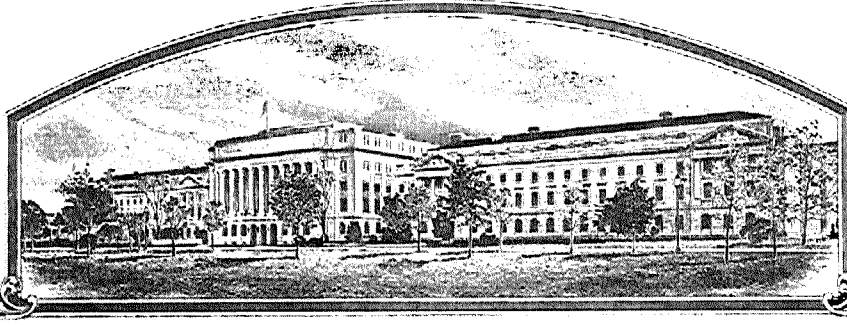


No.

202100038



# THE UNITED STATES OF AMERICA

**TO ALL TO WHOM THESE PRESENTS SHALL COME:**

## Oregon State University

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.)



WHEAT, COMMON

'Nixon'

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 ninth day of November, in the year two thousand twenty one.*

Attest:

Commissioner  
Plant Variety Protection Office  
Agricultural Marketing Service

Administrator  
Agricultural Marketing Service

REPRODUCE LOCALLY. Include form number and date on all reproductions

Form Approved - OMB No. 0581-0055

<b>U.S. DEPARTMENT OF AGRICULTURE</b> AGRICULTURAL MARKETING SERVICE SCIENCE AND TECHNOLOGY - PLANT VARIETY PROTECTION OFFICE  <b>APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE</b> <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 <b>Oregon State University</b>		2. TEMPORARY DESIGNATION OR EXPERIMENTAL NAME <b>OR2121086</b>	3. VARIETY NAME <b>Nixon</b>
4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP Code, and Country) Oregon State University Office of Commercialization and Corporate Development 312 Kerr Administration Building Oregon State University Corvallis, OR97331-2140		5. TELEPHONE (include area code) <b>541-737-3467</b>	<b>FOR OFFICIAL USE ONLY</b>
		6. FAX (include area code) <b>541-737-9041</b>	
7. IF THE OWNER NAMED IS NOT A "PERSON", GIVE FORM OF ORGANIZATION (corporation, partnership, association, etc.) <b>Educational Institution</b>		8. IF INCORPORATED, GIVE STATE OF INCORPORATION <b>Oregon</b>	FILING DATE <b>11/4/2020</b>
10. NAME AND ADDRESS OF OWNER REPRESENTATIVE(S) TO SERVE IN THIS APPLICATION. (First person listed will receive all papers) Oregon State University Director - Office of Commercialization and Corporate Development 312 Kerr Administration Building Oregon State University Corvallis, OR97331-2140		11. TELEPHONE (Include area code) <b>541-737-3467</b>	FILING AND EXAMINATION FEES: \$ <b>5150.00</b> 11/4/2020 DATE CERTIFICATION FEE: \$ DATE
		12. FAX (Include area code) <b>541-737-9041</b>	
13. E-MAIL <b>OCCD@oregonstate.edu</b>			
14. CROP KIND (Common Name) <b>wheat</b>	15. GENUS AND SPECIES NAME OF CROP <b>Triticum aestivum</b>	16. FAMILY NAME (Botanical) <b>Graminaceae</b>	
17. IS THE VARIETY A FIRST GENERATION HYBRID? <input type="radio"/> YES <input checked="" type="radio"/> NO	18. DOES THE VARIETY CONTAIN ANY BIOTECHNOLOGY EVENTS? <input type="radio"/> YES <input checked="" type="radio"/> NO  A biotechnology event is defined as a single insertion of a nucleic acid construct into a specific site in a plant's chromosome that is regulated under the U.S. Coordinated Framework for the Regulation of Biotechnology.	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="radio"/> YES (If "yes", answer items 21 and 22 below) <input type="radio"/> NO (If "no", go to item 23) <input type="radio"/> UNDECIDED	
19. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED (Follow instructions) 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). ✓ Make checks and money orders payable to "Treasurer of the United States" (Mail to the Plant Variety Protection Office) ✓ Credit Card Payments (See instructions on Page 2 of 11)		21. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF CLASSES? <input type="radio"/> YES <input checked="" type="radio"/> NO IF YES, WHICH CLASSES? <input type="checkbox"/> FOUNDATION <input type="checkbox"/> REGISTERED <input type="checkbox"/> CERTIFIED	
		22. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS? <input type="radio"/> YES <input checked="" type="radio"/> 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 next page.)	
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="radio"/> YES <input type="radio"/> 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 next page.)		24. IS THE VARIETY OR ANY COMPONENT OF THE VARIETY PROTECTED BY INTELLECTUAL PROPERTY RIGHT (PLANT BREEDER'S RIGHT OR PATENT)? <input type="radio"/> YES <input checked="" type="radio"/> NO  IF YES, PLEASE GIVE COUNTRY, DATE OF FILING OR ISSUANCE AND ASSIGNED REFERENCE NUMBER. (Please use space indicated on next page.)	
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 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 <i>Chris Stoner</i>		SIGNATURE OF OWNER	
NAME (Please print or type) Chris Stoner		NAME (Please print or type)	
CAPACITY OR TITLE Dir. of IP & Commercial Agrmts.	DATE 10/28/2020   14: 37:	CAPACITY OR TITLE 07 PDT	DATE

**Continuation Page from ST – 470 (Application for Plant Variety Protection Certificate)**

**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.)*

November 21, 2019

**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).)*

U.S. DEPARTMENT OF AGRICULTURE AGRICULTURAL MARKETING SERVICE SCIENCE AND TECHNOLOGY - PLANT VARIETY PROTECTION OFFICE APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE  <b>EXHIBIT A – ORIGIN AND BREEDING HISTORY</b> ** Use additional pages as needed.	<b>FOR OFFICIAL USE ONLY</b>  PVPO NUMBER
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1. Name of Owner  <b>Oregon State University</b>	2. Temporary Designation or Experimental Name  <b>OR2121086</b>	3. Variety Name  <b>Nixon</b>
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4. Describe the genealogy (back to and including public and commercial varieties, lines, or clones used) and the breeding method(s). \*\*

OR2121086 is an awned semi-dwarf soft white winter wheat from the cross Tubbs / Skiles. Tubbs is a soft white winter wheat cultivar from the OSU breeding program that had high yield potential, carried Pch1 for strawbreaker foot rot resistance but became susceptible to stripe rust and had mediocre end-use quality. Skiles is also a soft white winter wheat cultivar from the OSU breeding program that had excellent stripe rust resistance and good end-use quality. The initial cross between Tubbs and Skiles made in spring 2007 at the OSU Hyslop field laboratory in Corvallis, OR. The breeding approach followed a modified bulk-pedigree model with shuttle breeding between two locations prior to switching from a bulk to breeding lines. The F1 generation was grown as a bulk at the Hyslop field laboratory with minimal selection. The F2 generation was grown in the greenhouse and was screened for the presence of the Pch1 gene for foot rot resistance and photoperiod insensitivity using molecular markers. Seed from plants that carried the Pch1 gene and carried the ppd gene for photoperiod insensitivity were bulked to form the F3 generation. The F3 generation was grown as a bulk at both the Hyslop field laboratory and at the Ruggs research site east of Pendleton, OR. Minimal selection was done on the F3 bulk population, but at harvest instead of being bulked, individual heads were collected. Heads were individually threshed and planted as F4 head rows at the Ruggs research site in fall, 2011. Head rows were evaluated for stripe rust (*Puccinia striiformis* Westend.) resistance, height and uniformity and selected head rows were individually harvested and threshed. In 2012. Seed was evaluated for hardness (score below 35), seed size and seed weight using a Perten SKCS 4100 system. F5 lines with the desired seed characteristics were planted at Hyslop field laboratory and the Ruggs research site in 5'x 20' plots in fall 2012. At this time the designation OR2121086 was assigned. The F5 lines were evaluated for disease resistance, straw strength, height, yield, test weight and end-use quality. OR2121086 was advanced through the F6, F7 and F8 generations, being grown at additional sites in Oregon each year with further evaluation for disease resistance, agronomic performance and end-use quality. Molecular markers were used during the F6 generation to confirm the presence or absence of the Pch1 gene.

5. Give the details of subsequent stages of selection and multiplication. \*\*

Year	Detail of Stage	Selection Criteria
2007	cross between Tubbs and Skiles	none
2008	F1 bulk grown in the field	none
2009	F2 individual plants in greenhouse	Pch1 and ppd genes based on markers
2010	F3 bulk grown in the field	none
2011	F4 head rows	stripe rust, uniformity, seed traits
2012	F5 preliminary yield trials	yield, disease resistance, quality
2013	F6 preliminary yield trials	yield, disease resistance, quality
2014	F7 advanced yield trials	yield, disease resistance, quality
2015	F8 advanced yield trials	yield, disease resistance, quality
2016	Breeder seed head rows	uniformity and disease resistance
2017	Breeder seed and Foundation seed produced	uniformity and disease resistance
2018	Foundation seed produced	uniformity and disease resistance

6. Is the variety uniform?  Yes  No

How did you test for uniformity?

Visual observation of nurseries and drill strips of OR2121086 in 2014 through 2018.  
 Testing of seed for color and hardness from 2014 through 2018.

7. Is the variety stable?  Yes  No

How did you test for stability? Over how many generations?

Observed nursery plots and drill strips of OR2121086 for four years  
 Tested for presence of the Pch1 gene using molecular markers from 2014 to 2018

8. Are genetic variants observed or expected during reproduction and multiplication?  Yes  No

If yes, state how these variants may be identified, their type and frequency.

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
<b>EXHIBIT B – STATEMENT OF DISTINCTNESS</b> <b>** Use additional tables to present clear differences for additional comparison varieties. Use additional pages to present supporting evidence.</b>			PVPO NUMBER
1. Name of Owner <b>Oregon State University</b>	2. Temporary Designation or Experimental Name <b>OR2121086</b>	3. Variety Name <b>Nixon</b>	
Based on overall morphology, <u>Nixon</u> is most similar to <u>Tabbe-06</u> <b>Norwest Duet</b> . <span style="float: right;">MAH 3-09-2021</span> <small><i>Applicant's new variety</i></small> <small><i>Most similar comparison variety(ies)</i></small> <small>Nixon</small> most clearly differs from <small>Norwest Duet</small> in the following traits: <small><i>Applicant's new variety</i></small> <small><i>Most similar comparison variety(ies)</i></small>			
Name the specific trait. Then list the value of that trait for each variety in the comparison. Submit appropriate supporting evidence (see the <a href="#">Guidelines for Presenting Evidence in Support of Variety Distinctness in the instructions below</a> ).			
<i>Eg. Leaf Pubescence</i> <i>Eg. Leaf Color</i> <i>Eg. Plant Height</i>	<i>heavy pubescence</i> <i>Dark Green (5GY 3/4)</i> <i>200 cm +/- 10 cm (N=25)</i>	<i>glabrous</i> <i>Light Green (2.5GY 8/10)</i> <i>250 cm +/- 15 cm (N=25)</i>	<i>photograph attached</i> <i>Munsell Color Chart</i> <i>statistics attached</i>
<b>1. Qualitative traits:</b>	<b>Applicant's New Variety</b> <u>Nixon</u>	<b>1<sup>st</sup> Comparison Variety</b> <u>Norwest Duet</u>	<b>Location of Evidence Within the Application</b>
Strawbreaker foot rot resistance	moderately resistance	susceptible	Exhibit B table 1
<b>2. Color traits:</b>			
<b>3. Quantitative traits:</b>			
<b>4. Other:</b>			
Molecular marker profile KASP markers  Agarose markers	TaPpd-A29 TaPsy1-D1 Ta Sus-2B TaGlu-A1 ORW1D Bx6  SNP-A insensitive SNP-C increase YP SNP-T Low TKW SNP-A Ax2* or AX1 314 bp 231 bp	SNP-C sensitive SNP-T decrease YP SNP-C high TKW SNP-G null 263 bp 246 bp	Exhibit B - Table 2

## Exhibit B: Novelty Statement for Nixon (OR2121086) Wheat

OR2121086 (Nixon wheat) can be differentiated from Norwest Duet phenotypically by its response to strawbreaker foot rot caused by the pathogens *Oculimacula yallundae* and *O. aciformis* and genotypically by the use of molecular markers for the resistance gene for strawbreaker foot rot, *Pch1*. Nixon shows moderate resistance to strawbreaker foot rot while Norwest Duet displays a susceptible response (lodging) after infection (Exhibit B – Table 1) Besides *Pch1*, OR2121086 can be differentiated from Norwest Duet using molecular markers known to be polymorphic among cultivars (Exhibit B -Table 2). .

Exhibit B - Table 1. Disease response of six wheat cultivars and OR2121086 to strawbreaker foot rot in 2017 and 2018. Notes were taken in an inoculated field in July in Corvallis, OR both years. “*Pch*” designates known genes for resistance to strawbreaker foot rot.

Cultivar	Strawbreaker foot rot (% lodging)		
	2017	2018	mean
Norwest Duet	97	98	98
Bobtail ( <i>Pch2</i> )	35	43	39
OR2121086 ( <i>Pch1</i> )	47	24	36
Rosalyn ( <i>Pch1</i> + <i>Pch2</i> )	5	23	14

Exhibit B – Table 2. Molecular markers used to differentiate between OR2121086 (Nixon) and Northwest Duet. The following KASP SNP markers were used to differentiate between the two cultivars: TaPpd-A29, TaPsy1-D1, TaSus-2B, and TaGlu-A1 (Rasheed et al. 2016). *Pch1* (ORW1D) associated with strawbreaker foot rot resistance and Bx6 associated with grain quality are agarose markers that also show differences between Norwest Duet and Nixon. The KASP marker results were generated using the StepOne Plus genotyping platform (ABI technologies), using the protocols laid out in Rasheed et al. (2016). For the agarose marker ORW1D a touchdown PCR protocol was used having a final annealing temperature of 60<sup>0</sup> C as outlined by Heesacker et al. 2014. The agarose marker Bx6 is a functional marker for Glu-B1 from the MASWheat website ([maswheat.ucdavis.edu](http://maswheat.ucdavis.edu)) and was PCRed at 50<sup>0</sup> C annealing temperature.

	<b>KASP molecular markers</b>							
	TaPpd-A29		TaPsy1-D1		TaSus-2B		TaGlu-A1	
<b>Cultivars</b>	Allele	Reading	Allele	Reading	Allele	Reading	Allele	Reading
OR2121086 (Nixon)	SNP-A	insensitive	SNP-C	Inc YP	SNP-T	Lo TKW	SNP-A	Ax2* or Ax1
Norwest Duet	SNP-C	sensitive	SNP-T	Dec YP	SNP-C	Hi TKW	SNP-G	null
	<b>Agarose molecular markers</b>							
	ORW1D Bx6							
<b>Cultivars</b>	Pch1							
OR2121086 (Nixon)	314 bp	231 bp						
Norwest Duet	263 bp	246 bp						

#### References:

- Heesacker, A.F., J.M. Leonard, R. Zemetra, and O. Riera-Lizarazu. 2013. A breeder-friendly marker for eyespot resistance gene *Pch1* (Poster). XXI Plant and Animal Genome Conference, San Diego, California
- Rasheed, A., W. Wen, F. Gao, S. Zhai, H. Jin, J. Liu, Q. Guo, Y. Zhang, S. Dreisgacker, X. Xia, and Z. He. 2016. Development and validation of KASP assays for genes underpinning key economic traits in bread wheat. *Theor. Appl. Genet.* 129: 1843-1860.

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 2.5 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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202100038

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

**Exhibit C**

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

<b>NAME OF APPLICANT (S)</b> <b>Oregon State University</b>	<b>TEMPORARY OR EXPERIMENTAL DESIGNATION</b> <b>OR2121086</b>	<b>VARIETY NAME</b> <b>Nixon</b>
<b>ADDRESS (Street and No. or RD No., City, State, Zip Code and Country)</b> Oregon State University Office of Commercialization and Corporate Development 312 Kerr Administration Building Oregon State University Corvallis, OR97331-2140		<b>FOR OFFICIAL USE ONLY</b>  <b>PVPO NUMBER</b>

**PLEASE READ ALL INSTRUCTIONS CAREFULLY:**

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

**1. KIND:** 1

- 1 = Common
- 2 = Durum
- 3 = Club
- 4 = Other (Specify) \_\_\_\_\_

**1a. COMMON WHEAT MARKET CLASSES:**

- HRW (Hard Red Winter)
- HRS (Hard Red Spring)
- HW (Hard White)
- SRW (Soft Red Winter)
- SW (Soft White)

**2. VERNALIZATION:** 2

- 1 = Spring
- 2 = Winter

**3. COLEOPTILE ANTHOCYANIN:** 1

- 1 = Absent
- 2 = Present

**4. JUVENILE PLANT GROWTH:** 2

- 1 = Prostrate
- 2 = Semi-Erect
- 3 = Erect

**5. PLANT COLOR:** (boot stage) 3

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

**6. FLAG LEAF:** (boot stage)

- 1 1 = Erect                      2 = Recurved
- 2 1 = Not Twisted              2 = Twisted
- 2 1 = Wax Absent              2 = Wax Present

**7. EAR EMERGENCE:**

- 138 Number of Days (Average)
- 2 Number of Days Earlier Than \* \_\_\_\_\_
- Same As \* \_\_\_\_\_
- \_\_\_\_\_ Number of Days Later Than \* \_\_\_\_\_

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



8. ANTHOR COLOR: 1 1 = Yellow 2 = Purple

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

91 cm (Average)

3 cm Taller Than SY Ovation \*

Same As \_\_\_\_\_ \*

7 cm Shorter Than Norwest Duet \*

10. STEM:

A. ANTHOCYANIN 1 1 = Absent 2 = Present

D. INTERNODE 1 1 = Hollow 2 = Semi-Solid 3 = Solid

\_\_\_\_\_ Number of Nodes

B. WAXY BLOOM 2 1 = Absent 2 = Present

E. PEDUNCLE 1 1 = Erect 2 = Recurved 3 = Semi-Erect

\_\_\_\_\_ cm Length

C. HAIRINESS (last internode of rachis) 1 1 = Absent 2 = Present

F. AURICLE

1 Anthocyanin: 1 = Absent 2 = Present

2 Hair: 1 = Absent 2 = Present

11. HEAD: (At Maturity)

A. DENSITY 2

1 = Lax  
2 = Middense (Laxidense)  
3 = Dense

C. CURVATURE 1

1 = Erect  
2 = Inclined  
3 = Recurved

B. SHAPE 1

1 = Tapering  
2 = Strap  
3 = Clavate  
4 = Other (Specify) \_\_\_\_\_

D. AWNEDNESS 4

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

12. GLUMES: (At Maturity)

A. COLOR 1

1 = White  
2 = Tan  
3 = Other (Specify) \_\_\_\_\_

E. BEAK WIDTH 1

1 = Narrow  
2 = Medium  
3 = Wide

B. SHOULDER 2

1 = Wanting 2 = Oblique  
3 = Rounded 4 = Square  
5 = Elevated 6 = Apiculate  
7 = Other (Specify) \_\_\_\_\_

F. GLUME LENGTH 3

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

C. SHOULDER WIDTH 2

1 = Narrow  
2 = Medium  
3 = Wide

G. WIDTH 3

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

D. BEAK 3

1 = Obtuse  
2 = Acute  
3 = Acuminate

H. PUBESCENCE 1

1 = Not Present  
2 = Present

## 13. SEED:

A. SHAPE 1 1 = Ovate 2 = Oval 3 = EllipticalE. COLOR 1 1 = White 2 = Amber 3 = Red  
4 = Other (Specify) \_\_\_\_\_B. CHEEK 1 1 = Rounded 2 = AngularF. TEXTURE 2 1 = Hard 2 = Soft 3 = Other (Specify) \_\_\_\_\_

## C. BRUSH

3 1 = Short 2 = Medium 3 = Long  
1 1 = Not Collared 2 = CollaredG. PHENOL REACTION (See Instructions) 41 = Ivory 4 = Dark Brown  
2 = Fawn 5 = Black  
3 = Light Brown

## D. CREASE

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

## H. SEED WEIGHT

47 g/1000 Seed (whole number only)3 1 = Depth 20% or less of Kernel  
2 = Depth 35% or less of Kernel  
3 = Depth 50% or less of KernelI. GERM SIZE 21 = Small  
2 = Midsized  
3 = Large

## 14. DISEASE: PLEASE INDICATE THE SPECIFIC RACE OR STRAIN TESTED (0 = Not Tested 1 = Susceptible 2 = Resistant 3 = Intermediate 4 = Tolerant)

0 Stem Rust (*Puccinia graminis* f. sp. *tritici*) Race: \_\_\_\_\_0 Leaf Rust (*Puccinia recondita* f. sp. *tritici*) Race: \_\_\_\_\_2 Stripe Rust (*Puccinia striiformis*) Race: \_\_\_\_\_0 Loose Smut (*Ustilago tritici*) Race: \_\_\_\_\_0 Powdery Mildew (*Erysiphe graminis* f. sp. *tritici*) Race: \_\_\_\_\_1 Common Bunt (*Tilletia tritici* or *T. laevis*) Race: \_\_\_\_\_1 Dwarf Bunt (*Tilletia controversa*) Race: \_\_\_\_\_0 Karnal Bunt (*Tilletia indica*) Race: \_\_\_\_\_0 Flag Smut (*Urocystis agropyri*) Race: \_\_\_\_\_0 Tan Spot (*Pyrenophora tritici-repentis*) Race: \_\_\_\_\_0 Halo Spot (*Selenophoma donacis*) Race: \_\_\_\_\_

\_\_\_\_ Septoria spp. Race: \_\_\_\_\_

\_\_\_\_ *Septoria nodorum* (Glume Blotch) Race: \_\_\_\_\_\_\_\_\_ *Septoria avenae* (Speckled Leaf Disease) Race: \_\_\_\_\_\_\_\_\_ *Septoria tritici* (Speckled Leaf Blotch) Race: \_\_\_\_\_0 Scab (*Fusarium* spp.) Race: \_\_\_\_\_0 "Snow Molds" Race: \_\_\_\_\_0 Kernel Smudge ("Black Point") Race: \_\_\_\_\_0 Common Root Rot (*Fusarium*, *Cochliobolus* and *Bipolaris* spp.) Race: \_\_\_\_\_1 Barley Yellow Dwarf Virus (BYDV) Race: \_\_\_\_\_0 Rhizoctonia Root Rot (*Rhizoctonia solani*) Race: \_\_\_\_\_1 Soilborne Mosaic Virus (SBMV) Race: \_\_\_\_\_0 Black Chaff (*Xanthomonas campestris* pv. *translucens*) Race: \_\_\_\_\_

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

0 Wheat Yellow (Spindle Streak) Mosaic Virus Race: \_\_\_\_\_

0 Bacterial Leaf Blight (*Pseudomonas syringae* pv. *syringae*) Race: \_\_\_\_\_

0 Wheat Streak Mosaic Virus (WSMV) Race: \_\_\_\_\_

2 Other (Specify) Pseudocercospora foot rot Race: \_\_\_\_\_

\_\_\_\_\_ Other (Specify) \_\_\_\_\_ Race: \_\_\_\_\_

\_\_\_\_\_ Other (Specify) \_\_\_\_\_ Race: \_\_\_\_\_

\_\_\_\_\_ Other (Specify) \_\_\_\_\_ Race: \_\_\_\_\_

15. **HOMOZYGOUS FOR SPECIFIC DISEASE RESISTANCE GENE**

\_\_\_\_\_ Stem rust \_\_\_\_\_

\_\_\_\_\_ Leaf rust \_\_\_\_\_

\_\_\_\_\_ Other \_\_\_\_\_

16. **INSECT: PLEASE SPECIFY BIOTYPE (Where Needed) (0 = Not Tested 1 = Susceptible 2 = Resistant 3 = Intermediate 4 = Tolerant)**

0 Stem Sawfly (*Cephus* spp.) (Specify) \_\_\_\_\_

0 Cereal Leaf Beetle (*Oulema melanopa*) (Specify) \_\_\_\_\_

0 Russian Aphid 1 (*Diuraphis noxia*) \_\_\_\_\_

0 Russian Aphid 2 (*Diuraphis noxia*) \_\_\_\_\_

0 Greenbug (*Schizaphis graminum*) (General) \_\_\_\_\_

\_\_\_\_\_ Greenbug (*Schizaphis graminum*) Biotype A \_\_\_\_\_

0 Greenbug (*Schizaphis graminum*) Biotype B \_\_\_\_\_

0 Greenbug (*Schizaphis graminum*) Biotype C \_\_\_\_\_

0 Greenbug (*Schizaphis graminum*) Biotype E \_\_\_\_\_

0 Greenbug (*Schizaphis graminum*) Other (Specify) \_\_\_\_\_

0 Aphids (Specify) \_\_\_\_\_

\_\_\_\_\_ Other (Specify) \_\_\_\_\_

0 Hessian Fly (*Mayetiola destructor*) Biotype A \_\_\_\_\_

0 Hessian Fly (*Mayetiola destructor*) Biotype B \_\_\_\_\_

0 Hessian Fly (*Mayetiola destructor*) Biotype C \_\_\_\_\_

0 Hessian Fly (*Mayetiola destructor*) Biotype D \_\_\_\_\_

0 Hessian Fly (*Mayetiola destructor*) Biotype E \_\_\_\_\_

0 Hessian Fly (*Mayetiola destructor*) Biotype F \_\_\_\_\_

0 Hessian Fly (*Mayetiola destructor*) Biotype G \_\_\_\_\_

0 Hessian Fly (*Mayetiola destructor*) Biotype GP \_\_\_\_\_

0 Hessian Fly (*Mayetiola destructor*) Biotype H \_\_\_\_\_

16. **INSECT:** (continued) (0 = Not Tested 1 = Susceptible 2 = Resistant 3 = Intermediate 4 = Tolerant)

0 Hessian Fly (*Mayetiola destructor*) Biotype I \_\_\_\_\_  
0 Hessian Fly (*Mayetiola destructor*) Biotype J \_\_\_\_\_  
0 Hessian Fly (*Mayetiola destructor*) Biotype L \_\_\_\_\_  
0 Hessian Fly (*Mayetiola destructor*) Biotype M \_\_\_\_\_  
0 Hessian Fly (*Mayetiola destructor*) Biotype N \_\_\_\_\_  
0 Hessian Fly (*Mayetiola destructor*) Biotype O \_\_\_\_\_  
0 Hessian Fly (*Mayetiola destructor*) (Specify) \_\_\_\_\_

17. **HIGH MOLECULAR WEIGHT GLUTENIN SUBUNIT PROFILE** (Check those that apply):

Glu-A1	Glu-B1	Glu-D1
<u>    </u> 1	<u>    </u> 6+8	<u>    </u> 2+11
<u>    </u> 2*	<u>    </u> 7+8	<input checked="" type="checkbox"/> 2+12
<u>    </u> null	<u>    </u> 7+9	<u>    </u> 3+12
<u>    </u> 1*	<u>    </u> 13+16	<u>    </u> 5+10
	<u>    </u> 13+19	<u>    </u> null
	<u>    </u> 17+18	

18. **TRANSLOCATIONS** (1=Present 2=Absent 3=Heterogeneous 4= Not Tested):

4 1BL/1RS    4 1A/1R    4 2NS/2AS    4 4DL/4AgS

19. **IMIDAZOLINONE HERBICIDE TOLERANCE** (1=Present 2=Absent 3=Not Tested):

2 Als-1    2 Als-2    2 Als-3

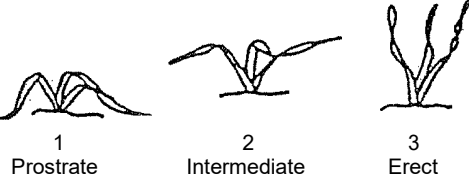




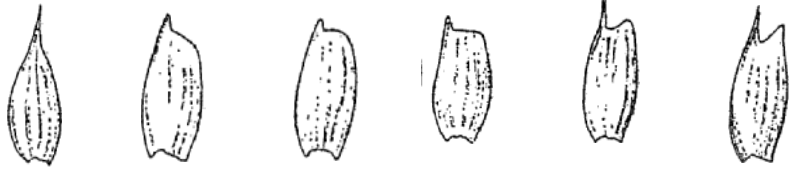
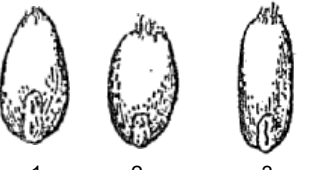

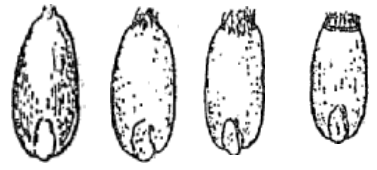
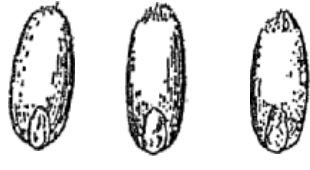



20. **END USE QUALITY:**

Grain Protein \_\_\_\_\_  
 Flour Protein \_\_\_\_\_  
 SDS \_\_\_\_\_  
 Farniograph \_\_\_\_\_  
 Other \_\_\_\_\_

21. **ADDITIONAL INFORMATION ON ANY ITEM ABOVE OR GENERAL COMMENTS:**

WHEAT DESCRIPTOR ILLUSTRATIONS

Section Numbers Correspond to the Numbers of the Sections on the Form

<p>4. EARLY PLANT GROWTH HABIT:</p>  <p>1 Prostrate      2 Intermediate      3 Erect</p>	<p>10. (D.) STEM INTERNODE X-SECTION:</p>  <p>1 Hollow      2 Semi-solid      3 Solid</p>	<p>11. (B.) SPIKE SHAPE:</p>  <p>1 Tapering      2 Oblong      3 Clavate      4 Elliptical</p>	
<p>11. (D.) AWNEDNESS:</p>  <p>1 Awnless      2 Apically Awnleted      3 Awnleted      4 Awned</p>	<p>12. (D.) BEAK SHAPE:</p>  <p>1 Obtuse      2 Acute      3 Acuminate</p>	<p>12. (C.) SHOULDER SHAPE:</p>  <p>1 Wanting      2 Oblique      3 Rounded      4 Square      5 Elevated      6 Apiculate</p>	
<p>13. (A.) SEED SHAPE:</p>  <p>1 Ovate      2 Oval      3 Elliptical</p>	<p>13. (B.) CHEEK SHAPE:</p>  <p>1 Rounded      2 Angular</p>	<p>13. (C.) BRUSH SIZE</p>  <p>1 Small      2 Midsized      3 Large      4 Collared</p>	<p>13. (C.) BRUSH HAIR LENGTH:</p>  <p>1 Short      2 Medium      3 Long</p>
<p>13. (I.) GERM (EMBRYO) SIZE:</p>  <p>1 Small      2 Midsized      3 Large</p>	<p>13. (D.) SEED CREASE WIDTH:</p>  <p>1 Narrow      2 Mid-wide      3 Wide</p>	<p>13. (D.) SEED CREASE DEPTH:</p>  <p>1 Shallow      2 Mid-Deep      3 Deep</p>	

References:

- (a) L.W. Briggie and L.P. Reitz. 1963. Classification of Triticum Species and Wheat Varieties Grown in the United States. Technical Bulletin 1278. United States Department of Agriculture.
- (b) W.E. Walls. 1965. A Standardized Phenol Method for Testing Wheat Seeds for Varietal Purity. Contribution No. 28 to the handbook of seed testing prepared by the Association of Official Seed Analysts.

## Exhibit D. Additional Description of OR2121086 (Nixon) soft white winter wheat

OR2121086 is a common soft white winter wheat (*Triticum aestivum* L.) developed by Oregon State University (OSU) was released based on its yield potential, disease resistance and adaptation to growing conditions in the intermediate to high rainfall wheat production areas of Oregon and Washington. OR2121086 is stripe rust (*Puccinia striiformis* Westend) resistant and carries the *Pch1* gene that confers resistance to strawbreaker foot rot (*Oculimacula acufiformis* and *O. yallundae*). End-use quality of OR2121086 was evaluated by the Pacific Northwest Wheat Quality Council in 2017 and was found to have good end-use quality. The proposed name for OR2121086 is 'Nixon', in honor of Bob and Jean Nixon for their contributions to the wheat and grass seed industry in Oregon and Oregon State University. This name has been cleared through the USDA.

OR2121086 is an awned semi-dwarf soft white winter wheat from the cross Tubbs / Skiles. Tubbs is a soft white winter wheat cultivar from the OSU breeding program that had high yield potential, carried *Pch1* for strawbreaker foot rot resistance but became susceptible to stripe rust and had mediocre end-use quality. Skiles is a soft white winter wheat cultivar from the OSU breeding program that is photoperiod insensitive has excellent stripe rust resistance and good end-use quality. The initial cross between Tubbs and Skiles made in spring 2007 at the OSU Hyslop field laboratory in Corvallis, OR. The breeding approach followed a modified bulk-pedigree model with shuttle breeding between two locations prior to switching from a bulk to breeding lines. The F<sub>1</sub> and F<sub>2</sub> generations were grown as bulks at the Hyslop field laboratory with minimal selection. The F<sub>3</sub> generation was grown as a bulk at both the Hyslop field laboratory and at the Ruggs research site east of Pendleton, OR. Minimal selection was done on the F<sub>3</sub> bulk population, but at harvest instead of being bulked, individual heads were collected. Heads were individually threshed and planted as F<sub>4</sub> head rows at the Ruggs research site in fall, 2011. Head rows were evaluated for stripe rust (*Puccinia striiformis* Westend.) resistance, height and uniformity and selected head rows were individually harvested and threshed. Seed was evaluated for hardness (score below 35), seed size and seed weight using a Perten SKCS 4100 system. F<sub>5</sub> lines with the desired seed characteristics were planted at Hyslop field laboratory and the Ruggs research site in 1.5 m x 4.6 m plots in fall 2012. At this time the designation OR2121086 was assigned. The F<sub>5</sub> lines were evaluated for disease resistance, straw strength, height, yield, test weight and end-use quality. OR2121086 was advanced through the F<sub>6</sub>, F<sub>7</sub> and F<sub>8</sub> generations, being grown at additional sites in Oregon each year with further evaluation for disease resistance, agronomic performance and end-use quality. Molecular markers were used during the F<sub>6</sub> generation to determine the presence or absence of the *Pch1* gene for strawbreaker foot rot resistance. End-use quality evaluation in these generations was done both at OSU and at the USDA-ARS Western Wheat Quality Laboratory in Pullman, WA. In fall, 2016 OR2121086 was entered into Extension trials in Oregon, Washington and Idaho,

and in the Western Regional Soft Winter Wheat Nursery. Based on its disease resistance, agronomic performance and end-use quality it was decided to release OR2121086.

### **Agronomics of OR2121086**

OR2121086 is a soft white winter wheat targeted at the intermediate to high rainfall / irrigated production areas in the Pacific Northwest. OR2121086 does have the potential for use under low rainfall conditions as well. OR2121086 is a winter wheat that requires vernalization and, based on field response and genotypic screening using molecular markers, is photoperiod insensitive. It has an intermediate level of winter-hardiness based on laboratory testing by the USDA-ARS wheat research program in Pullman, WA (Exhibit D - Table 1). Agronomically OR2121086 is intermediate in height and is earlier heading than both SY Ovation and Norwest Duet (Exhibit D - Tables 3, 4, 5 and 6). In 2017, falling number testing was done on OR2121086 on seed from two locations of the Oregon Soft White Winter Wheat Statewide Nursery and the average score for OR2121086 was 383 (Exhibit D - Table 5).

OR2121086 has performed well in breeding and extension trials in Oregon. In the OSU Soft White Advanced Nursery in 2016, OR2121086 had an equal or higher yield compared to Tubbs 06, Kaseberg and Bobtail and had a higher test weight than all three check cultivars in the trial (Exhibit D - Table 2). In the OSU Soft White Elite nursery harvested in 2017, OR2121086 had a similar yield to SY Ovation and Jasper and a slightly lower yield than Norwest Duet and SY Assure (Exhibit D - Table 3). In the same nursery harvested in 2018, OR2121086 was higher yielding than Norwest Duet and had a similar yield as SY Ovation and SY Assure (Exhibit D - Table 4). In both 2017 and 2018 OR2121086 had a mean test weight over 75 kg/hl (Exhibit D - Tables 3 and 4). In extension testing in 2016-2017 OR2121086 was evaluated in fourteen locations split between high rainfall / irrigated sites (Table 5) and low to intermediate rainfall sites (Exhibit D - Table 7). In 2018, OR2121086 was tested in ten locations split between high rainfall / irrigated (6 sites) and low-intermediate rainfall (4 sites). Under high rainfall / irrigated conditions, OR2121086 was similar in yield to Jasper, SY Ovation, SY Assure and Norwest Duet in 2017. OR2121086 performed in a similar manner in 2018, having a similar yield to SY Ovation and SY Assure but higher than Norwest Duet for yield (Exhibit D - Table 6). In terms of test weight, OR2121086 averaged over 75 kg/hl across locations and years in extension testing under high rainfall / irrigated conditions in Oregon (Exhibit D - Tables 5 and 6). Under low to intermediate rainfall conditions in 2017, OR2121086 was similar in yield to Jasper, SY Ovation and Norwest Duet and slightly lower in average yield compared to SY Assure (Exhibit D - Table 7). In 2018 OR2121086 had a similar yield to Norwest Duet but was lower in yield compared to SY Ovation and SY Assure (Exhibit D - Table 8). Test weight of OR2121086 averaged over 75 kg/hl across locations and years under low to intermediate rainfall conditions in Oregon (Exhibit D - Tables 7 and 8). These results indicate that OR2121086 is best adapted to higher rainfall or irrigated growing conditions in Oregon but will maintain test weight across all growing conditions. In Washington State cereal extension testing, OR2121086 did well in 2017 under

high and intermediate rainfall conditions (Exhibit D - Table 9), yielding similar to Bobtail under both growing conditions but maintaining a 75 kg/hl test weight across growing conditions. In 2018 (Exhibit D - Table 10), OR2121086 did not perform as well for yield being most similar to SY Assure under both high and intermediate rainfall conditions but lower than the other check cultivars. Again, OR2121086 maintained test weight under both high and intermediate rainfall conditions. OR2121086 has potential in Washington, especially in intermediate rainfall areas that may be prone to Strawbreaker foot rot.

### **Milling and Baking Quality of OR2121086**

End-use quality of OR2121086 was tested by the USDA-ARS Western Wheat Quality Laboratory, Pullman, WA in 2017 and 2018 using samples for the OSU cereal extension trials grown in Oregon in 2016 and 2017, respectively. Comparing OR2121086 to Bobtail and Stephens for grain characteristics (Exhibit D - Table 11), OR2121086 had a consistently lower kernel hardness over the two years of testing than the two check varieties. In terms of milling characteristics (Exhibit D - Table 12), OR2121086 had a percent break flour yield that was less than the high quality check variety Bobtail but greater than Stephens. For flour quality based on Solvent Retention Capacity (SRC), OR2121086 was similar to both Bobtail and Stephens for sodium carbonate SRC, water SRC and sucrose SRC (Exhibit D - Table 13). For lactic acid SRC, OR2121086 was similar to Stephens but lower than Bobtail indicating it had a weaker gluten strength than Bobtail. OR2121086 performed well in baking tests, having a slightly higher sugar snap cookie diameter than Bobtail and a slightly lower sponge cake volume than Bobtail when averaged over two years. In both years, OR2121086 was better for sugar snap cookie diameter and sponge cake volume than Stephens (Exhibit D - Table 14). OR2121086 was submitted to the Pacific Northwest Wheat Quality Council in fall, 2017 for evaluation at the January, 2018 meeting. OR2121086 was found to have the desired quality for a soft white winter wheat cultivar.

### **Disease Response of OR2121086**

A strength of OR2121086 is its level of disease resistance, especially to stripe rust (*Puccinia striiformis* Westend). OR2121086 has shown good resistance to stripe rust over multiple years of evaluation (2016 – Exhibit D - Table 15 and 2017 – Exhibit D - Table 16) under testing by X. Chen USDA-ARS, Pullman, WA. In each year OR2121086 was found to be resistant to the prevalent races of stripe rust in both eastern and western Washington. Based on the response in Mount Vernon, Washington (LOC5), OR2121086 appears to have high temperature adult plant (HTAP) resistance as well. In the Oregon statewide extension trials in 2017 the Hermiston and Ruggs sites did not have fungicide applied and showed a significant level of stripe rust. Older cultivars such as Stephens and Tubbs 06 had a significant level of stripe rust while OR2121086 was highly resistant, similar to Bobtail (Exhibit D - Table 17). Based on molecular marker data, OR2121086 carries the *Pch1* gene that confers resistance to strawbreaker foot rot (*Oculimacula aciformis* and *O. yallundae*) and shows a moderate level of resistance to this disease under



intense disease pressure (Exhibit D - Table 19). OR2121086 appears to have a moderate level of tolerance to Fusarium crown rot (*Fusarium pseudograminearum*) but is susceptible to Septoria leaf blotch (*Septoria tritici* Roberge in Dezma) (Exhibit D - Table 18). OR2121086 shows a low to moderate level of tolerance to Cephalosporium stripe (*Cephalosporium gramineum* Nis. & Ika.) (Exhibit D - Table 19). OR2121086 is susceptible to soilborne wheat mosaic virus (sbWMV).

Exhibit D - Table 1. Low temperature tolerance of OR2121086 compared to other cultivars grown in the Pacific Northwest based on controlled freezing studies. Goetze was used as the susceptible check and Eltan was used as the tolerant check. Data is reported as percent survival.

cultivar	-10C	-11.5C	-13C
Goetze	0.45	0.04	0.01
Skiles	0.90	0.78	0.13
SY Ovation	0.94	0.63	0.05
Puma	0.74	0.78	0.00
ORCF 101	1.00	0.51	0.08
Eltan	0.99	0.97	0.77
<b>OR2121086</b>	<b>0.89</b>	<b>0.73</b>	<b>0.43</b>

Exhibit D - Table 2. Agronomic results of OR2121086 and check cultivars from the 2015-2016 Soft White Advanced Yield nursery grown in seven locations in Oregon.

(no. of sites)	heading date 1	height 7	yield 7	test weight 7
entry	(Julian)	(cm)	(kg/ha)	(kg/hl)
Tubbs 06	134	98.3	4,601	72.1
Kaseberg	126	87.6	5,135	73.6
Bobtail	133	87.9	5,166	72.1
<b>OR2121086</b>	<b>121</b>	<b>93.1</b>	<b>5,248</b>	<b>77.0</b>

Exhibit D - Table 3. Agronomic results of OR2121086 and check cultivars from the 2016-2017 Soft White Elite Yield nursery grown in ten locations in Oregon.

(no. of sites)	heading date 1	height 9	yield 10	test weight 10
entry	(Julian)	(cm)	(kg/ha)	(kg/hl)
Kaseberg	148	83.4	5,568	77.0
Bobtail	153	85.5	5,919	74.8
Jasper	152	92.0	5,612	76.3
SY Ovation	152	88.0	5,718	78.8
SY Assure	147	83.9	5,982	80.1
NW Duet	149	99.0	5,932	78.0
<b>OR2121086</b>	<b>147</b>	<b>90.3</b>	<b>5,693</b>	<b>77.9</b>

Exhibit D - Table 4. Agronomic results of OR2121086 and check cultivars from the 2017-2018 Soft White Elite Yield nursery grown in ten locations in Oregon.

	heading date	height	yield	tw
(no. of sites)	1	10	10	10
entry	(Julian)	(cm)	(kg/ha)	(kg/hl)
Stephens	139	94.9	6,352	77.3
Bobtail	141	91.4	6,383	75.5
SY Ovation	141	94.6	7,024	79.4
SY Assure	134	92.5	6,829	79.0
NW Duet	136	102.5	6,145	78.8
<b>OR2121086</b>	<b>134</b>	<b>98.9</b>	<b>6,980</b>	<b>78.9</b>

Exhibit D - Table 5. Agronomic results of OR2121086 and check cultivars from the 2016-2017 Oregon High Rainfall and Irrigated Soft White Winter Wheat Statewide nurseries grown in seven locations in Oregon and one location in Washington.

	heading date	height	lodging	yield	test weight	falling number
(no. of sites)	5	8	2	8	8	2
entry	(Julian)	(cm)	(%)	(kg/ha)	(kg/hl)	(sec)
Stephens	129	94.2	0	7,106	75.9	363
Tubbs 06	131	107.2	45	7,106	77.0	379
Bobtail	133	96.3	35	8,518	75.8	369
Jasper	134	105.4	4	8,110	77.3	347
SY Ovation	133	97.8	1	8,078	78.1	338
SY Assure	127	93.0	11	7,940	78.6	368
Norwest Duet	131	110.5	28	8,204	78.4	410
<b>OR2121086</b>	<b>128</b>	<b>101.1</b>	<b>6</b>	<b>8,122</b>	<b>78.1</b>	<b>383</b>

Exhibit D - Table 6. Agronomic results of OR2121086 and check cultivars from the 2017-2018 Oregon High Rainfall and Irrigated Soft White Winter Wheat Statewide nurseries grown in six locations in Oregon.

(no. of sites) entry	heading date	height	yield	test weight
	2 (Julian)	6 (cm)	8 (kg/ha)	8 (kg/hl)
Stephens	147	99.6	7,620	79.3
Tubbs 06	148	110.0	7,400	78.5
Bobtail	149	95.5	8,355	77.7
SY Ovation	147	98.8	7,846	78.9
SY Assure	139	91.7	8,009	81.0
Norwest Duet	148	111.5	7,539	80.1
<b>OR2121086</b>	<b>146</b>	<b>101.3</b>	<b>8,078</b>	<b>80.3</b>

Exhibit D - Table 7. Agronomic results of OR2121086 and check cultivars from the 2016-2017 Oregon Low to Intermediate Rainfall Soft White Winter Wheat Statewide nurseries grown in six locations in Oregon.

(no. of sites) entry	heading date	height	yield	test weight
	4 (Julian)	6 (cm)	8 (kg/ha)	8 (kg/hl)
Stephens	134	76.7	3,804	76.6
Tubbs 06	137	87.4	3,816	76.8
Bobtail	138	78.0	4,162	75.6
Jasper	139	83.1	4,124	76.1
SY Ovation	138	78.7	4,042	77.7
SY Assure	131	74.4	4,400	79.2
Norwest Duet	137	88.1	3,948	77.9
<b>OR2121086</b>	<b>135</b>	<b>81.5</b>	<b>4,137</b>	<b>78.0</b>

Exhibit D - Table 8. Agronomic results of OR2121086 and check cultivars from the 2017-2018 Oregon Low to Intermediate Rainfall Soft White Winter Wheat Statewide nurseries grown in four locations in Oregon.

entry	(no. of sites)	height	yield	test weight
		4	4	4
		(cm)	(kg/ha)	(kg/hl)
Stephens		80.3	4,199	78.1
Tubbs 06		89.2	4,601	78.1
Bobtail		78.7	4,909	75.9
SY Ovation		80.0	4,840	78.2
SY Assure		79.0	4,858	79.8
Norwest Duet		90.9	4,588	79.2
<b>OR2121086</b>		<b>85.3</b>	<b>4,538</b>	<b>79.0</b>

Exhibit D - Table 9. Agronomic results of OR2121086 and check cultivars in the 2016-2017 Washington State University cereal extension trials grown under high rainfed (> 20 in) and intermediate rainfed (16 – 20 in) conditions.

entry	(no. of sites)	yield > 20 in	yield 16 - 20 in.	test weight > 20 in	test weight 16-20 in
		4	4	4	4
		(kg/ha)	(kg/ha)	(kg/hl)	(kg/hl)
Bobtail		7,344	8,474	72.8	77.2
Jasper		8,049	7,595	75.9	78.1
SY Ovation		6,591	7,909	77.0	80.1
SY Assure		7,721	7,658	78.8	80.4
Norwest Duet		7,972	7,846	77.9	79.9
<b>OR2121086</b>		<b>7,344</b>	<b>8,223</b>	<b>77.7</b>	<b>80.1</b>

Exhibit D - Table 10. Agronomic results of OR2121086 and check cultivars in the 2017-2018 Washington State University cereal extension trials grown under high rainfed (> 20 in) and intermediate rainfed (16 – 20 in) conditions.

entry	(no. of sites)	yield > 20 in	yield 16 - 20 in.	test weight > 20 in	test weight 16-20 in
		4	4	4	4
		(kg/ha)	(kg/ha)	(kg/hl)	(kg/hl)
Bobtail		8,474	7,972	75.8	77.1
Jasper		8,411	7,595	77.1	79.0
SY Ovation		8,411	7,470	78.2	79.2
SY Assure		7,470	7,156	80.2	81.0
Norwest Duet		8,223	7,281	77.3	80.2
<b>OR2121086</b>		<b>7,532</b>	<b>6,967</b>	<b>78.1</b>	<b>80.2</b>

Exhibit D - Table 11. Grain quality characteristics of OR2121086 compared to Bobtail and Stephens for percent whole grain protein (WPROT), kernel hardness (SKHRD), kernel weight (SKWT) and kernel size (SKSIZE) in 2016 and 2017. The 2016 data are means from seven locations grown in Oregon and the 2017 data are means from six locations grown in Oregon.

YEAR	VAR	WPROT	SKHRD	SKWT	SKSIZE
2016	Bobtail	10.5	27.4	35.7	2.3
<b>2016</b>	<b>OR2121086</b>	<b>10.2</b>	<b>24.3</b>	<b>41.1</b>	<b>2.4</b>
2016	Stephens	11.0	33.9	41.3	2.6

YEAR	VAR	WPROT	SKHRD	SKWT	SKSIZE
2017	Bobtail	9.6	23.6	34.5	2.6
<b>2017</b>	<b>OR2121086</b>	<b>9.9</b>	<b>20.4</b>	<b>38.4</b>	<b>2.7</b>
2017	Stephens	9.9	30.1	40.2	2.8

Exhibit D - Table 12. Flour quality characteristics of OR2121086 compared to Bobtail and Stephens for percent flour protein (FPROT), percent flour ash (FASH), percent flour yield (FYELD) and percent break flour yield (BKFYELD) in 2016 and 2017. The 2016 data are means from seven locations grown in Oregon and the 2017 data are means from six locations grown in Oregon.

YEAR	VAR	FPROT	FASH	FYELD	BKFYELD
2016	Bobtail	9.1	0.38	68.9	46.2
<b>2016</b>	<b>OR2121086</b>	<b>8.9</b>	<b>0.34</b>	<b>67.5</b>	<b>43.2</b>
2016	Stephens	9.6	0.35	66.0	40.1

YEAR	VAR	FPROT	FASH	FYELD	BKFYELD
2017	Bobtail	8.3	0.40	70.3	52.3
<b>2017</b>	<b>OR2121086</b>	<b>8.5</b>	<b>0.39</b>	<b>70.4</b>	<b>51.1</b>
2017	Stephens	8.3	0.40	69.5	48.2

Exhibit D - Table 13. Solvent Retention Capacity (SRC) scores for of OR2121086 compared to Bobtail and Stephens for sodium carbonate SRC (FSR\_C), lactic acid SRC (FSR\_L), water SRC (FSR\_W) and sucrose SRC (FSR\_S) in 2016 and 2017. The 2016 data are means from seven locations grown in Oregon and the 2017 data are means from six locations grown in Oregon.

YEAR	VAR	FSR_C	FSR_L	FSR_W	FSR_S
2016	Bobtail	68.3	114.6	57.1	91.3
<b>2016</b>	<b>OR2121086</b>	<b>68.2</b>	<b>82.1</b>	<b>56.6</b>	<b>90.5</b>
2016	Stephens	69.6	87.7	56.9	92.3

YEAR	VAR	FSR_C	FSR_L	FSR_W	FSR_S
2017	Bobtail	74.6	102.7	54.3	74.0
<b>2017</b>	<b>OR2121086</b>	<b>78.5</b>	<b>84.3</b>	<b>53.8</b>	<b>73.6</b>
2017	Stephens	74.5	79.3	53.4	73.9

Exhibit D - Table 14. Baking quality for of OR2121086 compared to Bobtail and Stephens for sugar snap cookie diameter (CODI – cm) and sponge cake volume (CAVOL – cc) 2016 and 2017. The sugar snap cookie diameter scores are a mean from seven locations grown in Oregon in 2016 and six locations in 2017. Sponge cake volume scores are from two locations in Oregon in 2016 and two locations in 2017.

YEAR	VAR	CODI	CAVOL
2016	Bobtail	9.39	1240.0
<b>2016</b>	<b>OR2121086</b>	<b>9.43</b>	<b>1225.0</b>
2016	Stephens	9.31	1218.8

YEAR	VAR	CODI	CAVOL
2017	Bobtail	9.21	1107.5
<b>2017</b>	<b>OR2121086</b>	<b>9.27</b>	<b>1180.0</b>
2017	Stephens	9.19	1126.7

Exhibit D - Table 15. Stripe rust infection type (IT) and severity (%) on Stephens, Tubbs-06, Bobtail and OR2121086 at Pullman (LOC 04) and Mount Vernon (LOC 05), WA when recorded at the indicated dates in 2016 under natural field infection.

	LOC 04		LOC 05			
	6/10/216		4/18		5/17	
	Late flower		Jointing		Head-flower	
Cultivar	IT	%	IT	%	IT	%
Stephens	2	10	8	50	3	20
Tubbs-06	5	20	8	60	2	20
Bobtail	2	1	7	30	3	10
<b>OR2121086</b>	<b>2</b>	<b>1</b>	<b>5</b>	<b>20</b>	<b>3</b>	<b>10</b>

Exhibit D - Table 16. Stripe rust infection type (IT) and severity (%) on Stephens, Tubbs-06, Bobtail and OR2121086 at Pullman (LOC 04) and Mount Vernon (LOC 05), WA when recorded at the indicated dates in 2017 under natural field infection.

	LOC 04		LOC 05			
	6/14		5/2		6/6	
	Fks 10.51		5		10.10-10.51	
	IT	%	IT	%	IT	%
Stephens	5	10	8	30	8	80
Tubbs-06	5	10	8	40	5	60
Bobtail	2	1	2	5	2	20
<b>OR2121086</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>5</b>	<b>2</b>	<b>20</b>



Exhibit D - Table 17. Response of OR2121086 and check cultivars to stripe rust in the Oregon statewide extension trials grown in Hermiston and the Ruggs research site east of Pendleton in 2016-2017. The trials did not have fungicide applied and percent severity of stripe rust data was taken June 1, 2017 at both sites.

Cultivar	Hermiston (% severity)	Ruggs (% severity)
Stephens	63	38
Tubbs 06	70	53
SY Ovation	15	55
Bobtail	0	0
SY Assure	0	9
<b>OR2121086</b>	<b>0</b>	<b>4</b>

Table 18. Disease response of OR2121086, Stephens, Tubbs-06, and Bobtail to infection of *Septoria tritici* blotch, Fusarium crown rot, and Cephalosporium stripe in 2017 and 2018. Disease notes were taken in June in all cases, in Corvallis, OR for Septoria, Moro, OR for Fusarium crown rot, and Pendleton, OR for Cephalosporium stripe. Septoria infection was from naturally-occurring inoculum. The Fusarium crown rot and Cephalosporium stripe nurseries were artificially inoculated.

Cultivar	Septoria (% canopy)			Fusarium (% whiteheads)			Ceph. Stripe (% whiteheads)		
	2017	2018	Mean	2017	2018	Mean	2017	2018	Mean
Stephens	72	68	70	49	42	45	56	40	48
Tubbs-06	55	38	47	34	28	31	45	50	48
Bobtail	43	32	37	12	14	13	14	0	7
<b>OR2121086</b>	<b>62</b>	<b>38</b>	<b>50</b>	<b>13</b>	<b>15</b>	<b>14</b>	<b>30</b>	<b>12</b>	<b>21</b>

Table 19. Disease response of six wheat cultivars and OR2121086 to strawbreaker foot rot in 2017 and 2018. Notes were taken in an inoculated field in July in Corvallis, OR both years. “*Pch*” designates known genes for resistance to strawbreaker foot rot.

Cultivar	Strawbreaker foot rot (% lodging)		
	2017	2018	mean
Norwest Duet	97	98	98
SY Assure	92	74	83
LCS Shark	91	70	80
Bobtail ( <i>Pch2</i> )	35	43	39
Tubbs ( <i>Pch1</i> )	40	25	32
<b>OR2121086 (<i>Pch1</i>)</b>	<b>47</b>	<b>24</b>	<b>36</b>
Rosalyn ( <i>Pch1</i> + <i>Pch2</i> )	5	23	14

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
<b>EXHIBIT E - STATEMENT OF THE BASIS OF OWNERSHIP</b>	

1. Name of Owner <b>Oregon State University</b>	2. Temporary Designation or Experimental Name <b>OR2121086</b>	3. Variety Name <b>Nixon</b>
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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*).

**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.