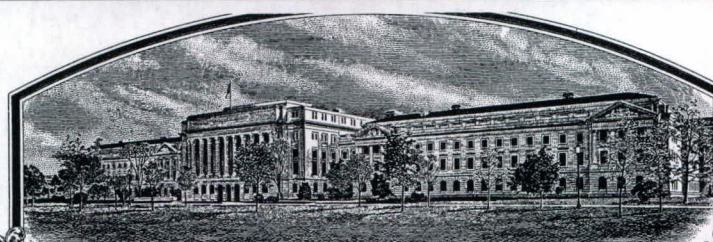


No.



# THE UNITED STATES OF AMERICA

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

## University of Idaho

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

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

Now, therefore, this certificate of plant variety protection is to grant unto the said applicant(s) and the successors, heirs or assigns of the said applicant(s) for the term of TWENTY years from the date of this grant, subject to the payment of the required fees and periodic replenishment of viable basic seed of the variety in a public repository as provided by LAW, the right to exclude others from selling the variety, offering it for sale, or reproducing it, or importing it, or exporting it, or conditioning it for propagation, or stocking it for any of the above purposes, or using it in producing a hybrid or different variety therefrom, to the extent provided by the PLANT VARIETY PROTECTION ACT. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

POTATO

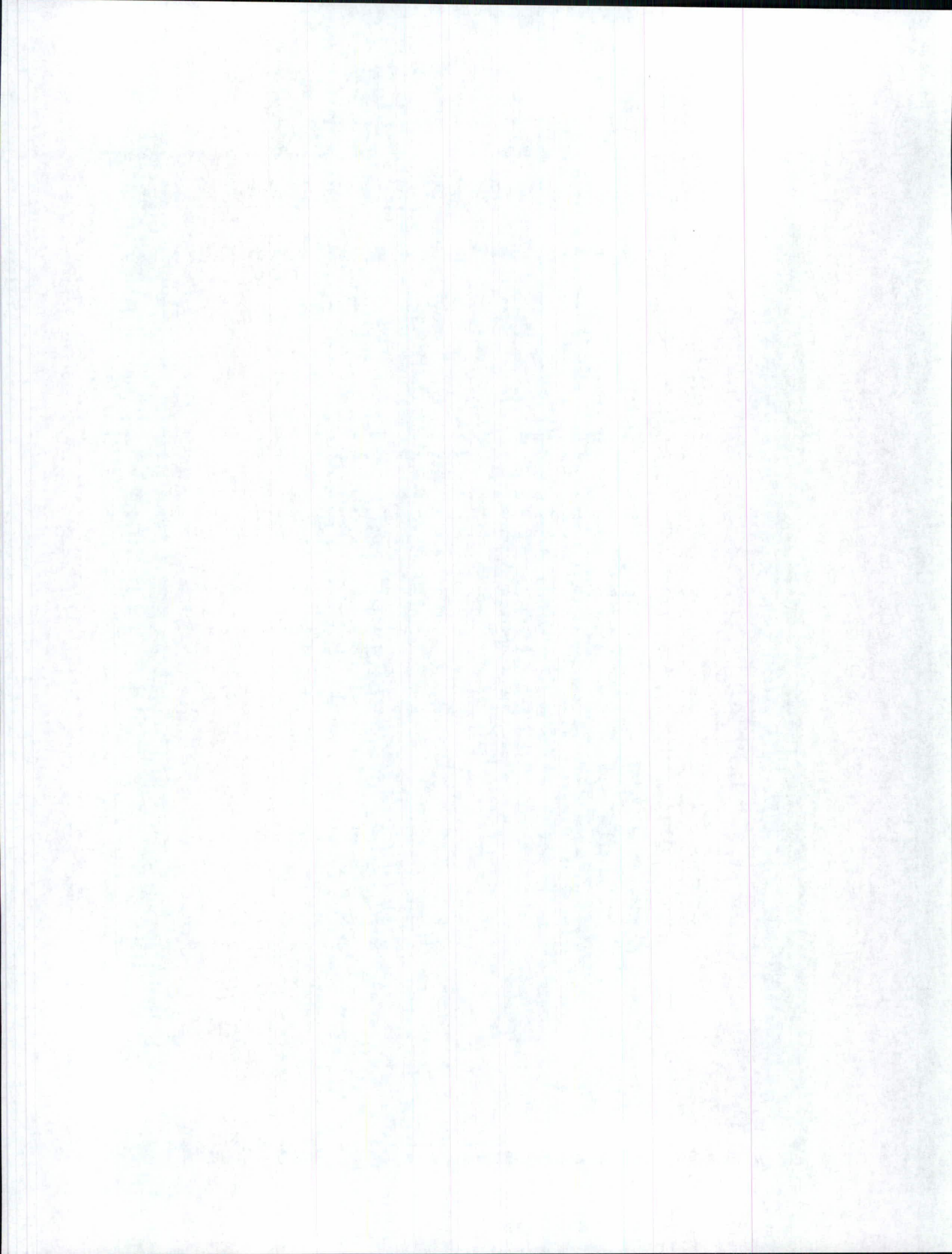
'Alturas'

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 seventeenth day of March, in the year two thousand and ten.*

Attest:

Commissioner  
Plant Variety Protection Office  
Agricultural Marketing Service

Secretary of Agriculture



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

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

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

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>UNIVERSITY OF Idaho</b>		2. TEMPORARY DESIGNATION OR EXPERIMENTAL NAME <b>A82360-7</b>	3. VARIETY NAME <b>Alturas</b>
4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP Code, and Country) <b>Idaho Agricultural Experiment Station University of Idaho Moscow, ID 83843-4196</b>		5. TELEPHONE (include area code) <b>(208) 885-7173</b>	FOR OFFICIAL USE ONLY PVPO NUMBER <b>200200158</b> FILING DATE <b>05/10/02</b>
7. IF THE OWNER NAMED IS NOT A "PERSON", GIVE FORM OF ORGANIZATION (corporation, partnership, association, etc.) <b>Land Grant University</b>		6. FAX (include area code) <b>(208) 885-6654</b>	
8. IF INCORPORATED, GIVE STATE OF INCORPORATION		9. DATE OF INCORPORATION	

10. NAME AND ADDRESS OF OWNER REPRESENTATIVE(S) TO SERVE IN THIS APPLICATION. (First person listed will receive all papers)		FILING AND EXAMINATION FEES: \$ <b>2705</b> DATE <b>05/10/02</b> CERTIFICATION FEE: \$ <b>768</b> DATE <b>10/20/09</b>
<b>Stephen L. Love</b> Aberdeen R&E Center PO Box 870 Aberdeen, ID 83210	<b>Gaylene Anderson</b> Licensing Associate University of Idaho Office of Technology Transfer Morrill Hall 414 P.O. Box 443003 Moscow, ID 83844-3003  208-885-4550 gaylene@uidaho.edu	

11. TELEPHONE (Include area code) <b>(208) 397-4181</b>	12. FAX (Include area code) <b>(208) 397-4311</b>	13. E_MAIL <b>slove@uidaho.edu</b>	14. CROP KIND (Common Name) <b>Potato</b>
15. GENUS AND SPECIES NAME OF CROP <b>Solanum Tuberosum</b>		16. FAMILY NAME (Botanical) <b>Solanaceae</b>	17. IS THE VARIETY A FIRST GENERATION HYBRID? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO


18. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED (Follow instructions on reverse) a. <input checked="" type="checkbox"/> Exhibit A. Origin and Breeding History of the Variety b. <input checked="" type="checkbox"/> Exhibit B. Statement of Distinctness c. <input checked="" type="checkbox"/> Exhibit C. Objective Description of Variety d. <input checked="" type="checkbox"/> Exhibit D. Additional Description of the Variety (Optional) e. <input checked="" type="checkbox"/> Exhibit E. Statement of the Basis of the Owner's Ownership f. <input checked="" type="checkbox"/> Voucher Sample (2,500 viable untreated seeds or, for tuber propagated varieties, verification that tissue culture will be deposited and maintained in an approved public repository) g. <input checked="" type="checkbox"/> Filing and Examination Fee (\$2,450), made payable to "Treasurer of the United States" (Mail to the Plant Variety Protection Office)	19. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE SOLD AS A CLASS OF CERTIFIED SEED? See Section 83(a) of the Plant Variety Protection Act <input type="checkbox"/> YES (If "yes", answer items 20 and 21 below) <input checked="" type="checkbox"/> NO (If "no," go to item 22)
	20. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS? <input type="checkbox"/> YES <input type="checkbox"/> NO
	21. IF "YES" TO ITEM 20, WHICH CLASSES OF PRODUCTION BEYOND BREEDER SEED? <input type="checkbox"/> FOUNDATION <input type="checkbox"/> REGISTERED <input type="checkbox"/> CERTIFIED

22. 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 type="checkbox"/> YES <input checked="" type="checkbox"/> NO IF YES, YOU MUST PROVIDE THE DATE OF FIRST SALE, DISPOSITION, TRANSFER, OR USE FOR EACH COUNTRY AND THE CIRCUMSTANCES. (Please use space indicated on reverse.)	23. IS THE VARIETY OR ANY COMPONENT OF THE VARIETY PROTECTED BY INTELLECTUAL PROPERTY RIGHT (PLANT BREEDER'S RIGHT OR PATENT)? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO IF YES, PLEASE GIVE COUNTRY, DATE OF FILING OR ISSUANCE AND ASSIGNED REFERENCE NUMBER. (Please use space indicated on reverse.)
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24. The owners declare that a viable sample of basic seed of the variety will be furnished with application and will be replenished upon request in accordance with such regulations as may be applicable, or for a tuber propagated variety a tissue culture will be deposited in a public repository and maintained for the duration of the certificate.

The undersigned owner(s) is(are) the owner of this sexually reproduced or tuber propagated plant variety, and believe(s) that the variety is new, distinct, uniform, and stable as required in Section 42, and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act.

Owner(s) is(are) informed that false representation herein can jeopardize protection and result in penalties.

SIGNATURE OF OWNER 		SIGNATURE OF OWNER	
NAME (Please print or type) <b>Richard C. Heimsch</b>		NAME (Please print or type)	
CAPACITY OR TITLE <b>Assoc. Dean/Director</b>	DATE <b>5/6/2002</b>	CAPACITY OR TITLE	DATE

02 MAY 10 912 78

REC  
USDA-A

## INSTRUCTIONS

**GENERAL:** To be effectively filed with the Plant Variety Protection Office (PVPO), **ALL** of the following items must be received in the PVPO: (1) Completed application form signed by the owner; (2) completed exhibits A, B, C, E; (3) for a seed reproduced variety at least 2,500 viable untreated seeds, for a hybrid variety at least 2,500 untreated seeds of each line necessary to reproduce the variety, or for tuber reproduced varieties verification that a viable (*in the sense that it will reproduce an entire plant*) tissue culture will be deposited and maintained in an approved public repository; (4) check drawn on a U.S. bank for \$3,652 (\$432 filing fee and \$3,220 examination fee), payable to "Treasurer of the United States" (See Section 97.6 of the Regulations and Rules of Practice.) Partial applications will be held in the PVPO for not more than 90 days, then returned to the applicant as unfilled. Mail application and other requirements to Plant Variety Protection Office, AMS, USDA, Room 401, NAL Building, 10301 Baltimore Avenue, Beltsville, MD 20705-2351. **Retain one copy for your files.** All items on the face of the application are self explanatory unless noted below. Corrections on the application form and exhibits must be initialed and dated. **DO NOT** use masking materials to make corrections. If a certificate is allowed, you will be requested to send a check payable to "Treasurer of the United States" in the amount of \$432 for issuance of the certificate. Certificates will be issued to owner, not licensee or agent.

**Plant Variety Protection Office**

**Telephone: (301) 504-5518**

**FAX: (301) 504-5291**

**Homepage: <http://www.ams.usda.gov/science/pvpo/pvpindex.htm>**

To avoid conflict with other variety names in use, the applicant must check the appropriate recognized authority and provide evidence that name has been cleared by the appropriate recognized authority before the Certificate of Protection is issued. For example, for agricultural and vegetable crops, contact: Seed Branch, AMS, USDA, 10301 Baltimore Avenue, Suite 401 NAL Building, Beltsville, MD 20705. Telephone: (301) 504-5682 <http://www.ams.usda.gov/lsg/seed.htm>.

## ITEM

- 19a. Give:
- (1) the genealogy, including public and commercial varieties, lines, or clones used, and the breeding method;
  - (2) the details of subsequent stages of selection and multiplication;
  - (3) evidence of uniformity and stability; and
  - (4) the type and frequency of variants during reproduction and multiplication and state how these variants may be identified
- 19b. Give a summary of the variety's distinctness. Clearly state how this application variety may be distinguished from all other varieties in the same crop. If the new variety is most similar to one variety or a group of related varieties:
- (1) identify these varieties and state all differences objectively;
  - (2) attach statistical data for characters expressed numerically and demonstrate that these are clear differences; and
  - (3) submit, if helpful, seed and plant specimens or photographs (prints) of seed and plant comparisons which clearly indicate distinctness.
- 19c. Exhibit C forms are available from the PVPO Office for most crops; specify crop kind. Fill in Exhibit C (Objective Description of Variety) form as completely as possible to describe your variety.
- 19d. Optional additional characteristics and/or photographs. Describe any additional characteristics that cannot be accurately conveyed in Exhibit C. Use comparative varieties as is necessary to reveal more accurately the characteristics that are difficult to describe, such as plant habit, plant color, disease resistance, etc.
- 19e. Section 52(5) of the Act requires applicants to furnish a statement of the basis of the applicant's ownership. An Exhibit E form is available from the PVPO.
20. If "Yes" is specified (*seed of this variety be sold by variety name only, as a class of certified seed*), the applicant **MAY NOT** reverse this affirmative decision after the variety has been sold and so labeled, the decision published, or the certificate issued. However, if "No" has been specified, the applicant may change the choice. (*See Regulations and Rules of Practice, Section 97.103*).
23. See Sections 41, 42, and 43 of the Act and Section 97.5 of the regulations for eligibility requirements.
24. See Section 55 of the Act for instructions on claiming the benefit of an earlier filing date.

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

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**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.*)

The first exploitive sales of Alturas were made in the US and Canada in the spring of 2003.

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**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).*)

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**NOTES:** It is the responsibility of the applicant/owner to keep the PVPO informed of any changes of address or change of ownership or assignment or owner's representative during the life of the application/certificate. The fees for filing a change of address; owner's representative; ownership or assignment; or any modification of owner's name is specified in Section 97.175 of the regulations. (*See Section 101 of the Act, and Sections 97.130, 97.131, 97.175(h) of the Regulations and Rules of Practice.*)

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According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0581-0055. The time required to complete this information collection is estimated to average 1.4 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

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To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 14th and Independence Avenue, SW, Washington, DC 20250-9410 or call 202-720-5964 (voice and TDD). USDA is an equal opportunity provider and employer.

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www.fda.gov/cdrh  
www.fda.gov/cdrh

Exhibit A

**Origin and Breeding History of the Variety**

**Variety:** Alturas

**Experimental Designation:** A82360-7

**Owner:** University of Idaho

Alturas was derived from a cross made at University of Idaho's Aberdeen Research and Extension Center in 1982. It was first selected in the field in 1989 and subsequently went through 12 years of evaluation and selection. In 1995-1997, Alturas was tested in seven western states as part of the Western Regional Variety Trial. Alturas was originally maintained under the breeding designation A82360-7. A four-generation pedigree is attached.

Alturas originated from a cross of A77182-1 and A75188-3 made at the Alturas was selected out of an F<sub>1</sub> population specifically for use in the dehydration industry using the following selection criteria: yield, specific gravity, and total dry matter production, and resistance to common field diseases including Verticillium wilt, early blight, and net necrosis.

Alturas has been clonally propagated since the first year of selection. It was observed and inspected for both uniformity and stability of visible traits over the 8-year period and 11 locations that it was in both unreplicated and replicated yield trials. The variety was determined to be both uniform and stable. It has not produced recognizable variants.

Government of Ontario  
Ministry of Education  
100 Queen Street West  
Toronto, Ontario M5H 2M2  
Canada

Dear Sir/Madam,

Reference is made to your letter of the 12th day of the month of March 2008, in which you advised that you are in receipt of the enclosed copy of the Ontario Education Act, R.S.O. 1990, c. 32, as amended, and the Ontario Education Regulations, R.R.O. 1990, c. 600, as amended, and that you are in receipt of the enclosed copy of the Ontario Education Act, R.S.O. 1990, c. 32, as amended, and the Ontario Education Regulations, R.R.O. 1990, c. 600, as amended.

The enclosed copy of the Ontario Education Act, R.S.O. 1990, c. 32, as amended, and the Ontario Education Regulations, R.R.O. 1990, c. 600, as amended, are being provided to you for your information and use.

Very truly yours,  
[Signature]

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A82360-7

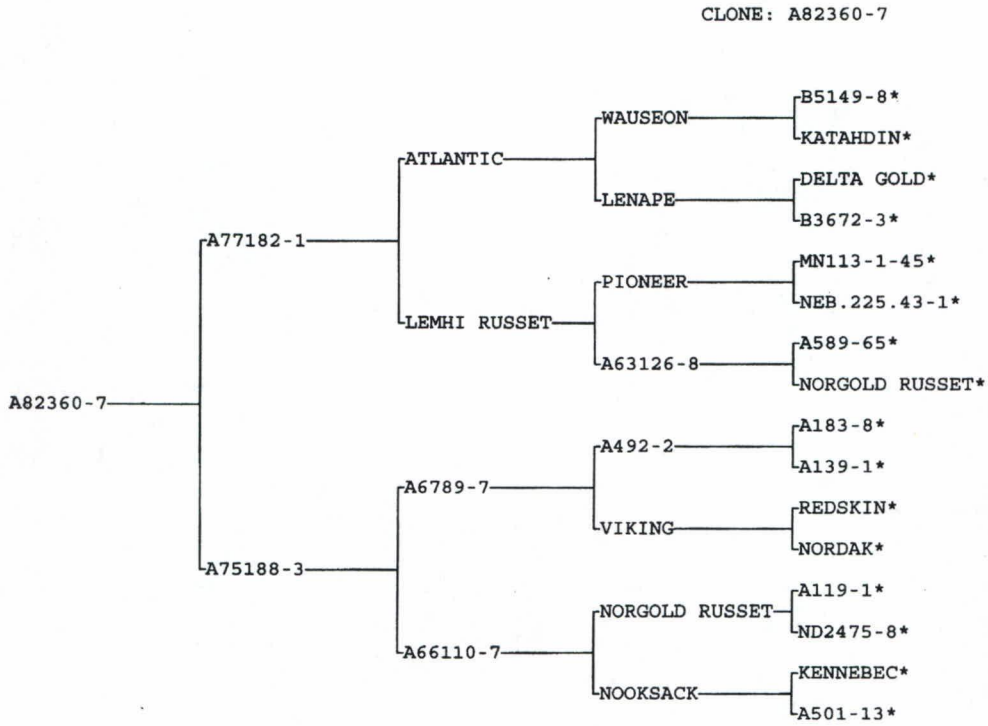


Figure 1. Pedigree of A82360-7.

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DRAFT Exhibit A Form

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

See previously submitted pedigree figure.

2. Give the details of subsequent stages of selection and multiplication.

Year	Detail of Stage	Selection Criteria
1990	12-hill unreplicated plots	appearance, SG, fry
1991	2 replicate reliminary yield trial	yield, grade, quality
1992	3 replicate/2 loc intermediate yield trial	yield, grade, quality
1993	4 replicate/2 loc advanced yield trial	yield, grade, quality
1994	Tri-state cooperative trial	yield, grade, quality, adaptation
1995-97	Western Regional Cooperative Trial	yield, grade, quality adaptation

3a. Is the variety uniform?  Yes  No

How did you test for uniformity?

Detailed observation notes on individual plots for maturity, vine size, flower color, disease incidence, tuber skin color, and tuber defect occurrence. Inspections made for variants.

3b. Is the variety stable?  Yes  No

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

Comparison of observations across years for the traits described above. Data accumulated for 8 years. Because the variety is clonally propagated, inspections were made for sports.

4. 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.

Continue on additional pages if necessary.

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## Exhibit B

**Statement of Distinctness****Variety:** Alturas**Owner:** University of Idaho

Alturas is distinct from Russet Burbank, the best comparative variety as outlined in Exhibit B form. In replicated trials, Alturas was distinct from Russet Burbank in producing lighter fry color following cold (40 F) storage (See table below and accompanying statistical analyses).

In Exhibit C, other differences are documented between the two varieties. Alturas is distinct from the most similar variety Russet Burbank in that it has a more rotate corolla and broader shaped anther cone (see inflorescence picture), has netted rather than russeted skin (see tuber picture), and has oblong rather than long tubers (see tuber picture). Alturas has greater resistance than Russet Burbank to verticillium wilt and tuber net necroses caused by PLRV (see included variety release paper for documentation).

Comparison of fry color and dry matter yield of Alturas with those of Russet Burbank.<sup>1</sup>

Variety	Fry Color 1997 <sup>2</sup>	Fry Color 1998 <sup>2</sup>
Alturas	2.4	1.9
Russet Burbank	3.9	2.8
LSD (.05)	1.0	0.1

<sup>1</sup>Data accumulated at Aberdeen, Idaho in 1998 and 1999. The trials were designed as typical one-row variety trials with four replications and 20-foot plots (N=4 for each variety x year).

<sup>2</sup>Fry color was determined using tubers stored for 3 months at 40°F. Fry color was rated using a modified version of the USDA Fry Color Chart wherein 0=light, attractive color, 4=dark, unattractive color (see accompanying chart).

The following information is provided for your information and is not intended to constitute an offer of insurance. It is provided for your information only and should not be relied upon as a basis for an investment decision.

Year	2006	2007	2008
Revenue	100	110	120
Expenses	80	90	100
Profit	20	20	20

This information is provided for your information only and should not be relied upon as a basis for an investment decision. It is provided for your information only and should not be relied upon as a basis for an investment decision.

DRAFT Exhibit B Form

Based on overall morphology, Alturas is most similar to Russet Burbank.  
*Applicant's new variety*  *Most similar comparison variety(ies)*

Alturas most clearly differs from Russet Burbank in the following traits:  
*Applicant's new variety*  *Most similar comparison variety(ies)*

Name the specific trait, then list the value of that trait for each variety in the comparison. Attach appropriate supporting evidence (see the Guidelines for Presenting Evidence in Support of Variety Distinctness, available from the PVP Office or website).

<i>Eg. Terminal leaflet tip shape</i> <i>Eg. Corolla inner Color</i>  <i>Eg. NumberEye/Tuber</i>	<i>Cuspidate</i> <i>Violet (85A)</i>  <i>15 +/- 2 (N=100)</i>	<i>Obtuse</i> <i>Red Purple (74B)</i>  <i>30 +/- 4 (N=100)</i>	<i>photograph attached</i> <i>Royal Horticultural</i> <i>Society Colour Chart</i> <i>statistics attached</i>
1. Qualitative traits: Corolla shape  Anther shape  Skin texture	Applicant's New Variety <u>Alturas</u> Rotate (2)  Broad cone (1)	1 <sup>st</sup> Comparison Variety <u>R. Burbank</u> Semi-stellate (4)  Pear-shaped cone (3)	Location of Evidence see picture  see picture
2. Color traits:			
3. Quantitative traits: Fry color	1997 USDA Color 2.4 1998 USDA Color 1.9	1997 USDA Color 3.9 1998 USDA Color 2.8	see color chart, statistics, SOP, written statement of distinctness
4. Other: Verticillium Resistance PLRV Net Necrosis Resistance	2  2	6  7	see release paper

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



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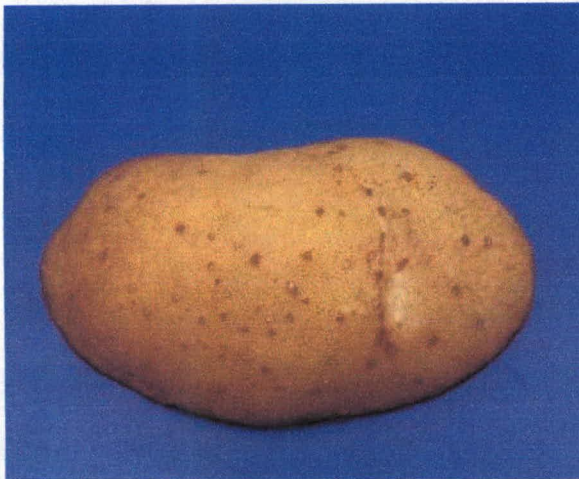
Comparison of Alturas (A82360-7) and Russet Burbank



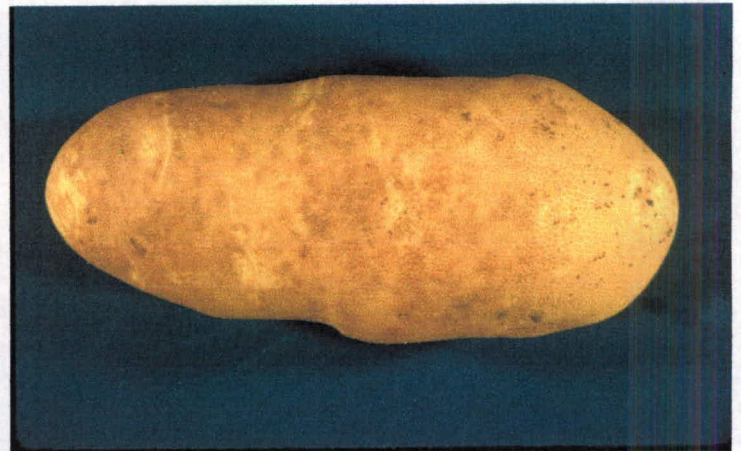
Alturas Inflorescence



Russet Burbank Inflorescence



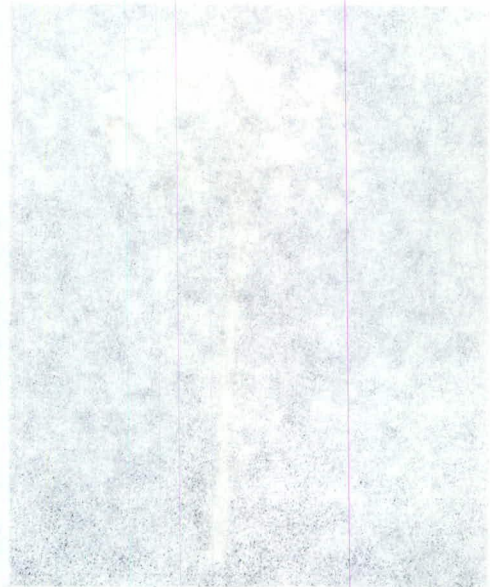
Alturas Tuber



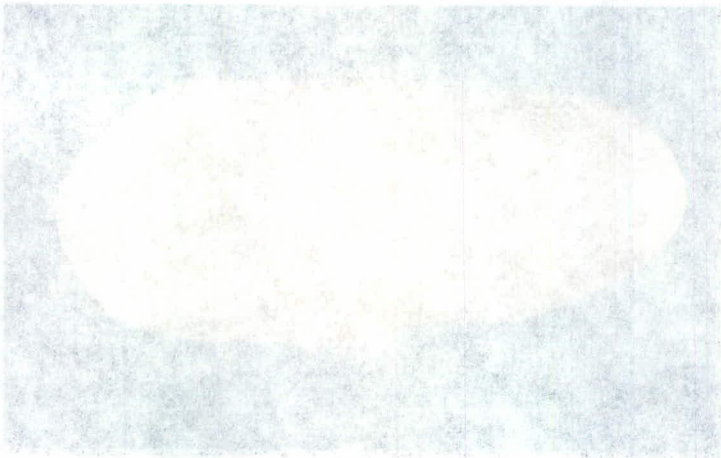
Russet Burbank Tuber



Plant Identification



Plant Identification



Plant Identification



Plant Identification

REPRODUCE LOCALLY. Include form number and date on all reproductions.

Form Approved OMB NO 0581-0055

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

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).

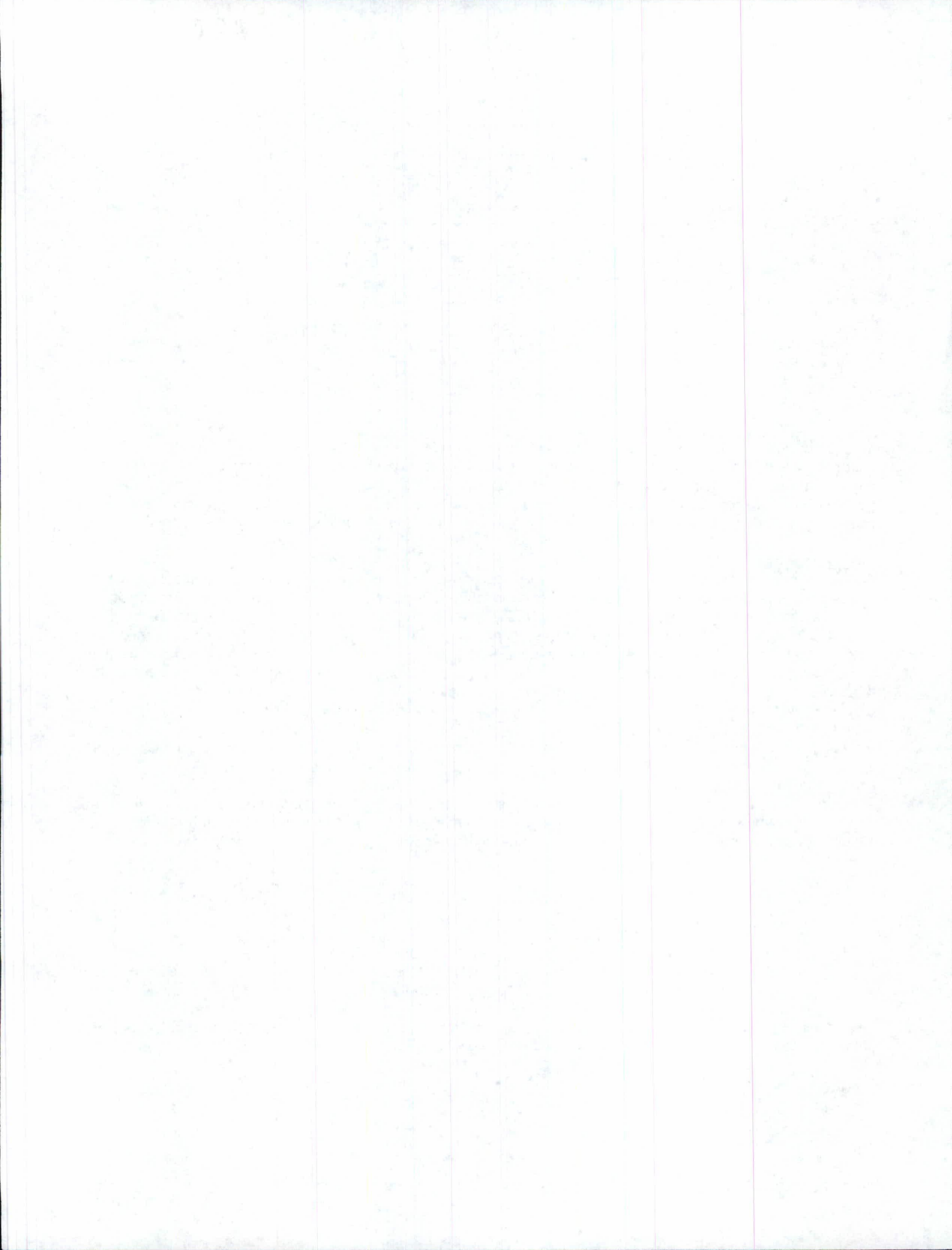
**Reference Varieties:**

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).

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**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.

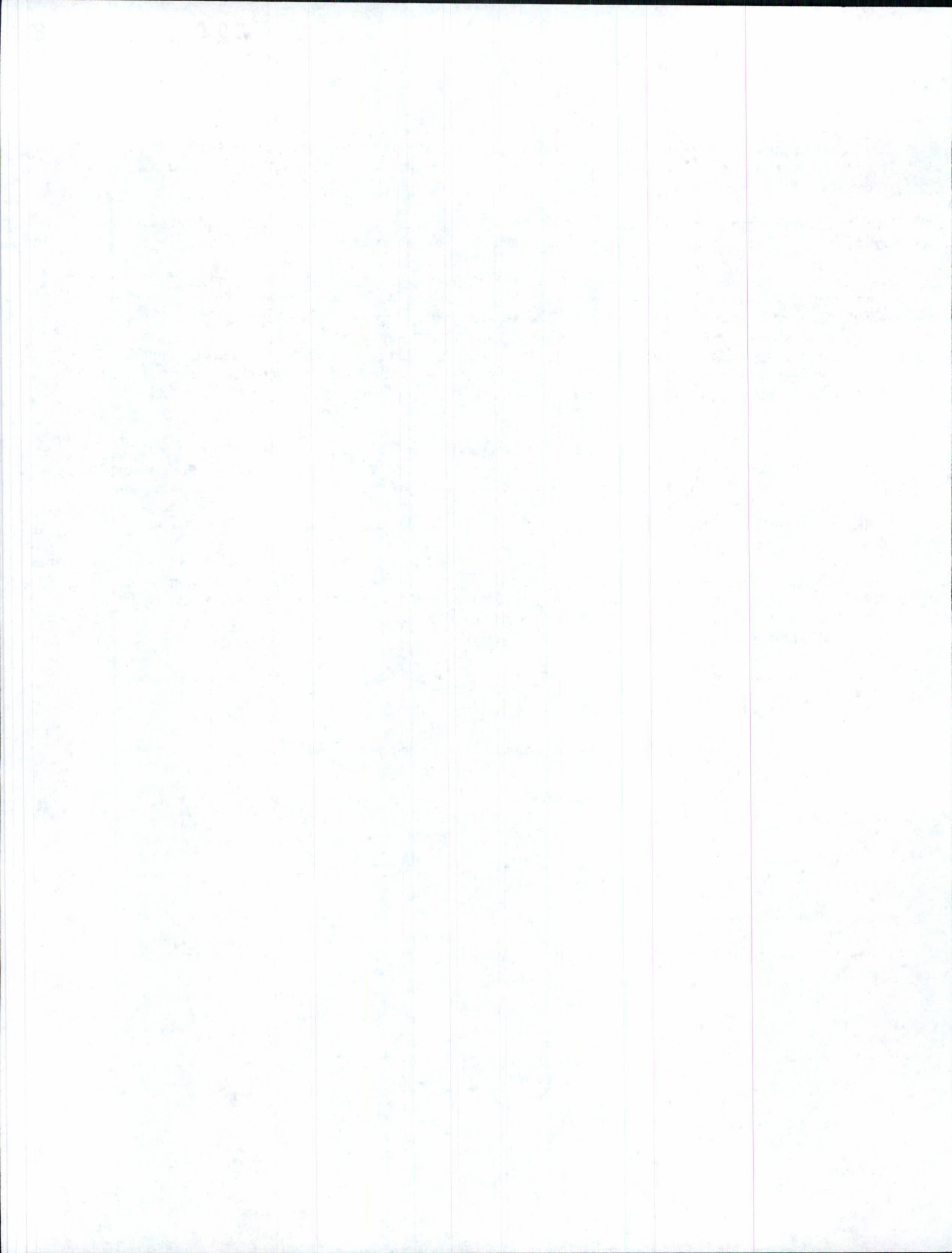
Legend:

**V** = Application Variety

**R1-R4** = Reference Varieties

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

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NAME OF APPLICANT (S) <b>University of Idaho</b>	TEMPORARY OR EXPERIMENTAL DESIGNATION <h2 style="text-align: center;">A82360-7</h2>	VARIETY NAME <b>Alturas</b>
ADDRESS (Street and No. or RD No., City, State, Zip Code, and Country) <b>Office of Technology Transfer Morrill Hall 414 PO Box 443003 Moscow ID 83844-3003</b>		FOR OFFICIAL USE ONLY  PVPO NUMBER <h1 style="text-align: center;">#200200158</h1>

**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)
Alturas	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 Dehydration processing

V 6	R1 4-5	R2	R3	R4
-----	--------	----	----	----

**2. LIGHT SPROUT CHARACTERISTICS: (See Figure 1)**

**\*LIGHT SPROUT: GENERAL SHAPE**

1 = Spherical   2 = Ovoid   3 = Conica   4 = Broad cylindrical   5 = Narrow cylindrical   6 = Other \_\_\_\_\_

V 1	R1 2	R2	R3	R4
-----	------	----	----	----

**\*LIGHT SPROUT BASE: PUBESCENCE OF BASE**

1 = Absent   2 = Weak   3 = Medium   4 = Strong   5 = Very Strong

V 3	R1 3	R2	R3	R4
-----	------	----	----	----

**\*LIGHT SPROUT BASE: ANTHOCYANIN COLORATION**

1 = Green   2 = Red-violet   3 = Blue-violet   4 = Other(describe) \_\_\_\_\_

V 2	R1 2	R2	R3	R4
-----	------	----	----	----

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**\*LIGHT SPROUT BASE: INTENSITY OF ANTHOCYANIN COLORATION (IF PRESENT)**

1 = Absent   2 = Weak   3 = Medium   4 = Strong   5 = Very Strong

V 4	R1 3	R2	R3	R4
-----	------	----	----	----

**\* LIGHT SPROUT TIP: HABIT**

1 = Closed   2 = Intermediate   3 = Open

V 3	R1 1	R2	R3	R4
-----	------	----	----	----

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2. LIGHT SPROUT CHARACTERISTICS: (continued)

LIGHT SPROUT TIP: PUBESCENCE

1 = Absent 2 = Weak 3 = Medium 4 = Strong 5 = Very Strong

V	2	R1	3	R2		R3		R4	
---	---	----	---	----	--	----	--	----	--

LIGHT SPROUT TIP ANTHOCYANIN COLORATION

1 = Green 2 = Red-violet 3 = Blue-violet 4 = Other(describe) \_\_\_\_\_

V	2	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	3	R1	2	R2		R3		R4	
---	---	----	---	----	--	----	--	----	--

LIGHT SPROUT ROOT INITIALS: FREQUENCY

1 = Absent 2 = Some 3 = Abundant

V	1	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	5	R1	5	R2		R3		R4	
---	---	----	---	----	--	----	--	----	--

TYPE:

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

V	2	R1	1	R2		R3		R4	
---	---	----	---	----	--	----	--	----	--

MATURITY: Days after planting (DAP) at vine senescence

V	150+	R1	130	R2		R3		R4	
---	------	----	-----	----	--	----	--	----	--

PLANTING DATE:

V	4-28-1997, 4-28-1998	R1	4-28-1997, 4-28-1998	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	5	R1	4	R2		R3		R4	
---	---	----	---	----	--	----	--	----	--

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4. STEM CHARACTERISTICS: Measure at early first bloom

\* STEM ANTHOCYANIN COLORATION:

1 = Absent 3 = Weak 5 = Medium 7 = Strong 9 = Very Strong

V	5	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	1	R1	1	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	144A	R1	146B	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	3	R1	5	R2		R3		R4	
---	---	----	---	----	--	----	--	----	--

PETIOLES ANTHOCYANIN COLORATION:

1 = Absent 3 = Weak 5 = Medium 7 = Strong 9 = Very Strong

V	3	R1	3	R2		R3		R4	
---	---	----	---	----	--	----	--	----	--

LEAF STIPULES SIZE: (See Figure 5)

1 = Absent 3 = Small 5 = Medium 7 = Large

V	3	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	
---	---	----	---	----	--	----	--	----	--

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5. LEAF CHARACTERISTICS: (continued)

TERMINAL LEAFLET TIP SHAPE: (See Figures 6 and 8)

1 = Acute 2 = Cuspidate 3 = Acuminate 4 = Obtuse 5 = Other \_\_\_\_\_

V	3	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	2	R1	2	R2		R3		R4	
---	---	----	---	----	--	----	--	----	--

NUMBER OF PRIMARY LEAFLET PAIRS: (See Figure 6)

AVERAGE:

V	5.0	R1	4.3	R2		R3		R4	
---	-----	----	-----	----	--	----	--	----	--

RANGE:

V	4	to	6	R1	2	to	5	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	3	R1	3	R2		R3		R4	
---	---	----	---	----	--	----	--	----	--

PRIMARY LEAFLET SIZE:

1 = Very Small 2 = Small 3 = Medium 4 = Large 5 = Very Large

V	3	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	3	R1	3	R2		R3		R4	
---	---	----	---	----	--	----	--	----	--

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

AVERAGE:

V	4.5	R1	3.7	R2		R3		R4	
---	-----	----	-----	----	--	----	--	----	--

RANGE:

V	2	to	10	R1	2	to	10	R2		to	R3		to	R4		to
---	---	----	----	----	---	----	----	----	--	----	----	--	----	----	--	----

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5. LEAF CHARACTERISTICS: (continued)

NUMBER OF INFLORESCENCE/PLANT:

AVERAGE:

V	3.1	R1	2.2	R2		R3		R4	
---	-----	----	-----	----	--	----	--	----	--

RANGE:

V	1	to	8	R1	1	to	5	R2		to		R3		to		R4		to	
---	---	----	---	----	---	----	---	----	--	----	--	----	--	----	--	----	--	----	--

NUMBER OF FLORETS/INFLORESCENCE:

AVERAGE:

V	12.1	R1	8.6	R2		R3		R4	
---	------	----	-----	----	--	----	--	----	--

RANGE:

V	9	to	19	R1	5	to	15	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 A	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 A	R1	155 A	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	5	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	13 A	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	
---	---	----	---	----	--	----	--	----	--

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6. INFLORESCENCE CHARACTERISTICS: (continued)

POLLEN PRODUCTION:

1 = None 3 = Some 5 = Abundant

V	5	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 Munsell Color Chart (Circle the appropriate color chart)

V	143 B	R1	146 B	R2		R3		R4	
---	-------	----	-------	----	--	----	--	----	--

BERRY PRODUCTION: (Under field conditions)

1 = Absent 3 = Low 5 = Moderate 7 = Heavy 9 = Very Heavy

V	3	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	5	R2		R3		R4	
---	---	----	---	----	--	----	--	----	--

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

V	164 C	R1	164 A	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	3	R1	4	R2		R3		R4	
---	---	----	---	----	--	----	--	----	--

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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	2	R1	3	R2		R3		R4	
---	---	----	---	----	--	----	--	----	--

TUBER LENGTH (mm):

AVERAGE:

V	102	R1	118	R2		R3		R4	
---	-----	----	-----	----	--	----	--	----	--

RANGE:

V	76	to	130	R1	87	to	151	R2		to	R3		to	R4		to
---	----	----	-----	----	----	----	-----	----	--	----	----	--	----	----	--	----

STANDARD DEVIATION:

V	11	R1	11	R2		R3		R4	
---	----	----	----	----	--	----	--	----	--

AVERAGE WEIGHT OF SAMPLE TAKEN:

V	225g	R1	225g	R2		R3		R4	
---	------	----	------	----	--	----	--	----	--

TUBER WIDTH (mm)

AVERAGE:

V	68	R1	63	R2		R3		R4	
---	----	----	----	----	--	----	--	----	--

RANGE:

V	58	to	78	R1	54	to	73	R2		to	R3		to	R4		to
---	----	----	----	----	----	----	----	----	--	----	----	--	----	----	--	----

STANDARD DEVIATION:

V	45	R1	37	R2		R3		R4	
---	----	----	----	----	--	----	--	----	--

AVERAGE WEIGHT OF SAMPLE TAKEN (g):

V	225g	R1	225g	R2		R3		R4	
---	------	----	------	----	--	----	--	----	--

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7. TUBER CHARACTERISTICS: (continued)

TUBER THICKNESS (mm):

AVERAGE:

V	59	R1	53	R2		R3		R4	
---	----	----	----	----	--	----	--	----	--

RANGE:

V	49	to	71	R1	44	to	63	R2		to		R3		to		R4		to	
---	----	----	----	----	----	----	----	----	--	----	--	----	--	----	--	----	--	----	--

STANDARD DEVIATION:

V	4.5	R1	4.0	R2		R3		R4	
---	-----	----	-----	----	--	----	--	----	--

AVERAGE WEIGHT OF SAMPLE TAKEN (g):

V	225	R1	225	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	3	R1	5	R2		R3		R4	
---	---	----	---	----	--	----	--	----	--

NUMBER EYE/TUBER:

AVERAGE:

V	13.7	R1	27.7	R2		R3		R4	
---	------	----	------	----	--	----	--	----	--

RANGE:

V	7	to	20	R1	16	to	36	R2		to		R3		to		R4		to	
---	---	----	----	----	----	----	----	----	--	----	--	----	--	----	--	----	--	----	--

DISTRIBUTION OF TUBER EYES:

1 = Predominantly apical    2 = Evenly distributed

V	1	R1	2	R2		R3		R4	
---	---	----	---	----	--	----	--	----	--

PROMINENCE OF TUBER EYEBROWS:

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

V	1	R1	1	R2		R3		R4	
---	---	----	---	----	--	----	--	----	--

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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	159 B	R1	159 B	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	2	R1	1	R2		R3		R4	
---	---	----	---	----	--	----	--	----	--

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8. DISEASES CHARACTERISTICS:

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

LATE BLIGHT: (Phytophthora)

V	7	R1	7	R2		R3		R4	
---	---	----	---	----	--	----	--	----	--

EARLY BLIGHT: (Alternaria)

V	4	R1	6	R2		R3		R4	
---	---	----	---	----	--	----	--	----	--

SOFT ROT (Erwinia)

V	6	R1	6	R2		R3		R4	
---	---	----	---	----	--	----	--	----	--

COMMON SCAB (Streptomyces)

V	3	R1	2	R2		R3		R4	
---	---	----	---	----	--	----	--	----	--

POWDERY SCAB (Spongospora)

V	0	R1	0	R2		R3		R4	
---	---	----	---	----	--	----	--	----	--

DRY ROT (Fusarium)

V	5	R1	6	R2		R3		R4	
---	---	----	---	----	--	----	--	----	--

POTATO LEAF ROLL VIRUS (PLRV)

V	9	R1	9	R2		R3		R4	
---	---	----	---	----	--	----	--	----	--

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8. DISEASES CHARACTERISTICS: (continued)

POTATO VIRUS X (PVX)

V	5	R1	9	R2		R3		R4	
---	---	----	---	----	--	----	--	----	--

POTATO VIRUS Y (PVY)

V	7	R1	7	R2		R3		R4	
---	---	----	---	----	--	----	--	----	--

POTATO VIRUS M (PVM)

V	0	R1	0	R2		R3		R4	
---	---	----	---	----	--	----	--	----	--

POTATO VIRUS A (PVA)

V	0	R1	0	R2		R3		R4	
---	---	----	---	----	--	----	--	----	--

GOLDEN NEMATODE (Globodera)

V	7	R1	7	R2		R3		R4	
---	---	----	---	----	--	----	--	----	--

ROOT - KNOT NEMATODE (Meloidogyne)

V	7	R1	7	R2		R3		R4	
---	---	----	---	----	--	----	--	----	--

OTHER DISEASE Net Necrosis

V	2	R1	7	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		R2		R3		R4	
---	--	----	--	----	--	----	--	----	--

9. PESTS CHARACTERISTICS:

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

COLORADO POTATO BEETLE (CPB) (*Leptinotarsa*)

V	0	R1	0	R2		R3		R4	
---	---	----	---	----	--	----	--	----	--

GREEN PEACH APHID (*Myzus*)

V	0	R1	0	R2		R3		R4	
---	---	----	---	----	--	----	--	----	--

OTHER:

V		R1		R2		R3		R4	
---	--	----	--	----	--	----	--	----	--

OTHER:

V		R1		R2		R3		R4	
---	--	----	--	----	--	----	--	----	--

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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 5

R1 3-4

R2

R3

R4

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

V 2.8

R1 5.2

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.

Comparison of french fry color

Alturas 2.2 USDA Color

Russet Burbank 3.1 USDA Color

USDA Color 0-4 0= light , 4 dark

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.

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. ADDITIONAL COMMENTS AND CHARACTERISTICS:

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

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Protocols for determination of french fry color and dry matter yield.

#### General

Dry matter yield and tuber samples for french fry color were procured from variety trials grown at Aberdeen, Idaho in 1997, 1998, and 1999. The varieties were grown on single-row, twenty foot plots, replicated four times.

#### French fry color

Samples consisting of three tubers from each replication of a field trial are stored at 40 or 50 F for approximately 3 months.

Tubers are sliced in strips one-half inch in diameter, rinsed, and cooked at 375 F in vegetable oil for three and a half minutes. The fries were rated for color using the USDA french fry color chart. The scale is from 0 to 4 with lower numbers indicating lighter color and three or less being acceptable.

#### Dry matter yield

Specific gravity was determined on an eight-pound sample of tubers from each plot using the weight-in-air, weight-in-water method. The percent solids was estimated based on the tuber specific gravity. Dry matter yield was calculated by multiplying the percent tuber dry matter by the yield of fresh tubers.





## Alturas: A Multi-Purpose, Russet Potato Cultivar with High Yield and Tuber Specific Gravity

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### ABSTRACT

'Alturas', a late-maturing, high-yielding, russet potato cultivar with high tuber specific gravity, was released in 2002 by the USDA-ARS and the Agricultural Experiment Stations of Idaho, Oregon, and Washington. Originally selected for dehydration processing, its cold-sweetening resistance also makes it suitable for processing out of storage into french fries and other frozen potato products. Culinary quality is high, with larger tubers suitable for fresh market if heavily russeted skin is not essential. Alturas consistently produced greater total and U.S. No. 1 yields than 'Russet Burbank' and 'Ranger Russet' in southern Idaho trials. Across other western trial sites, total yields of Alturas have on average been 29% and 14% greater than Russet Burbank and Ranger Russet, respectively. Alturas is resistant to *Verticillium* wilt (*Verticillium dahliae*) and early blight (*Alternaria solani*). Compared with Russet Burbank and Ranger Russet, Alturas is less susceptible to corky ringspot and foliar and tuber infection by late blight (*Phytophthora infestans*). It also is less susceptible to tuber net necrosis and *Fusarium* dry rot than Russet Burbank, and is more resistant to common scab (*Strepto-*

*myces scabies*) than Ranger Russet. However, Alturas is more susceptible to infection by PVY and PVX than Ranger Russet. Total nitrogen application recommendations for Alturas are approximately 40% less than those for Russet Burbank. Alturas requires 15% to 20% more water during the growing season than does Russet Burbank.

### INTRODUCTION

Alturas was first grown and selected in the field at Aberdeen, ID, in 1989. Designated as A82360-7, it originated from a 1982 cross between russeted selections A77182-1 and A75188-3. Potato cultivars in the pedigree of Alturas (Figure 1) include Atlantic (Webb et al. 1978), Lemhi Russet (Pavek et al. 1981), Lenape (Akeley et al. 1967), Nooksack (Hoyman and Holland 1974), Norgold Russet (Johansen 1965), Pioneer (Miller and O'Keefe 1963), Viking (Johansen et al. 1963), and Wauseon (Cunningham et al. 1968).

Alturas was evaluated as a 12-hill selection in 1990, and from 1991 through 2002 in replicated yield trials in Idaho. Alturas was entered in Tri-State trials in Idaho, Oregon, and Washington in 1994, and subsequently advanced to the Western Regional Trials where it was evaluated at sites in California, Colorado, Idaho, New Mexico, Oregon, Texas, and Washington from 1995-1997. Seed increases and commercial trials of Alturas were conducted in Idaho, Oregon, and Washington.

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ADDITIONAL KEY WORDS: *Solanum tuberosum*, variety, release, breeding.

On the basis of research and commercial trials, the decision was made to release A82360-7 as Alturas. The name, Alturas, refers to a prehistoric lake that covered much of south-central Idaho; a smaller Alturas Lake is present in the Sawtooth National Recreation Area of central Idaho. Release documents were completed in 2002.

**VARIETAL DESCRIPTION**

**Plants (Figure 2A)**

*Growth Habit:* Large, semi-erect vine, with a semi-closed canopy and late maturity (approximately 2-3 weeks later than Russet Burbank). *Stems:* Green, with moderate anthocyanin pigmentation, and straight-edged stem wings (1-2 mm wide). *Leaves (Figure 2B):* Yellow-green, moderately pubescent with a medium-open silhouette; weak pigmentation of petioles. *Terminal leaflets:* Narrowly ovate, with an acuminate tip, cuneate base, and slightly wavy margins; average length of 80 mm, width of 38 mm (100 leaves). *Primary leaflets:* Range of four to six pairs, with an average of 5.0; narrowly ovate with an acuminate tip and obtuse base. *Secondary leaflets:* Range of zero to five pairs, average of 3.0. *Tertiary leaflets:* Range of zero to five pairs, average of 1.0. *Stipules:* Small, semi-clasping.

**Flowers (Figure 2B)**

*Inflorescences:* Range of one to eight inflorescences per plant, average of 3.1, with a range of nine to 19 buds/inflorescence; moderate pigmentation of calyx. *Corolla:* White, rotate shape, with a mean width of 37 mm. *Anthers:* Yellow (Value 13A, Royal Horticultural Society Color Chart, London, England), broad cone-shaped, with abundant pollen shed; successfully used as a male parent. *Stigma:* Capitata. *Berries:* Low numbers generally found in the field; successfully used as a female parent in sexual hybridizations.

**Tubers (Figure 2C)**

Oval to oblong, width and thickness comparable to Russet Burbank, but an average of 16 mm shorter than Russet Burbank (100 tubers 170-280 g); mean length: 102 mm (range 76-130), mean width: 68 mm (range 56-78), mean thickness: 59 (range 49-71). *Set:* Medium (8-15/hill). *Skin:* Tan to brown color; light russeting. *Eyes:* Shallow to intermediate depth, with a mean number of 14 eyes/tuber concentrated near the apical end; eyebrows are not prominent. *Flesh:* White. *Dormancy:* In a one-year storage trial, Alturas had a dormancy of 110 days following storage at 7.3 C, as compared with Russet Burbank at 155 days (Gale Kleinkopf, pers comm). Dormancy break is based on 80% of tubers showing one or more eyes with growth greater than peeping but < 5mm in length.

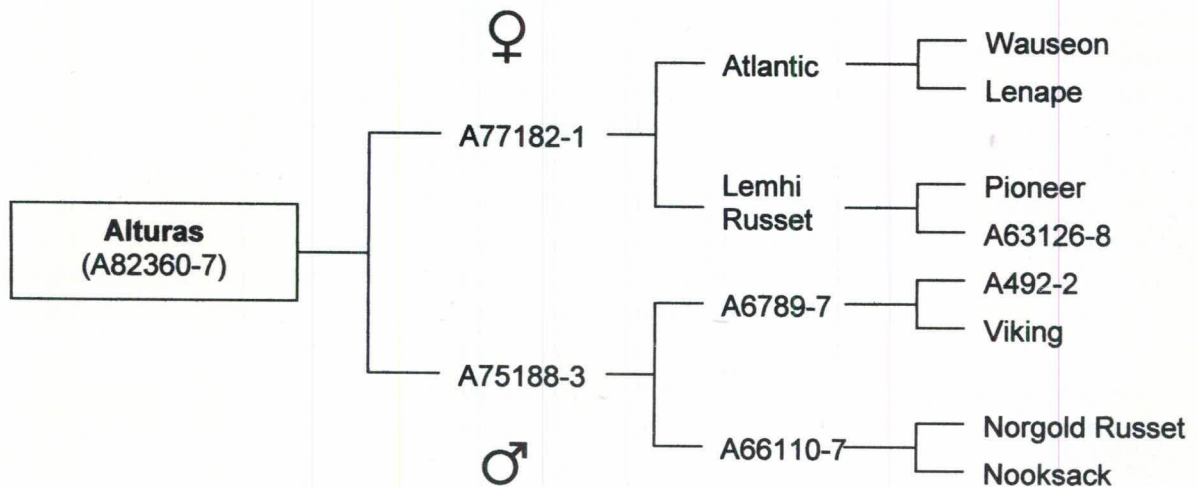


Figure 1. Pedigree of Alturas.

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**Light Sprouts (Figure 2D)**

Broad, green, no pigmentation, slight pubescence.

**Agronomic Performance**

Alturas is a notably, high-yielding cultivar, surpassing Ranger Russet and Russet Burbank by 11 and 17 mt/ha, respectively, in full-season trials (135-150 days after planting) in southern Idaho (Table 1). Specific gravity and percentage U.S. No. 1 yield of Alturas are similar to those of Ranger Russet and substantially better than observed for Russet Burbank. However, the tuber size of Alturas tends to be smaller than Ranger Russet with 11% fewer tubers in the oversize (>341 g) class and an additional 8% in the undersize (<114 g) category.

Alturas also was evaluated in the 1995-1997 Western Regional Potato Variety Trials (Table 2). In those full-season trials, mean total yield across locations was greater than either

Ranger Russet or Russet Burbank, while percentage of U.S. No. 1 yield and specific gravity were comparable to Ranger Russet.

**Tuber Quality Characteristics and Usage**

The mean specific gravity of tubers of Alturas was consistently higher than for Russet Burbank in Idaho and other western sites, and comparable to the tuber specific gravity of Ranger Russet (Tables 1, 2). French fry color was consistently lighter than either Ranger Russet or Russet Burbank after extended storage at 4.4 or 7.3 C (Table 1). Mean french fry color of Alturas was almost acceptable from extended storage at 4.4 C, indicating its potential as a cold-sweetening resistant variety (Table 1). Although the dormancy of Alturas is shorter than that of Russet Burbank or Ranger Russet at a storage temperature of 7.3 C, its cold-sweetening resistance would allow its storage at lower temperatures, thereby prolonging the dura-

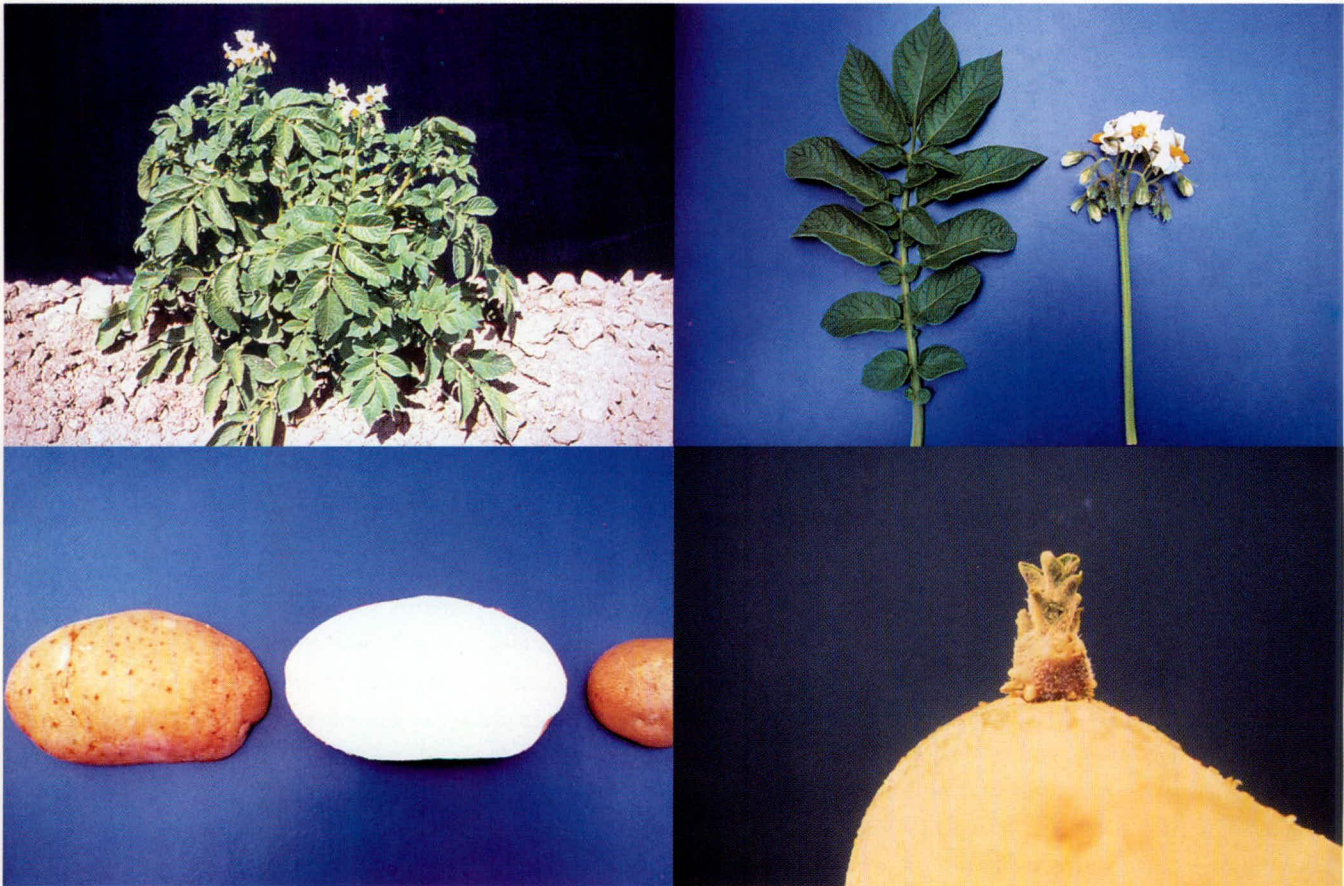


Figure 2.  
Alturas: (A) plant, (B) leaf and inflorescence, (C) tuber and flesh, and (D) light sprout.

TABLE 1—Average total yield, U.S. No. 1 yield, tuber size distribution, specific gravity and French fry color of Alturas, Ranger Russet, and Russet Burbank from 27 full-season yield trials in southern Idaho locations<sup>1</sup>.

Cultivar	Yield (mt/ha)			Specific Gravity <sup>2</sup>	Tuber Size Distribution as Percent of Total Yield					Fry Color <sup>3</sup>	
	Total	U.S. No. 1	% No. 1		>341 g	170-341 g	114-170 g	<114 g	Cull	4.4 C	7.3 C
Alturas	60.8	46.8	77	1.091	15	43	20	16	7	2.4	0.9
Ranger Russet	49.8	40.3	81	1.089	26	42	13	8	11	3.1	1.5
Russet Burbank	43.8	27.1	62	1.080	12	34	16	16	22	3.3	1.5

<sup>1</sup>Trials were conducted from 1993 to 2001 and included the following ID locations with their respective number of trials: Aberdeen (8), Kimberly (7), Parma (3), Raft River (1), Rexburg (4), and Shelley (4).

<sup>2</sup>Specific gravity was determined using the weight-in-air/weight-in-water method.

<sup>3</sup>French fry scores rated using USDA standards, with 0 = light and 4 = dark. A rating of  $\leq 2.0$  is an acceptable score. Tubers were evaluated following 3-6 months storage at 4.4 or 7.3 C.

TABLE 2—Total yield, percentage U.S. No. 1 yield, and specific gravity of Alturas, Ranger Russet and Russet Burbank in full-season trials in the 1995-1997 Western Regional Potato Variety Trials<sup>1</sup>.

	CA	CO <sup>2</sup>	ID-1	ID-2	NM <sup>3</sup>	OR-1 <sup>2</sup>	OR-2	OR-3	WA	Mean
<i>Total Yield (mt/ha)</i>										
Alturas	72.4	56.6	61.7	60.1	65.5	106.7	58.6	76.2	82.0	<b>71.1</b>
Ranger Russet	66.2	n.a.	52.6	48.8	61.1	74.3	58.4	60.6	76.0	<b>62.3</b>
Russet Burbank	51.7	48.6	51.3	48.2	50.6	68.2	49.6	60.1	69.7	<b>55.3</b>
<i>% U.S. No. 1</i>										
Alturas	81	79	81	74	85	85	80	76	75	<b>80</b>
Ranger Russet	83	n.a.	85	76	92	87	80	74	73	<b>81</b>
Russet Burbank	83	73	64	53	88	74	64	58	61	<b>69</b>
<i>Specific Gravity</i>										
Alturas	1.084	1.087	1.091	1.090	1.086	1.082	1.090	1.092	1.073	<b>1.086</b>
Ranger Russet	1.077	n.a.	1.088	1.081	1.094	1.084	1.085	1.093	1.074	<b>1.085</b>
Russet Burbank	1.086	1.087	1.084	1.080	1.083	1.080	1.084	1.078	1.074	<b>1.082</b>

<sup>1</sup>Trial locations were Tulelake (CA), San Luis Valley (CO), Aberdeen (ID-1), Kimberly (ID-2), Farmington (NM), Hermiston (OR-1), Klamath Falls (OR-2), Ontario (OR-3), and Othello (WA).

<sup>2</sup>Means of 1995 and 1997 trials; Alturas was not included in the 1996 trials.

<sup>3</sup>Means of 1996 and 1997 trials; Alturas was not included in the 1995 trial.

tion of tuber dormancy. These combined characteristics make it suitable for processing into dehydrated and frozen potato products.

With respect to internal and external defects, Alturas resembles Ranger Russet in resistance to second growth and hollow heart, but is more resistant to blackspot bruise (Table 3).

Alturas was initially developed as a high-yielding, dehydration processing variety, with tubers in the mid-sized range (114-341 g). However, larger tubers of Alturas have been found acceptable for fresh-pack use. Taste panel evaluations support fresh use of Alturas, with sensory ratings nearly identical to Russet Burbank prior to storage and following extended storage (Table 4).

## Disease Response

Alturas is notable for its resistances to *Verticillium* wilt (*Verticillium dahliae*) and early blight (*Alternaria solani*) (Table 5). Compared to Ranger Russet and Russet Burbank, Alturas is less susceptible to corky ringspot, and foliar and tuber infection by late blight (*Phytophthora infestans*). It also is less susceptible to tuber net necrosis and Fusarium dry rot than Russet Burbank, and is more resistant to common scab (*Streptomyces scabies*) than Ranger Russet.

Alturas is susceptible to potato leafroll virus (PLRV), potato virus X and Y (PVX and PVY), Erwinia soft rot, Columbia root-knot nematode (*Meloidogyne chitwoodi*), and bacterial ring rot (*Clavibacter michiganensis* subsp. *sepedonicus*).

TABLE 3—Evaluation of internal and external defects for Alturas, Ranger Russet, and Russet Burbank in trials conducted in southern Idaho.

Cultivar	Growth Cracks <sup>1,3</sup>	Second Growth <sup>1,3</sup>	Shatter bruise <sup>1,4</sup>	Hollow Heart <sup>2,5</sup>	Blackspot Bruise <sup>1,6</sup>
Alturas	4.3	4.9	3.2	1.0	3.3
Ranger Russet	4.5	4.4	3.2	0.5	2.2
Russet Burbank	4.1	3.4	3.6	11.6	3.0

<sup>1</sup>Rated using a 1-5 scale with 1 = severe and 5 = none observed.

<sup>2</sup>Rated as the percentage of tubers >341 g with hollow heart.

<sup>3</sup>Average of 15 trials.

<sup>4</sup>Average of 10 trials.

<sup>5</sup>Average of 27 trials.

<sup>6</sup>Average of 24 trials.

TABLE 4—Sensory evaluations of baked tubers of Alturas and Russet Burbank<sup>1</sup>.

Cultivar	Pre-storage <sup>2</sup>				Post-storage <sup>3</sup>			
	Color	Texture	Flavor	Overall appeal	Color	Texture	Flavor	Overall appeal
Alturas	6.7	5.9	6.1	6.0	6.8	6.1	6.1	6.1
Russet Burbank	6.5	6.2	6.0	6.1	6.7	6.1	6.0	6.1

<sup>1</sup> The pre-storage and post-harvest blind sensory evaluations were conducted using 10-12 trained panelists. The values given represent the mean of 4 sessions conducted over a four-year period (1 session/year). Tubers were rated for color, texture, flavor, and overall appeal using a scale with 1 = very poor quality and 9 = exceptional quality.

<sup>2</sup> Pre-storage evaluations were conducted approximately 1 month after harvest, prior to the time that the final holding temperature of 4.4 C was reached.

<sup>3</sup> Post-storage evaluations were conducted following 5-6 months storage at 4.4 C.

TABLE 5—Disease responses of Alturas, Ranger Russet, and Russet Burbank<sup>1</sup>.

Cultivar	Vert. wilt	Common scab	Early Blight ( <i>Alternaria solani</i> )		Late Blight ( <i>Phytophthora infestans</i> )		Viruses <sup>2</sup>			Symptoms of virus infection		Storage diseases	
			Foliar	Tuber	Foliar	Tuber	PLRV	PVY	PVX	Net Necrosis	Corky Ringspot	Erwina soft rot	Fus. dry rot
Alturas	VR	MS	R	MS	MS	MS	S	S	S	MR	MS	S	MS
Ranger Russet	MR	S	S	MS	S	VS	S	MR	VR	MR	S	S	MS
Russet Burbank	S	MR	S	MS	S	S	S	S	S	S	S	S	S

<sup>1</sup> Ratings were based on a minimum of two years of controlled field evaluations. Ratings are defined as very resistant (VR), resistant (R), moderately resistant (MR), moderately susceptible (MS), susceptible (S), and very susceptible (VS).

<sup>2</sup> Virus reaction was based on seed-born infection as determined by ELISA, following field evaluation with inter-planted virus-infected potato plants and a high population density of green peach aphids.

Alturas exhibits a delayed foliar response to bacterial ring rot in comparisons with Russet Burbank and Russet Norkotah. Expression of bacterial ring rot infection in the foliage includes: green wilt, early dwarfing, rosette growth, and interveinal necrosis (Oscar Gutbrod and Jeff McMorran, unpublished data; Rob Davidson, unpublished data).

Assignments of disease resistance/susceptibility ratings were based on a minimum of two years of replicated field evaluations. Verticillium wilt, common scab, and early blight evaluations were conducted at Aberdeen, Idaho, using naturally occurring inoculum. The protocol for assessing germplasm

response to Verticillium wilt was previously described by Corsini et al. (1988). Common scab and early blight evaluations consisted of three replicates in a randomized complete block (RCB) design with analyzed data used for assigning disease reactions. Late blight field evaluations with naturally occurring inoculum were conducted at Mount Vernon, Washington, and Corvallis, Oregon. Protocols used in the evaluations were as described by Inglis et al. (1996). Late blight screening at Corvallis consisted of a replicated trial with inoculation of a spreader row with zoospores of US-8 and subsequent irrigation of the entire study to stimulate disease

TABLE 6—*Biochemical analyses of Alturas, Ranger Russet, and Russet Burbank tubers sampled from the 1995-1997 Western Regional Potato Variety Trials at Aberdeen, ID<sup>1</sup>.*

Cultivar	Dry matter (% FWB <sup>2</sup> )	Sucrose (% FWB <sup>2</sup> )	Reducing Sugars (% DWB <sup>2</sup> )	Protein (% DWB <sup>2</sup> )	Vitamin C (mg/100g FWB <sup>2</sup> )	Total glycoalkaloids (mg/100 g FWB <sup>2</sup> )
Alturas	23.6	0.29	0.10	5.8	20.7	2.8
Ranger Russet	22.8	0.22	0.17	5.2	30.4	4.2
Russet Burbank	21.4	0.17	0.10	4.5	19.1	5.2

<sup>1</sup>Analyses were conducted on freeze-dried tuber tissue; tissue was taken from tubers six weeks after harvest.

<sup>2</sup>FWB = fresh weight basis; DWB = dry weight basis.

development (Mosley and Yilma, pers comm). Evaluations of PLRV, PVY, and PVX resistances were conducted at Kimberly, Idaho using virus-infected spreader rows as described by Corsini et al. (1994). Corky ringspot evaluations in a RCB design were conducted in the Egin Bench region of Idaho, the Klamath Basin of Oregon, and the Columbia Basin of Washington and Oregon, using protocols described by Brown et al. (2000). Storage disease assessments were as described by Corsini and Pavek (1986). Columbia root-knot nematode ratings were provided by Dr. Chuck Brown and Dr. Ken Rykbost on the basis of data from replicated trials conducted in nematode-infected fields of the Columbia Basin of Washington state and the Klamath Basin of Oregon, respectively (unpublished data).

### **Biochemical and Nutritional Characteristics**

Tubers of Alturas, Ranger Russet, and Russet Burbank, grown at Aberdeen, Idaho, were analyzed over a three-year period to assess biochemical and nutritional components (Table 6). Alturas was higher in dry matter content and protein than either Ranger Russet or Russet Burbank. While sucrose levels were higher in Alturas than in the check cultivars, reducing sugars were lower than for Ranger Russet and identical to those of Russet Burbank. Vitamin C content was comparable to that of Russet Burbank and lower than Ranger Russet. Total glycoalkaloids for Alturas were low at 2.8 mg/100g tuber fresh weight.

### **Management**

Studies on management practices optimal for production of Alturas were conducted primarily in southeastern Idaho. However, the results of these studies also provide growers in

other production regions with a foundation for the development of management guidelines specific for their locale.

Seed-spacing trials indicate that optimal spacings of Alturas seedpieces on 91 cm rows are (1) seed production—25.4 to 30.5 cm, (2) commercial—33 to 38 cm; spacing of >38 cm may be warranted if Alturas is to be used for processing into french fries (Love et al. 2003).

Nitrogen management recommendations were developed based on an experimental trial, combined with predictions based on growth habit; recommendations were validated in their successful adoption in commercial production. Total nitrogen application recommendations for Alturas are approximately 40% less than those required for Russet Burbank (Love et al. 2003). In southeastern Idaho, where potential potato yields are 33.6 to 44.8 mt/ha (300 to 400 cwt/A), it is recommended that 118 to 163 kg N/ha (105 to 145 lbs N/acre) be applied. In shorter season seed-growing regions, all nitrogen can be applied pre-plant. In commercial production areas of Idaho, nitrogen application may be split into a pre-plant application and a second application that should be made no later than 31 July. Nitrogen applied after the July deadline will delay maturity of this already late-maturing cultivar, creating difficulties with vine kill, tuber maturation and subsequent bulking. Problems with vine kill and tuber maturation also may be experienced if Alturas is planted the year immediately following alfalfa. Continued mineralization of nitrogen late into the summer following the incorporation of alfalfa residue may be sufficient to delay Alturas' maturation. No information is yet available on critical petiole nitrate levels.

No detailed research has been conducted regarding the phosphorus, potassium, or micronutrient requirements of Alturas. For these nutrients, it is recommended that growers

follow guidelines developed in their area for Russet Burbank. On the basis of replicated trial observations, the seasonal water requirements of Alturas are 15% to 20% greater than those of Russet Burbank (Steve Love, pers comm).

No sensitivity to metribuzin, when applied at labeled rates, has been observed in Alturas. No injury has been observed on Alturas with the use of other herbicides currently registered for use on potatoes. The critical period for weed control in Alturas is prior to row closure; after that period, Alturas produces a vine that competes with most mid- to late-season weeds.

### SEED AVAILABILITY

In 2002, seed was available from potato seed growers in Colorado, Idaho, Minnesota, Montana, Oregon, Washington, and Wisconsin. Small amounts of seed, for research purposes, can be obtained by contacting the corresponding author. The University of Idaho, acting on behalf of the Tri-State Potato Breeding Program, has filed an application for Plant Variety Protection for Alturas.

### ACKNOWLEDGMENTS

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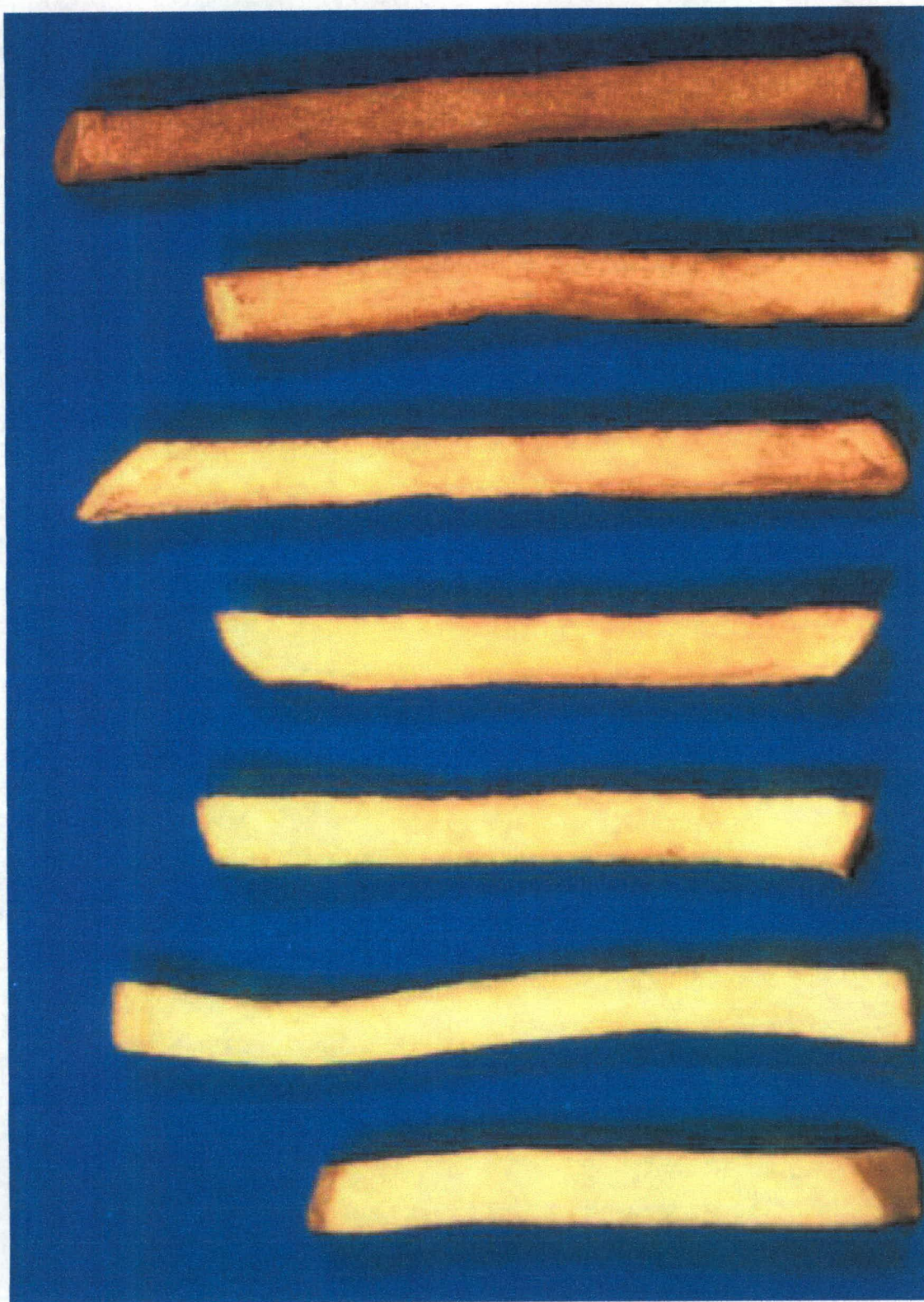
**ERRATUM**

C.C. Shock should have been listed as one of the authors of the article "Modoc: A potato variety with bright red skin and early maturity for fresh market." (Pp. 235-240, Vol 80, Number 4, July-August, 2003).

The list of authors should read:

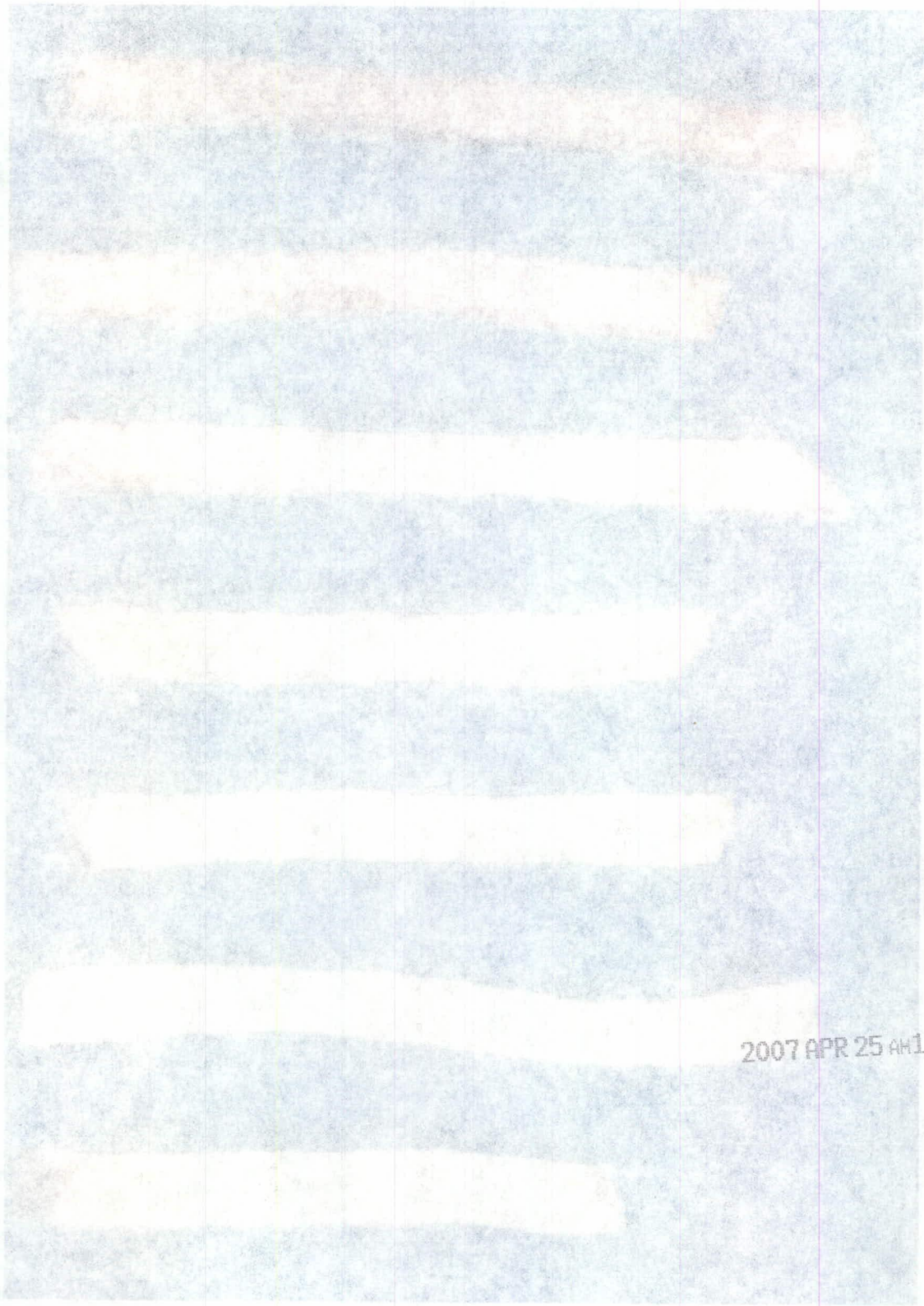
K.A. Rykbost, S.R. James, A.R. Mosley, B.A. Charlton, D.C. Hane, C.C. Shock, E. Eldredge, R. Voss, R.H. Johansen, S.L. Love, and R.E. Thornton.





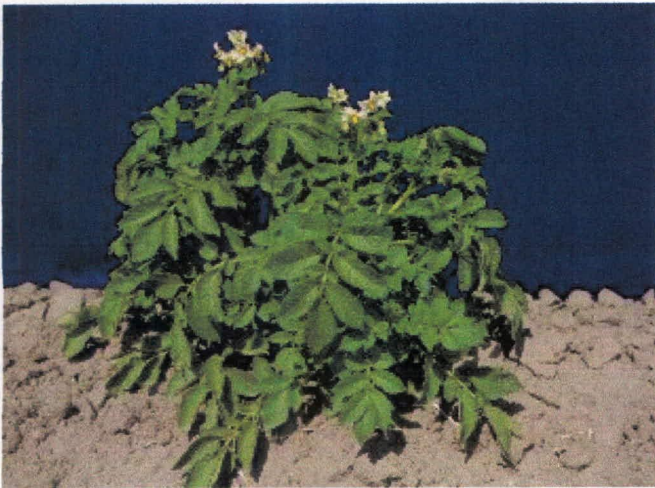
4  
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Comparison of Alturas (A82360-7) and Russet Burbank



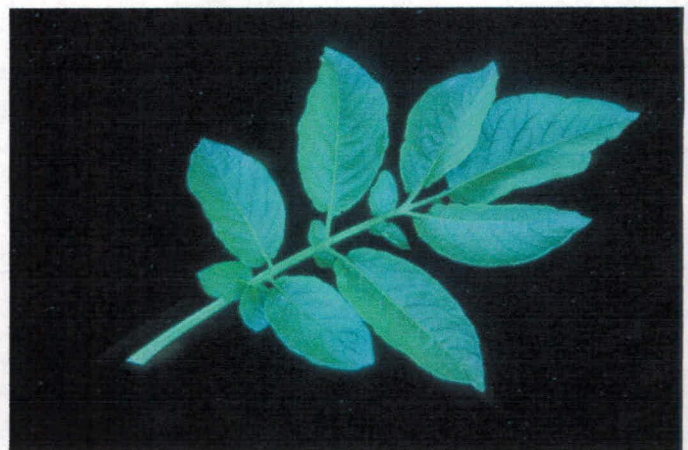
Alturas Plant



Russet Burbank Plant



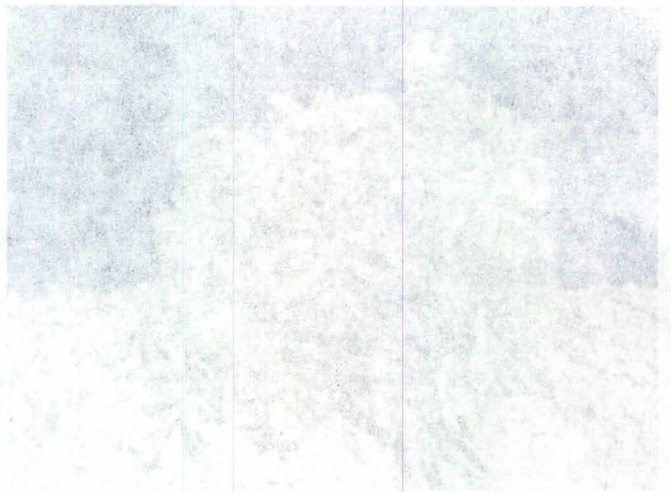
Alturas Leaf



Russet Burbank Leaf



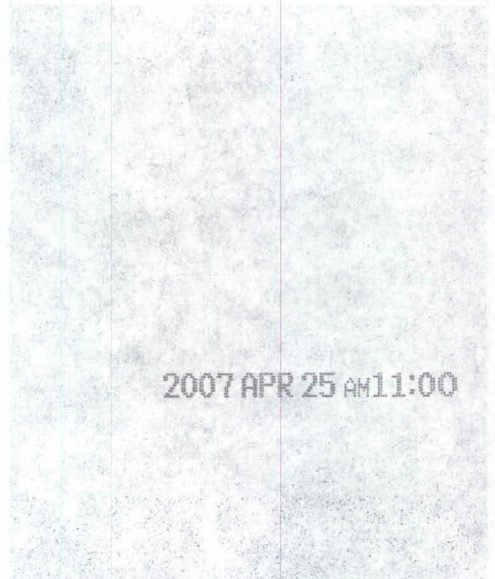
Label for plant specimen



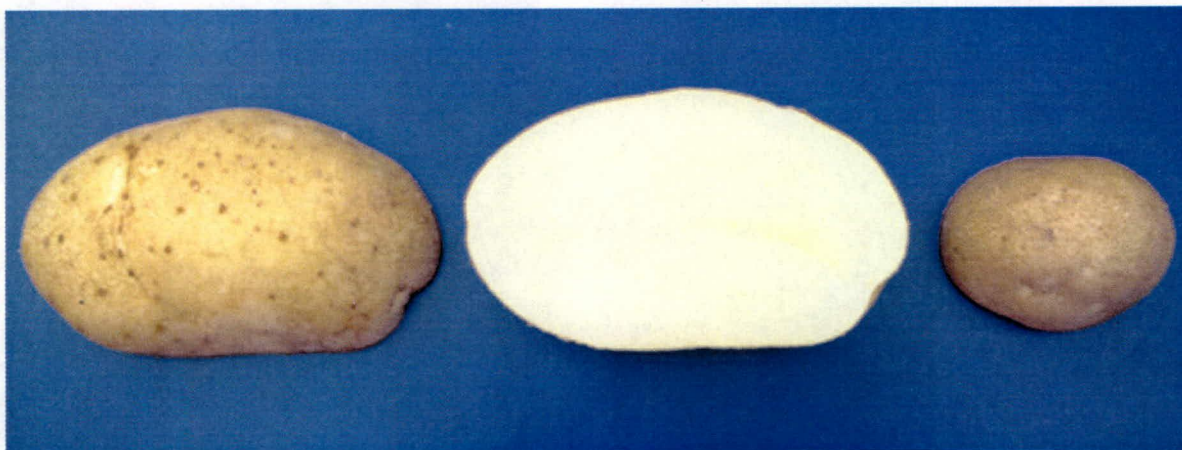
Label for plant specimen



Label for plant specimen



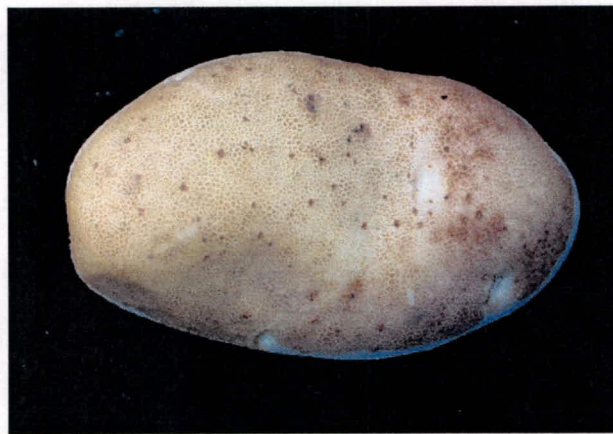
Label for plant specimen



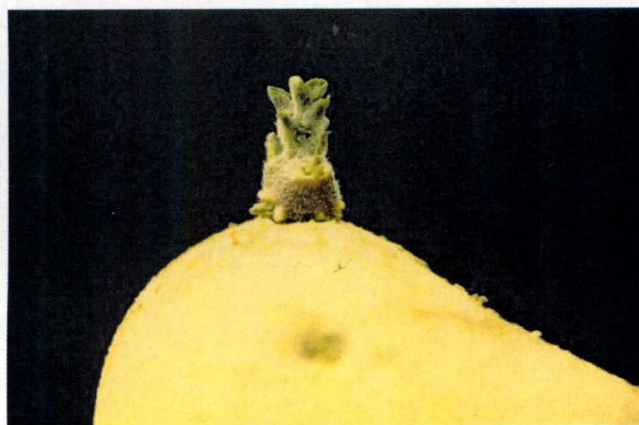
a)



b)



c)



d)

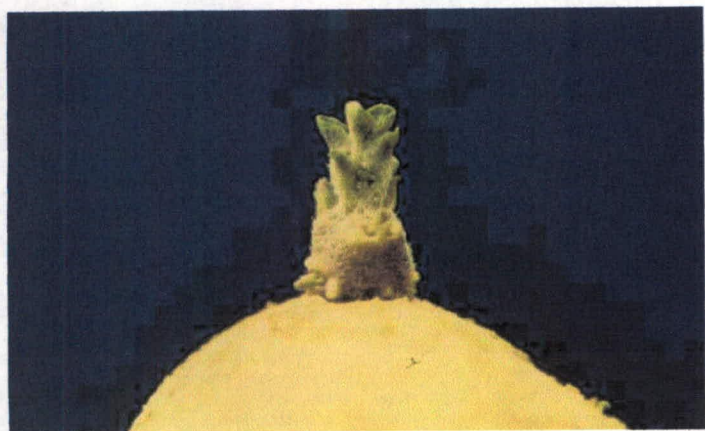


e)

Photographs of Alturas (A82360-7) showing: a) tuber flesh color, b) whole plant, c) individual tuber, d) light sprout, e) compound leaf and flower.



Comparison of Alturas (A82360-7) and Russet Burbank



Alturas Light Sprout



Russet Burbank Light Sprout

Comparison of (A) and (B) and (C) and (D)



Figure 1: Comparison of (A) and (B) and (C) and (D)



Figure 2: Comparison of (A) and (B) and (C) and (D)

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----- year=97 variety=Alturas -----

#200200158

The MEANS Procedure

Analysis Variable : fry40

N	Mean	Std Dev	Minimum	Maximum
4	2.3750000	0.4645787	1.8000000	2.8000000

----- year=97 variety=RBurbank -----

Analysis Variable : fry40

N	Mean	Std Dev	Minimum	Maximum
4	3.8750000	0.2500000	3.5000000	4.0000000

----- year=98 variety=Alturas -----

Analysis Variable : fry40

N	Mean	Std Dev	Minimum	Maximum
4	1.8500000	0.1000000	1.8000000	2.0000000

----- year=98 variety=RBurbank -----

Analysis Variable : fry40

N	Mean	Std Dev	Minimum	Maximum
4	2.7500000	0.0577350	2.7000000	2.8000000

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----- year=97 -----

The ANOVA Procedure

Class Level Information

Class	Levels	Values
year	1	97
rep	4	1 2 3 4
variety	2	Alturas RBurbank

Number of Observations Read 8  
Number of Observations Used 8

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----- year=97 -----

## The ANOVA Procedure

Dependent Variable: fry40

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	4	4.75500000	1.18875000	6.15	0.0838
Error	3	0.58000000	0.19333333		
Corrected Total	7	5.33500000			

R-Square	Coeff Var	Root MSE	fry40 Mean
0.891284	14.07030	0.439697	3.125000

Source	DF	Anova SS	Mean Square	F Value	Pr > F
rep	3	0.25500000	0.08500000	0.44	0.7414
variety	1	4.50000000	4.50000000	23.28	0.0170

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----- year=97 -----

## The ANOVA Procedure

t Tests (LSD) for fry40

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	3
Error Mean Square	0.193333
Critical Value of t	3.18245
Least Significant Difference	0.9895

Means with the same letter are not significantly different.

t Grouping	Mean	N	variety
A	3.8750	4	RBurbank
B	2.3750	4	Alturas

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----- year=98 -----

The ANOVA Procedure

Class Level Information

Class	Levels	Values
year	1	98
rep	4	1 2 3 4
variety	2	Alturas RBurbank

Number of Observations Read 8  
Number of Observations Used 8

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----- year=98 -----

## The ANOVA Procedure

Dependent Variable: fry40

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	4	1.6500000	0.4125000	123.75	0.0012
Error	3	0.0100000	0.0033333		
Corrected Total	7	1.6600000			

R-Square	Coeff Var	Root MSE	fry40 Mean
0.993976	2.510219	0.057735	2.300000

Source	DF	Anova SS	Mean Square	F Value	Pr > F
rep	3	0.0300000	0.0100000	3.00	0.1955
variety	1	1.6200000	1.6200000	486.00	0.0002

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----- year=98 -----

## The ANOVA Procedure

t Tests (LSD) for fry40

NOTE: This test controls the Type I comparisonwise error rate, not the experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	3
Error Mean Square	0.003333
Critical Value of t	3.18245
Least Significant Difference	0.1299

Means with the same letter are not significantly different.

t Grouping	Mean	N	variety
A	2.75000	4	RBurbank
B	1.85000	4	Alturas

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----- year=97 variety=Alturas -----

The UNIVARIATE Procedure  
Variable: fry40

Moments

N	4	Sum Weights	4
Mean	2.375	Sum Observations	9.5
Std Deviation	0.46457866	Variance	0.21583333
Skewness	-0.5609766	Kurtosis	-2.4781384
Uncorrected SS	23.21	Corrected SS	0.6475
Coeff Variation	19.5612068	Std Error Mean	0.23228933

Basic Statistical Measures

Location		Variability	
Mean	2.375000	Std Deviation	0.46458
Median	2.450000	Variance	0.21583
Mode	.	Range	1.00000
		Interquartile Range	0.75000

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----	
Student's t	t 10.22432	Pr >  t	0.0020
Sign	M 2	Pr >=  M	0.1250
Signed Rank	S 5	Pr >=  S	0.1250

Tests for Normality

Test	--Statistic---	-----p Value-----	
Shapiro-Wilk	W 0.916705	Pr < W	0.5186
Kolmogorov-Smirnov	D 0.257898	Pr > D	>0.1500
Cramer-von Mises	W-Sq 0.042303	Pr > W-Sq	>0.2500
Anderson-Darling	A-Sq 0.268033	Pr > A-Sq	>0.2500

Quantiles (Definition 5)

Quantile	Estimate
100% Max	2.80
99%	2.80
95%	2.80
90%	2.80
75% Q3	2.75

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----- year=97 variety=Alturas -----

The UNIVARIATE Procedure  
Variable: fry40

Quantiles (Definition 5)

Quantile	Estimate
50% Median	2.45
25% Q1	2.00
10%	1.80
5%	1.80
1%	1.80
0% Min	1.80

Extreme Observations

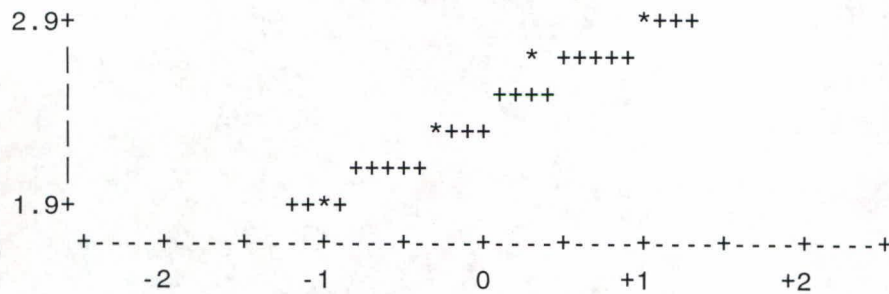
----Lowest----		----Highest---	
Value	Obs	Value	Obs
1.8	3	1.8	3
2.2	4	2.2	4
2.7	1	2.7	1
2.8	2	2.8	2

Stem Leaf	#	Boxplot
28 0	1	
26 0	1	+-----+
24		*-----*
22 0	1	+
20		+-----+
18 0	1	

-----+-----+-----+-----+

Multiply Stem.Leaf by 10\*\*-1

Normal Probability Plot



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----- year=97 variety=RBurbank -----

The UNIVARIATE Procedure  
Variable: fry40

Moments

N	4	Sum Weights	4
Mean	3.875	Sum Observations	15.5
Std Deviation	0.25	Variance	0.0625
Skewness	-2	Kurtosis	4
Uncorrected SS	60.25	Corrected SS	0.1875
Coeff Variation	6.4516129	Std Error Mean	0.125

Basic Statistical Measures

Location		Variability	
Mean	3.875000	Std Deviation	0.25000
Median	4.000000	Variance	0.06250
Mode	4.000000	Range	0.50000
		Interquartile Range	0.25000

Tests for Location: Mu0=0

Test	-Statistic-		-----p Value-----
Student's t	t	31	Pr >  t  <.0001
Sign	M	2	Pr >=  M  0.1250
Signed Rank	S	5	Pr >=  S  0.1250

Tests for Normality

Test	--Statistic--		-----p Value-----
Shapiro-Wilk	W	0.629776	Pr < W 0.0012
Kolmogorov-Smirnov	D	0.441462	Pr > D <0.0100
Cramer-von Mises	W-Sq	0.162472	Pr > W-Sq 0.0090
Anderson-Darling	A-Sq	0.826838	Pr > A-Sq 0.0075

Quantiles (Definition 5)

Quantile	Estimate
100% Max	4.00
99%	4.00
95%	4.00
90%	4.00
75% Q3	4.00

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----- year=97 variety=RBurbank -----

The UNIVARIATE Procedure  
Variable: fry40

Quantiles (Definition 5)

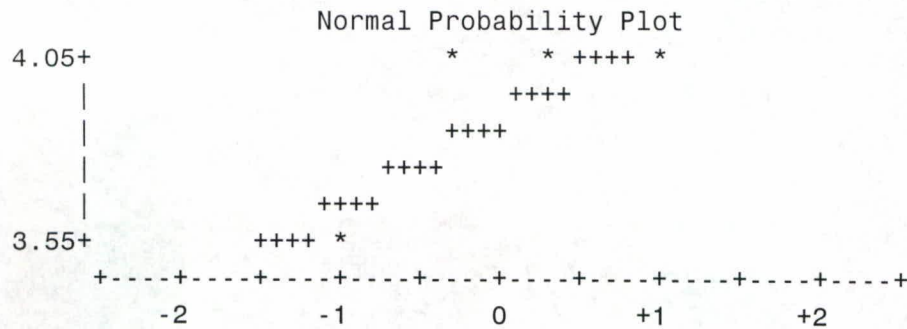
Quantile	Estimate
50% Median	4.00
25% Q1	3.75
10%	3.50
5%	3.50
1%	3.50
0% Min	3.50

Extreme Observations

----Lowest----		----Highest---	
Value	Obs	Value	Obs
3.5	5	3.5	5
4.0	8	4.0	6
4.0	7	4.0	7
4.0	6	4.0	8

Stem Leaf	#	Boxplot
40 000	3	+-----+
39		
38		+
37		+-----+
36		
35 0	1	

-----+-----+-----+-----+  
Multiply Stem.Leaf by 10\*\* -1



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----- year=98 variety=Alturas -----

The UNIVARIATE Procedure  
Variable: fry40

Moments

N	4	Sum Weights	4
Mean	1.85	Sum Observations	7.4
Std Deviation	0.1	Variance	0.01
Skewness	2	Kurtosis	4
Uncorrected SS	13.72	Corrected SS	0.03
Coeff Variation	5.40540541	Std Error Mean	0.05

Basic Statistical Measures

Location		Variability	
Mean	1.850000	Std Deviation	0.10000
Median	1.800000	Variance	0.01000
Mode	1.800000	Range	0.20000
		Interquartile Range	0.10000

Tests for Location: Mu0=0

Test	-Statistic-		-----p Value-----
Student's t	t	37	Pr >  t  <.0001
Sign	M	2	Pr >=  M  0.1250
Signed Rank	S	5	Pr >=  S  0.1250

Tests for Normality

Test	--Statistic--		-----p Value-----
Shapiro-Wilk	W	0.629776	Pr < W 0.0012
Kolmogorov-Smirnov	D	0.441462	Pr > D <0.0100
Cramer-von Mises	W-Sq	0.162472	Pr > W-Sq 0.0090
Anderson-Darling	A-Sq	0.826838	Pr > A-Sq 0.0075

Quantiles (Definition 5)

Quantile	Estimate
100% Max	2.0
99%	2.0
95%	2.0
90%	2.0
75% Q3	1.9

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----- year=98 variety=Alturas -----

The UNIVARIATE Procedure  
Variable: fry40

Quantiles (Definition 5)

Quantile	Estimate
50% Median	1.8
25% Q1	1.8
10%	1.8
5%	1.8
1%	1.8
0% Min	1.8

Extreme Observations

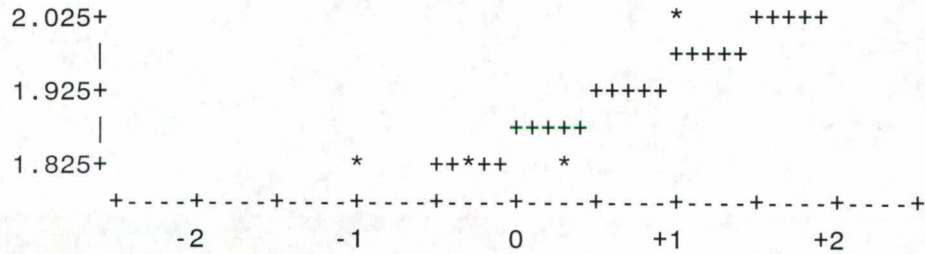
----Lowest----		----Highest---	
Value	Obs	Value	Obs
1.8	12	1.8	9
1.8	11	1.8	11
1.8	9	1.8	12
2.0	10	2.0	10

Stem Leaf	#	Boxplot
20 0	1	
19		
19		+-----+
18		+
18 000	3	*-----*

-----+-----+-----+-----+

Multiply Stem.Leaf by 10\*\*-1

Normal Probability Plot



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----- year=98 variety=RBurbank -----

The UNIVARIATE Procedure  
Variable: fry40

Moments

N	4	Sum Weights	4
Mean	2.75	Sum Observations	11
Std Deviation	0.05773503	Variance	0.00333333
Skewness	0	Kurtosis	-6
Uncorrected SS	30.26	Corrected SS	0.01
Coeff Variation	2.09945552	Std Error Mean	0.02886751

Basic Statistical Measures

Location		Variability	
Mean	2.750000	Std Deviation	0.05774
Median	2.750000	Variance	0.00333
Mode	2.700000	Range	0.10000
		Interquartile Range	0.10000

NOTE: The mode displayed is the smallest of 2 modes with a count of 2.

Tests for Location: Mu0=0

Test	-Statistic-	-----p Value-----
Student's t	t 95.26279	Pr >  t  <.0001
Sign	M 2	Pr >=  M  0.1250
Signed Rank	S 5	Pr >=  S  0.1250

Tests for Normality

Test	--Statistic--	-----p Value-----
Shapiro-Wilk	W 0.728634	Pr < W 0.0239
Kolmogorov-Smirnov	D 0.306762	Pr > D >0.1500
Cramer-von Mises	W-Sq 0.096221	Pr > W-Sq 0.0903
Anderson-Darling	A-Sq 0.576024	Pr > A-Sq 0.0473

Quantiles (Definition 5)

Quantile	Estimate
100% Max	2.80
99%	2.80
95%	2.80

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#200200158

----- year=98 variety=RBurbank -----

The UNIVARIATE Procedure  
Variable: fry40

Quantiles (Definition 5)

Quantile	Estimate
90%	2.80
75% Q3	2.80
50% Median	2.75
25% Q1	2.70
10%	2.70
5%	2.70
1%	2.70
0% Min	2.70

Extreme Observations

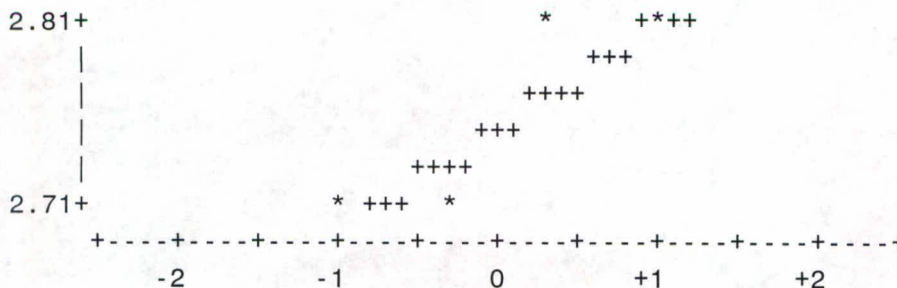
----Lowest----		----Highest---	
Value	Obs	Value	Obs
2.7	15	2.7	13
2.7	13	2.7	15
2.8	16	2.8	14
2.8	14	2.8	16

Stem Leaf	#	Boxplot
280 00	2	+-----+
278		
276		
274		*-+-*
272		
270 00	2	+-----+

-----+-----+-----+

Multiply Stem.Leaf by 10\*\*-2

Normal Probability Plot

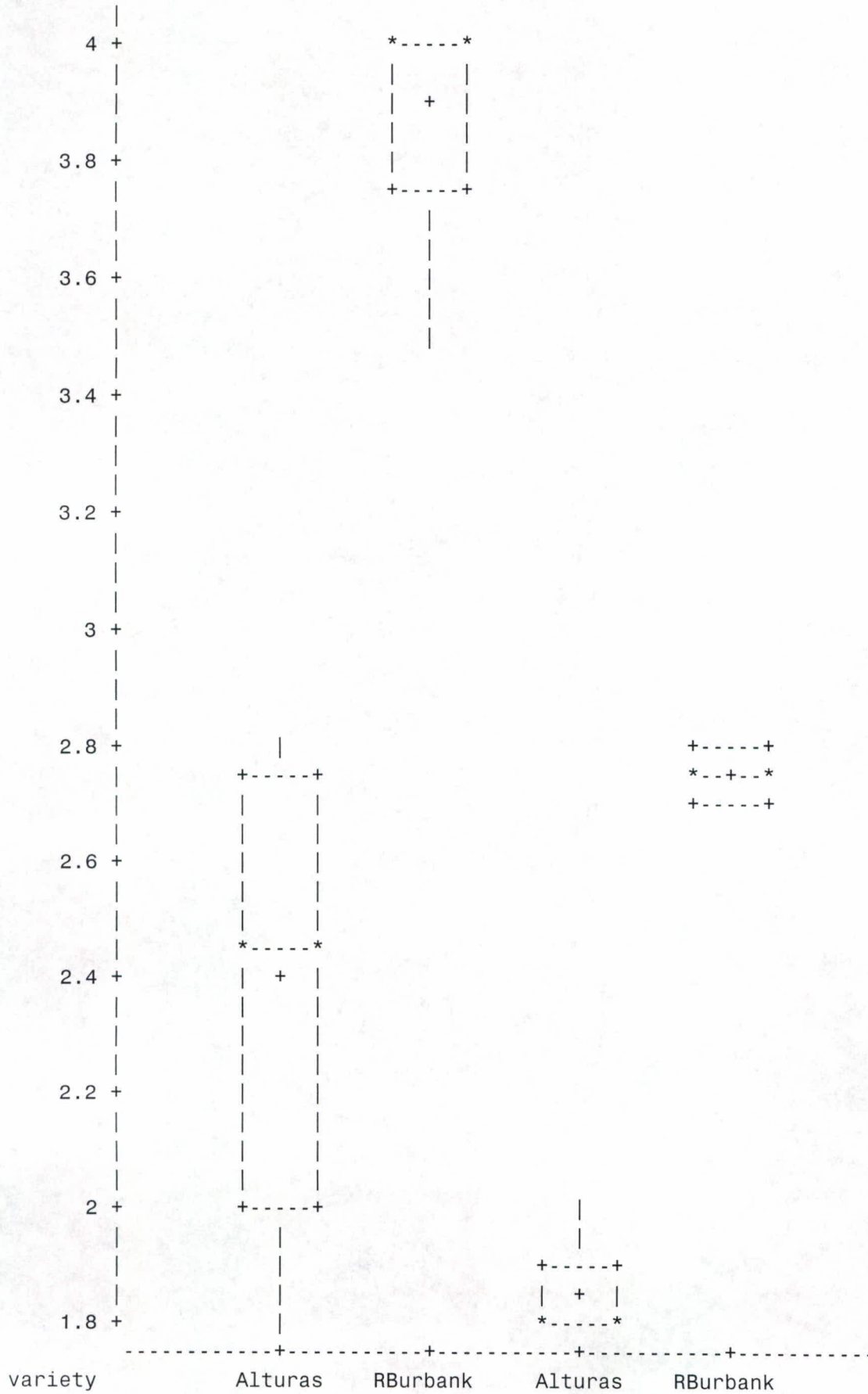


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#200200158

The UNIVARIATE Procedure  
Variable: fry40

Schematic Plots



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The UNIVARIATE Procedure  
Variable: fry40

#200200158

Schematic Plots

year

97

97

98

98

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U.S. DEPARTMENT OF AGRICULTURE  
 AGRICULTURAL MARKETING SERVICE

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

**EXHIBIT E**  
**STATEMENT OF THE BASIS OF OWNERSHIP**

1. NAME OF APPLICANT(S)  University of Idaho	2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER A82360-7	3. VARIETY NAME Alturas
4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP, and Country) Idaho Agricultural Experiment Station University of Idaho Moscow, ID 83844	5. TELEPHONE (Include area code) 208-397-4181	6. FAX (Include area code) 208-397-4311
7. PVPO NUMBER 200200158		

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

9. Is the applicant (individual or company) a U.S. national or a U.S. based company? If no, give name of country.  YES  NO

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

a. If the original rights to variety were owned by individual(s), is (are) the original owner(s) a U.S. National(s)?  YES  NO If no, give name of country

b. If the original rights to variety were owned by a company(ies), is (are) the original owner(s) a U.S. based company?  YES  NO If no, give name of country

11. Additional explanation on ownership (Trace ownership from original breeder to current owner. Use the reverse for extra space if needed):  
 The University of Idaho collaborated with the USDA/ARS, Oregon State University, and Washington State University in developing this variety. Under an internal "Tri-State" agreement, the University of Idaho is considered the owner of record and represents the other institutions.

**PLEASE NOTE:**

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

1. If the rights to the variety are owned by the original breeder, that person must be a U.S. national, national of a UPOV member country, or national of a country which affords similar protection to nationals of the U.S. for the same genus and species.
2. If the rights to the variety are owned by the company which employed the original breeder(s), the company must be U.S. based, owned by nationals of a UPOV member country, or owned by nationals of a country which affords similar protection to nationals of the U.S. for the same genus and species.
3. If the applicant is an owner who is not the original owner, both the original owner and the applicant must meet one of the above criteria.

The original breeder/owner may be the individual or company who directed the final breeding. See Section 41(a)(2) of the Plant Variety Protection Act for definitions.

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0581-0055. The time required to complete this information collection is estimated to average 0.1 hour per response, including the time for reviewing the instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

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To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 14th and Independence Avenue, SW, Washington, D.C. 20250-9410 or call (202) 720-5964 (voice and TDD). USDA is an equal opportunity provide and employer.

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**Voucher Sample Statement****Variety:** Alturas**Owner:** University of Idaho

Plantlets of Alturas will be maintained *in vitro* in the University of Idaho tissue culture facility located in the Department of Plant, Soil, and Entomological Sciences in Moscow, Idaho. Additional samples are available for shipment to a site indicated by the PVP office.

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**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)  University of Idaho	ADDRESS (Street and No. or RD No., City, State, and Zip Code and Country)  Idaho Agricultural Experiment Station University of Idaho Moscow, ID 83844	TEMPORARY OR EXPERIMENTAL DESIGNATION A82360-7  VARIETY NAME Alturas
NAME OF OWNER REPRESENTATIVE (S)  University of Idaho	ADDRESS (Street and No. or RD No., City, State, and Zip Code and Country)  Idaho Agricultural Experiment Station University of Idaho Moscow, ID 83844	FOR OFFICIAL USE ONLY  PVP NUMBER #200200158

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.

Deposited in the University of Idaho Potato Germplasm Bank.

  
 \_\_\_\_\_  
 Signature

23 Apr 07  
 \_\_\_\_\_  
 Date

2007 APR 25 AM 11:01