow ( ) 2 = Yellow (Jet Neuf, Primor) 3 = Orange ( ) 4 = White ( )

* _1_ Anther dotting (at opening of flower; given percentage %) 1 = Absent (X) 2 = Few ( ) 3 = Medium (Primor) 4 = Many ( )

* __ Flowering class (Autumn sown) _3_ Flowering class (Spring sown): 57 Days after planting to 50% flower bloom, same as 'Sterling'

1 = Very early (Arvor)	1 = Very early (Tower)
2 = Early (Primor)	2 = Early (Kosa)
3 = Medium early ( )	3 = Medium early (x)
4 = Medium late ()	4 = Medium late ( )
5 = Late (Marcus)	5 = Late (Petranova)
6 = Very late ( )	6 = (Very late)

---

9. **PODS** (Slique)

* _1_ Pod type: 1 = Bilateral single pod (Jet Neuf) 2 = Other ( )

* _2_ Silique beak length: (given length: 12.09 mm)1 = Short (Forto) 2 = Medium (Liragold) 3 = Long (Rapol)

* _3_ Pod length; (give length: _81_._23_ mm) 1 = Short ( ) 2 = Medium ( ) 3 = Long (X)

* _2_ Pod width; (give width: _4_._08_ mm) 1 = Narrow ( ) 2 = Medium (X) 3 = Wide ( )

* _4_ Pod habit: 1 = Erect (Gulliver) 2 = Semi-erect to erect (Oro) 3 = Semi-erect 4 = Horizonal to semi-erect (Brink) 5 = Horizonal

* _2_ Pedicel length: (given length _20.86_ mm) 1 = Very short ( ) 2 = Short ( ) 3 = Long ( )

* _2_ Ripening Class (Autum sown): 1 = Very early ( ) 2 = Early (X) 3 = Medium ( ) 4 = Late ( ) 5 = Very late ( )

* _1_ _1_ _2_ Days to Maturity

* __ _8_ Days earlier than Check variety: _Reston_

* Maturity same as Check variety: _Sterling_

* ___ _1_ Days later than Check variety: _Hero_

---

10. SEEDS

* _3_._1_ g/1000 unsized seed

* ___.___ g less than Check variety: _____

* Weight same as Check variety: _Sterling_

* _0_._5_ g more than Check variety: _Hero_

* _2_ Weight Class (grams): 1 = less than 3.0 (Candle) 2 = 3.0 – 3.9 (X) 3 = 4.0 – 5.0 (Jet Neuf) 4 = more than 5.0 ( )

_X_ Seeds Per Pod: (give number: _28.01_ per pod): 1 = Low ( ) 2 = Medium (X) 3 = High ( )

* _5_ Testa Color: 1 = Black (Jet Neuf) 2 = Red ( )
3 = Yellow (Yellow Sarson) 4 = Dark to black (X)
5 = Reddish-brown to black ( ) 6 = Other _____

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11. CHEMICAL COMPOSITION OF SEED

* _2-3_ Euric Acid: 1 = Low (less than 2%) 2 = Intermediate 3 = High (more than 50%)

* _1_ Glucosinate Content; (give: _1_ _2_ . _4_ µmol/gram of defatted seed meal)
1 = Low – less than 30 µmol/gram of defatted seed meal (Candle) 2 = High – More than 30 µmol/gram of defatted seed meal (Mikado)

* _40_ . _4_ % Oil

___.___ % Protein (oil free meal)

Fatty Acid Composition (%):

Palmitic	Stearic	Oleic	Linoleic	Linolenic	Eicosenoic	Erucic
16:0	18:0	18:1	18:2	18:3	20:1	22:1
* 2.9	1.1	15.6	11.6	6.7	8.8	46.3

12. **FROST TOLERANCE** (Late spring frosts)

* _3_ Tolerance: 1 = Not hardy – susceptible (Indore) 2 = Moderately suscesptible () 3 = Moderately resistant (X) 4 = Hardy (Bridger)

13. LODGING RESISTANCE

* _3_ Resistance: 1 = Weak (Span) 2 = Moderately weak (Olga) 3 = Moderately strong (X) 4 = Strong (Torpe)

14. HERBICIDE RESISTANCE

* _1_ Atrazine: 1 = Susceptible (Jet Neuf) 2 = Resistant ( )

* _5_ Imazamox (2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1*H*-imidazol-2-yl]-50(methoxymethyl)-3-pyridinecarboxyl acid):
1 = Suscept ( ); 5 = Highly tolerant (X).

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)

Glucosinolate composition of seed meal (µmol g^{-1} defatter seed meal

Butenyl	OH Butenyl	Pentenyl	OH Pentenyl
3.27	8.91	0.27	Trace

17. DIRECTIONS

Select the number which characterizes the variety in the features above. **11, 14, & 16**. 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 _Inland Pacific Northwest__ conditions _2001 to 2007.

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'Gem'
Spring Rapeseed
***Brassica napus* L.**

Exhibit D: Additional Description of Variety

Gem leaves have weak to moderate serration, medium strong lobing and the leaf attachment is semi-clasping (Figure D1). Gem plants flowered on average 57.3 days after planting, which is not significantly different from Sterling (57.4 days after planting) or Hero (58.3 days after planting) (Table D1). Gem plants were on average 117.6 cm tall, which was not significantly are significantly taller than Sterling (115.3 cm) or Hero (117.1 cm). Gem plants reached full maturity on average 94 days after planting, which was not significantly different from Sterling which reaches maturity, on average, 96 days after planting. Average 1000-seed weight was 3.1 g, similar to Sterling at 3.0 g. Gem is moderately resistant to lodging and slightly resistant to seed shatter at maturity.

Gem was grown in replicated yield trials alongside Sterling and Hero at a total of 79 year-sites between 2001 and 2007. None of these yield evaluation trial had imazamox herbicide applied. Averaged over all years and sites, Gem seed yield was 1,650 kg ha^{-1}, which was not significantly higher than Sterling (1,625 kg ha^{-1}) but significantly higher yield than Hero (1,494 kg ha^{-1}) (Table D2). Seed yield of Gem was higher than Hero in every year tested.

Gem was compared to the cultivar '45A71' and selection 'PM.2' in yield trials at two locations in 2004 and 2005 where seedlings in the trials were sprayed with 0X, 2X (70 g a.i. ha^{-1}), and 3X rates (105 g a.i. ha^{-1}) of imazamox herbicide at the 4-5 leaf stage (Table D3). 45A71 is a selection that is homozygous for the PM_1 and PM_2 herbicide tolerance genes, while PM.2 is a selection which is homozygous only for the PM_2 herbicide tolerance gene and hence usually has lesser tolerance than 45A71. Averaged over years and sites, seed yield of Gem was almost identical with 0X herbicide rate (1,762 kg ha^{-1}) compared to 2X herbicide rate (1,731 kg ha^{-1}), and only slightly reduced yield at the 3X herbicide rate (1,640 kg ha^{-1}). Gem seed yield was significantly higher than PM.2 at all herbicide application rates. Plant stand counts, plant height, days to flower start and seed oil content of Gem remained constant irrespective of imazamox herbicide application rates.

In a similar study conducted in 2004 and 2005 at two locations, the performance of Gem planted into soils previously treated with Pursuit® (Ammonium salt of imazethapyr ($\underline{+}$)-2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-5-ethyl-3-pyridinecarboxyic acid) at 0X, 0.5X (equivalent to 17.5 g a.i. ha^{-1}), 1X (equivalent to 35 g a.i. ha^{-1}) and 2X (equivalent to 70 g a.i. ha^{-1}) recommended application rates, and thereafter seedlings sprayed with imaxamox at a 0X, 1X (equivalent to 35 g a.i. ha^{-1}), and 2X (equivalent to 70 g a.i. ha^{-1}) foliar application rate (Table D4). Imazethapyr and imazamox are both imidazoline class herbicides. Seed yield of Gem remained constant over all herbicide and non-herbicide treatments, except at Moscow in 2005, again stressing the high tolerance of Gem to imazamox herbicide residue in the soil and foliar

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applications of this herbicide.

Over the 70 year-sites of testing, oil content of Gem ranged from a high of 453 g kg^{-1} to a low of 386 g kg^{-1} (individual site data not shown), and average oil content of 404 g kg^{-1}, which was not significantly different from either Sterling (397 g kg^{-1}) or Hero (395 g kg^{-1}) (Table D5). Seed oil fatty acid composition of Gem was similar to Sterling. The primary oil in Gem is erucic acid, accounting for 463 g kg^{-1}, which significantly higher erucic acid content compared to Sterling (Table D6). Gem seed oil consistently contained less than 67 g kg^{-1} linolenic acid and approximately 40 g kg^{-1} total saturated fats (sum of stearic acid and palmitic acid). Total glucosinolate content of Gem seed meal was low (average of 12.4 µmol g^{-1} of defatted seed meal). The primary glucosinolate was 2-hydroxy-3-butenyl glucosinolate (average 8.9 µmol g^{-1}) followed by 3-butenyl glucosinolate (average 3.2 µmol g^{-1}) (Table D7).

References

Brown, J., J.B. Davis, A.P. Brown, D.A. Erickson and L. Seip, 1997. Registration of 'Sterling' spring rapeseed. *Crop Sci.* 38:542-543.

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Figure D1. Lower, middle and upper leaves of Gem spring rapeseed.

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Table D1. Days to flower, plant height, lodging and seed shatter of Gem, Sterling, and Hero spring rapeseed tested in regional trials throughout the Pacific Northwest region between 2001 and 2007.

Cultivar	Days to Flower -- day -- 28 year-site	Plant Height -- inches -- 24 year-site	Lodging -- 1-9 scale -- 12 year-site	Seed Shatter -- 1-9 scale -- 2 year-site
Gem	57.3	46.3	5.8	7.4
Sterling	57.4	45.1	5.8	7.4
Hero	58.3	46.1	6.3	6.9
Mean	57.5	46.1	6.7	7.6
LSD 5%	-	-	-	0.2
Sig	n.s.	n.s.	n.s.	*

Table D2. Seed yield of Gem, Sterling, and Hero spring rapeseed tested in regional trials throughout the Pacific Northwest region between 2001 and 2007.

Cultivar	Seed Yield								
	Average	Rank	2007 10 sites	2006 12 sites	2005 11 sites	2004 13 sites	2003 7 sites	2002 12 sites	2001 14 sites
			---------- kg ha^{-1} ----------						
Gem	1,650	1	1,750	1,823	1,591	1,505	1,234	1,586	2,061
Sterling	1,628	2	1,833	1,586	1,505	1,713	1,344	1,485	1,933
Hero	1,494	3	1,689	1,661	1,500	1,401	1,158	1,342	1,709
Mean	1,591		1,757	1,690	1,532	1,540	1,245	1,471	1,901
LSD 5%	313		312	455	349	233	113	375	355
Sig	*		*	n.s.	n.s.	**	**	n.s.	*

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Table D3. Seed yield, plant stand counts, Julian days to flower start, plant height after flower and seed oil content of Gem, 45A71 and PM.2, grown at three locations after Beyond (imazamox) herbicide was applied at the 0X, 2X and 3X application rates.

Identifier	Beyond Rate	Seed Yield	Plant Stand	Flower Start	Plant Height	Seed Oil
		- kg ha^{-1}-	-- m^{-1}--	-- days --	-- cm --	mg kg^{-1}
Gem	0X	1762	53	177	114	360
Gem	2X	1731	48	177	112	360
Gem	3X	1640	56	177	113	350
45A71	0X	1349	52	178	119	350
45A71	2X	1581	55	178	121	350
45A71	3X	1643	55	178	121	350
PM.2	0X	1166	46	181	124	350
PM.2	2X	866	40	181	119	350
PM.2	3X	866	31	182	122	350
Average		1400	48	179	118	350
s.e.		185.0	n.s.	0.5	3.4	5
LSD 5%		543.0	n.s.	1.4	9.9	16

Table D4. Seed yield of Gem grown at Moscow and Genesee in 2004 and 2005 with four rates of Pursuit herbicide applied pre-plant incorporated (0X, 0.5X, 1X and 2X) and three rates of Beyond applied foliar (0X, 1X, and 2X).

Cultivar	Pursuit Rate	Beyond Rate	Average	Moscow 2005	Genesee 2005	Moscow 2004	Genesee 2004
			---------- kg ha^{-1} ----------				
Gem	2X	2X	1,368	838	676	2,091	1,868
Gem	2X	1X	1,347	952	551	1,950	1,936
Gem	2X	0X	1,427	936	648	2,174	1,951
Gem	1X	2X	1,426	1,038	643	2,188	1,836
Gem	1X	1X	1,310	1,061	522	1,739	1,917
Gem	1X	0X	1,343	1,086	629	2,097	1,563
Gem	0.5X	2X	1,372	831	648	1,988	2,021
Gem	0.5X	1X	1,274	1,062	594	1,404	2,038
Gem	0.5X	0X	1,295	732	586	1,858	2,003
Gem	0X	2X	1,346	828	644	1,966	1,945
Gem	0X	1X	1,352	877	505	1,909	2,117
Gem	0X	0X	1,342	631	560	2,236	1,940
Average			1,350	906	601	1,967	1,928
LSD 5%			n.s.	156	n.s.	n.s.	n.s.

Table D5. Seed oil content of Gem, Sterling, and Hero spring rapeseed tested in regional trials throughout the Pacific Northwest region between 2001 and 2007.

Cultivar	Oil Content								
	Average	Rank	2007	2006	2005	2004	2003	2002	2001
			8 sites	11 sites	11 sites	11 sites	6 sites	10 sites	13 sites
	---------- mg kg^{-1} ----------								
Gem	404	1	403	409	386	406	391	403	427
Sterling	397	2	392	402	380	398	400	396	413
Hero	395	3	389	405	388	391	387	395	408
Mean	399		395	405	385	398	393	398	416
LSD 5%	7		18	12	13	18	21	16	17
Sig	n.s.		*	n.s.	n.s.	**	**	n.s.	*

Table D6. Fatty acid profile of Gem and Sterling spring rapeseed.

Cultivar	Fatty Acid Profile						
	16:0†	18:0	18:1	18:2	18:3	20:1	22:1
	---------- mg kg^{-1} ----------						
Gem	29	11	156	116	67	88	463
s.e.	0.2	0.2	14.7	4.8	9.0	12.4	21.6
Sterling	33	12	160	129	70	97	449
s.e.	0.6	0.8	2.6	1.2	1.2	1.6	5.0

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

Table D7. Glucosinolate profile of Gem and Sterling spring rapeseed.

Cultivar	Glucosinolates				
	Total	Butenyl †	Hy-Butenyl	Pentenyl	Hy-Pentenyl
	---------- µmol g^{-1} ----------				
Gem	12.446	3.257	8.915	0.274	Tr
s.e.	0.322	0.089	0.214	0.019	.
Sterling	10.706	2.251	7.238	0.349	0.213
s.e.	0.473	0.044	0.111	0.032	0.092

† 3-butenyl glucosinolate; 2-hydroxy-3-butenyl glucosinolate; 4-pentenyl glucosinolate; 2-hydroxy-4-pentenyl glucosinolate

dbc 04/22/2014 g/kg = ppt

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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) University of Idaho
~~Jack Brown~~ (bt: 5/13/2011)
~~PO Box 443003~~
~~Morrill Hall 414~~
~~Moscow, ID 83844-3003~~

2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER
UI.G.1.04

3. VARIETY NAME
Gem

4. ADDRESS *(Street and No., or R.F.D. No., City, State, and ZIP, and Country)*
~~PSES, CALS~~ 875 Perimeter Drive, MS3003
~~PO Box 442339 443003~~
University of Idaho; ~~Morrill Hall 414~~
Moscow, ID 83844-~~2339~~3003

5. TELEPHONE *(Include area code)*
208 885 ~~7078~~ 4550

6. FAX *(Include area code)*
208 885 ~~7760~~ 4551

7. PVPO NUMBER
#201100052

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.** ☒ 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.

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 0.1 hour per response, including the time for reviewing the instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

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To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410, or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

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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 875 Perimeter Drive, MS3003	~~PSES, CALS, PO Box 442339 Morrill Hall 414~~ ~~University of Idaho, PO Box 443003~~ Moscow, ID 83844-~~2339~~ 3003	UI.G.1.04 **VARIETY NAME** Gem
NAME OF OWNER REPRESENTATIVE (S)	**ADDRESS** *(Street and No. or RD No., City, State, and Zip Code and Country)*	FOR OFFICIAL USE ONLY **PVPO NUMBER**
Jack Brown	PSES, CALS, PO Box 442339 University of Idaho Moscow, ID 83844-2339	#201100052

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