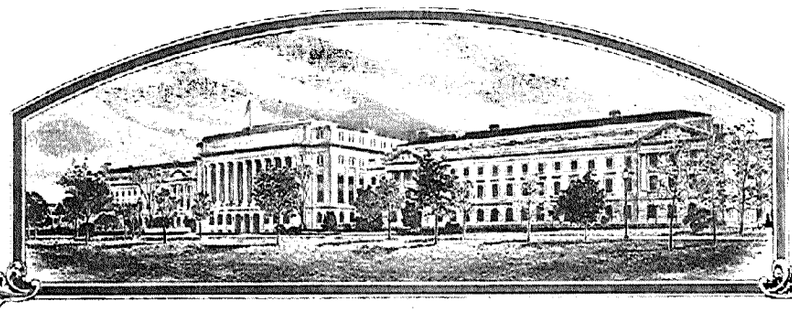

No. 202000286

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

University of Idaho, Washington State University, Oregon State University, and The United States Government as represented by the Secretary of Agriculture

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. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

POTATO

'Galena Russet'

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

202000286

REPRODUCE LOCALLY. *Include form number and date on all reproductions* Form Approved - OMB No. 0581-0055

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

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE
(Instructions and information collection burden statement on reverse)

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

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

1. NAME OF OWNER
University of Idaho, Washington State University, Oregon State University, U.S. Government as represented by the Secretary of A

2. TEMPORARY DESIGNATION OR EXPERIMENTAL NAME
A03141-6

3. VARIETY NAME
Galena Russet

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

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

6. FAX *(include area code)*
208-885-6127

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PVPO NUMBER
202000286

FILING DATE
6/11/2020

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

8. IF INCORPORATED, GIVE STATE OF INCORPORATION
Idaho

9. DATE OF INCORPORATION
1947

10. NAME AND ADDRESS OF OWNER REPRESENTATIVE(S) TO SERVE IN THIS APPLICATION. *(First person listed will receive all papers)*
Karen Stevenson and Rhett Spear
Office of Technology Transfer
Morrill Hall PO Box 443003
Moscow, ID 83844-3003

11. TELEPHONE (Include area code)
(208) 885-4550 or 397-4181

12. FAX (Include area code)
(208) 885-4551 or 397-4311

FEES RECD

FILING AND EXAMINATION FEES:
$ 4382.00
DATE 6/11/2020

CERTIFICATION FEE:
$
DATE

13. E-MAIL
karens@uidaho.edu or rhetts@uidaho.edu

14. CROP KIND *(Common Name)*
Potato

15. GENUS AND SPECIES NAME OF CROP
Solanum tuberosum

16. FAMILY NAME *(Botanical)*
Solanaceae

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

18. DOES THE VARIETY CONTAIN ANY BIOTECHNOLOGY EVENTS?
☐ YES ☒ 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)*
☐ YES *(If "yes", answer items 21 and 22 below)*
☒ NO *(If "no", go to item 23)*
☐ UNDECIDED

19. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED (Follow instructions)
a ☑ Exhibit A. Origin and Breeding History of the Variety
b ☑ Exhibit B. Statement of Distinctness
c ☑ Exhibit C. Objective Description of Variety
d ☑ Exhibit D. Additional Description of the Variety *(Optional)*
e ☑ Exhibit E. Statement of the Basis of the Owner's Ownership
f ☐ 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?
☐ YES ☒ NO
IF YES, WHICH CLASSES? ☐ FOUNDATION ☐ REGISTERED ☐ CERTIFIED

22. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS?
☐ YES ☒ 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?
☐ YES ☒ NO
IF YES, YOU MUST PROVIDE THE DATE OF FIRST SALE, DISPOSITION, TRANSFER, OR USE FOR EACH COUNTRY AND THE CIRCUMSTANCES. *(Please use space indicated on next page.)*

24. IS THE VARIETY OR ANY COMPONENT OF THE VARIETY PROTECTED BY INTELLECTUAL PROPERTY RIGHT *(PLANT BREEDER'S RIGHT OR PATENT)*?
☐ YES ☒ 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
BRIAN NAKANISHI Digitally signed by BRIAN NAKANISHI Date: 2020.06.08 18:35:25 -04'00'

NAME *(Please print or type)*
Brian Nakanishi

CAPACITY OR TITLE
Acting Assistant Administrator, OTT

DATE
June 8, 2020

SIGNATURE OF OWNER
Karen Stevenson Digitally signed by Karen Stevenson DN: cn=Karen Stevenson, o=University of Idaho, ou=OTT, email=karens@uidaho.edu, c=US Date: 2020.06.09 12:10:49 -07'00'

NAME *(Please print or type)*
Karen Stevenson

CAPACITY OR TITLE
Licensing Assoc.

DATE
June 9, 2020

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.)*

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

EXHIBIT A – ORIGIN AND BREEDING HISTORY
** Use additional pages as needed.

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1. Name of Owner	2. Temporary Designation or Experimental Name	3. Variety Name
University of Idaho, Washington State University, Oregon State University, U.S. Government as represented b	A03141-6	Galena Russet

4. Describe the genealogy (back to and including public and commercial varieties, lines, or clones used) and the breeding method(s). **

Galena Russet was derived from a sexual hybridization made at the University of Idaho's Aberdeen Research and Extension Center in 2003 by the USDA-ARS. It resulted from a cross of A98083-9 (female parent) and Premier Russet (male parent). It was first selected in the field in 2007 at the University of Idaho Research and Extension Center, Aberdeen, Idaho.

A four generation pedigree is attached.

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

Year	Detail of Stage	Selection Criteria
2007	Field selection in 2007 at Aberdeen, Idaho	
2008-2012	Replicated yield trial evaluations and propagation	
2013-2014	In 2013-2014 Galena Russet was evaluated in the Tri-State Potato Variety Trials.	Yield, higher protein, resistance to tuber defects, french fry processing market
2015-2017	In 2015-2017 Galena Russet was entered and evaluated in the Western Regiaonal Variety Trials. Galena was selected for use in the early and late season french fry processing markets	
2016-2017	Galena Russet in agronomic field trials	

6. Is the variety uniform? X Yes ____ No

How did you test for uniformity?

Galena Russet has been clonally propagated since the first year of selection. The variety has remained uniform during all subsequent years of maintenance and propagation.

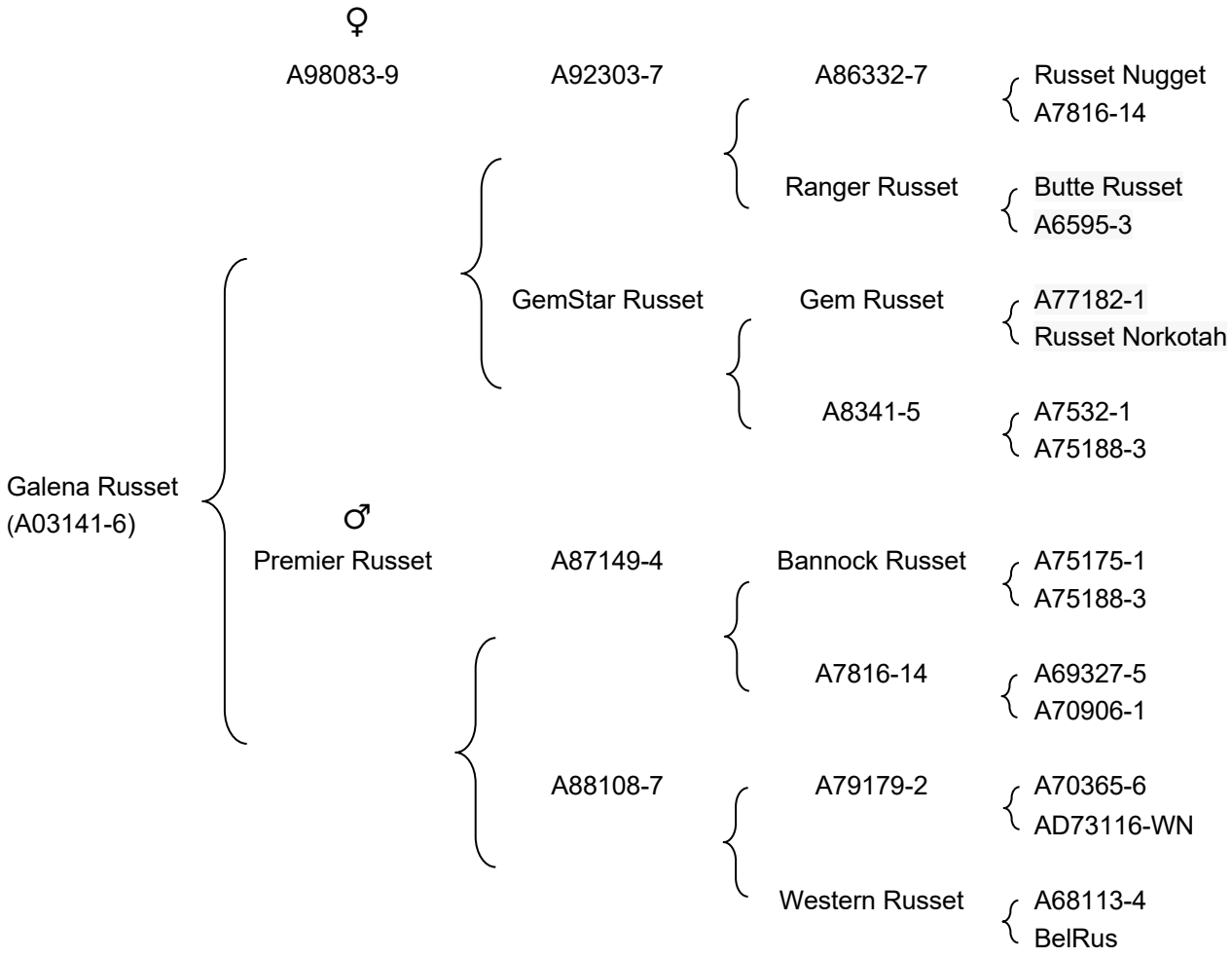
7. Is the variety stable? X Yes ____ No

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

Galena Russet has been clonally propagated for ten years of evaluations. It has shown stability over ten generations and has not produced any recognizable variants.

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

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


♀
A98083-9
A92303-7
A86332-7
Russet Nugget
A7816-14
Ranger Russet
Butte Russet
A6595-3
GemStar Russet
Gem Russet
A77182-1
Russet Norkotah
A8341-5
A7532-1
A75188-3
Galena Russet
(A03141-6)
♂
Premier Russet
A87149-4
Bannock Russet
A75175-1
A75188-3
A7816-14
A69327-5
A70906-1
A88108-7
A79179-2
A70365-6
AD73116-WN
Western Russet
A68113-4
BelRus

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

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PVPO NUMBER

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	2. Temporary Designation or Experimental Name	3. Variety Name
University of Idaho, Washington State University, Oregon State University, U.S. Government as represented b	A03141-6	Galena Russet

Based on overall morphology, Galena Russet (*Applicant's new variety*) is most similar to Russet Burbank (*Most similar comparison variety(ies)*).
Galena Russet (*Applicant's new variety*) most clearly differs from Russet Burbank (*Most similar comparison variety(ies)*) in the following traits:

Name the specific trait. Then list the value of that trait for each variety in the comparison. Submit appropriate supporting evidence (see the Guidelines for Presenting Evidence in Support of Variety Distinctness in the instructions below).

Eg. Leaf Pubescence ***Eg. Leaf Color*** ***Eg. Plant Height***	***heavy pubescence*** ***Dark Green (5GY 3/4)*** ***200 cm +/- 10 cm (N=25)***	***glabrous*** ***Light Green (2.5GY 8/10)*** ***250 cm +/- 15 cm (N=25)***	***photograph attached*** ***Munsell Color Chart*** ***statistics attached***
1. Qualitative traits:	**Applicant's New Variety** Galena Russet	**1st Comparison Variety** Russet Burbank	**Location of Evidence Within the Application**
Plant Characteristics: -growth habit -type	Erect (3) Open foliage (1)	Semi-erect (5) Intermediate (2)	Exhibit C and photographs
2. Color traits:			
Anthocyanin: (referring to intensity of coloration) 1) Light sprout tip 2) Light sprout base 3) Stem wings Terminal leaflet: 1) Tip shape 2) Margin waviness 1) Primary leaflet tip shape 2) Corolla shape 3) Leaf color	1) Strong (4) 2) Very Strong (5) 3) Strong (5) 1) Acute (1) 2)Medium (4) 1) Acute (1) 2) Rotate (2) 3) Medium Green (RHSCC 137A)	1) Weak (2) 2) Medium (3) 3) Weak (3) 1) Acuminate (3) 2) Weak (3) 1) Acuminate (3) 2) Semi-stellate (4) 3) Olive green (RHSCC 146A)	Exhibit C and photographs
3. Quantitative traits:			
Fry 40F Percent sugar ends Percent hollow heart Blackspot bruise Shatter bruise	1.0 (light) 26% (moderate) 7.5% (low) 2.88 (moderate) 2.1 (low)	2.7 (moderate) 68% (very high) 42.5% (high) 4.13 (high) 3.28 (moderate)	Table 3 - exhibit D Table 4 - exhibit D
4. Other:			

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

Exhibit C

OBJECTIVE DESCRIPTION OF VARIETY
Potato (*Solanum tuberosum* L.)

INSTRUCTIONS

The Objective Description Form:
The objective description form lists characteristics to be used as the basis for developing the description of potato varieties. It is designed to guide the applicant in describing a variety in detail so a meaningful comparison with other potato varieties can be accomplished. It is recommended that this form be completed in as much detail as possible to ensure an accurate description. Please fill in the requested data and place the appropriate number that describes the varietal characters typical of this potato variety and the reference varieties in the respective boxes.

Test Guidelines:
Any statistical and trial (field test) data that may be necessary to support the variety description should be attached to this form. Please include for trial data the plot size, number of replications, number of plants, plant spacing, trial locations and growing periods. Trials should normally be conducted at one place, in the region that the variety has been adapted for, with a minimum of one growing period in the United States. All comparative data should be determined from varieties entered in the same trials. The size of the plots should be such that plants or parts of plants may be removed for measuring and counting without prejudice to the observations which must be made at the end of the growing period. As a minimum, each test should include a total of 60 plants which should be divided between two or more replicates. Separate plots for observation and measuring can only be used if they have been subject to similar environmental conditions. To determine color for a plant or plant parts a recognized standard color chart must be used such as the Royal Horticultural Society (RHS) Color Chart or Munsell Color Chart (MCC).

Reference Varieties:
The application variety should be compared to at least one reference variety preferably a set of reference varieties. The reference varieties should be market class standard varieties currently grown in the United States and or the variety (ies) most similar. The following varieties are recommended as market class standards to be used as reference varieties:

Yellow-flesh table-stock	Yukon Gold
Round-white table-stock	Superior
Chip-processing	Atlantic, Snowden, Norchip
Frozen-processing	Russet Burbank
Russet table-stock	Russet Burbank, Russet Norkotah, Goldrush
Red table-stock	Red Pontiac, Red Norland, Red Lasoda

If the applicant does not use one of the recommended reference varieties by the PVP office, a complete description of the reference variety should be submitted by the applicant (Exhibit C).

Characteristics:
Light sprout characteristics are supplied in **Figure 1**. The plant type and growth habit characteristics are collected at early first bloom. **Figure 2** is supplied to help visualize the growth habit. For this descriptor, look at the stems rather than the stems and foliage. Plant maturity is measured at natural vine senescence.

Stem characteristics are also collected at early bloom. Stem anthocyanin coloration is divided into two descriptors: Location and intensity. **Figure 3** is supplied to give an example of stem wings.

Leaf characteristics are observed at early first bloom. Fully-developed leaves located on the middle third of the plant should be used. Leaf pubescence refers to general trichomes. **Figure 4** is supplied for examples of leaf silhouette. Leaf stipules are shown in **Figure 5** for visual definition. **Figure 6** is supplied to define leaf characteristics. **Figure 7** should be used to describe terminal and primary leaflet shape. **Figures 8 and 9** are used to describe the terminal and primary leaflet shape of tip and base, respectively. To measure the total number of primary leaflets pairs, collect 10 fully developed petioles (with leaves attached from each replication) and take the average number of secondary and tertiary leaflets. Glandular trichomes should be described in the Additional Comments and Characteristics (Descriptor 15).

Inflorescence characteristics should be measured at early first bloom. **Figures 10, 11 and 12** are supplied to describe anther and stigma shape, respectively. Corolla, calyx, anther, stigma, and pollen should be observed on newly opened flowers. Berry production should be based on field-grown plants rather than greenhouse plants.

Tuber characteristics should be observed following harvest**. Figures 13 and 14** are available to describe distribution of secondary color and tuber shape, respectively.

Disease and pest reactions should be based upon specific tests or statistical analysis rather than just field observations, rating 1 as Highly Resistance and 9 as Highly Susceptible, please follow the scale on each descriptor. Other diseases or pests reactions not requested can be described if it is felt that it would be helpful to determine novelty of the variety.

Quality characteristics should be described according to the market use.

If the plant is transgenic, this gene insertion(s) should be described.

Chemical identification and any other characteristics can be described if they are helpful in distinguishing the variety.

Legend:

V = Application Variety

R1-R4 = Reference Varieties

* = Both the reference variety (ies) and application variety must be described for characteristics designated with an asterisk.

20200286

NAME OF APPLICANT (S)	TEMPORARY OR EXPERIMENTAL DESIGNATION	VARIETY NAME
University of Idaho Washington State University Oregon State University U.S. Government as represented by the Secretary of Agriculture	A03141-6	Galena Russet

ADDRESS *(Street and No. or RD No., City, State, Zip Code, and Country)*	FOR OFFICIAL USE ONLY
Office of Technology Transfer Morrill Hall 414 PO Box 443003 Moscow ID 83844-3003	PVPO NUMBER

REFERENCE VARIETIES: Enter the reference variety name in the appropriate box.

Application Variety (V)	Reference Variety 1 (R1)	Reference Variety 2 (R2)	Reference Variety 3 (R3)	Reference Variety 4 (R4)
Galena Russet	Russet Burbank			

PLEASE READ ALL INSTRUCTIONS CAREFULLY:

1. MARKET CHARACTERISTICS:

***MARKET CLASS**:
1 = Yellow-flesh Tablestock 2 = Round-white Tablestock 3 = Chip-processing 4 = Frozen-processing
5 = Russet Tablestock 6 = Other _____

V	R1	R2	R3	R4
4-5	4-5			

2. LIGHT SPROUT CHARACTERISTICS: (See Figure 1)

***LIGHT SPROUT: GENERAL SHAPE**
1 = Spherical 2 = Ovoid 3 = Conica 4 = Broad cylindrica 5 = Narrow cylindrical 6 = Other _____

V	R1	R2	R3	R4
2	2			

***LIGHT SPROUT BASE: PUBESCENCE OF BASE**
1 = Absent 2 = Weak 3 = Medium 4 = Strong 5 = Very Strong

V	R1	R2	R3	R4
3	3			

***LIGHT SPROUT BASE: ANTHOCYANIN COLORATION**
1 = Green 2 = Red-violet 3 = Blue-violet 4 = Other(describe) _____

V	R1	R2	R3	R4
2	2			

***LIGHT SPROUT BASE: INTENSITY OF ANTHOCYANIN COLORATION (IF PRESENT)**
1 = Absent 2 = Weak 3 = Medium 4 = Strong 5 = Very Strong

V	R1	R2	R3	R4
5	3			

* **LIGHT SPROUT TIP: HABIT**
1 = Closed 2 = Intermediate 3 = Open

V	R1	R2	R3	R4
2	2			

2. LIGHT SPROUT CHARACTERISTICS: (continued)

LIGHT SPROUT TIP: PUBESCENCE
1 = Absent 2 = Weak 3 = Medium 4 = Strong 5 = Very Strong

V	3	R1	3	R2		R3		R4	

LIGHT SPROUT TIP ANTHOCYANIN COLORATION
1 = Green 2 = Red-violet 3 = Blue-violet 4 = Other(describe) _____

V	1	R1	2	R2		R3		R4	

LIGHT SPROUT TIP: INTENSITY OF ANTHOCANIN COLORATION (IF PRESENT)
1 = Absent 2 = Weak 3 = Medium 4 = Strong 5 = Very Strong

V	4	R1	2	R2		R3		R4	

LIGHT SPROUT ROOT INITIALS: FREQUENCY
1 = Absent 2 = Some 3 = Abundant

V	3	R1	2	R2		R3		R4	

3. PLANT CHARACTERISTICS:

GROWTH HABIT: (See Figure 2)
3 = Erect (>45° with ground) 5 = Semi-erect (30-45° with ground) 7 = Spreading

V	3	R1	5	R2		R3		R4	

TYPE:
1 = Stem (foliage open, stems clearly visible) 2 = Intermediate 3 = Leaf (Foliage closed, stems hardly visible)

V	1	R1	2	R2		R3		R4	

MATURITY: Days after planting (DAP) at vine senescence

V	111	R1	111	R2		R3		R4	

PLANTING DATE:

V	5-May/2016, 5-May/2017	R1	5-May/2016, 5-May/2017	R2		R3		R4	

*__REGIONAL AREA__:
1 = Pacific North West (WA, OR, ID, CO, CA) 2 = North Central (ND, WI, MI, MN, OH) 3 = North East (ME, NY, PA, NJ, MD, MA, RI,)
4 = Mid-Atlantic Erect (VI, NC, SC, South NJ, FL) 5 = South (LA, TX, AZ, NE) 6 = Canada
7 = Europe 8 = England 9 = Latin America 10 = Brazil 11 = Other _____

V	1 Aberdeen, ID	R1	1 Aberdeen, ID	R2		R3		R4	

MATURITY CLASS:
1 = Very Early (<100 DAP) 2 = Early (100-110 DAP) 3 = Mid-season (111-120 DAP) 4 = Late (121-130 DAP) 5 = Very Late (>130 DAP).

V	3	R1	3	R2		R3		R4	

4. STEM CHARACTERISTICS: Measure at early first bloom

*** STEM ANTHOCYANIN COLORATION**:
1 = Absent 3= Weak 5 = Medium 7 = Strong 9 = Very Strong

V	1	R1	3	R2		R3		R4	

STEM WINGS: (See Figure 3)
1 = Absent 3 = Weak 5 = Medium 7 = Strong 9 = Very Strong

V	5	R1	3	R2		R3		R4	

5. LEAF CHARACTERISTICS:

LEAF COLOR: (*Observe fully developed leaves located on middle 1/3 of plant)*
1 = Yellowing-green 2 = Olive-green 3 = Medium Green 4 = Dark Green 5 = Grey-green 6 = Other _____

V	3	R1	2	R2		R3		R4	

LEAF COLOR CHART VALUE: Royal Horticulture Society Color Chart or Munsell Color Chart
(*Observe fully developed leaves located on middle 1/3 of plant and circle the appropriate color chart)*

V	137 A	R1	146 A	R2		R3		R4	

LEAF PUBESCENCE DENSITY:
1 = Absent 2 = Sparse 3 = Medium 4 = Thick 5 = Heavy

V	3	R1	3	R2		R3		R4	

LEAF PUBESCENCE LENGTH:
1 = None 2 = Short 3 = Medium 4 = Long 5 = Very Long

V	2	R1	2	R2		R3		R4	

(*Note Descriptor #15 can be used to describe the type and length of the glandular trichomes observed.)*

*** LEAF SILHOUETTE**: (See Figure 4)
1 = Closed 3 = Medium 5 = Open

V	5	R1	5	R2		R3		R4	

PETIOLES ANTHOCYANIN COLORATION:
1 = Absent 3 = Weak 5 = Medium 7 = Strong 9 = Very Strong

V	1	R1	3	R2		R3		R4	

LEAF STIPULES SIZE: (Se Figure 5)
1 = Absent 3 = Small 5 = Medium 7 = Large

V	5	R1	5	R2		R3		R4	

TERMINAL LEAFLET SHAPE (See Figures 6 and 7)
1 = Narrowly ovate 2 = Medium Ovate 3 = Broadly Ovate 4 = Lanceolate 5 = Elliptical 6 = Obovate 7 = Oblong 8 = Other _____

V	1	R1	2	R2		R3		R4	

5. LEAF CHARACTERISTICS: (continued)

TERMINAL LEAFLET TIP SHAPE: (See Figures 6 and 8)
1 = Acute 2 = Cuspidate 3 = Acuminate 4 = Obtuse 5 = Other _____

V	1	R1	3	R2		R3		R4	

* **TERMINAL LEAFLET BASE SHAPE**: (See Figure 9)
1 = Cuneate 2 = Acute 3 = Obtuse 4 = Cordate 5 = Truncate 6 = Lobed 7 = Other _____

V	2	R1	3	R2		R3		R4	

TERMINAL LEAFLET MARGIN WAVINESS:
1 = Absent 2 = Slight 3 = Weak 4 = Medium 5 = Strong

V	4	R1	3	R2		R3		R4	

NUMBER OF PRIMARY LEAFLET PAIRS: (See Figure 6)

AVERAGE:

V	4.1	R1	3.4	R2		R3		R4	

RANGE:

V	3 to 5	R1	2 to 4	R2	to	R3	to	R4	to

PRIMARY LEAFLET TIP SHAPE: (See Figures 6 and 8)
1 = Acute 2 = Cuspidate 3 = Acuminate 4 = Obtuse 5 = Other _____

V	1	R1	3	R2		R3		R4	

PRIMARY LEAFLET SIZE:
1 = Very Small 2 = Small 3 = Medium 4 = Large 5 = Very Large

V	2	R1	3	R2		R3		R4	

PRIMARY LEAFLET SHAPE: (See Figures 6 and 7)
1 = Narrowly ovate 2 = Medium ovate 3 = Broadly ovate 4 = Lanceolate 5 = Elliptical 6 = Ovate 7 = Oblong 8 = Other _____

V	1	R1	2	R2		R3		R4	

PRIMARY LEAFLET BASE SHAPE: (See Figures 6 and 9)
1 = Cuneate 2 = Acute 3 = Obtuse 4 = Cordate 5 = Truncate 6 = Lobed 7 = Other _____

V	2	R1	3	R2		R3		R4	

NUMBER OF SECONDARY AND TERTIARY LEAFLET PAIRS: (See Figure 6)

AVERAGE:

V	7.8	R1	6.1	R2		R3		R4	

RANGE:

V	5 to 11	R1	2 to 11	R2	to	R3	to	R4	to

5. LEAF CHARACTERISTICS: (continued)

NUMBER OF INFLORESCENCE/PLANT:

AVERAGE:

V	3.4	R1	4.2	R2		R3		R4	

RANGE:

V	1 to 8	R1	1 to 9	R2	to	R3	to	R4	to

NUMBER OF FLORETS/INFLORESCENCE:

AVERAGE:

V	15.2	R1	12.0	R2		R3		R4	

RANGE:

V	11 to 25	R1	5 to 18	R2	to	R3	to	R4	to

*** COROLLA INNER SURFACE COLOR CHART VALUE**: Royal Horticulture Society Color Chart or Munsell Color Chart (Measure predominant color of newly open flower and circle the appropriate color chart)

V	155 B	R1	155 A	R2		R3		R4	

* **COROLLA OUTER SURFACE COLOR CHART VALUE**: Royal Horticulture Society Color Chart or Munsell Color Chart (Measure predominant color of newly open flower and circle the appropriate color chart)

V	155 B	R1	155 B	R2		R3		R4	

* **COROLLA INNER SURFACE COLOR**: (Measure predominant color of newly open flower, if flowers are bi-color please use the ratio codes)
1 = White 2 = Red-violet 3 = Blue-violet 4 = Cream 5 = Red-purple 6 = Blue 7 = Pink 8 = Pink-white 9 = Purple 10 = Violet 11 = Purple-violet 13 = Violet-White 1:1 14 = Violet-White 1:3 15 = Violet-White 3:1 16 = Violet-White Halo 17 = Pink-White 1:1 18 = Pink-White 1:3 19 = Pink-White 3:1 20 = Pink-White Halo 21 = RedViolet-White 1:1 22 = RedViolet-White 1:3 23 = RedViolet-White 3:1 24 = RedViolet-White Halo 25 = BlueViolet-White 1:1 26 = BlueViolet-White 1:3 27 = BlueViolet-White 3:1 28 = BlueViolet-White Halo 12 = Other _____

V	1	R1	1	R2		R3		R4	

COROLLA SHAPE: (See Figure 10)
1 = Very rotate 2 = Rotate 3 = Pentagonal 4 = Semi-stellate 5 = Stellate

V	2	R1	4	R2		R3		R4	

6. INFLORESCENCE CHARACTERISTICS:

CALYX ANTHOCYANIN COLORATION:
1 = Absent 3 = Weak 5 = Medium 7 = Strong 9 = Very strong

V	3	R1	3	R2		R3		R4	

ANTHER COLOR CHART VALUE: Royal Horticulture Society Color Chart or Munsel Color Chart (Measure when newly opened flower is fully expanded and circle the appropriate color chart)

V	17 B	R1	15 A	R2		R3		R4	

ANTHER SHAPE: (See Figure 11)
1 = Broad cone 2 = Narrow cone 3 = Pear-shaped cone 4 = Loose 5 = Other

V	1	R1	3	R2		R3		R4	

6. INFLORESCENCE CHARACTERISTICS: (continued)

POLLEN PRODUCTION:
1 = None 3 = Some 5 = Abundant

V	3	R1	1	R2		R3		R4	

STIGMA SHAPE: (See Figure 12)
1 = Capitate 2 = Clavate 3 Bi-lobed

V	1	R1	1	R2		R3		R4	

STIGMA COLOR CHART VALUE: Royal Horticulture Society Color Chart or Munsel Color Chart (Circle the appropriate color chart)

V	144 A	R1	146 B	R2		R3		R4	

BERRY PRODUCTION: (Under field conditions)
1 = Absent 3 = Low 5 = Moderate 7 = Heavy 9 = Very Heavy

V		R1	1	R2		R3		R4	

7. TUBER CHARACTERISTICS:

*** PREDOMINANT SKIN COLOR**:
1 = White 2 = Light Yellow 3 = Yellow 4 = Buff 5 = Tan 6 = Brown 7 = Pink 8 = Red 9 = Purplish-red
10 = Purple 11 = Dark purple-black 12 = Other _____

V	4	R1	6	R2		R3		R4	

PREDOMINANT SKIN COLOR CHART VALUE: Royal Horticulture Society Color Chart or Munsell Color Chart (Circle the appropriate color chart)

V	161 B	R1	164 B	R2		R3		R4	

SECONDARY SKIN COLOR:
1 = Absent 2 = Present (please describe)

V	1	R1	1	R2		R3		R4	

SECONDARY SKIN COLOR CHART VALUE: Royal Horticulture Society Color Chart or Munsell Color Chart (Circle the appropriate color)

V		R1		R2		R3		R4	

SECONDARY SKIN COLOR DISTRIBUTION: (See Figure 13)
1 = Eyes 2 = Eyebrows 3 = Splashed 4 = Scattered 5 = Spectacled 6 = Stippled 7 = Other _____

V		R1		R2		R3		R4	

SKIN TEXTURE:
1 = Smooth 2 = Rough (flaky) 3 = Netled 4 = Russetted 5 = Heavily russetted 6 = Other _____

V	4	R1	4	R2		R3		R4	

7. TUBER CHARACTERISTICS: (continued)

*** TUBER SHAPE**: (See Figure 14)
1 = Compressed 2 = Round 3 = Oval 4 = Oblong 5 = Long 6 = Other _____

V	4	R1	5	R2		R3		R4	

TUBER THICKNESS:
1 = Round 2 = Medium thick 3 = Slightly flattened 4 = Flattened 5 = Other _____

V	3	R1	3	R2		R3		R4	

TUBER LENGTH (mm):

AVERAGE:

V	119	R1	135	R2		R3		R4	

RANGE:

V	87 to 170	R1	85 to 180	R2	to	R3	to	R4	to

STANDARD DEVIATION:

V	16.10	R1	18.6	R2		R3		R4	

AVERAGE WEIGHT OF SAMPLE TAKEN:

V	291	R1	236	R2		R3		R4	

TUBER WIDTH (mm)

AVERAGE:

V	69	R1	61	R2		R3		R4	

RANGE:

V	54 to 87	R1	49 to 79	R2	to	R3	to	R4	to

STANDARD DEVIATION:

V	7.39	R1	5.82	R2		R3		R4	

AVERAGE WEIGHT OF SAMPLE TAKEN (g):

V	291	R1	236	R2		R3		R4	

7. TUBER CHARACTERISTICS: (continued)

TUBER THICKNESS (mm):

AVERAGE:

V	58.4	R1	53	R2		R3		R4	

RANGE:

V	45 to 80	R1	43 to 72	R2	to	R3	to	R4	to

STANDARD DEVIATION:

V	7.50	R1	5.56	R2		R3		R4	

AVERAGE WEIGHT OF SAMPLE TAKEN (g):

V	291	R1	236	R2		R3		R4	

TUBER EYE DEPTH:

1 = Protruding 3 = Shallow 5 = Intermediate 7 = Deep 9 = Very deep

V	5	R1	5	R2		R3		R4	

TUBER LATERAL EYES:

1 = Protruding 3 = Shallow 5 = Intermediate 7 = Deep 9 = Very deep

V	5	R1	5	R2		R3		R4	

NUMBER EYE/TUBER:

AVERAGE:

V	19.5	R1	26.6	R2		R3		R4	

RANGE:

V	13 to 28	R1	19 to 42	R2	to	R3	to	R4	to

DISTRIBUTION OF TUBER EYES:

1 = Predominantly apical 2 = Evenly distributed

V	2	R1	2	R2		R3		R4	

PROMINENCE OF TUBER EYEBROWS:

1= Absent 2 = Slight prominence 3 = Medium prominence 4 = Very prominent 5 = Other _____

V	2	R1	2	R2		R3		R4	

7. TUBER CHARACTERISTICS: (continued)

PREDOMINANT TUBER FLESH COLOR
1 = White 2 = Light Yellow 3 = Yellow 4 = Buff 5 = Tan 6 = Brown 7 = Pink 8 = Red 9 = Purplish-red
10 = Purple 11 = Dark purple-black 12 = Other _____

V	1	R1	1	R2		R3		R4	

PRIMARY TUBER FLESH COLOR CHART VALUE: Royal Horticulture Society Color Chart or Munsell Color Chart (Circle the appropriate color chart)

V	158 B	R1	158 C	R2		R3		R4	

SECONDARY TUBER FLESH COLOR:

1 = Absent 2 = Present, please describe: _____

V	1	R1	1	R2		R3		R4	

SECONDARY TUBER FLESH COLOR CHART VALUE: Royal Horticulture Society Color Chart or Munsell Color Chart (Circle the appropriate color chart)

V		R1		R2		R3		R4	

NUMBER OF TUBERS/PLANT:
1 = Low (<8) 2 = Medium (8-15) 3 = High (>15)

V	5.5	R1	5.9	R2		R3		R4	

8. DISEASES CHARACTERISTICS:

DISEASES REACTION: 0 = Not Tested 1 = Highly Resistant 2 = Resistant Few Symptoms 3 = Resistance Few Lessions in Number and Size 4 = Moderately Resistance 5 = Intermedia Susceptible 6 = Moderate Susceptible 7 = Susceptible 9 = Highly Susceptible

LATE BLIGHT: (Phytophthora)

V		R1	7	R2		R3		R4	

EARLY BLIGHT: (Alternaria)

V		R1	6	R2		R3		R4	

SOFT ROT (Erwinia)

V		R1	7	R2		R3		R4	

COMMON SCAB (Streptomyces)

V		R1	4	R2		R3		R4	

POWDERY SCAB (Spongospora)

V		R1	0	R2		R3		R4	

DRY ROT (Fusarium)

V		R1	7	R2		R3		R4	

POTATO LEAF ROLL VIRUS (PLRV)

V		R1	9	R2		R3		R4	

8. DISEASES CHARACTERISTICS: (continued)

POTATO VIRUS X (PVX)

V		R1	9	R2		R3		R4	

POTATO VIRUS Y (PVY)

V		R1	7	R2		R3		R4	

POTATO VIRUS M (PVM)

V		R1	0	R2		R3		R4	

POTATO VIRUS A (PVA)

V		R1	0	R2		R3		R4	

GOLDEN NEMATODE (Globodera)

V		R1	0	R2		R3		R4	

ROOT – KNOT NEMATODE (Meloidogyne)

V		R1	0	R2		R3		R4	

OTHER DISEASE Corky Ringspot (Tobacco rattle Virus)

V		R1	9	R2		R3		R4	

PHYSIOLOGICAL DISORDER

1 = Malformed shape 2 = Tuber cracking 3 = Feathering 4 = Hollow heart 5 = Internal necrosis
6 = Blackheart 7 = Internal sprouting 8 = Other _____

V		R1	4	R2		R3		R4	

9. PESTS CHARACTERISTICS:

PEST REACTION: 0 = Not Tested 1 = Highly Resistant 2 = Resistant Few Symptoms 3 = Resistance Few Lessions in Number and Size
4 = Moderately Resistance 5 = Intermedia Susceptible 6 = Moderate Susceptible
7 = Susceptible 9 = Highly Susceptible

COLORADO POTATO BEETLE (CPB) (*Leptinotarsa*)

V		R1	0	R2		R3		R4	

GREEN PEACH APHID *(Myzus)*

V		R1	0	R2		R3		R4	

OTHER:

V		R1	0	R2		R3		R4	

OTHER:

V		R1	0	R2		R3		R4	

10. GENE TRAITS:

INSERTION OF GENES: 1 = YES 2 = NO ☑

IF YES, describe the gene(s) introduced or attach information:

11. QUALITY CHARACTERISTICS:

CHIEF MARKET:

SPECIFIC GRAVITY (wt. air/wt. air – wt. water)
1 = <1.060 2 = 1.060-1.069 3 = 1.070-1.079 4 = 1.080-1.089 5 = >1.090

V	4	R1	3	R2		R3		R4	

TOTAL GLYCOALKALOID CONTENT (mg./100 g. fresh tuber)

V	5.60	R1	2.68	R2		R3		R4	

OTHER QUALITY CHARACTERISTICS: Describe any other quality characteristics that may aid in identification, (e.g., chip-processing, french fry processing, baking, boiling, after-cooking darkening). Please attach data and corresponding protocol.

Galena Russet has lighter fry color at 40F (1.02) and 45F (0.77),than Russet Burbank 40F(2.67),and 45 F(1.03)

Galena Russet produces lower percentage of sugar ends (26%) compared to Russet Burbank at (68%).

See attached Exhibit D for protocol.

12. CHEMICAL IDENTIFICATION:

Describe chemical traits of the candidate variety that aid in its identification (e.g., protien or DSN electrophoresis). Please attach data and the corresponding protocol.

Galena Russet has higher percent protein content (6.26%) than Russet Burbank (5.08%).

Galena Russet has higher Vitamin C content (26.43 mg/100g FWB) than Russet Burbank (21.77 mg/100g FWB).

See protocol in attached Exhibit D

13. FINGER PRINTING MARKERS:

ISOZYMES 1 = YES 2 = NO ☑

IF YES, attach information

14. DNA PROFILE: 1 = YES 2 = NO ☑

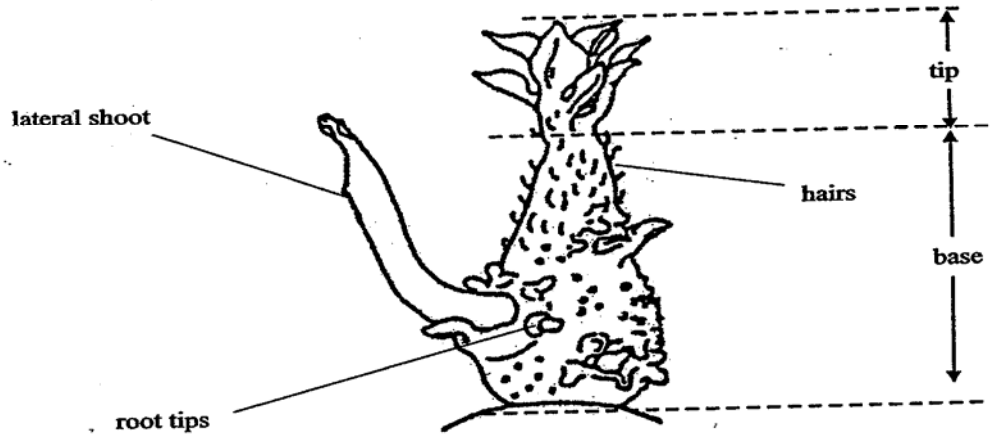
IF YES, attach information

15. ADDDITIONAL COMMENTS AND CHARACTERISTICS:

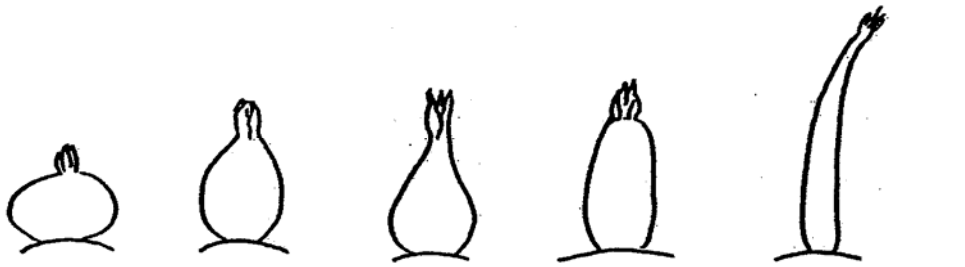
Include any additional descriptors that would be useful in distringuishing the candidate variety.

Figure 1: Light sprout

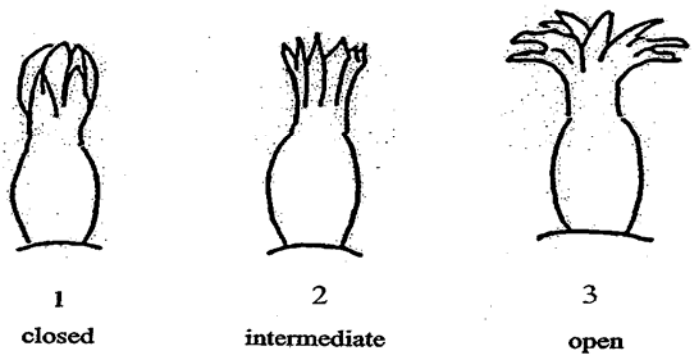
Light sprout dissection



Light sprout shape

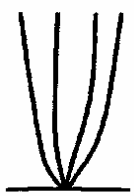


Light sprout tip habit

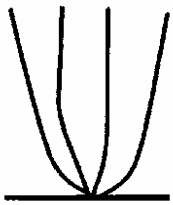


The characteristic should be observed after about 10 weeks to obtain a good differentiation in the collection.

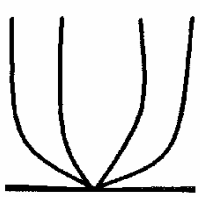
Figure 2: Growth Habit



Erect



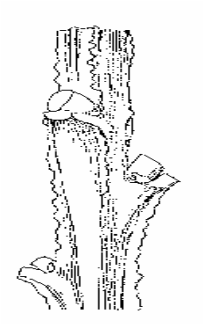
Semi Erect



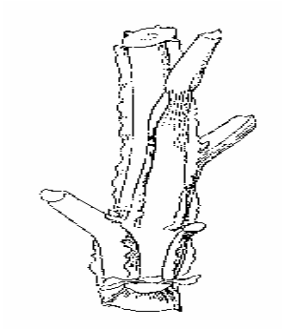
Spreading

Figure 3: Stem Wings

Weak



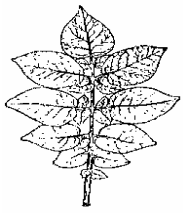
Medium



Strong

Figure 4: Leaf Sillhouette

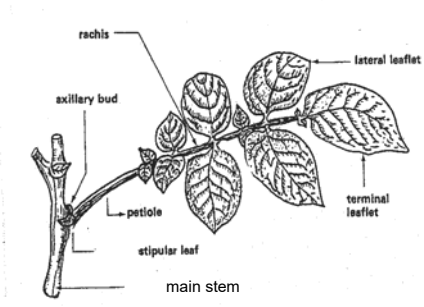
Closed



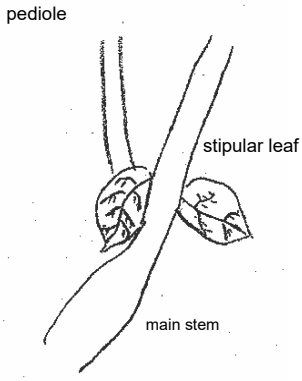
Medium

Open

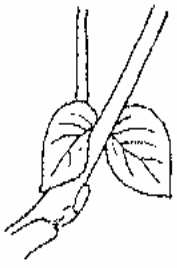
Figure 5: Leaf Stipules



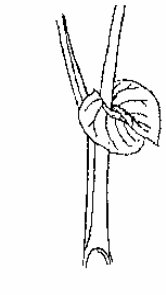
General structures



Small stipular leaf



Medium stipular leaf



Large stipular leaf

Figure 6: Leaf Dissection

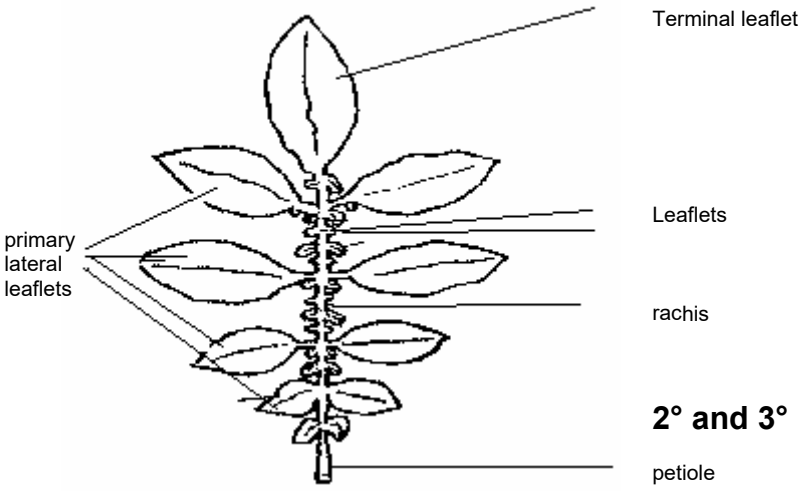


Figure 7: Terminal Leaflet Shape/Primary Leaflet Shape

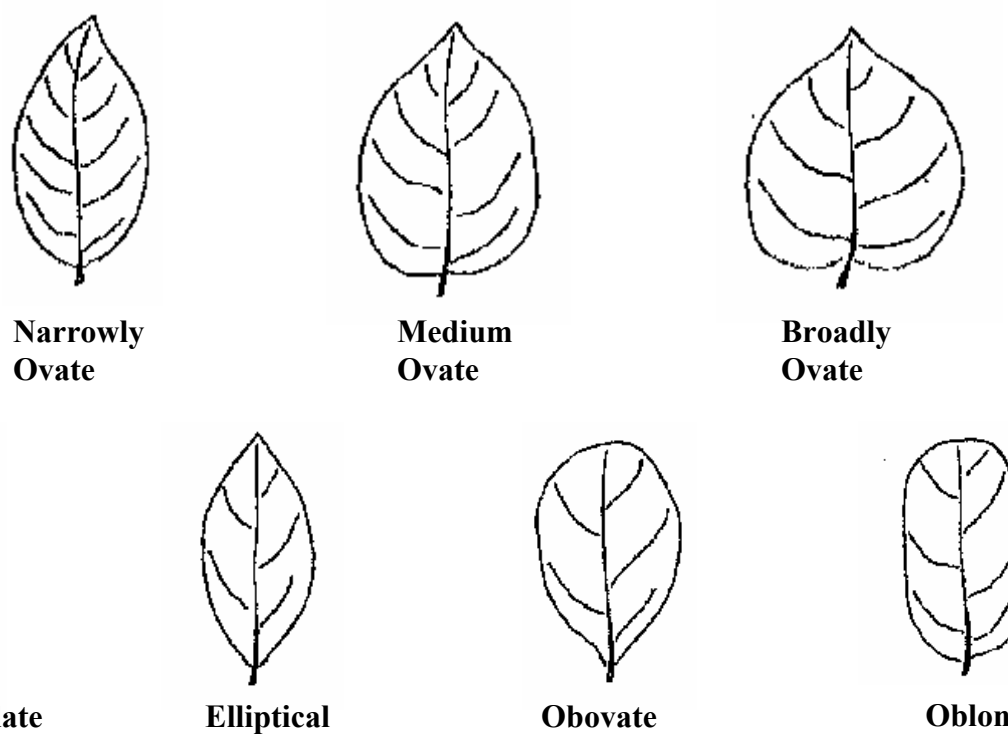


Figure 8: Terminal Leaflet Shape of Tip/Primary Leaflet Shape of Tip

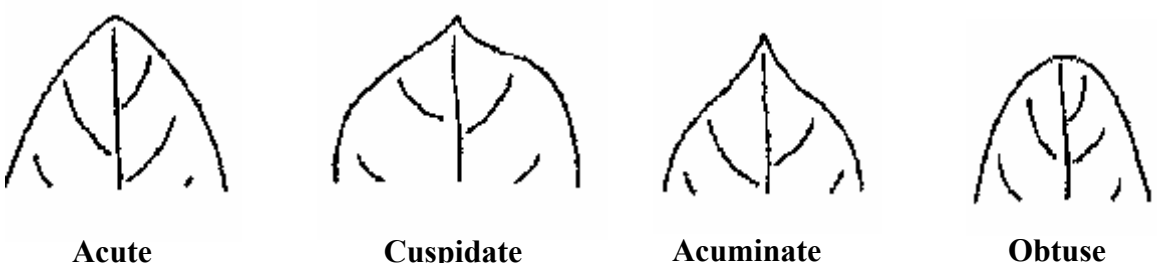


Figure 9: Terminal Leaflet Shape of Base/Primary Leafelet Shape of Base

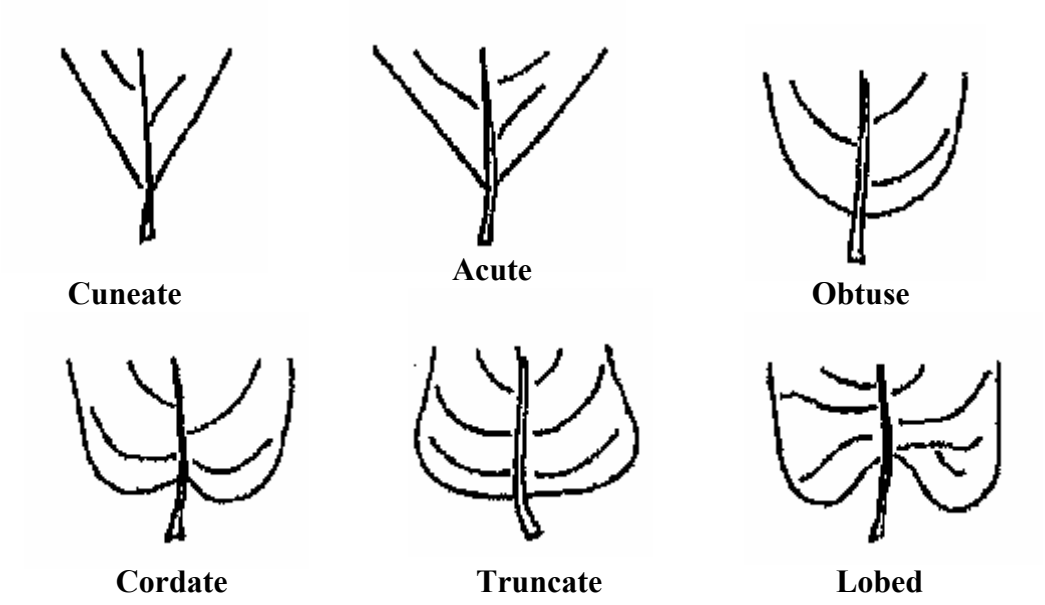


Figure 10: Corolla Shape

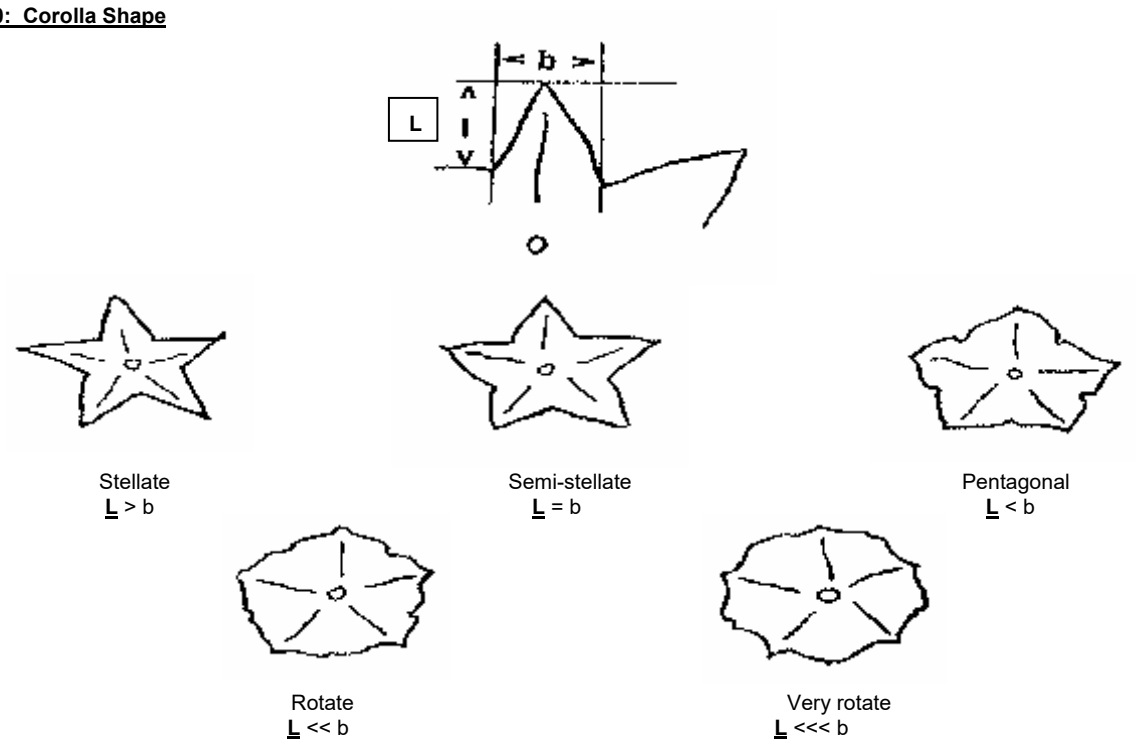


Figure 11: Anther Shape

Figure 12: Stigma Shape

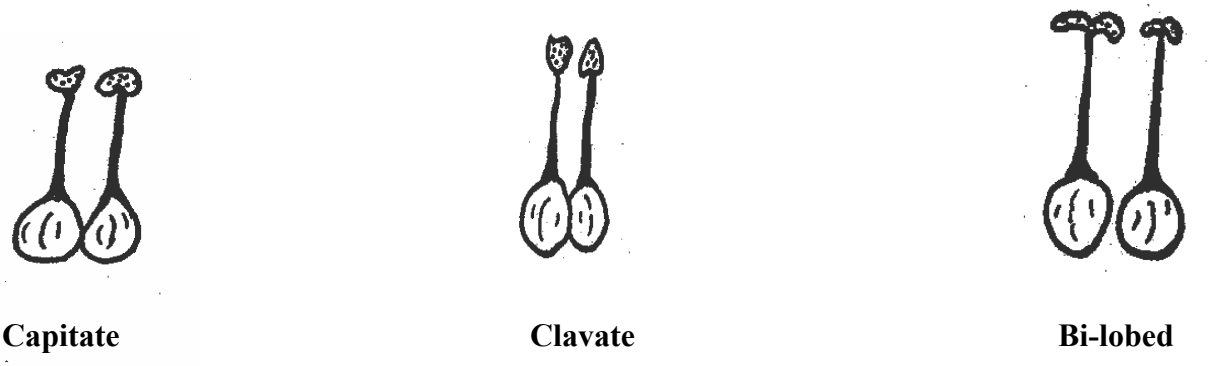


Figure 13: Distribution of Secondary Skin Tuber Color

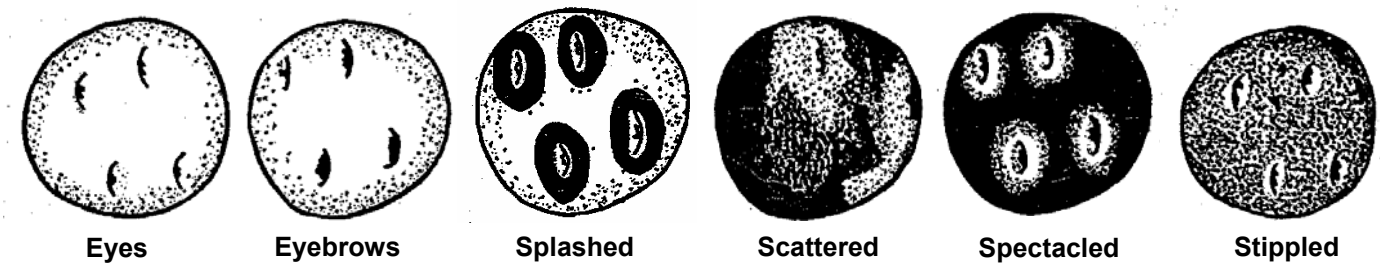
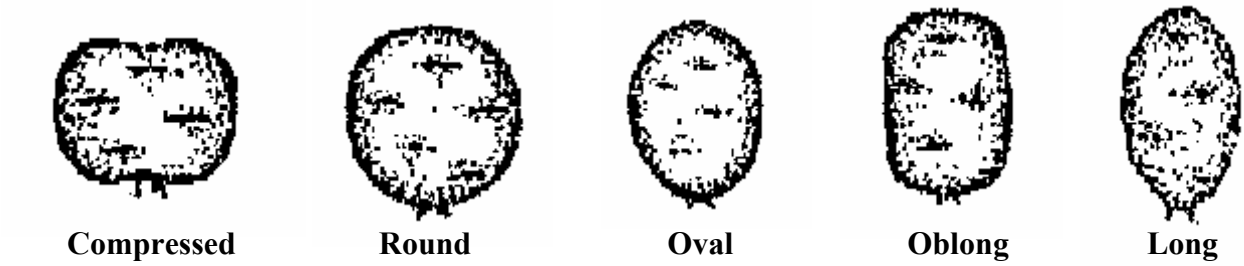


Figure 14: Tuber Shape



References:
Huaman, Z. 1986. Systematic botany and morphology of the potato. Technical information Bulletin 6. International Potato Center, Lima, Peru.

Huaman, Z., Williams, J.T., Salhuana, W. and Vincent, L. Descriptors for the cultivated potato and the maintenance and distribution of germplasm collections. 1977. International Board for Plant Genetic Resources. Rome, Italy.

Potato (*Solanum tuberosum* L.) Guidelines for the conduct of tests for distinctness, uniformity and stability. International union for the protection of new varieties of plants (UPOV). 2004-03-31.

Application for Plant Variety Protection Certificate

Exhibit D: Additional Description Information
Variety: Galena Russet
Owner: University of Idaho, Washington State University, Oregon State University, U.S. Government as represented by the Secretary of Agriculture

Galena Russet is shown to have relatively higher vitamin c content than Russet Burbank (26.43 mg/100g FWB* for Galena Russet vs. 21.77 mg/100g FWB for Russet Burbank averaged over 5 years) Table 1.

Five year average percent protein and solids for Galena Russet (6.26% protein, 23.17% solids) were higher than Russet Burbank (5.08% protein, 21.02% solids) as well as higher specific gravities (1.091 for Galena Russet vs. 1.077 for Russet Burbank) show in Table 2.

Using data collected from three trials grown at Aberdeen and Kimberly, Idaho in 2013-2017, Galena Russet produced lighter French fry color (based on USDA color chart) from tubers stored for approximately 3 months at 40^{o}F (1.0 for Galena Russet vs. 2.7 for Russet Burbank). Galena Russet also had lower percentage of sugar ends (26%) than Russet Burbank (68%) shown in Table 3.

In 2014 Galena Russet presented a lower incident of hollow heart than Russet Burbank, 7.5% vs 42.5%, and in 2017 showed resistance to both blackspot and shatter bruise. Galena Russet with a 2.88 blackspot and 2.10 while Russet Burbank was scored with a 4.13 blackspot and 3.28 shatter scores shown in table 4.

Protocols are attached. Statistical analysis was performed using the GLM procedure from SAS.

*Fresh Weight Basis

Table 1. Galena Russet and Russet Burbank comparisons for glycoalkaloids and vitamin C and sucrose (2015-2017) using the GLM Procedure for potatoes grown at Aberdeen, Idaho in 2013-2017.

Anova		**Glycoalkaloids**		**Vitamin C**		**Sucrose**	
Source	DF	F Value	PR > F	F Value	PR > F	F Value	PR > F
Variety	1	13.86	0.0204	20.06	0.0110	20.34	0.0002
Replication	4 / 3 (Suc)	2.06	0.2509	6.84	0.0447	0.12	0.9490

Variety		**Glycoalkaloids (mg/100g FWB)**	**Vitamin C (mg/100g FWB)**	**Sucrose (Percent FWB) (2015-2017)**
Galena Russet	Mean	**5.42**	**26.43**	**0.276**
	Minimum	3.06	22.68	0.189
	Maximum	7.64	30.91	0.431
	Stdev	1.85	3.559	0.091
Russet Burbank	Mean	**2.67**	**21.77**	**0.146**
	Minimum	1.91	17.38	0.102
	Maximum	4.04	24.96	0.182
	Stdev	0.85	2.89	0.024
LSD = 0.05		2.05	2.89	0.060

Table 2. Galena Russet and Russet Burbank comparisons for percent protein, solids content and specific gravity using the GLM Procedure for potatoes grown at Aberdeen, Idaho in 2013-2017.

Anova		**Protein**		**Solids**		**Gravity**	
Source	DF	F Value	PR > F	F Value	PR > F	F Value	PR > F
Variety	1	21.72	0.0096	27.22	0.0064	108.17	0.0005
Replication	4	3.80	0.1123	0.70	0.6295	1.65	0.3196

Variety		**Protein (percentage)**	**Solids (percentage)**	**Gravity**
Galena Russet	Mean	**6.26**	**23.17**	**1.091**
	Minimum	5.52	22.68	1.088
	Maximum	7.09	24.12	1.093
	Stdev	0.69	0.56	0.0021
Russet Burbank	Mean	**5.08**	**21.018**	**1.077**
	Minimum	4.37	18.45	1.074
	Maximum	5.70	21.00	1.080
	Stdev	0.55	1.04	0.0026
LSD = 0.05		0.71	1.59	0.0036

Table 3. Galena Russet and Russet Burbank comparisons for french fry color stored at 40 or 45°F and percent sugar end using the GLM Procedure for potatoes grown at Aberdeen and Kimberly, Idaho in 2013-2017.

Anova		Fry Color 40°F		Fry Color 45°F		Sugar Ends	
Source	DF	F Value	PR > F	F Value	PR > F	F Value	PR > F
Variety	1	48.49	<.0001	1.61	0.2115	11.55	0.0015
Replication	3	0.29	0.8330	0.18	0.9088	0.38	0.7683

Variety		Fry Color 40°F (USDA 00-4.0)	Fry Color 45°F (USDA 00-4.0)	Sugar Ends (percentage)
Galena Russet	**Mean**	**1.02**	**0.77**	**26.04**
	Minimum	0.5	0.3	0
	Maximum	2.3	2.5	100
	Stdev	0.50	0.56	21.35
Russet Burbank	**Mean**	**2.67**	**1.03**	**68.04**
	Minimum	0.8	0.3	0
	Maximum	4.0	3.0	100
	Stdev	1.02	0.81	32.55
LSD =0.05		0.48	0.42	18.99

USDA color chart {00-4.0 (darkest)}. Samples stored at 40 or 45° F for approximately 3 months.
Sugar end determined when end of fry is >1.0 darker than remaining fry.

Table 4. Galena Russet and Russet Burbank comparisons for hollow heart in 2014, blackspot and shatter bruise in 2017 using the GLM Procedure for potatoes grown at Aberdeen, Idaho.

Anova		Hollow Heart		Blackspot Bruise		Shatter Bruise	
Source	DF	F Value	PR > F	F Value	PR > F	F Value	PR > F
Variety	1	11.31	0.0436	30.74	0.0116	98.91	0.0022
Replication	3	2.31	0.2550	1.02	0.4948	2.91	0.2018

Variety		Hollow Heart (percentage)	Blackspot Bruise	Shatter Bruise
Galena Russet	**Mean**	**7.5**	**2.88**	**2.10**
	Minimum	0	2.70	1.90
	Maximum	20	3.20	2.20
	Stdev	9.57	0.24	0.14
Russet Burbank	**Mean**	**42.5**	**4.13**	**3.28**
	Minimum	10	3.90	2.90
	Maximum	70	4.70	3.60
	Stdev	25.00	0.39	0.30
LSD =0.05		33.12	0.72	0.38

TGA Standard Operating Procedure

Title: Determination of Total Glycoalkaloid Content in Freeze-dried Tuber Powder.

Reagents :

1. **80% Ethanol : 20% Ultra Purified Water**

2. **Acetic acid solution 10%**: Mix 100ml. glacial acetic acid in Ultra Purified Water, bring to 1 liter final volume.

3. **Ammonium Hydroxide**, concentrated reagent.

4. Phosphoric Acid 7% (w/w) add 4.9ml. of 85% H_3PO_4 to 93ml. UP H_20.

5. **Paraformaldehyde-Phosphoric Acid reagent**: Dissolve 30mg paraformaldehyde in 100 ml concentrated (85%) phosphoric acid.
[Alternatively use 0.065 g 37% formaldehyde in 135g 85% H_3PO_4 which gives enough reagent for about 20 determinations (80 ml)]

6. **Solanine standard 1mg/ml**: dissolve 5mg Solanine powder in 5ml of 7% phosphoric acid.

Procedure:

1. Weigh 8 grams freeze dried and ground potato tissue into 250ml evaporating flask.

2. Add 100 ml 80% ethanol and 2 glass beads. Turn on hot plates and water on temp controlled refluxing apparatus! Bring to boil. Boil for 15 minutes.

3. TURN ON HOT WATER BATHS

4. Filter the hot extract through Whatman filter paper in a Buchner funnel with suction into a Buchner vacuum flask. Wash flask and filter with 3 washes of 80% ethanol.

5. Transfer filtrate to 500 ml evaporating flask with at least 3 washes of 80% ethanol.

6. Attach flask to rotary evaporator at about 60^0C. Let sample heat for 3 minutes then turn on the vacuum.
Concentrate to about one-tenth of the original volume. (10mls) takes about 10 to 15 minutes and works best with partial vacuum (can slightly feel vacuum on end of hose).

7. Transfer to 50ml centrifuge tubes and mix with 20ml of 10% acetic acid, using this acid to rinse flask 10mls at a time. DO THIS IN VENTILATION HOOD.

8. Centrifuge (8 at a time) at 10^0 for 30 minutes at 10,000g to remove interfering lipids.
Carefully decant supernatant into another 50 ml centrifuge tube.

9. Add concentrated NH_4OH to pH 10 (about 6 ml; use pH strips to check pH).
This will often cause a clouding and a yellow color to develop. IN HOOD!

10. The alkaloids are then precipitated by heating for 20 minutes in a 70^0C waterbath.

IN VENTILATION HOOD! Put the centrifuge tube in rack and cover with glass cover six inches in diameter, with water level just below the edge of the lid.

11. Cool to 4^0C for at least 3 hours or refrigerate overnight.

12. Centrifuge at 10^0C next morning for 30 minutes at 10,000g.

13. Carefully pour of supernatant and discard.

14. Turn upside down on a paper towel and let dry 45 minutes.
This can then be reserved in a desiccator in the refrigerator for up to a week.

WHEN READY TO READ GLLYCOALKALOID CONTENT

15. Dissolve pellet in 4 ml of 7% phosphoric acid (use more or less volume of 7% Phos. acid, depending on glycoalkaloid concentration)

16. For Blank: Put 0.4 ml 7% phos. acid in 20 ml test tube and proceed with **17**.
For a Standards: Use 0.2, 0.3, and 0.4 ml of 1mg/ml standard Solanine solution (200ug, 300ug and 400ug) in three different 20 ml test tubes and proceed with **17**.

17. Mix 0.4ml (or other suitable aliquot, depending on alkaloid concentration) with 4ml of paraformaldehyde:phosphoric acid reagent, in a 20ml test tube.
Vortex to mix thoroughly!
A blue color develops reaching maximum intensity between 20-40 minutes and then slowly fades.

18. Read absorbance at 600nm around 30 minutes after addition of reagent.

Calculation:
OD unknown x ug solanine OD unit = ug solanine in unknown sample/0.4 alɔiquot.
Ug solanine/0.4 aliquot x 4 ml total volume = ug x 10 = total ug solanine.
Total ug solanine Ɔ sample weight in g = ug/g convert to mg/22 dry weight.

Reference:
Bergers, W.W. (1980). A rapid quantitative assay for solanidine glycoalkaloids in potatoes and industrial potato protein. Potato Research 23:105-110.

7 % Phosphoric Acid		
Samples	H_3PO_4	UP H_2O
Generous	ml	ml
20	4.9	93
40	9.8	186
50	12.0	228
70	16.9	325.5

Paraform/Phos. Acid		
Samples	Paraformaldehyde	H_3PO_4
	mg	ml
20	30	100
30	45	150
55	75	250
70	90	300

100	24	456	100	135	450
120	28.5	541	120	150	500

VITAMIN C

Standard Operating Procedure

Title: Determination of Vitamin C Content of Freeze-dried Tuber Powder
Total Ascorbic Acid Microfluorometric Method.

Reagents:

1. Extracting solution: Dissolve with shaking 15g. Meta-phosphoric Acid in 200ml Ultra Purified H_2O (UPH_2O) and 40ml. Glacial Acetic Acid; dilute to 500ml and filter rapidly through fluted paper into glass bottle with stopper; store in refrigerator – good for 1 week.
2. O-Phenylenediamine Solution: For each 100ml solution, weigh 20 mg O-Phenylenedine-2HCL; Dilute to volume with UPH_2O immediately before use.
3. Sodium Acetate Solution: Dissolve 500g Sodium Acetate Tri-hydrate in UPH_2O and dilute to 1 liter.
4. Boric Acid – Sodium Acetate Solution: Dissolve 3g boric acid in 100ml. Sodium Acetate Solution; Prepare fresh for each assay.
5. Activated Charcoal

Procedure:

1. Preparation of Standard Curve: Dissolve 10mg L-Ascorbic Acid in 100ml extraction solution; dilute 10ml, 20ml, and 30ml aliquots to 100ml with extracting solution. Proceed with these standard solutions in the ascorbic acid determination. Final concentrations of standard solutions are 10µg /ml, 20µg /ml and 30µg /ml.
2. Sample Preparation: Use 1.5 grams freeze dried material per 50ml extracting solution (25g fresh tuber tissue per 150ml) Place in 125 ml flask; allow to sit at least 5 minutes; filter through a Whatman #4 filter paper folded and placed in a funnel. Proceed with ascorbic acid determination.
3. Weigh 50 grams Acid-washed Norit (Charcoal) into 50ml flasks. Pour 25ml extract into Norit, shake vigorously and pour through clean Whatman #4 filter paper, discarding first few ml.
4. Transfer 5ml of this filtrate to a 100ml volumetric flask containing 5ml boric acid-sodium acetate solution. Let stand 15 minutes swirling occasionally. This is the blank determination since the H3BO3-dehydroascorbate complex will not produce a fluorophor with phenylenediamine. After 15 minutes dilute to volume with UPH_2O.

5. During the 15 minute period during which the blank is sitting, transfer a second 5ml of filtrate to a 100ml volumetric containing 5ml sodium acetate solution and 75ml of UPH_2O, dilute to volume with UPH_2O.
6. Transfer 2ml of each solution to a test tube. Add 5ml O-Phenylenediamine solution to each tube; mix well; let stand 35 minutes at room temp protected from the light (i.e. in closed cabinet).
7. Measure fluorescence of each tub at 1X setting in a Turner fluorometer primary filter 7-60 secondary filter 2A. Net fluorescence in the difference between the borate treated and non-treated extract. Unknown samples are determined by comparison with known reading as defined by the standard curve.

Reference: AOAC Handbook 12th Edition 43.056**3.**

VITAMIN C MSDS

LABORATORY PROTECTIVE EQUIPMENT: NITRILE GLOVES, GOGGLES, LAB COAT

Meta-Phosphoric Acid

HAZARDS IDENTIFICATION
OSHA Hazards: Corrosive
HMIS Classification: Health Hazard: 3 Flammability: 0 Physical hazards: 0
NFPA Rating: Health Hazard: 3 Fire: 0 Reactivity Hazard: 0

Potential Health Effects
INHALATION: May be harmful if inhaled. Material is extremely destructive to the tissue of the mucous membranes and upper respiratory tract.
DERMAL May be harmful if absorbed through skin. Causes skin burns.
EYES: Causes eye burns.
INGESTION: May be harmful if swallowed. Causes burns.

FIRST AID MEASURES
GENERAL ADVICE: Consult a physician. Show this safety data sheet to the doctor in attendance.
Move out of dangerous area.
IF INHALED**:** If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.
IN CASE OF SKIN CONTACT : Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Consult a physician.
IN CASE OF EYE CONTACT: Continue rinsing eyes during transport to hospital.Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.
IF SWALLOWED: Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

Acetic Acid Glacial

HAZARDS IDENTIFICATION

Emergency Overview
OSHA Hazards: Combustible Liquid, Target Organ Effect, Harmful by skin absorption., Corrosive
Target Organs: Teeth., Kidney
HMIS Classification: Health Hazard: 3 Chronic Health Hazard: * Flammability: 2 Physical hazards: 0
NFPA Rating: Health Hazard: 3 Fire: 2 Reactivity Hazard: 0

Potential Health Effects
INHALATIONI: May be harmful if inhaled. Material is extremely destructive to the tissue of the mucous membranes and upper respiratory tract.
SKIN: Harmful if absorbed through skin. Causes skin burns.
EYES: Causes eye burns.
INGESTION: May be harmful if swallowed. Causes burns.

FIRST AID MEASURES
GENERAL ADVICE: Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.
IF INHALED: If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.
IN CASE OF SKIN CONTACT: Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Consult a physician.
IN CASE OF EYE CONTACT: Continue rinsing eyes during transport to hospital.Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.
IF SWALLOWED: Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

O-Phenylenediamine dihydrochloride

Hazards Identification: Toxic. Dangerous for the environment. Harmful by inhalation and in contact with skin. Toxic if swallowed. Irritating to eyes. Limited evidence of a carcinogenic effect. May cause sensitization by skin contact. Very toxic toaquatic organisms, may cause long-term adverse effects in the aquatic environment. Possible risk of irreversible effects.
Possible Carcinogen US). (Target organ(s): Bladder. Liver.

HMIS RATING: HEALTH: 3* FLAMMABILITY: 0 REACTIVITY: 1
NFPA RATING: HEALTH: 3 FLAMMABILITY: 0 REACTIVITY: 1
*additional chronic hazards present. For additional information on toxicity, please refer to Section 11.

FIRST AID MEASURES
ORAL EXPOSURE: If swallowed, wash out mouth with water provided person is conscious. Call a physician immediately.
INHALATION EXPOSURE: If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.
DERMAL EXPOSURE: In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician.
EYE EXPOSURE: In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Boric Acid

HAZARDS IDENTIFICATION

OSHA Hazards: Delayed target organ effects Reproductive hazard
Target Organs Testes.
HMIS Classification: Health Hazard: 1 Chronic Health Hazard: * Flammability: 0 Physical hazards: 0
NFPA Rating: Health Hazard: 0 Fire : 0 Reactivity Hazard: 0

Potential Health Effects
INHALATION: May be harmful if inhaled. May cause respiratory tract irritation.
SKIN: May be harmful if absorbed through skin. May cause skin irritation.
EYES: May cause eye irritation.
INGESTION: May be harmful if swallowed.

FIRST AID MEASURES
General advice: Move out of dangerous area.
IF INHALED: If breathed in, move person into fresh air. If not breathing give artificial respiration
IN CASE OF SKIN CONTACT: Wash off with soap and plenty of water.
IN CASE OF EYE CONTACT: Flush eyes with water as a precaution.
IF SWALLOWED: Never give anything by mouth to an unconscious person. Rinse mouth with water

Sodium Acetate Trihydrate

HAZARDS IDENTIFICATION
OSHA Hazards: No OSHA Hazards
HMIS Classification: Health Hazard: 0 Flammability: 0 Physical hazards: 0
NFPA Rating: Health Hazard: 0 Fire : 0 Reactivity Hazard: 0

Potential Health Effects
INHALATION: May be harmful if inhaled. May cause respiratory tract irritation.
SKIN: May be harmful if absorbed through skin. May cause skin irritation.
EYES: May cause eye irritation.
INGESTION: May be harmful if swallowed.

FIRST AID MEASURES
IF INHALED: If breathed in, move person into fresh air. If not breathing give artificial respiration
IN CASE OF SKIN CONTACT: Wash off with soap and plenty of water.
IN CASE OF EYE CONTACT: Flush eyes with water as a precaution.
IF SWALLOWED: Never give anything by mouth to an unconscious person. Rinse mouth with water.

SUGARS

Standard Operating Procedure

Title: Dextrose and Sucrose Content of Potato Tubers

Reagents:

6. Sodium Phosphate Buffer: Dissolve 10g Na_2HPO_4 and 40g NaH_2PO_4 in one liter of Ultra Purified Water (UPH_2O). The pH should be about 6.2.

7. Invertase: Dissolve 50mg invertase (Sigma I 4504) in 5ml Sodium Phosphate Buffer.

8. Dextrose Calibration Standard (2.5g/L): Dissolve 0.25g Dextrose in 100 ml S Sodium Phosphate Buffer.

9. Linearity Standard: Dissolve .45g dextrose in 50ml Sodium Phosphate Buffer.

Procedure:

8. Weigh 3g of freeze-dried tuber powder into a 125ml Erlenmeyer flask. Add 50ml Sodium Phosphate Buffer. Mix thoroughly using a magnetic stir bar. Allow to sit 15 minutes at room temperature.
9. To a 3 ml aliquot, add 100µl Invertase solution. Mix gently and set aside for later assay (keep covered).
10. Fill the calibration standard and buffer solution bottles and set them in place inside the YSI analyzer. Calibrate the YSI analyzer (see SOP MCY 1999-1, Maintenance and Calibration of the YSI 2700) which should be equipped with a 2365 glucose membrane. The YSI 2700 is self calibrating and will continuously recalibrate after ever fifth unknown sample.
11. Assay the original (no invertase) potato extract samples. Beginning 20 minutes after the addition of invertase, assay the aliquots with the added invertase. Do this by placing the samples (in test tubes) into the sample holder, from which the sipper arm will automatically obtain a sufficient aliquot.

Calculations:

1. The value given by the YSI analyzer is equivalent to grams dextrose/L.
2. Multiply YSI reading (grams dextrose/L)x0.05L (.25Lfor fresh tuber samples) which equals total extract volume, to give total grams dextrose.
3. Divide total grams dextrose by sample weight (in grams), then multiply by 100 to five % dextrose dry weight basis (DWB).
4. Convert to % dextrose on a fresh weight basis by multiplying the percent dextrose (DWB) by the % tuber solids.
5. Calculate the % sucrose by subtracting the % dextrose of the sample without added invertase from the % dextrose of the corresponding aliquot with the added invertase and then multiplying by a correction factor of 1.9 (sucrose is made up of fructose + glucose, and only glucose is measured by the YSI glucose analyzer using the glucose membrane).

Optional Procedure for Fresh Tuber Material:

1. Weight 75 to 100 g of freshly diced tuber material. Record the exact weight to 0.1g Place the tuber material into a kitchen blender. Add 100ml of Sodium Phosphate Buffer and blend on medium speed for 2 minutes.
2. Transfer the sample puree into a calibrated 250 ml Erlenmeyer flask. Rinse the blender 3 times with sodium phosphate buffer and add the rinsate to the sample puree. Add sufficient sodium phosphate buffer to bring the final volume to 250 ml.
3. Mix the sample well and let stand at room temperature for 15 minutes.
4. Proceed with the procedure outlined for freeze-dried tuber material, beginning with step 2.

Reference: Dextrose and sucrose measurements in potatoes, Application Note No. 102, Scientific Division, Yellow Springs Instrument Co., Yellow Springs, Ohio 45387.

SUGARS MSDS

LABORATORY PROTECTIVE EQUIPMENT: NITRILE GLOVES, GOGGLES, LAB COAT

LABORATORY PROTECTIVE EQUIPMENT: NITRILE GLOVES, GOGGLES, LAB COAT

Sodium Phosphate Buffer:

3. HAZARDS IDENTIFICATION
Emergency Overview
OSHA Hazards No OSHA Hazards
HMIS Classification
Health Hazard: 0 **Flammability**: 0 **Physical hazards**: 0
NFPA Rating: Health Hazard: 0 **Fire** : 0 **Reactivity Hazard**: 0

Potential Health Effects
Inhalation May be harmful if inhaled. May cause respiratory tract irritation.
Skin May be harmful if absorbed through skin. May cause skin irritation.
Eyes May cause eye irritation.
Ingestion May be harmful if swallowed.

4. FIRST AID MEASURES
If inhaled
If breathed in, move person into fresh air. If not breathing give artificial respiration
In case of skin contact
Wash off with soap and plenty of water.
In case of eye contact
Flush eyes with water as a precaution.
If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water.

Invertase:

3. HAZARDS IDENTIFICATION
Emergency Overview
OSHA Hazards No OSHA Hazards
HMIS Classification
Health Hazard: 0 **Flammability**: 0 **Physical hazards**: 0
NFPA Rating: Health Hazard: 0 **Fire** : 0 **Reactivity Hazard**: 0
Potential Health Effects
Inhalation May be harmful if inhaled. May cause respiratory tract irritation.
Skin May be harmful if absorbed through skin. May cause skin irritation.
Eyes May cause eye irritation.
Ingestion May be harmful if swallowed.

4. FIRST AID MEASURES
If inhaled
If breathed in, move person into fresh air. If not breathing give artificial respiration
In case of skin contact
Wash off with soap and plenty of water.
In case of eye contact

Flush eyes with water as a precaution.
If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water.

PROTEIN

Standard Operating Procedure

Title: Determination of Protein Content of Freeze-dried Tuber Powder
Coomassie Blue Protein Assay.

Reagents:

10. Dye Reagent: Dissolve 100mg Coomassie Blue G-250 (Sigma) in 50ml of 95% Methanol; Add several hundred ml Ultra Purified Water (UPH_2O) , mix, slowly add 100ml of 85% Phosphoric Acid, bring to 1 liter final volume with UPH_2O. Protect from light. Discard after 2 weeks.

11. 0.5 N Sodium Hydroxide: Disolve 20g NaOH in about 500ml UPH_2O, cool, make up to 1 liter.

12. Protein standard (100ug/ml): Make up solution of Bovine Gamma Globulin (BGG) 5 mg/50ml 0.5N NaOH. BGG dissolves best in 1N NaOH, therefore, Dissolve 5mg BGG in 25 ml 1N NaOH then add 25ml UPH_2O. Should be made up fresh daily.

Procedure:

12. Weigh sample of about 15mg of freeze dried and ground tuber tissue into a test tube. Record exact weight. Duplicate each sample.
13. Add 5ml of 0.5N NaOH, gently mix (with vortex) with minimum foaming.
14. Let stand at room temperature for 2.5 hours.
15. Transfer a 0.2ml aliquote of the sample extract into a clean test tube and add 0.8ml of 0.5N NaOH.
16. Add 5ml dye reagent, mix well, read absorbance at 595nm after 5 minutes but within ½ hour of dye addition.
17. For standards add 0.1, 0.2, 0.3, 0.4 and 0.5ml to test tubes, bring to 1 ml volume with 0.5N NaOH, add 5ml of dye reagent, mix and read absorbance after 5 minutes but within ½ hr of dye addition.
18. Blank 1 ml 0.5N NaOH and 5ml dye reagent.

Calculations:

1. Determine average µg protein per OD unit from standards.
2. Unknown OD x µg protein/OD unit = µg protein in unknown per 0.2 aliquot.
3. µg protein per 0.2 ml aliquot x 5ml total extract volume – total µg

4. Total microgram protein υ mg tissue extracted =µg /mg (or mg/g)
-- or total microgram protein ∑ µg tissue extracted x 100 - % protein
--actual protein* = coomassie blue protein estimate using BGG (mg/G) – 5.6
0.86

*Actual protein determined from microkjeldahl anaysis of 80% ethanol extracted freeze dried powder compared with coomassie blue estimate using BGG standard (linear regression analysis 1989).

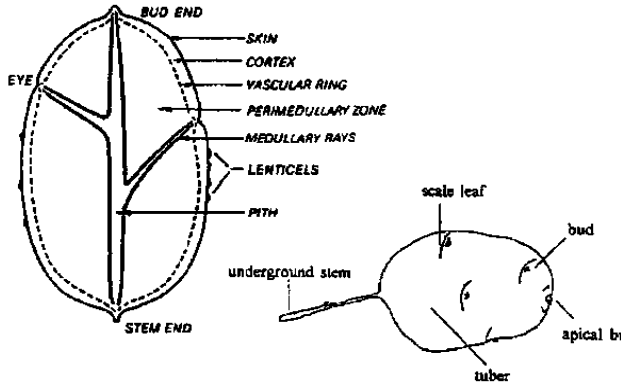
Reference: Bradford N.M. (1975) A rapid and sensitive method for the quantitation of microgram quantities of protein using the principle of protein dye binding. Anal. Biochem. 73:248-254

Solids

Standard Operating Procedure

Title: Determination of Solid Content of Freeze-dried Tuber Powder.

Tuber Prep Procedure:



1. Wash Tubers
2. Quarter potatoes length-wise (stem to bud end) reserving one quarter for sample. (Toss remaining ¾ unless, of course, the sample is too small. Then use 1/2 or all.) This method of cutting is to ensure a random sampling of all parts of each potato skin to pith, stem to bud all areas inclusive.
3. Cube potatoes into approximately 1/2" cubes.
    a. AVOID: All green and rotten areas, bruise, Rizok and scab if possible and any dirt missed in washing.
4. Mix sample well.
5. *Weigh up sample (Fresh Weight) in corresponding numbered Ziploc freezer bag & record exact fresh weight on solids sheet.
    a. *TARE (zero) scale with bag and large weigh plate
6. For 150 grams and up add 2 scoops of liquid nitrogen. For 100 grams and under add 1 scoop of liquid nitrogen.
    a. 1 Scoop = aprox. 8 oz.

Freeze Dryer Start Up Procedure:

1. Close both the condenser and the product chamber doors.
2. Press “CONDENSER” to begin cooling the condenser. Wait until the condenser reaches -50oC before proceeding.

3. Fill trays with frozen samples, making sure bags are all open, and air can move freely past opening.
4. Insert temperature probes into samples near the middle of each tray and slide trays into position in product chamber.
5. Close product chamber door.
6. Press "VACUUM" to start the vacuum pump.
7. Check both doors to make sure they are sealed and pulling a vacuum.
8. Set Shelf Control on Manual and set Shelf Set Point on 30.
    a. Red light on M.

During Run:

1. Check temperature of samples daily.
2. Samples are done when probe temperatures are 28-30°C.
    a. Depending on sample size and fullness of tray
    b. This will take 2 to 5 days for large tuber samples.
3. Remove from freeze-dryer and weigh for Dry Weight.
    a. *TARE (zero) scale with bag and large weigh plate.

Standard Operating Procedure

Title: Determination of Specific Gravity

1. A random 8-10 lb sample of dry, 6-12 oz U.S. No. 1 tubers is first weighed in air.
2. After submerging the same tuber sample in water, the tubers are weighed again.
3. From these two measurements, specific gravity is calculated by the following formula:

$$\text{Specific gravity} = \frac{\text{Weight in air}}{\text{Weight in air} - \text{Weight in Water}}$$

For example,

$$\frac{10.0 \text{ lb}}{10.0 \text{ lb} - 0.81 \text{ lb}}$$

$$= 1.081$$

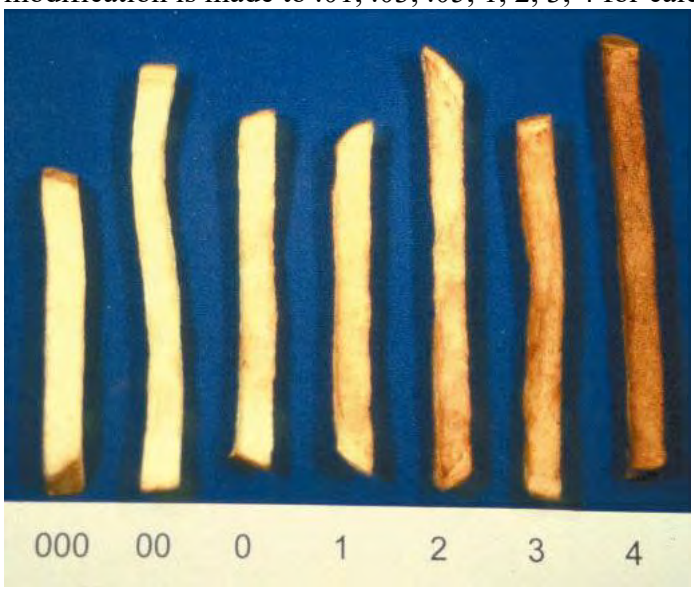
Protocol for frying russet variety potatoes at the University of Idaho

After harvest, potatoes are graded sized and weighed. A three-tuber sample is used for two temperature regimes. Tubers are gradually cooled to approximately 45-50° F during a 4-6 week period. The samples are then moved to 40° or 45° storage unit, where they remained for 6 weeks.

Tubers are cut stem to bud end using a Shaver Specialty Co Cutter (20608 Earl Street Torrance, CA 90503. Phone (310) 370-6941). Four 3/8" fry strips are cut from the center of each of three tubers. Oil temperature is 375° F and fry time is 3.5 minutes. A creamy liquid frying shortening made from soybean oil is used in frying. (Purchased from the local grocery/bakery). Frying is done in a Hobart commercial fryer.

The presence or absence of sugar end was recorded for each strip. A strip was considered to have a sugar end if a predominant color of number 3 or darker, when compared with the USDA Color Chart for French Fried Potatoes, was seen on any 2 sides extending ½ inch or more from the end of the fried strip.

Color is rated visually using the USDA fry color chart with a scale of 000-4. A scale modification is made to .01, .03, .05, 1, 2, 3, 4 for calculating averages.



Standard Operating Procedures

Title: Determination of potato tuber susceptibility to blackspot bruise.

Procedures:

I. Select ten tubers from each plot, avoiding damaged, rotten, or green tubers. Tubers range in size between 160 and 336g. Replicate at least 4 times.

II. Condition the tubers at approximately 45º F for at least 48 hours.

III. Place the tubers into the Hobart abrasive peeler for approximately 30 seconds. Attach the hose to the peeler. Run water through peeler when operating. Use a screen to catch all the peels and discard in waste disposal.

IV. Tubers are then set aside at room temperature for 18-24 hours. The tubers need to be kept at near 100% humidity during this time period. This can be accomplished by simply covering with black plastic sheeting.

V. Rate the tubers individually for the development of black pigment on the surface. The rating scale is 1-5 with 5 most severe.
   1. – no grey
   2. – slight grey with only a small amount
   3. – dark or intense gray at stem area
   4. – blackening in a small area
   5. – intense black over a large area around the stem end or most of tuber

VI. Record the rating score for each tuber. Average the values for the 10 tuber sample to obtain one value for the plot.

Standard Operating Procedures

Title: Determination of potato tuber susceptibility to shatter bruise.

Procedures:

I. Select ten tubers from each plot, avoiding damaged, rotten, or green tubers. Tubers range in size between 160 and 336g. Replicate at least 4 times.

II. Condition the tubers at approximately 45º F for at least 48 hours.

III. Subject each tuber sample to shatter inducing damage by dropping the tubers through the shatter bruise chamber. The chamber is a 7.5 foot tall, narrow box structure, open top and bottom, with alternating baffles made of potato harvester chain links. This creates a cascade motion when the tubers bounce back and forth from baffle to baffle as they drop through the chamber. The impact events induced are random by relatively consistent in number.

IV. Tubers are then set aside at room temperature for at least 48 hours in relatively dry air conditions to allow cracks to dehydrate and become visible.

V. Rate each tuber based on an established bruise scale described below. Calculate the average of the 10-tuber sample to derive a sample value. The rating scale is 1-5 with 5 most severe.
   1. – no visible cracks or damage
   2. – 1 to 3 small (<1/2 inch) thumbnail cracks
   3. – Several small (<1/2 inch) thumbnail cracks
   4. – Numerous small (<1/2) inch) cracks plus a few shallow cracks up to 1 inch
   5. – Numerous small and large, deep cracks with some up to half the diameter of the tuber

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

EXHIBIT E - STATEMENT OF THE BASIS OF OWNERSHIP

FOR OFFICIAL USE ONLY

PVPO NUMBER

1. Name of Owner	2. Temporary Designation or Experimental Name	3. Variety Name
University of Idaho, Washington State University, Oregon State University, U.S. Governmen as represe ted by the Secr	A03141-6	Galena Russet

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.

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

EXHIBIT F
DECLARATION REGARDING DEPOSIT

NAME OF OWNER (S)	ADDRESS *(Street and No. or RD No., City, State, and Zip Code and Country)*	TEMPORARY OR EXPERIMENTAL DESIGNATION
University of Idaho, Washington State University, Oregon State University, U.S. Government as represented by the Secretary of Agriculture	875 Perimeter Drive, MS 3003 Moscow, ID 83844-3003	A03141-6 **VARIETY NAME** Galena Russet
NAME OF OWNER REPRESENTATIVE (S)	**ADDRESS** *(Street and No. or RD No., City, State, and Zip Code and Country)*	**FOR OFFICIAL USE ONLY**
Karen Stevenson Rhett Spear	875 Perimeter Drive, MS 3003 Moscow, ID 83844-3003	**PVPO NUMBER**

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

Signature

June 9, 2020
Date