

No.

202000446

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

University of Idaho

Whereas THERE HAS BEEN PRESENTED TO THE

Administrator of the Agricultural Marketing Service

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

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



RAPESEED

'Industrious'

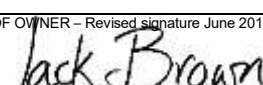
In Testimony Whereof, *I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D.C. this twenty eighth day of September, in the year two thousand twenty-one.*

Attest:

Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

Administrator
Agricultural Marketing Service

202000446

U.S. DEPARTMENT OF AGRICULTURE AGRICULTURAL MARKETING SERVICE SCIENCE AND TECHNOLOGY - PLANT VARIETY PROTECTION OFFICE APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE <i>(Instructions and information collection burden statement on reverse)</i>		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 UI.07.SI.8.A10	3. VARIETY NAME Industrious
4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP Code, and Country) University of Idaho OTT, PO Box 443003 Morrill Hall 414 Moscow, Idaho, 83844-3003		5. TELEPHONE (include area code) (208) 885 4550	FOR OFFICIAL USE ONLY
		6. FAX (include area code) (208) 885 4551	PVPO NUMBER 202000446
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 N/A	9. DATE OF INCORPORATION N/A
10. NAME AND ADDRESS OF OWNER REPRESENTATIVE(S) TO SERVE IN THIS APPLICATION. (First person listed will receive all papers) Jack Brown PSES, CALS 875 Perimeter Dr. MS 2339 University of Idaho Moscow, ID 83844-2339		11. TELEPHONE (Include area code) (208) 885 7078 and (208) 885 4550	FILING AND EXAMINATION FEES: \$ 4382.00 DATE 9/28/2020
		12. FAX (Include area code) (208) 885 7760 and (208) 885 4551	CERTIFICATION FEE: \$ DATE
13. E-MAIL jbrown@uidaho.edu, copy to karens@uidaho.edu			
14. CROP KIND (Common Name) Spring rapeseed		15. GENUS AND SPECIES NAME OF CROP Brassica napus L.	16. FAMILY NAME (Botanical) Brassicaceae
17. IS THE VARIETY A FIRST GENERATION HYBRID? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		18. DOES THE VARIETY CONTAIN ANY TRANSGENES? (OPTIONAL) <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO IF YES, PLEASE GIVE THE ASSIGNED USDA-APHIS REFERENCE NUMBER FOR THE APPROVED PETITION TO DEREGULATE THE GENETICALLY MODIFIED PLANT FOR COMMERCIALIZATION.	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) <input checked="" type="checkbox"/> YES (If "yes", answer items 21 and 22 below) <input type="checkbox"/> NO (If "no", go to item 23) <input type="checkbox"/> UNDECIDED
19. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED (Follow instructions on reverse) a. <input checked="" type="checkbox"/> Exhibit A. Origin and Breeding History of the Variety b. <input checked="" type="checkbox"/> Exhibit B. Statement of Distinctness c. <input checked="" type="checkbox"/> Exhibit C. Objective Description of Variety d. <input checked="" type="checkbox"/> Exhibit D. Additional Description of the Variety (Optional) e. <input checked="" type="checkbox"/> Exhibit E. Statement of the Basis of the Owner's Ownership f. <input checked="" type="checkbox"/> Filing and Examination Fee (\$4,382), mDNH FKHFNV payable to "Treasurer of the United States" (Mail to the Plant Variety Protection Office) RWKHU PHWKRGV RI SD\PHQW HJ\SODLQHG LQ WKH LQVWUXFWLRQV		21. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF CLASSES? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO IF YES, WHICH CLASSES? <input checked="" type="checkbox"/> FOUNDATION <input type="checkbox"/> REGISTERED <input checked="" type="checkbox"/> CERTIFIED	
		22. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO IF YES, SPECIFY THE NUMBER 1,2,3, etc. FOR EACH CLASS. <input checked="" type="checkbox"/> FOUNDATION <input type="checkbox"/> REGISTERED <input checked="" type="checkbox"/> CERTIFIED <i>(If additional explanation is necessary, please use the space indicated on the reverse.)</i>	
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? <input checked="" type="checkbox"/> NO <input type="checkbox"/> YES 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)? <input type="checkbox"/> YES <input checked="" type="checkbox"/> 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 will be furnished directly to an acceptable depository in support of the variety within three months of filing. Seed will be replenished upon request in accordance with such regulations as may be applicable. For a tuber propagated variety or vegetative propagated parent of the variety, a tissue culture or vegetative sample will be deposited in a public repository within three months of the date of the certificate fee request letter. These will be maintained for the duration of the certificate. The undersigned owner(s) is (are) the owner(s) 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 - Revised signature June 2017 		SIGNATURE OF OWNER	
NAME (Please print or type) Jack Brown		NAME (Please print or type)	
CAPACITY OR TITLE Plant Breeder/Professor		CAPACITY OR TITLE	
DATE 7/22/2019		DATE	

Oct. 22, 2020 11:48 AM

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

Production of Industrious should be limited to Foundation and Certified seed only (i.e. no Registered seed class).

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.)*

Industrious seed has never been sold or transferred for increase to any third party prior to submitting this PVP application.

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).)*

N/A

<p>U.S. DEPARTMENT OF AGRICULTURE AGRICULTURAL MARKETING SERVICE SCIENCE AND TECHNOLOGY - PLANT VARIETY PROTECTION OFFICE APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE</p> <p>EXHIBIT A – ORIGIN AND BREEDING HISTORY ** Use additional names as needed</p>		<p>FOR OFFICIAL USE ONLY</p> <p>PVPO NUMBER</p> <p style="font-size: 1.2em;">202000446</p>						
<p>1. Name of Owner</p> <p>University of Idaho</p>	<p>2. Temporary Designation or Experimental Name</p> <p>UI.07.SI.8.A10..</p>	<p>3. Variety Name</p> <p>Industrious</p>						
<p>4. Describe the genealogy (back to and including public and commercial varieties, lines, or clones used) and the breeding method(s). **</p> <p>See Exhibit A attached below</p>								
<p>5. Give the details of subsequent stages of selection and multiplication. **</p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">Year</th> <th style="width: 40%;">Detail of Stage</th> <th style="width: 40%;">Selection Criteria</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">See Exhibit A attached below</td> <td style="text-align: center;">See Exhibit A attached below</td> <td style="text-align: center;">See Exhibit A attached below</td> </tr> </tbody> </table>			Year	Detail of Stage	Selection Criteria	See Exhibit A attached below	See Exhibit A attached below	See Exhibit A attached below
Year	Detail of Stage	Selection Criteria						
See Exhibit A attached below	See Exhibit A attached below	See Exhibit A attached below						
<p>6. Is the variety uniform? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>How did you test for uniformity? Variety is visually inspected for morphological uniformity. In addition variety was tested throughout the selection process for seed glucosinolate content and type and seed oil fatty acid profile.</p>								
<p>7. Is the variety stable? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>How did you test for stability? Over how many generations? The variety has been field tested over multiple years and sites and found to have stable performance.</p>								
<p>8. Are genetic variants observed or expected during reproduction and multiplication? Yes <input checked="" type="checkbox"/> No</p> <p>If yes, state how these variants may be identified, their type and frequency. No off-types or variants were observed in any of the seed increase stages</p>								

**‘Industrious’
Spring Rapeseed
Brassica napus L.**

Exhibit A: Origin and Breeding History

‘Industrious’ spring rapeseed (*Brassica napus* L. spp. *oleifera* (Metzg) Sinsk. f. *annua*) was developed for use as an industrial oil-quality (high erucic acid in seed oil) cultivar by the Idaho Agricultural Experimental Station, Moscow, ID 83844. This cultivar is protected by U.S. Plant Variety Protection (PVP pending). Industrious is a near pure-line spring rapeseed cultivar which has been developed to be adapted to the intermediate and high rainfall regions of the Pacific Northwest.

Industrious was developed from the cross UI.05.SI.13.B5.JB.8/UI.05.SI.4.B3.JB.13 (coded as 07.SI.8) completed in the spring of 2007. UI.05.SI.13.B5.JB.8 is a spring rapeseed breeding line selected at the University of Idaho with high erucic acid and low polyunsaturated seed oil fats and low seed meal glucosinolates from the cross [UI.96.SI.5.10.3.12/IMC.129]; UI.96.SI.5.10.3 is a spring rapeseed breeding line selected at the University of Idaho with high erucic acid fats in seed oil and low seed meal glucosinolates from the cross Hyola.308/UI.92.SN.47.2.1; where UI.92.SI.47.2.1 is a spring rapeseed breeding line selected at the University of Idaho to have high erucic acid and low polyunsaturated seed oil fats and low seed meal glucosinolates from the cross Starr x Hero. Starr is a spring canola cultivar developed in by Dansk Planterforaeding, Denmark; and Hero is a spring industrial rapeseed cultivar (*i.e.* high erucic acid content in the seed oil) developed at the University of Manitoba, Canada. IMC.129 is a spring canola cultivar developed by Inter-Mountain Canola. UI.05.SI.4.B3.13 is a spring rapeseed breeding line selected at the University of Idaho with high erucic acid and low polyunsaturated seed oil fats and low seed meal glucosinolates from the cross Sterling/Allons; Sterling is a spring rapeseed cultivar developed at the University of Idaho from the cross Jaguar/Hero; where Jaguar is a canola quality cultivar developed by Maribo Seeds Co., Denmark, and Hero (see above). Allons is a low linolenic acid spring canola developed at the University of Manitoba, Canada.

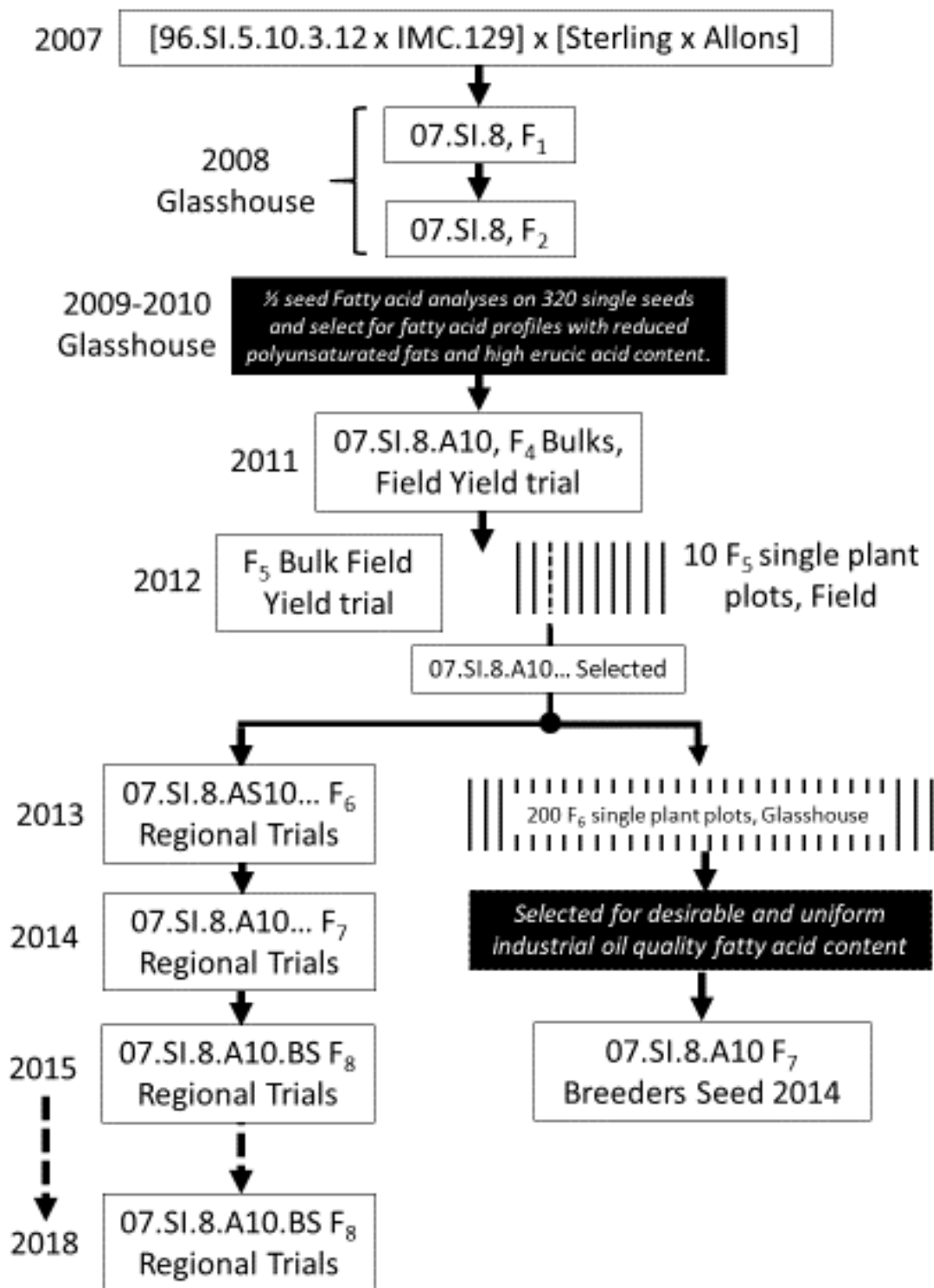
The development of Industrious spring rapeseed is shown diagrammatically in Figure A1. F₁ seed from the initial two-parent cross was produced in 2007. F₁ seed was grown in the greenhouse without selection to produce F₂ seed harvested in spring of 2008. ½-seed analyses, where a small portion of seed cotyledon is removed, oil extracted and fatty acid content determined through gas chromatography. Seed from selected fatty acid profiles are thereby planted in the glasshouse to produce F₃ seed in the glasshouse in 2009 to 2010.

Seed from F_{3,4} bulk were planted replicated field yield trials and in seed-increase plots in spring of 2011. Yield trial plots were evaluated for crop establishment, flowering date, plant height, absence from pests and diseases and seed yield, were evaluated from the yield trials. After harvest a sample of seed from each yield trial plot was taken and used for quality determination (fatty acid profile of seed oil and glucosinolate content of de-fatted seed meal). At crop maturity 10 plants were selected from the seed increase plots and seed from each plant trashed separately and used to plant F_{4,5} single plant plots (5 m x 0.4 m) in spring of 2012. The remainder of the seed-increase plot was bulk harvested and used to plant F₅ yield trials in 2012.

2012 F_{4:5} yield trial plots were evaluated in for crop establishment, flowering date, plant height, absence from pests and diseases and seed yield, were evaluated from the yield trials. After harvest a sample of seed from each yield trial plot was taken and used for quality determination (fatty acid profile of seed oil and glucosinolate content of de-fatted seed meal). F_{4:5} single plant plots also were visually evaluated for Breeders' Preference (a visual assessment of commercial worth). At maturity, one of the F_{5:6} single plant plots (07.SI.8..) was selected and seed from that plot hand-harvested and trashed and used to plant Regional Trials in 2013.

200 seeds from the F_{5:6} bulk were planted and grown to maturity in a glasshouse in 2013. At maturity seed was harvested from each plant separately and fatty acid profile determined. Seed from 30 F_{5:7} plants with higher than 460 g kg erucic acid were used to plant single-plant plots in the field in 2014. Each single plant plot was visually inspected throughout the growing season and 2 'off-type' plots were removed. The remaining 28 plots were bulk harvested as Breeders' Seed and used for planting Regional Trials 2015 through 2018.

Certified Seed Classes will be restricted to Foundation and Certified. Requests for Seed can be made through the University of Idaho, Foundation Seed Program, Moscow, ID 83844-2090 (seed@uidaho.edu). To obtain production License contact the University of Idaho, Office of Technology Transfer: telephone: 208-885-4550.



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

FOR OFFICIAL USE ONLY

PVPO NUMBER

202000446

EXHIBIT B – STATEMENT OF DISTINCTNESS

**** Use additional tables to present clear differences for additional comparison varieties. Use additional pages to present supporting evidence.**

1. Name of Owner University of Idaho	2. Temporary Designation or Experimental Name 7.SI.8.A10	3. Variety Name Industrious
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Based on overall morphology, **Industrious** is most similar to **Gem**. Industrious most clearly differs from Gem in the following traits
 Name the specific trait. Then list the value of that trait for each variety in the comparison.
 Appropriate supporting evidence (see the [Guidelines for Presenting Evidence in Support of Variety Distinctness in the instructions](#)):

<i>Eg. Leaf Pubescence</i> Green (2.5GY 8/10) +/- 15 cm (N=25)	<i>heavy pubescence photograph attached</i> <i>Eg. Leaf Color Munsell Color Chart</i> <i>statistics attached</i>	<i>glabrous</i> Dark Green (5GY 3/4) 200 cm +/- 10 cm (N=25)	<i>Light</i> 250 cm
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1. Qualitative traits:	2. Color traits:	3. Quantitative traits:	4. Other traits:
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Application Variety	Days to 50% flower bloom (See Table B1, below) Plant height (see Table B2, below);			
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Comparison Variety	Gem Industrious is highly Susceptible to different Group 2 class herbicides, including imidazolinone; while Gem is highly tolerant to Group 2 herbicides.			Gem (See Leaf Photograph, Figure B1 and B2).
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**** Use additional tables to present clear differences for additional comparison varieties. Use additional pages to present supporting evidence.**

**‘Industrious’
Spring Rapeseed
Brassica napus L.**

Exhibit B: Statement of Distinctness

Industrious is most similar in general plant appearance (i.e. leaf shape and color) to the spring rapeseed cultivar Gem. Both Industrious and Gem glasshouse grown plants are similar leaf color and waxes (Figure B1): however, Industrious glasshouse plants have more distinct leaf attachments and overlapping leaf lobes. Lower leaves of field grown Gem plants had small leaf attachment compared to Industrious plants (Figure B2) Gem field grown plants have greater lobing and Industrious plants show greater crossover lobes. Upper leaves and flowers of Industrious and Gem were very similar.

Industrious plants flower on average over 2-3 days earlier than Gem (Table B1). The earlier flowering trait of Industrious was observed in each year and location (12 year-sites) where this flowering was recorded. Industrious plants post bloom are on average over 5.6 cm shorter than Gem plants (Table B2). On average Industrious plants post bloom were 102 cm tall, while the taller rapeseed cultivar Gem was 107 cm tall. The difference in plant height between Industrious and Gem was exhibited in all years and sites.

The primary distinctness between Industrious and Gem relate to herbicide tolerance. Gem has high tolerance to several Group 2 herbicides including: **Beyond**[®] [ammonium salt of imazamox (12.1%), (2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1*H*-imidazol-2-yl]-5-(methoxymethyl)-3-pyridinecarboxylic acid)]; **Ally XP**[®] [metsulfuron methyl (60%), (methyl 2-[[[(4-methoxy-6-methyl-1,3,5-triazin-2yl)amino]carbonyl]amino]sulfonyl]benzoate)]; **Harmony Extra SG**[®] [thifensulfuron-methyl (33.33%), (methyl 3--[[[(4-methoxy-6-methyl-1,3,5-triazin-2yl)amino]carbonyl] amino] sulfonyl]-2-thiophenecarboxylate), tribenuron-methyl (16.67%) (methyl 2-[[[[N-(4-methoxy-6-methyl-1,3,5-triazin-2yl) methylamino] carbonyl] amino] sulfonyl] benzoate)]; **Olympus**[®] [sulfonylaminocarbonyl triazolinone (70%), (2-[(4-Methyl-5-oxo-3-propoxy-1,2,4-triazolin-1-yl)carbamidosulfonyl] benzoic acid methyl ester sodium salt)]; and **Powerflex HL**[®] [pyroxsulam (13.13%), (N-(5,7-dimethoxy-[1,2,4]triazolo[1,5-a]pyrimidin-2-yl)-2-methoxy-4-(trifluoromethyl)pyridine-3-sulfonamide)]. Industrious is highly susceptible to all Group 2 herbicides.

Table B1. Days from planting to 50% flower bloom of Gem and Industrious spring rapeseed grown in replicated field evaluation trials grown at Moscow and Genesee in Northern Idaho from 2013 through 2018.

	Average	Rank	2018	2017	2016	2015	2014	2013
# sites	12		2	2	2	2	2	2
Cultivar	----- DAP -----							
Gem	47.7 ^a	1.0	47.0	45.0	47.5	47.0	50.3	49.5
Industrious	45.0 ^b	2.0	44.6	41.5	45.2	46.0	45.6	47.0
Mean	46.8		45.8	43.3	46.4	49.0	47.9	48.3
LSD ($p=0.05$)	0.9		0.7	0.8	1.1	0.6	1.0	1.3
C.V. (%)	1.6		1.6	1.2	1.7	1.3	1.9	1.9

Means within columns with different superscript letter are significantly different ($P<0.05$).

Table B2. Plant height post flower bloom of Gem and Industrious spring rapeseed grown in replicated field evaluation trials grown at Moscow and Genesee in Northern Idaho from 2013 through 2018.

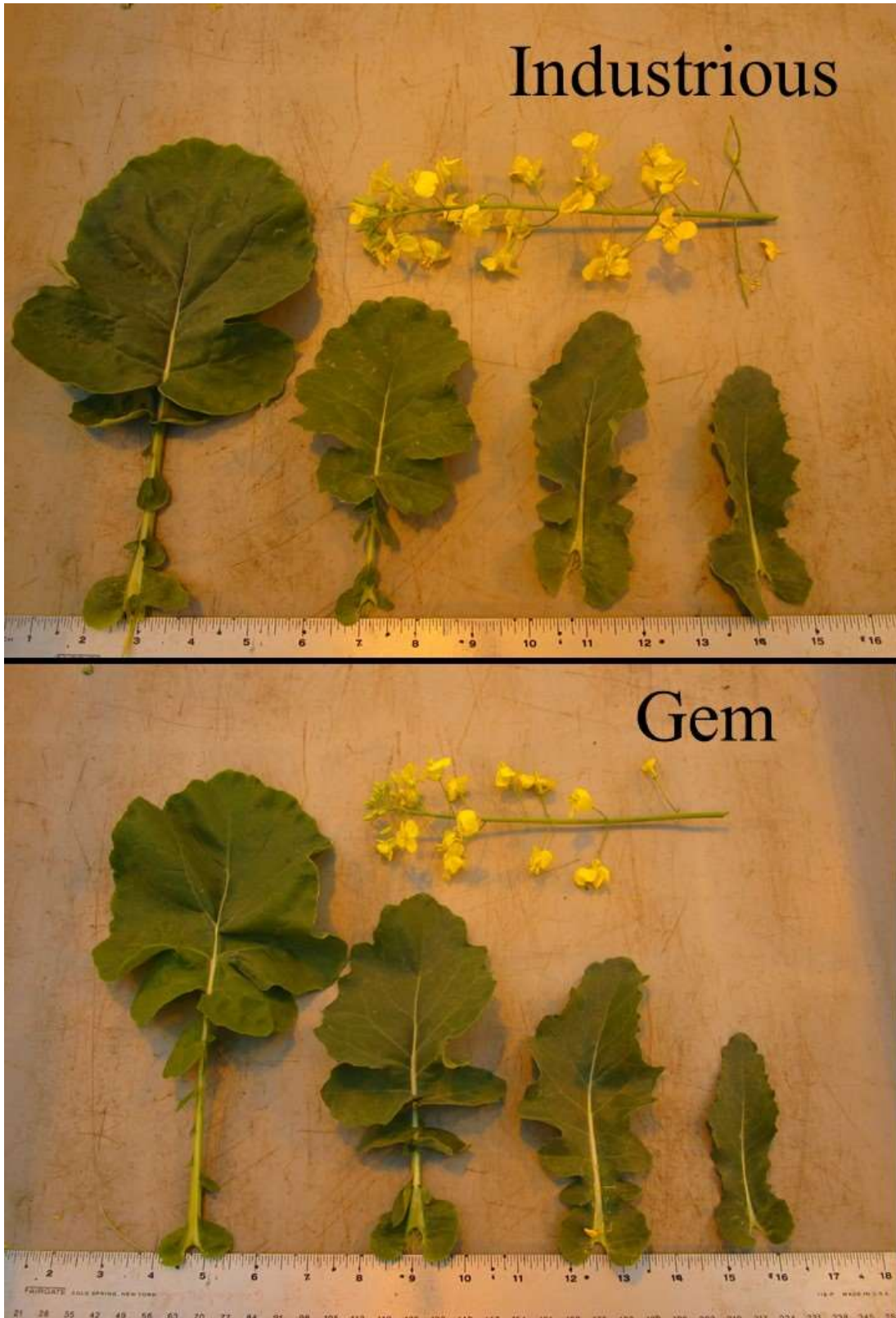
	Average	Rank	2018	2017	2016	2015	2014	2013
# sites	12		2	2	2	2	2	2
Cultivar	----- cm -----							
Gem	107.2 ^a	1.0	110.6	100.6	103.0	114.3	99.4	115.1
Industrious	101.6 ^b	2.0	104.4	97.9	100.0	109.2	85.6	112.5
Mean	106.1		107.5	99.3	101.5	121.9	92.5	113.8
LSD ($p=0.05$)	4.5		5.3	4.3	3.8	5.1	4.1	4.6
C.V. (%)	5.1		4.7	4.9	4.1	4.3	6.2	6.4

Means within columns with different superscript letter are significantly different ($P<0.05$).

Figure B1. Lower leaf comparison between glasshouse grown Industrious and Gem plants.



Figure B2. Lower leaf comparison between field grown Industrious and Gem plants.



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

**OBJECTIVE DESCRIPTION OF VARIETY
SPRING RAPESEED (*Brassica napus* L.)**

NAME OF APPLICANT (S)	TEMPORARY OR EXPERIMENTAL DESIGNATION	VARIETY NAME
Idaho Agricultural Experiment Station	7.SI.8.A10..	'Industrious'
ADDRESS (Street and No. or RD No., City, State, Zip Code, and Country)		FOR OFFICIAL USE ONLY
University of Idaho Moscow, Idaho, 83844-2339		PVPO NUMBER 202000446

1. SPECIES: *Brassica napus* L.

2. TYPE

* Spring type Winter type

3. PLANT HEIGHT (at pod maturity)

102 cm Tall (compare to standard variety below)

cm shorter than Check variety:

Height same as Check variety:

5.6 cm shorter than Check variety: Gem

* Height Class: 1

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

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 () 2 = Medium () 3 = Broad ()

6. SEEDLING GROWTH HABIT (leaf rosette)

1 1 = Upright 2 = Prostrate (short photoperiod)

7. LEAVES

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

* 3 Lobing (fully developed leaf on plant or rosette)

- 1 = Absent or very weak () 2 = Weak () 3 = Medium ()
4 = Medium Strong () 5 = Strong () – See photograph attached Figure B1 & Figure B2

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

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

* 2 Glaucosity: 1 = Absent () 2 = Weak (X) 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: 0%)
1 = Absent (X) 2 = Few () 3 = Medium () 4 = Many ()

* 2 Flowering class (Spring sown)

- 1 = Very early ()
- 2 = Early (X)
- 3 = Medium early ()
- 4 = Medium late ()
- 5 = Late ()
- 6 = (Very late)

9. PODS (*Siliqua*)

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

* 3 Siliqua beak length: (given length: 13.2 mm) 1 = Short () 2 = Medium () 3 = Long (X)

* 3 Pod length: (give length: 66.0 mm) 1 = Short () 2 = Medium () 3 = Long (X)

* 2 Pod width: 1 = Narrow () 2 = Medium (X) 3 = Wide ()

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

* 3 Pedicel length: (give length: 18.6 mm) 1 = Very short () 2 = Short () 3 = Long (X)

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

* 45.0 Days to 50% bloom

* 2.7 Days earlier than Check variety: Gem

* Maturity same as Check variety: _____

* Day earlier than Check variety: _____

10. SEEDS

* 2.91 g/1000 unsized seed

* _____ g less than Check variety: _____

* Weight same as Check variety: Gem

* _____ g more than Check variety: _____

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

* 3 Seeds Per Pod: (give number: 29.3 per pod): 1 = Low () 2 = Medium () 3 = High (X)

* 2 Testa Color: 1= dark brown (), 2= brown (X), 3= Reddish-brown (), 4= Yellow (),
and 5= orange-yellow (), 6 = Other _____

11. CHEMICAL COMPOSITION OF SEED

* 2 Erucic Acid: 1 = Low (less than 2%) 2 = Intermediate (2-50%) 3 = High (more than 50%): (given as 250 gram/kg of seed oil) (See Table D6)

* 1 Glucosinolate Content; (give: 11.3 $\mu\text{mol}/\text{gram}$ defatted seed meal). See Comments for glucosinolate profile.
1 = Low – less than 30 $\mu\text{mol}/\text{gram}$ defatted seed meal () 2 = Moderately high 30-150 $\mu\text{mol}/\text{gram}$ defatted seed meal;
3 = High – More than 150 $\mu\text{mol}/\text{gram}$ defatted seed meal (See Table D7)

* 41.4 % Oil (See Table D4)

* % Protein (oil-free meal): Not Recorded

Fatty Acid Composition (g kg^{-1}):

Sample	Palmitic† 16:0	Stearic 18:0	Oleic 18:1	Linoleic 18:2	Linolenic 18:3	Eicosenoic 20:1	Erucic 22:1
	----- g kg ⁻¹ -----						
Gem	26	11	162	106	76	105	468
Industrious	25	11	204	84	58	102	470
s.e. Mean	1	0	3	11	1	3	4

† 16:0 = palmitic acid; 18:0 = stearic acid; 18:1 = oleic acid; 18:2 = linoleic acid; 18:3 = linolenic acid;
20:1 = eicosenoic acid; 22:1 = erucic acid; and 24:1 = nervonic acid.

§ ns = no significant difference between varieties.

12. FROST TOLERANCE (Late spring frosts)

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

13. LODGING RESISTANCE

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

14. HERBICIDE RESISTANCE

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

* 1 Several Group 2 herbicides including: **Beyond**[®] [ammonium salt of imazamox (12.1%), (2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-5-(methoxymethyl)-3-pyridinecarboxylic acid)]; **Ally XP**[®] [metsulfuron methyl (60%), (methyl 2-[[[4-methoxy-6-methyl-1,3,5-triazin-2-yl]amino]carbonyl]amino)sulfonyl]benzoate)]; **Harmony Extra SG**[®] [thifensulfuron-methyl (33.33%), (methyl 3-[[[4-methoxy-6-methyl-1,3,5-triazin-2-yl]amino] carbonyl] amino] sulfonyl]-2-thiophenecarboxylate), tribenuron-methyl (16.67%) (methyl 2-[[[N-(4-methoxy-6-methyl-1,3,5-triazin-2-yl) methylamino] carbonyl] amino] sulfonyl] benzoate)]; **Olympus**[®] [sulfonylaminocarbonyl triazolinone (70%), (2-[(4-Methyl-5-oxo-3-propoxy-1,2,4-triazolin-1-yl) carbamidosulfonyl] benzoic acid methyl ester sodium salt)]; and **Powerflex HL**[®] [pyroxsulam (13.13%), (N-(5,7-dimethoxy-[1,2,4]triazolo[1,5-a]pyrimidin-2-yl)-2-methoxy-4-(trifluoromethyl)pyridine-3-sulfonamide)]: 1 = Susceptible (X) 4 = Resistant/tolerant ()

* 1 glyphosate: 1 = Susceptible (X) 4 = Resistant/tolerant ()

* 1 glufosinate: 1 = Susceptible (X) 4 = Resistant/tolerant ()

* X Other, None

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

* 0 Sclerotinia Stem Rot (*Scerotinia sclerotiorum*)

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

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

* 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)
 17. **Seed glucosinolate profile and total ($\mu\text{mol g}^{-1}$ defatted seed meal, See Table D9)**

Cultivator	3-butenyl	4-pentenyl	2-hydroxy-3-butenyl	2-hydroxy-4-pentenyl	Total
----- $\mu\text{mol g}^{-1}$ defatted seed meal -----					
Gem	3.3	0.2	8.9	0.3	12.7
Industrious	3.8	0.5	6.9	0.2	11.3
s.e. Mean	0.12	0.09	0.21	0.02	0.32

[†] 3-butenyl glucosinolate, 4-pentenyl glucosinolate, 2-hydroxy-3-butenyl glucosinolate, 2-hydroxy-4-pentenyl glucosinolate.

18. 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 Inland Pacific Northwest conditions Dryland agriculture.

19. **N/A**

Exhibit D: Additional Description of Variety

Industrious plants emerge and establish quickly after spring planting. On average, Industrious reached 50% bloom 45 days after planting which is significantly quicker than Gem (47.7 days). After flower end Industrious plants are significantly shorter (102 cm) than Gem (107 cm) (Table D2).

Industrious was evaluated in replicated field trials 2013, 2014, 2015, 2016, 2017 and 2018. These trials (Pacific Northwest Canola & Rapeseed Variety Trials) are grown at 8-10 locations throughout Idaho, Washington and Oregon and over the six years Industrious was included in 45 year-sites harvested. Seed yield of Industrious was significantly higher compared to Gem (Table D3).

Seed oil content of Industrious (41.4%) was not significantly different from the high oil content rapeseed Gem (Table D4).

Industrious plants produce seed pods which with significantly longer pedicels and pod beaks than Gem (Table D5). Pods on average are 66 mm long, were not significantly different than Gem pods (67 mm). Seed number per pod (29 seed pod⁻¹) of Industrious was significantly higher from Gem (24 seeds pod⁻¹). Thousand seed weight of Industrious was only medium at 2.91 g 1,000⁻¹ seeds.

Industrious produces high erucic acid industrial seed oils and canola-quality seed meal with very low seed meal glucosinolates adding to the livestock feed value of Industrious defatted seed meal. Industrious seed oil fatty acid profile is similar to Gem (from multiple samples taken from Industrious Breeders' Seed, Table D6). Industrious Breeders' Seed oils are 47 erucic acid (22:1), 8.4% linoleic acid (18:2), and 5.8 % linolenic acid (18:3). Seed meal total glucosinolates are very low (11.2 $\mu\text{mol g}^{-1}$ of defatted seed meal), similar to the low glucosinolate cultivar Gem (Table D7). Predominant glucosinolate type in Industrious seed meal is 2-hydroxy-3-butenyl glucosinolate (57%), and 3-butenyl glucosinolate (38%), a similar profile to Gem.

Table D1. Days from planting to 50% flower bloom of Gem and Industrious spring rapeseed grown in replicated field evaluation trials in 2013 through 2018.

	Average	Rank	2018	2017	2016	2015	2014	2013
# sites	12		2	2	2	2	2	2
Cultivar	----- DAP -----							
Gem	47.7 ^a	1.0	47.0	45.0	47.5	47.0	50.3	49.5
Industrious	45.0 ^b	2.0	44.6	41.5	45.2	46.0	45.6	47.0
Mean	46.8		45.8	43.3	46.4	49.0	47.9	48.3
LSD ($p=0.05$)	0.9		0.7	0.8	1.1	0.6	1.0	1.3
C.V. (%)	1.6		1.6	1.2	1.7	1.3	1.9	1.9

Means within columns with different superscript letter are significantly different ($P<0.05$).

Table D2. Plant height post flower bloom of Gem and Industrious spring rapeseed grown in replicated field evaluation trials in 2013 through 2018.

	Average	Rank	2018	2017	2016	2015	2014	2013
# sites	12		2	2	2	2	2	2
Cultivar	----- cm -----							
Gem	107.2 ^a	1.0	110.6	100.6	103.0	114.3	99.4	115.1
Industrious	101.6 ^b	2.0	104.4	97.9	100.0	109.2	85.6	112.5
Mean	106.1		107.5	99.3	101.5	121.9	92.5	113.8
LSD ($p=0.05$)	4.5		5.3	4.3	3.8	5.1	4.1	4.6
C.V. (%)	5.1		4.7	4.9	4.1	4.3	6.2	6.4

Means within columns with different superscript letter are significantly different ($P<0.05$).

Table D3. Seed yield of Gem and Industrious spring rapeseed grown in replicated field evaluation trials in ~~2016, 2017 and 2018.~~ 2013 to 2018

	Average	Rank	2018	2017	2016	2015	2014	2013
# sites	45		7	9	7	7	7	8
Cultivar	----- kg ha ⁻¹ -----							
Gem	1,613 ^b	2	1,539	1,278	2,075	1,447	1,639	1,775
Industrious	1,916 ^a	1	1,965	1,441	2,246	1,772	1,792	2,278
Mean	1,793		1,752	1,360	2,160	1,741	1,716	2,027
LSD (<i>p</i> =0.05)	152		221	122	169	137	157	105
C.V. (%)	15.0		14.9	18.3	11.6	15.3	16.8	13.1

Means within columns with different superscript letter are significantly different (*P*<0.05).

Table D4. Seed oil content of Gem and Industrious spring rapeseed grown in replicated field evaluation trials in ~~2016, 2017 and 2018.~~ 2013 to 2018

	Average	Rank	2018	2017	2016	2015	2014	2013
# sites	36		8	7	7	7	7	6
Cultivar	----- g kg ⁻¹ -----							
Gem	419	1	420	447	425	410	406	401
Industrious	414	2	418	448	416	404	397	403
Mean	417		419	447	420	407	401	402
LSD (<i>p</i> =0.05)	9.1		5.0	5.0	14.6	6.7	5.3	20.0
C.V. (%)	2.5		2.4	2.1	2.5	3.0	2.6	2.6

Means within columns with different superscript letter are significantly different (*P*<0.05).

Table D5. Pedicel^{icel} length, pod length, beak length and number of seeds per pod of Gem and Industrious spring rapeseed grown in replicated field evaluation trials in 2018.

Cultivar	Pedicels	Pod Length	Beak Length	Seeds pod ⁻¹
	----- mm -----			-- Count --
Gem	21.6 ^a	66.9	13.2 ^a	24.4 ^b
Industrious	18.6 ^b	66.0	10.4 ^b	29.3 ^a
Mean	20.1	66.4	11.8	26.8
LSD 5%	1.5	n.s.	1.3	1.4

Means within columns with different superscript letter are significantly different (P<0.05).

Table D6. Fatty acid profile of Gem and Industrious based on multiple seed samples taken from 2014 Breeders' Seed.

Variety	16:0 [†]	18:0	18:1	18:2	18:3	20:1	22:1
	----- g kg ⁻¹ -----						
Gem	26	11	162	106	76	105	468
Industrious	25	11	204	84	58	102	470
s.e. Mean	0.6	0.2	3.1	10.6	0.7	3.5	3.9

[†] 16:0 = palmitic acid; 18:0 = stearic acid; 18:1 = oleic acid; 18:2 = linoleic acid; 18:3 = linolenic acid; 20:1 = eicosenoic acid; 22:1 = erucic acid; and 24:1 = nervonic acid. [§] ns = no significant difference between varieties.

Table D7. Gem and Industrious seed meal glucosinolate profile and content on defatted seed means.

Cultivar	3-butenyl [†]	4-pentenyl	2-hydroxy-3-butenyl	2-hydroxy-4-pentenyl	Total
	----- μmol g ⁻¹ -----				
Gem	3.26	0.21	8.92	0.27	12.66
Industrious	3.76	0.50	6.87	0.16	11.29
s.e. Mean	0.122	0.089	0.214	0.019	0.322

[†] 3-butenyl glucosinolate, 4-pentenyl glucosinolate, 2-hydroxy-3-butenyl glucosinolate, 2-hydroxy-4-pentenyl glucosinolate.

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

FOR OFFICIAL USE ONLY

PVPO NUMBER

202000446

EXHIBIT E - STATEMENT OF THE BASIS OF OWNERSHIP

1. Name of Owner

University of Idaho

2. Temporary Designation or Experimental Name

7.SI.8.A10..

3. Variety Name

Industrious

4. Does the applicant own all rights to the variety? Mark an "X" in the appropriate block. If no, please explain.

YES

NO

5. Is the applicant a U.S. national or a U.S. based entity? If no, give name of country.

YES

NO

6. 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

7. 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.