No. 200300288

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Texas Agricultural Experiment Station

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED DISTINCT VARIETY OF SEXUALLY REPRODUCED, OR TUBER PROPAGATED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF TWENTY YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR IMPORTING IT, OR EXPORTING IT, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE ABOVE PURPOSES, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

POTATO

'Russet Norkotah 296'

Reissuance original grant, September 17, 2004

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 fifth day of August, in the year two thousand and eight.

Attest:

Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

Secretary of Agriculture

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

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

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

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

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

1. NAME OF OWNER
Texas Agricultural Experiment Station

2. TEMPORARY DESIGNATION OR EXPERIMENTAL NAME
TXNS 296

3. VARIETY NAME
Russet ~~Norkotah 296~~

4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP Code, and Country)
Frank E. Gilstrap
Associate Agency Director, TAES
2147 TAMU
College Station, TX 77843-2147

5. TELEPHONE (include area code)
979-845-4747

6. FAX (include area code)
979-458-4765

FOR OFFICIAL USE ONLY
PVPO NUMBER
200300288
FILING DATE
July 22, 2003

7. IF THE OWNER NAMED IS NOT A "PERSON", GIVE FORM OF ORGANIZATION (corporation, partnership, association, etc.)
State of Texas Research Agency

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)
Janie Hurley
Technology Licensing Manager, Agriculture/Life Sciences
Technology Licensing Office
The Texas A&M University System
3369 TAMU
College Station, TX 77843-3369

FEES RECEIVED
FILING AND EXAMINATION FEES: $ 3652.00 — 2nd EXAM $3,864.00
DATE 7/22/2003 — 8-23-07
CERTIFICATION FEE: $ 432.00 — $768.00
DATE 7/6/2004 — 4-23-08

11. TELEPHONE (Include area code)
979-847-8682

12. FAX (Include area code)
979-845-1402

13. E-MAIL
jhurley@tamu.edu

14. CROP KIND (Common Name)
Potato

15. GENUS AND SPECIES NAME OF CROP
Solanum tuberosum (L.)

16. FAMILY NAME (Botanical)
Solanaceae

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

18. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED (Follow instructions on reverse)
a. ☒ Exhibit A. Origin and Breeding History of the Variety
b. ☒ Exhibit B. Statement of Distinctness
c. ☒ Exhibit C. Objective Description of Variety
d. ☒ Exhibit D. Additional Description of the Variety *(Optional)*
e. ☒ Exhibit E. Statement of the Basis of the Owner's Ownership
f. ☒ 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. ☒ Filing and Examination Fee ($3,652), 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* ~~BOA~~ 6/3/04
☒ YES *(If "yes", answer items 20 and 21 below)* ☒ NO *(If "no", go to item 22)*

20. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF CLASSES? ☒ YES ☐ NO
IF YES, WHICH CLASSES? ☐ FOUNDATION ☐ REGISTERED ☒ CERTIFIED

21. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS? ☒ YES ☐ NO
IF YES, SPECIFY THE NUMBER 1,2,3, etc. FOR EACH CLASS.
☐ FOUNDATION ☐ REGISTERED [6] CERTIFIED
(If additional explanation is necessary, please use the space indicated on the reverse.)

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?
☒ YES ☐ NO
IF YES, YOU MUST PROVIDE THE DATE OF FIRST SALE, DISPOSITION, TRANSFER, OR USE FOR EACH COUNTRY AND THE CIRCUMSTANCES. *(Please use space indicated on reverse.)*

23. IS THE VARIETY OR ANY COMPONENT OF THE VARIETY PROTECTED BY INTELLECTUAL PROPERTY RIGHT *(PLANT BREEDER'S RIGHT OR PATENT)*?
☐ YES ☒ NO
IF YES, PLEASE GIVE COUNTRY, DATE OF FILING OR ISSUANCE AND ASSIGNED REFERENCE NUMBER. *(Please use space indicated on reverse.)*

24. The owners declare that a viable sample of basic seed of the variety has been furnished with application and will be replenished upon request in accordance with such regulations as may be applicable, or for a tuber propagated variety a tissue culture will be deposited in a public repository and maintained for the duration of the certificate.

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

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

SIGNATURE OF OWNER		SIGNATURE OF OWNER	
[signature]			
NAME (Please print or type)		NAME (Please print or type)	
Frank E. Gilstrap			
CAPACITY OR TITLE	DATE	CAPACITY OR TITLE	DATE
Assoc. Agency Director, TAES	7/9/03		

ST-470 (02-10-2003) designed by the Plant Variety Protection Office using Word 2000. Replaces former versions of ST-470, which are obsolete. *(See reverse for instructions and information collection burden statement)*

INSTRUCTIONS 200300288

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 unfiled. 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/pvp.htm

ITEM

18a. 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

18b. 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.

18c. 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.

18d. 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.*

18e. 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.

19. 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).*

22. *See Sections 41, 42, and 43 of the Act and Section 97.5 of the regulations for eligibility requirements.*

23. *See Section 55 of the Act for instructions on claiming the benefit of an earlier filing date.*

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

22. 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.)*

January 1, 2003, United States - First commercial sale of TXNS 296.

23. 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).)*

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. There is no charge for filing a change of address. The fee for filing a change of 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.)*

To avoid conflict with other variety names in use, the applicant must check the appropriate recognized authority. For example, for agricultural and vegetable crops, contact: Seed Branch, AMS, USDA, Room 213, Building 306, Beltsville Agricultural Research Center--East, Beltsville, MD 20705. Telephone: (301) 504-8089. http://www.ams.usda.gov/lsg/seed.htm

Exhibit A. Origin and Breeding History of the Variety.

Potato improvement through strain (sub-clonal, intraclonal, or line) selection within a variety has been practiced for years with several notable successes, including Russet Burbank from Burbank. Other examples include Red LaSoda from LaSoda (Miller, 1954) and Red Norland and Dark Red Norland from Norland. This form of potato improvement was thoroughly reviewed by Miller *et al.* (1995). The potato industry in Texas, as well as several other states, benefited from strain selection within Norgold Russet, with the introduction in the 1970s of Norgold Russet Strain M. (Lever *et al.*, 1994). Norgold Russet M possesses stronger vines and produces yields more than 20% higher than the standard Norgold Russet; therefore, it became the predominant russet variety grown in Texas and several other early-russet production areas (Miller *et al.*, 1995). Because of its stronger vines, Norgold Russet M was better able to withstand the hot desiccating winds and hail commonly encountered in West Texas, the primary russet production area in Texas.

With the introduction of Russet Norkotah (standard Russet Norkotah) in 1987 (Johansen *et al.*, 1988), it quickly became apparent that Russet Norkotah would replace Norgold Russet as the early-market russet variety of choice in the United States. By 1997, Russet Norkotah had become the second most popular variety in the U.S., with over 23,000 acres of certified seed grown in the U.S. and Canada (National Potato Council, 1998). The rapid acceptance of Russet Norkotah was due to many factors, including its attractive uniform tubers and high percentage of count carton tubers, as well as good storability for an early russet and resistance to second growth and hollow heart. Also, this new variety was superbly marketed to the industry. For these reasons, buyers began to demand Russet Norkotah rather than Norgold Russet. Therefore, if the early russet producing areas, including Texas, were to remain competitive they needed to grow the Russet Norkotah variety.

While Russet Norkotah has many desirable features, it is not perfect. Most notably, it possesses weak vines, is susceptible to most viruses, especially PVY and verticillium wilt, and requires considerable input of nitrogen fertilizer and pesticides. Russet Norkotah can be an unforgiving variety to grow. Based on the Norgold Russet experience, it was obvious that improved Russet Norkotah strains with stronger vines would be required. Furthermore, the urgency of the situation dictated that if this task were to be accomplished in a timely manner, it could not simply be left for seedsmen, but that the Texas Potato Variety Development Program must take leadership in the strain development effort. **The objectives of the Texas Russet Norkotah Strain (TXNS) selection and development project were to select, evaluate, and identify improved strains of Russet Norkotah with stronger vines and superior yield potential resulting in an enhanced ability to produce profitable yields under hail and hot desiccating wind conditions commonly encountered in Texas. Thus, the primary selection criteria throughout the development of 'Russet Norkotah 296' was vine strength and superior yield potential.**

A Russet Norkotah strain selection project was initiated in 1989 by Dr. J. Creighton Miller, Jr. of the Texas Agricultural Experiment Station, Texas A&M University System, as a component of the Texas Potato Variety Development Program (Miller *et al.*,1999). In that year, Dr. Miller selected 192 giant hill and/or tall type plants from seedsmen or commercial Russet Norkotah fields in Colorado, and 183 were selected from commercial fields in Texas. In 1990, the 375 clones (hills) were divided and half of the seed were planted near Springlake, TX, with the other half planted some 100 miles to the south near Seminole, TX. Dramatic differences in vine size were observed. Mechanical seed mixtures were eliminated. Selection pressure from 1990 forward was primarily for tuber type and yield, virtually ignoring plant vigor. The growing season in Seminole was marked by exceptionally high temperatures and hot desiccating winds, accompanied by drought stress. The plants at Springlake, while also grown in a hot environment, received adequate moisture. Based on performance at both Seminole and Springlake, some 58 of the 375 selections were kept for planting in 1991. In 1991, the seed of the surviving clones was divided, with half planted near Springlake, TX, and half planted in the Texas A&M University potato breeding nursery near Hooper, CO. Again, selection was primarily for yield and tuber-type, and 43 of the 58 clones were retained based on performance at both locations. In 1992, the 43 clones, 26 originally selected in Colorado in 1989 and 17 originally selected in Texas, in 1989, were planted. Based on their performance in both Colorado and Texas, 13 clones were kept through 1997, 4 originally from Colorado and 9 originally from Texas. By 1998, 6 clones remained, all originally selected in Texas, including 'Russet Norkotah 296' ('Russet Norkotah 296', TXNS 296). Replicated trials (four replications and 25 plants per replicate) were first conducted in Springlake, Texas and Hooper, Colorado from 1992-94 (Table 1). Both sites are sandy loam soils, with Tivoli fine sand in TX and Gunbarrel slightly sandy loam in CO. Hooper, CO is located at a latitude of 37.7° N with an elevation of 7,700 feet (2,348m), while Springlake, TX is at 34.1° N with an elevation of 3,682 feet (1,123m), but both are considered mid-latitudes climactically. Because both sites are at relatively high elevations, there is considerable day/night temperature variation, especially in Hooper. Average day temperatures during the latter part of the growing season are about 10° F (6° C) higher than the Texas site. Planting occurred between March 15 - April 10 in Texas and between May 10 - 20 in Colorado. Harvest dates were between August 10 - 20 in Texas and between September 25 - October 10 in Colorado.

Row spacing was 36 in (91 cm) and 34 in (86 cm) between rows, with 9 in (23 cm) and 12 in (30 cm) within rows in Texas and Colorado, respectively. All plantings were in commercial fields under center pivot sprinkler irrigation with four replications, and standard cultural practices for the respective areas were used. Details for each year's planting can be found in the West Texas Vegetable Breeding Newsletter, Potatoes (Miller and Smallwood, 1976-1996) and in the Texas Potato Breeding Report (Miller et al.,1998-2002).

Even though the check Russet Norkotah seed used in these trials had been certified as virus free, 'Russet Norkotah 296' still consistently out-yielded standard Russet Norkotah. Beginning in 1992, virus eradication procedures were initiated on 'Russet Norkotah 296' in the Texas Potato Variety Development Program Laboratory at College Station, because it had become contaminated with several viruses including PVS, PVY, PVX, and PLRV (Zapata *et al.,* 1995). Virus-free tissue culture plantlets were provided, under a memorandum of understanding, to Valley Tissue Culture, Halstad, MN, for mass increase and subsequent distribution to selected seed growers in Colorado for research and evaluation purposes, also under a memorandum of understanding.

Testing continued in Springlake and Dalhart, TX through 2002 using certified seed of standard Russet Norkotah and 'Russet Norkotah 296' with example results shown in Tables 2a, 2b, and 2c. Virus-free 'Russet Norkotah 296' was also entered in the Western Regional Trials in 1999, 2000, and 2001 (Exhibit D, Attachment 1), (Novy *et al.*, 1999, 2000, and 2001). These trials consisted of an early harvest at the following sites: Kern County, CA; Clovis, NM; Hermiston, OR; Malheur, OR; Springlake, TX; Dalhart, TX; Pasco, WA, and Othello, WA and a late harvest at: Tulelake, CA; Center, CO; Aberdeen and Kimberly, ID; Farmington, NM; Hermiston, Klamath Falls, and Malheur, OR; and Othello or Warden, WA).

'Russet Norkotah 296' was observed from 1989-2007 for 18 generations in 15+ locations and was determined to be genetically uniform and stable from generation to generation with no evidence of variants. See paper published in Amer. J. of Potato Res. (1999) 76:161-167 in Exhibit D.

Exhibit B. Novelty Statement.

Based on overall morphology, 'Russet Norkotah 296' is most similar to standard Russet Norkotah. 'Russet Norkotah 296' most clearly differs from standard Russet Norkotah in the following traits:

Trait	'Russet Norkotah 296'	Standard Russet Norkotah	Location of Evidence
Vigor (1=poor, 5=very vigorous)	3.7	3.0	Fig 1 and 2, Table 1c
Maturity (1=very early, 5=very late)	3.6	2.1	Fig 1, Table 1c
Vine Size (1=very small, 5=very large)	3.8	2.7	Fig 1 and 2, Table 1c
Percent Dead Vines (at vine kill)	20.7	75.2	Table 1c

Texas Table 1c. Average number of tubers per plant, average tuber weight, average number of stems per plant, percent stand 40 days after planting, percent stand 60 days after planting, plant characteristics and percent dead vines at vine kill of Russet Norkotah 296 and standard Russet Norkotah grown near Springlake and Dalhart, Texas-2000-2002.

Variety or Selection	Average Number Tubers/ Plant	Average Tuber Weight In oz.	Average Number Stems/ Plant	Percent Stand 40 DAP	Percent Stand 60 DAP	Plant Characteristics: Plant Type[1]	Plant Characteristics: Vigor[2]	Plant Characteristics: Maturity[3]	Plant Characteristics: Vine Size[4]	Percent Dead Vines
Dalhart - 2002										
TXNS296	6.8	9.3	2.4	98	100	2.0	**3.7**	**3.7**	**3.7**	**17**
Russet Norkotah	6.9	6.3	2.5	98	98	2.2	**3.0**	**2.5**	**3.0**	**57**
L.S.D. (.05)	ns	2.7	ns	ns	ns	ns	**0.6**	**0.6**	**0.6**	**32**
WR Springlake - 2002										
TXNS296	4.5	7.7	2.4	75	95	2.0	**3.9**	**3.9**	**4.4**	**13**
Russet Norkotah	3.9	7.6	1.8	57	97	2.0	**3.0**	**2.4**	**2.8**	**86**
L.S.D. (.05)	0.5	ns	0.2	ns	ns	ns	**0.6**	**0.6**	**0.4**	**19**
WR Springlake - 2001										
TXNS296	4.3	6.7	2.2	93	97	2.3	**3.7**	**3.2**	**3.2**	**29**
Russet Norkotah	3.5	6.3	1.6	92	96	2.0	**2.8**	**2.0**	**2.1**	**65**
L.S.D. (.05)	0.4	ns	ns	ns	ns	ns	**0.6**	**1.0**	**0.7**	**23**
WR Springlake - 2000										
TXNS296	3.7	7.7	2.8	75	99	1.5	**3.7**	**3.8**	**3.8**	**25**
Russet Norkotah	3.5	6.8	1.9	70	95	1.3	**3.0**	**1.4**	**3.0**	**93**
L.S.D. (.05)	ns	1.3	ns	ns	ns	ns	**0.5**	**0.7**	**0.6**	**20**
Average across years (2000-2002)										
TXNS296	4.8	7.9	2.5	85.2	97.8	1.9	**3.7**	**3.6**	**3.8**	**20.7**
Russet Norkotah	4.4	6.8	2.0	79.3	96.8	1.9	**3.0**	**2.1**	**2.7**	**75.2**

[1] 1= upright, 2= semiprostrate, 3= prostrate
[2] 1= poor, 2= fair, 3= medium, 4= vigorous, 5= very vigorous
[3] 1= very early, 2= early, 3= medium, 4=late, 5= very late
[4] 1=very small, 2=small, 3=medium, 4=large, 5=very large
[5]Includes only data for the years that it was available

#200300288

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#200300288

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

Exhibit C

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

INSTRUCTIONS

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

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

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

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

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

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

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

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

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

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

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

Quality characteristics should be described according to the market use.

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

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

Legend:

V = Application Variety

R1-R4 = Reference Varieties

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

NAME OF APPLICANT (S)	TEMPORARY OR EXPERIMENTAL DESIGNATION	VARIETY NAME
Texas Agricultural Experiment Station	TXNS 296	Russet Norkotah 296

ADDRESS (Street and No. or RD No., City, State, Zip Code, and Country)	FOR OFFICIAL USE ONLY PVPO NUMBER
Frank E. Gilstrap Associate Agency Director, TAES 2147 TAMU College Station, TX 77843-2147	#200300288

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)
Russet Norkotah 296	Russet Norkotah			

PLEASE READ ALL INSTRUCTIONS CAREFULLY:

1. MARKET CHARACTERISTICS:

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

V	R1	R2	R3	R4
5	5			

2. LIGHT SPROUT CHARACTERISTICS: (See Figure 1)

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

V	R1	R2	R3	R4
3	4			

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

V	R1	R2	R3	R4
2	2			

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

V	R1	R2	R3	R4
2	2			

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

V	R1	R2	R3	R4
4	4			

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

V	R1	R2	R3	R4
1	1			

2. LIGHT SPROUT CHARACTERISTICS: (continued)

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

V	R1	R2	R3	R4
3	3			

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

V	R1	R2	R3	R4
2	2			

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

V	R1	R2	R3	R4
2	2			

LIGHT SPROUT ROOT INITIALS: FREQUENCY
1 = Short 2 = Medium 3 = Long

V	R1	R2	R3	R4
1	1			

3. PLANT CHARACTERISTICS:

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

V	R1	R2	R3	R4
5	5			

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

V	R1	R2	R3	R4
2	2			

MATURITY: Days after planting (DAP) at vine senescence

V	R1	R2	R3	R4
120	90			

PLANTING DATE:

V	R1	R2	R3	R4
3-29	3-29			

***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	R1	R2	R3	R4
5	5			

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	R1	R2	R3	R4
4	1			

4. STEM CHARACTERISTICS: Measure at early first bloom

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

V	1	R1	1	R2		R3		R4	

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

V	3	R1	4	R2		R3		R4	

5. LEAF CHARACTERISTICS:

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

V	3	R1	4	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	147A	R1	137B	R2		R3		R4	

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

V	2	R1	2	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	6	R1	4	R2		R3		R4	

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

V	1	R1	1	R2		R3		R4	

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

V	6	R1	3	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	2.5	R1	2	R2		R3		R4	

5. LEAF CHARACTERISTICS: (continued)

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

V	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 Asymmetrically Obtu

V	4	R1	7	R2		R3		R4	

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

V	3	R1	3	R2		R3		R4	

NUMBER OF PRIMARY LEAFLET PAIRS: (See Figure 6)

AVERAGE:

V	4	R1	3	R2		R3		R4	

RANGE:

V	3 to 6	R1	3 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	2	R2		R3		R4	

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

V	3.5	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	2	R1	1	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	4	R1	4	R2		R3		R4	

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

AVERAGE:

V	13	R1	14	R2		R3		R4	

RANGE:

V	10 to 16	R1	8 to 19	R2	to	R3	to	R4	to

5. **LEAF CHARACTERISTICS**: (continued)

NUMBER OF INFLORESCENCE/PLANT:

AVERAGE:

V	R1	R2	R3	R4
4	3.2			

RANGE:

V	R1	R2	R3	R4
2 to 6	2 to 4	to	to	to

NUMBER OF FLORETS/INFLORESCENCE:

AVERAGE:

V	R1	R2	R3	R4
11.1	8.9			

RANGE:

V	R1	R2	R3	R4
7 to 17	6 to 12	to	to	to 4

*** 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	R1	R2	R3	R4
155C	192D			

*** 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	R1	R2	R3	R4
155C	155C			

*** 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	R1	R2	R3	R4
1	1			

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

V	R1	R2	R3	R4
3.5	5			

6. **INFLORESCENCE CHARACTERISTICS:**

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

V	R1	R2	R3	R4
1	1			

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	R1	R2	R3	R4
15A	17B			

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

V	R1	R2	R3	R4
2	2			

6. **INFLORESCENCE CHARACTERISTICS**: (continued)

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

V	3	R1	3	R2		R3		R4	

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

V	1	R1	1	R2		R3		R4	

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

V	137A	R1	137A	R2		R3		R4	

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

V	1	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	6	R1	6	R2		R3		R4	

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

V	199A	R1	199A	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 = Netted 4 = Russetted 5 = Heavily russetted 6 = Other _________________________

V	4.5	R1	5	R2		R3		R4	

7. **TUBER CHARACTERISTICS**: (continued)

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

V	R1	R2	R3	R4
4.5	4.5			

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

V	R1	R2	R3	R4
3	2			

TUBER LENGTH (mm):

AVERAGE:

V	R1	R2	R3	R4
112	86			

RANGE:

V	R1	R2	R3	R4
90 to 114	79 to 96	to	to	to

STANDARD DEVIATION:

V	R1	R2	R3	R4
16.9	5.7			

AVERAGE WEIGHT OF SAMPLE TAKEN:

V	R1	R2	R3	R4
195	128			

TUBER WIDTH (mm)

AVERAGE:

V	R1	R2	R3	R4
59	53			

RANGE:

V	R1	R2	R3	R4
48 to 65	46 to 59	to	to	to

STANDARD DEVIATION:

V	R1	R2	R3	R4
5.5	3.9			

AVERAGE WEIGHT OF SAMPLE TAKEN (g):

V	R1	R2	R3	R4
195	128			

7. **TUBER CHARACTERISTICS**: (continued)

TUBER THICKNESS (mm):

AVERAGE:

V	R1	R2	R3	R4
49	46			

RANGE:

V	R1	R2	R3	R4
42 to 52	40 to 53	to	to	to

STANDARD DEVIATION:

V	R1	R2	R3	R4
3.2	4.0			

AVERAGE WEIGHT OF SAMPLE TAKEN (g):

V	R1	R2	R3	R4
195	128			

TUBER EYE DEPTH:

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

V	R1	R2	R3	R4
3	2			

TUBER LATERAL EYES:

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

V	R1	R2	R3	R4
3	3			

NUMBER EYE/TUBER:

AVERAGE:

V	R1	R2	R3	R4
17	17			

RANGE:

V	R1	R2	R3	R4
10 to 24	16 to 18	to	to	to

DISTRIBUTION OF TUBER EYES:

1 = Predominantly apical 2 = Evenly distributed

V	R1	R2	R3	R4
2	2			

PROMINENCE OF TUBER EYEBROWS:

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

V	R1	R2	R3	R4
3	4			

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	157B	R1	157A	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	

8. **DISEASES CHARACTERISTICS:**

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

LATE BLIGHT: (Phytophthora) *Foliar Reaction*

V	R1	R2	R3	R4
8	7			

EARLY BLIGHT: (Alternaria)

V	R1	R2	R3	R4
6	7			

SOFT ROT (Erwinia)

V	R1	R2	R3	R4
6	6			

COMMON SCAB (Streptomyces)

V	R1	R2	R3	R4
4	4			

POWDERY SCAB (Spongospora)

V	R1	R2	R3	R4
0	0			

DRY ROT (Fusarium)

V	R1	R2	R3	R4
5	5			

POTATO LEAF ROLL VIRUS (PLRV)

V	R1	R2	R3	R4
8	7			

8. DISEASES CHARACTERISTICS: (continued)

POTATO VIRUS X (PVX)

V	7	R1	7	R2		R3		R4	

POTATO VIRUS Y (PVY)

V	7	R1	7	R2		R3		R4	

POTATO VIRUS M (PVM)

V	7	R1	7	R2		R3		R4	

POTATO VIRUS A (PVA)

V	0	R1	0	R2		R3		R4	

GOLDEN NEMATODE (Globodera)

V	0	R1	0	R2		R3		R4	

ROOT – KNOT NEMATODE (Meloidogyne)

V	0	R1	0	R2		R3		R4	

OTHER DISEASE ______________________________

V		R1		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 Lessions in Number and Size
4 = Moderately Resistance 5 = Intermedia Susceptible 6 = Moderate Susceptible
7 = Susceptible 9 = Highly Susceptible

COLORADO POTATO BEETLE (CPB) (*Leptinotarsa*)

V	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	

10. GENE TRAITS:

INSERTION OF GENES: 1 = YES 2 = NO [2]

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

11. QUALITY CHARACTERISTICS:

CHIEF MARKET: Fresh market, russet tablestock - (three-year average fresh merit score=3.8 vs 3.5 for Norkotah).

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	R1	R2	R3	R4
3	2			

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

V	R1	R2	R3	R4
2.6	3.3			

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.

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 [2]

IF YES, attach information

14. DNA PROFILE: 1 = YES 2 = NO [2]

IF YES, attach information

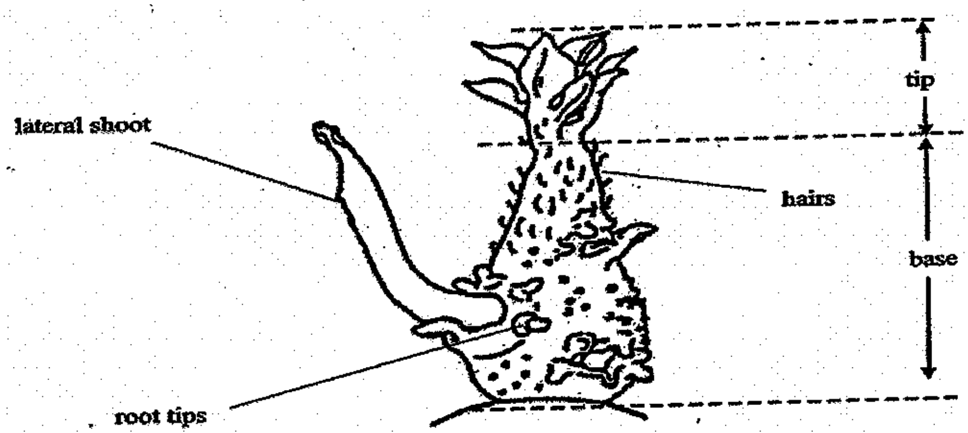
15. ADDDITIONAL COMMENTS AND CHARACTERISTICS:

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

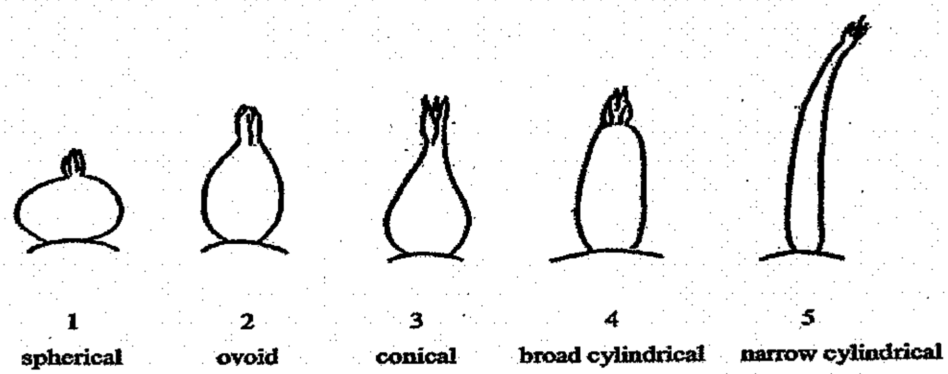
While the PVP Office discounts yield as a distinguishing characteristic, the differences in yield characteristic are consistent over three years in the Western Regional Trials, 14 sites, in seven states, for a total of more than 40 seperate trials. Dramatic yield between the reference variety Russet Norkotah (440 cwt) and the mutant selection Russet Norkotah 296 (553 cwt). This is the reason why this variety has become widely accepted throughout the Western United States even though it matures later than Russet Norkotah.

Figure 1: Light sprout

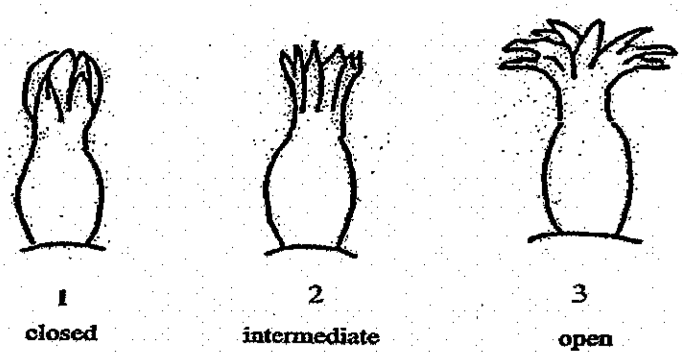
Light sprout dissection



Light sprout shape

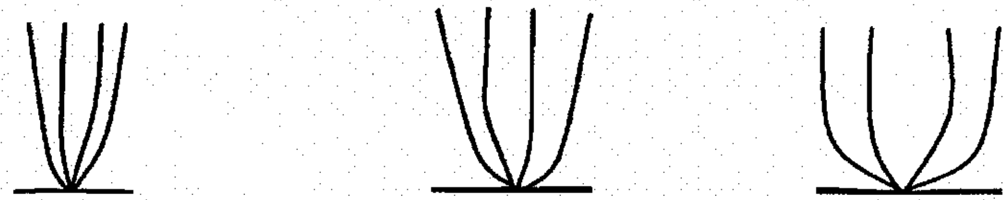


Light sprout tip habit



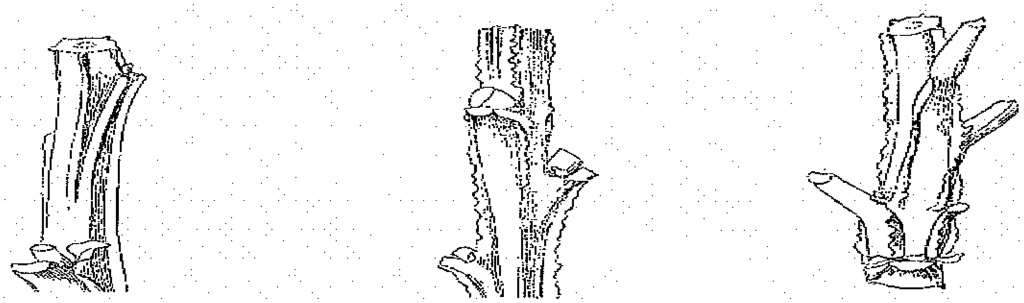
The characteristic should be observed after about 10 weeks to obtain a good differentiation in the collection.

Figure 2: Growth Habit



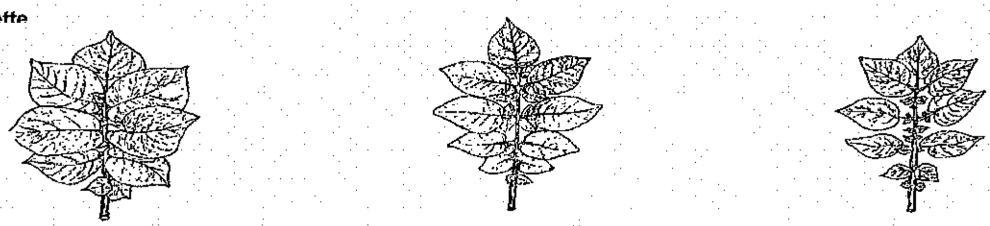
Erect Semi Erect Spreading

Figure 3: Stem Wings



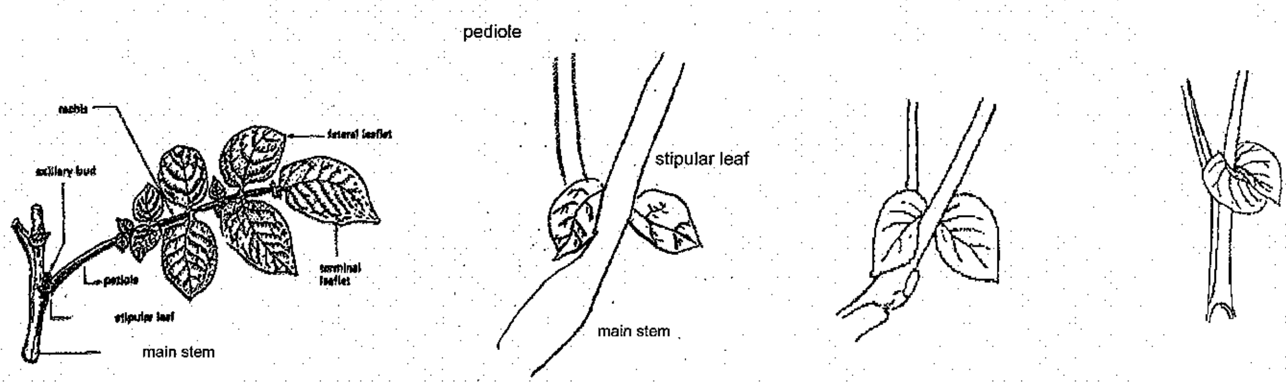
Weak Medium Strong

Figure 4: Leaf Sillhouette



Closed Medium Open

Figure 5: Leaf Stipules



General structures Small stipular leaf Medium stipular leaf Large stipular leaf

Figure 6: Leaf Dissection

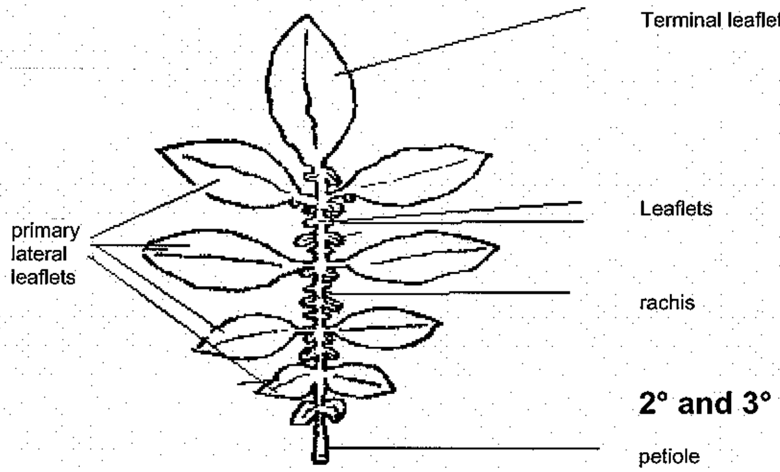


Figure 7: Terminal Leaflet Shape/Primary Leaflet Shape

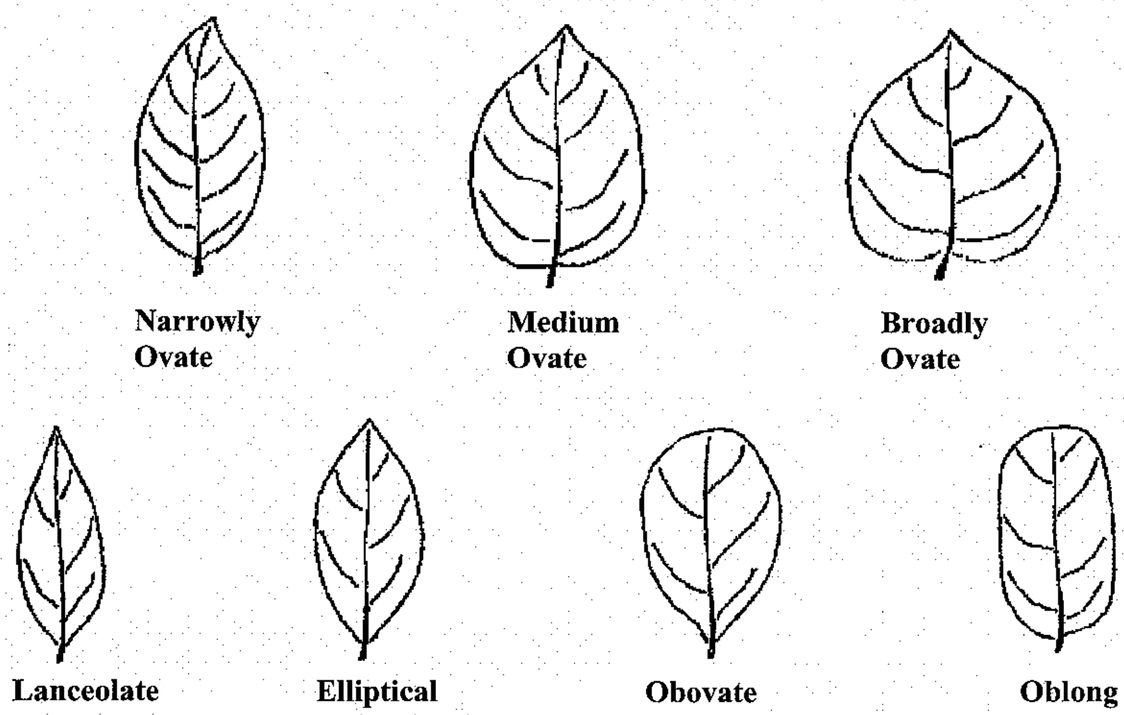


Figure 8: Terminal Leaflet Shape of Tip/Primary Leaflet Shape of Tip

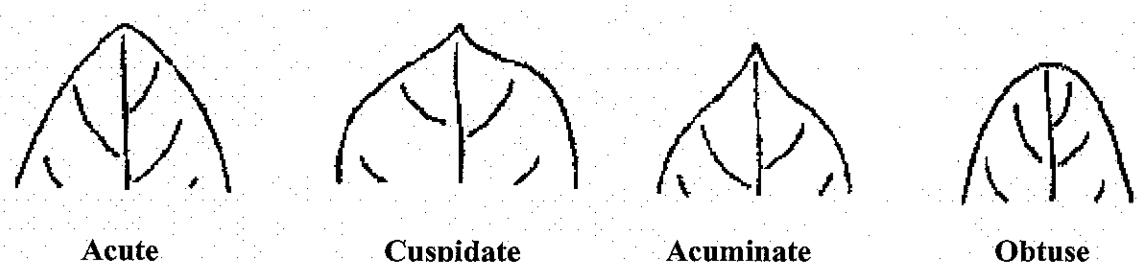


Figure 9: Terminal Leaflet Shape of Base/Primary Leafelet Shape of Base

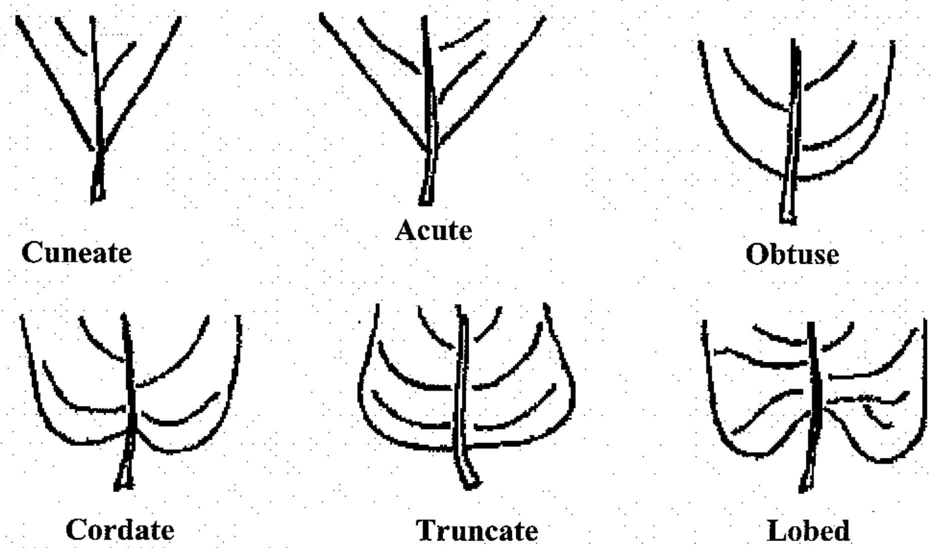


Figure 10: Corolla Shape

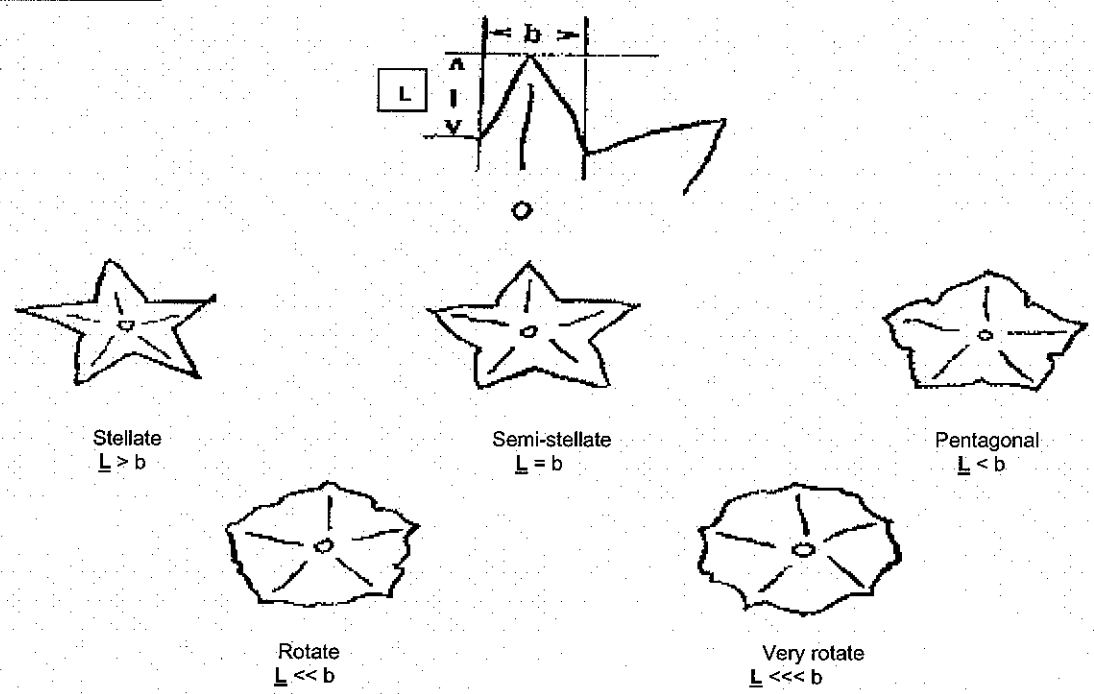


Figure 11: Anther Shape

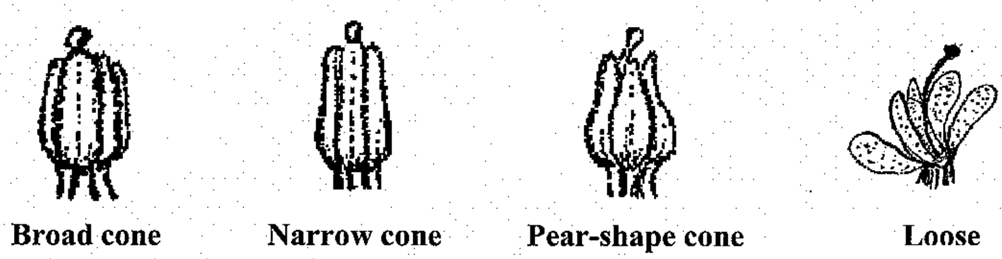
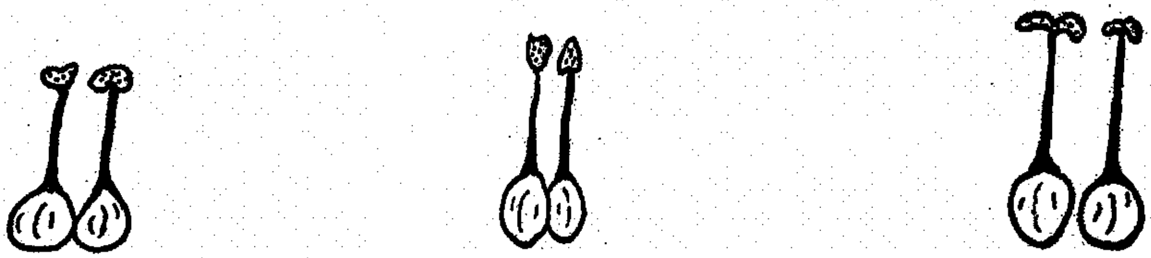
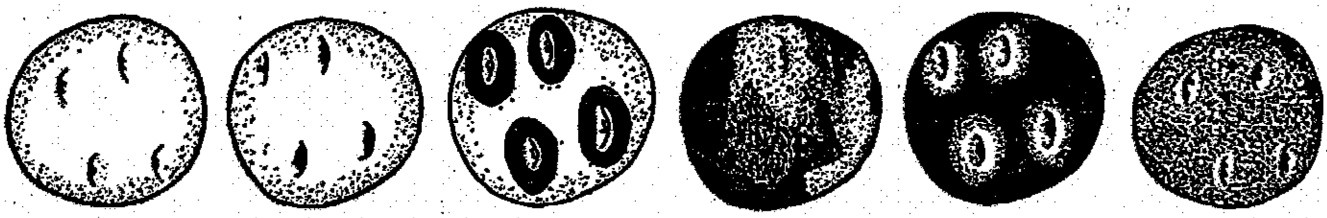


Figure 12: Stigma Shape



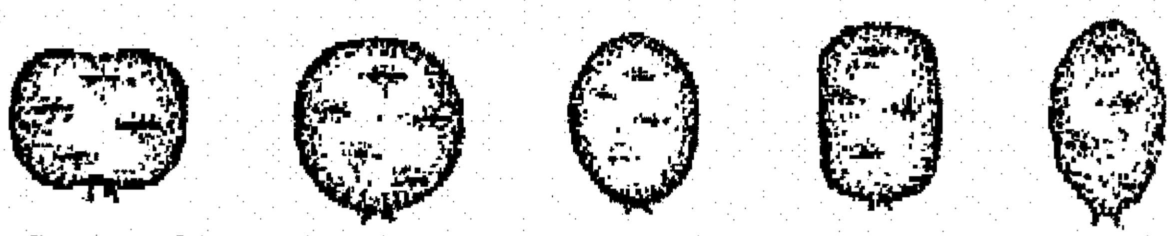
Capitate Clavate Bi-lobed

Figure 13: Distribution of Secondary Skin Tuber Color



Eyes Eyebrows Splashed Scattered Spectacled Stippled

Figure 14: Tuber Shape



Compressed Round Oval Oblong Long

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Exhibit D. Additional Description of the Variety
(Summary from attachments and other information).

- **Yield** – 'Russet Norkotah 296' is most similar to standard Russet Norkotah, however, 'Russet Norkotah 296' has consistently out-yielded standard Russet Norkotah by an average of at least 20% (Tables 1a, 1b, and 1c and Exhibit D, Attachment 1, Tables 3-6). The increased yield of the 'Russet Norkotah 296' is probably due to many factors, but certainly the larger vine size, and larger tuber size are the major factors that contribute to the higher yield observed.
- **Plant Characteristics**

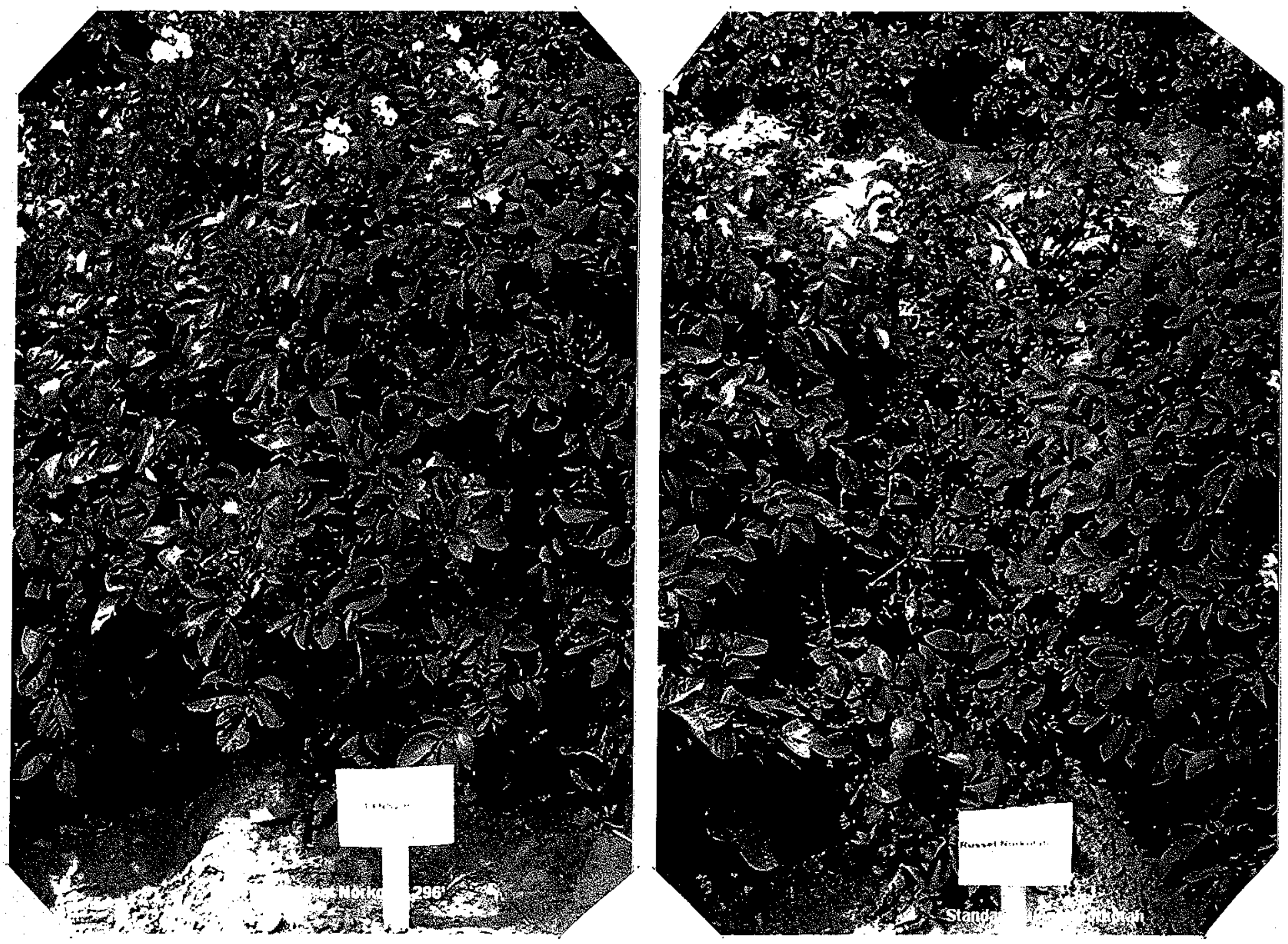

Fig. 1 Plants of 'Russet Norkotah 296' and standard Russet Norkotah

Texas Table 1a. Total yield, total yield of U.S. No.1, under 4 ounce and culls/No.2 potatoes and general rating of Texas Russet Norkotah and standard Russet Norkotah grown near Springlake and Dalhart, Texas-2000-2002.

Variety or Selection	**Total Yield Cwt/A**	U.S. No. 1 Cwt. Per Acre							
		Total Yield	4-6 oz	6-10 oz	10-18 oz	Over 18 oz	Under 4 oz.	Culls/ No.2	General Rating[1] Grading
Dalhart - 2002									
TXNS296	**675.9**	364.0	83.7	122.9	157.3	174.2	124.6	13.1	3.7
Russet Norkotah	**495.8**	376.6	75.0	152.5	149.1	20.8	98.4	0.0	3.0
L.S.D. (.05)	**26.6**	ns	ns	ns	ns	82.3	ns	3.6	ns
Springlake - 2002									
TXNS296	**407.6**	311.4	63.9	124.2	123.3	26.1	19.9	50.1	3.8
Russet Norkotah	**320.4**	225.3	64.7	77.4	83.1	58.7	21.3	15.1	3.6
L.S.D. (.05)	**69.2**	50.7	ns	11.7	ns	18.1	ns	ns	ns
WR Springlake - 2001									
TXNS296	**333.6**	291.3	76.0	117.4	98.0	10.0	30.8	1.4	3.6
Russet Norkotah	**257.4**	205.6	58.1	88.7	58.8	11.5	28.0	12.4	3.4
L.S.D. (.05)	**42.7**	33.9	17.6	ns	23.1	ns	ns	9.8	ns
WR Springlake - 2000									
TXNS296	**371.2**	262.3	39.8	109.9	112.6	17.7	45.0	46.2	3.5
Russet Norkotah	**285.9**	230.0	70.8	99.5	59.7	8.2	28.0	19.7	3.8
L.S.D. (.05)	**64.9**	ns	20.2	ns	47.7	ns	ns	ns	ns
Average across years (2000-2002)									
TXNS296	**447.1**	307.3	65.9	118.6	122.8	57.0	55.1	27.7	3.7
Russet Norkotah	**339.9**	259.4	67.2	104.5	87.7	24.8	43.9	11.8	3.5

[1] 1=very poor to 5= excellent

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Texas
Table 1b. Percent by weight of U.S. No. 1, under 4 ounce and culls/No.2 potatoes, specific gravity, tuber type and skin type of Texas Russet Norkotah and standard Russet Norkotah grown near Springlake and Dalhart, Texas-2000-2002.

Variety or Selection	Percent By Weight of U.S. No. 1				Percent By Weight						
	Total Yield	4-6 oz	6-10 oz	10-18 oz	Over 18 oz.	Under 4 oz.	Culls/ No. 2	Specific Gravity	% Solids	Tuber Type	Skin Type
Dalhart - 2002											
TXNS296	54.0	12.0	18.0	23.0	26.0	18.0	2.0	1.067	14.5	Long	Russet
Russet Norkotah	76.0	15.0	31.0	30.0	4.0	20.0	0.0	1.069	14.8	Long	Russet
L.S.D. (.05)	ns	ns	6.2	ns	11.7	ns	ns	0.001	ns		
Springlake - 2002											
TXNS296	77.0	16.0	31.0	30.0	6.0	5.0	12.0	1.064	13.9	Long	Russet
Russet Norkotah	70.0	20.0	24.0	26.0	18.0	7.0	5.0	1.065	14.1	Long	Russet
L.S.D. (.05)	ns	4.2	5.4	ns	2.5	ns	ns	ns	ns		
WR Springlake - 2001											
TXNS296	87.0	23.0	35.0	29.0	3.0	9.0	0.0	1.061	13.4	Long	Russet
Russet Norkotah	80.0	23.0	34.0	26.0	3.0	12.0	5.0	1.060	13.1	Long	Russet
L.S.D. (.05)	ns	ns	ns	ns	ns	ns	3.0	ns			
WR Springlake - 2000											
TXNS296	70.0	11.0	30.0	29.0	5.0	13.0	13.0	1.063	13.8	Oblong	Russet
Russet Norkotah	81.0	25.0	36.0	20.0	3.0	10.0	7.0	1.063	13.8	Long	Russet
L.S.D. (.05)	ns	9.7	ns	5.3	ns	ns	ns	ns			
Average across years (2000-2002)											
TXNS296	72.0	15.5	28.5	27.8	10.0	11.3	6.8	1.064	13.9		
Russet Norkotah	76.8	20.8	31.3	25.5	7.0	12.3	4.3	1.064	14.0		

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Texas
Table 1c.

Average number of tubers per plant, average tuber weight, average number of stems per plant, percent stand 40 days after planting, percent stand 60 days after planting, plant characteristics and percent dead vines at vine kill of Russet Norkotah 296 and standard Russet Norkotah grown near Springlake and Dalhart, Texas-2000-2002.

Variety or Selection	Average Number Tubers/ Plant	Average Tuber Weight In oz.	Average Number Stems/ Plant	Percent Stand 40 DAP	Percent Stand 60 DAP	Plant Characteristics: Plant Type [1]	Plant Characteristics: Vigor [2]	Plant Characteristics: Maturity [3]	Plant Characteristics: Vine Size [4]	Percent Dead Vines
Dalhart - 2002										
TXNS296	6.8	9.3	2.4	98	100	2.0	**3.7**	**3.7**	**3.7**	**17**
Russet Norkotah	6.9	6.3	2.5	98	98	2.2	**3.0**	**2.5**	**3.0**	**57**
L.S.D. (.05)	ns	2.7	ns	ns	ns	ns	**0.6**	**0.6**	**0.6**	**32**
WR Springlake - 2002										
TXNS296	4.5	7.7	2.4	75	95	2.0	**3.9**	**3.9**	**4.4**	**13**
Russet Norkotah	3.9	7.6	1.8	57	97	2.0	**3.0**	**2.4**	**2.8**	**86**
L.S.D. (.05)	0.5	ns	0.2	ns	ns	ns	**0.6**	**0.6**	**0.4**	**19**
WR Springlake - 2001										
TXNS296	4.3	6.7	2.2	93	97	2.3	**3.7**	**3.2**	**3.2**	**29**
Russet Norkotah	3.5	6.3	1.6	92	96	2.0	**2.8**	**2.0**	**2.1**	**65**
L.S.D. (.05)	0.4	ns	ns	ns	ns	ns	**0.6**	**1.0**	**0.7**	**23**
WR Springlake - 2000										
TXNS296	3.7	7.7	2.8	75	99	1.5	**3.7**	**3.8**	**3.8**	**25**
Russet Norkotah	3.5	6.8	1.9	70	95	1.3	**3.0**	**1.4**	**3.0**	**93**
L.S.D. (.05)	ns	1.3	ns	ns	ns	ns	**0.5**	**0.7**	**0.6**	**20**
Average across years (2000-2002)										
TXNS296	4.8	7.9	2.5	85.2	97.8	1.9	**3.7**	**3.6**	**3.8**	**20.7**
Russet Norkotah	4.4	6.8	2.0	79.3	96.8	1.9	**3.0**	**2.1**	**2.7**	**75.2**

[1] 1= upright, 2= semiprostrate, 3= prostrate
[2] 1= poor, 2= fair, 3= medium, 4= vigorous, 5= very vigorous
[3] 1= very early, 2= early, 3= medium, 4=late, 5= very late
[4] 1=very small, 2=small, 3=medium, 4=large, 5=very large
[5] Includes only data for the years that it was available

Texas
Table 1d. Flesh color, tuber shape, degree of russeting, eye depth, skin color, growth cracks, shatter bruise, scab, knobbiness, feathering, percent hollow heart, percent blackspot, percent vascular discoloration, percent internal brownspot of Texas Russet Norkotah and standard Russet Norkotah grown near Springlake and Dalhart, Texas-2000-2002.

Variety or Selection	Flesh Color[1]	Tuber Shape[2]	Degree of Russeting[3]	Eye Depth[4]	Skin Color[5]	Growth Cracks[6]	Shatter Bruise[7]	Scab[8]	Knobs[9]	Feathering[10]	Percent Hollow Heart	Percent Blackspot	Percent Vascular Discoloration[10]	Percent Internal Brownspot
Dalhart - 2002														
TXNS296	1.0	4.1	4.6	4.0	1.0	5.0	5.0	5.0	5.0	5.0	2	0	3	0
Russet Norkotah	1.0	4.0	4.5	4.5	1.0	5.0	5.0	5.0	5.0	5.0	1	0	0	0
L.S.D. (.05)	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Springlake - 2002														
TXNS296	1.0	4.1	4.6	3.3	1.0	5.0	5.0	5.0	5.0	5.0	2	0	35	0
Russet Norkotah	1.0	4.1	4.6	3.3	1.0	5.0	5.0	5.0	5.0	5.0	1	0	5	0
L.S.D. (.05)	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
WR Springlake - 2001														
TXNS296	1.0	5.0	5.0	4.0	1.0	5.0	5.0	5.0	5.0	5.0	0	0	10	10
Russet Norkotah	1.0	5.0	5.0	4.0	1.0	5.0	5.0	5.0	5.0	5.0	0	10	10	0
L.S.D. (.05)	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
WR Springlake - 2000														
TXNS296	1.0	4.3	5.0	4.5	1.0	5.0	5.0	5.0	5.0	5.0	0	0	0	0
Russet Norkotah	1.0	4.3	5.0	4.0	1.0	5.0	5.0	5.0	5.0	5.0	0	0	0	0
L.S.D. (.05)	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
Average across years (2000-2002)														
TXNS296	1.0	4.4	4.8	4.0	1.0	5.0	5.0	5.0	5.0	5.0	0.8	0.0	12.1	2.5
Russet Norkotah	1.0	4.3	4.8	4.0	1.0	5.0	5.0	5.0	5.0	5.0	0.3	2.5	3.8	0.0

[1] 1=light to 5=dark
[2] 1=round to 5=long
[3] 1=none to 5=heavy
[4] 1=deep to 5=shallow
[5] 1=light to 5=dark
[6] 1 to 5=none
[7] 1 to 5=none
[8] 1 to 5=none
[9] 1 to 5=none
[10] 1 to 5=none
[11] Stem end vascular discoloration severely evaluated

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Fig. 2 Individual plants of 'Russet Norkotah 296' and standard Russet Norkotah

- Vine Size – 'Russet Norkotah 296' is most similar to Russet Norkotah but 'Russet Norkotah 296' has much larger vines than standard Russet Norkotah. 'Russet Norkotah 296' possesses larger vines than Standard Russet Norkotah but smaller than Russet Burbank (Exhibit D, Attachment I, Tables 2).

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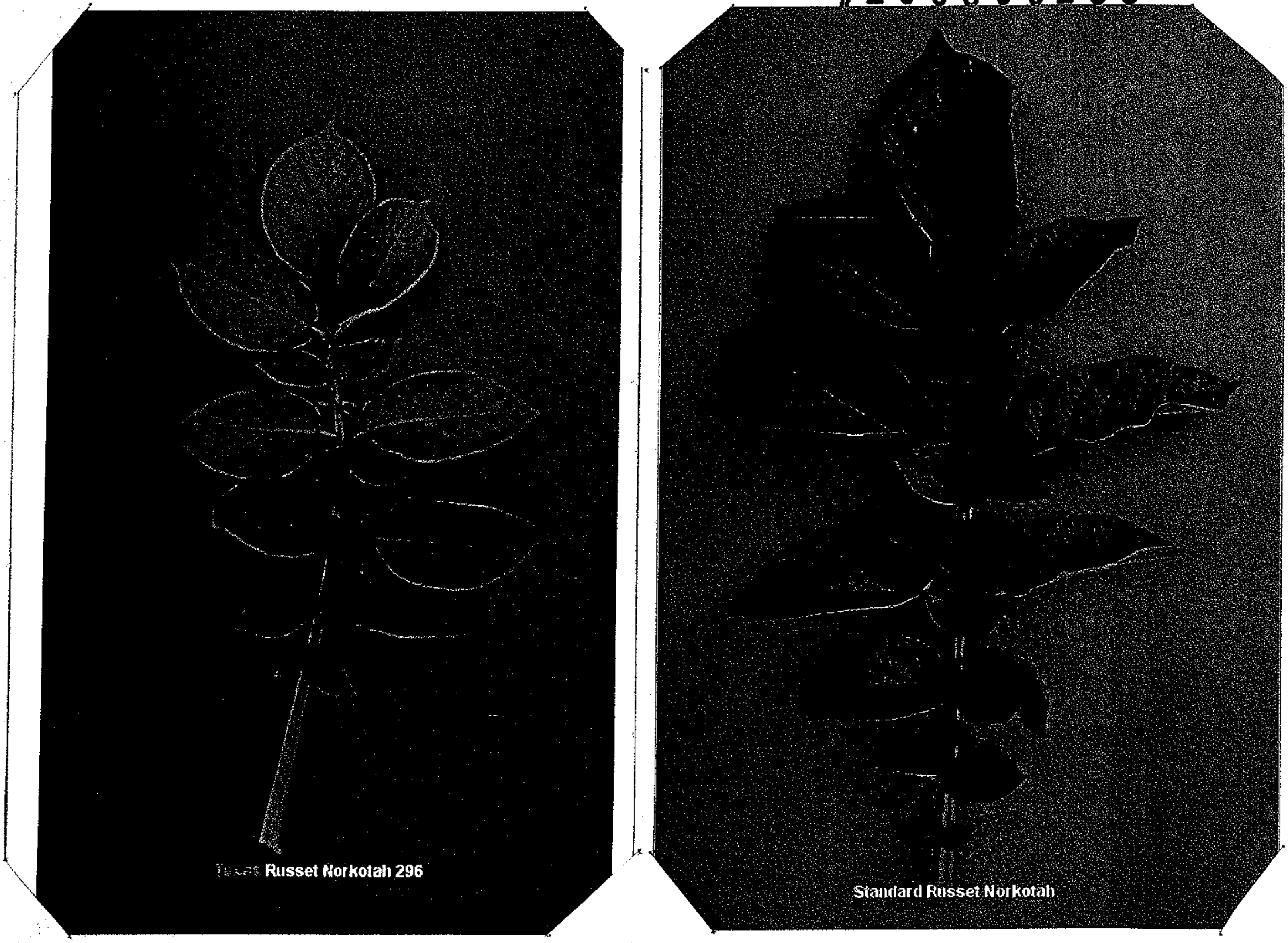
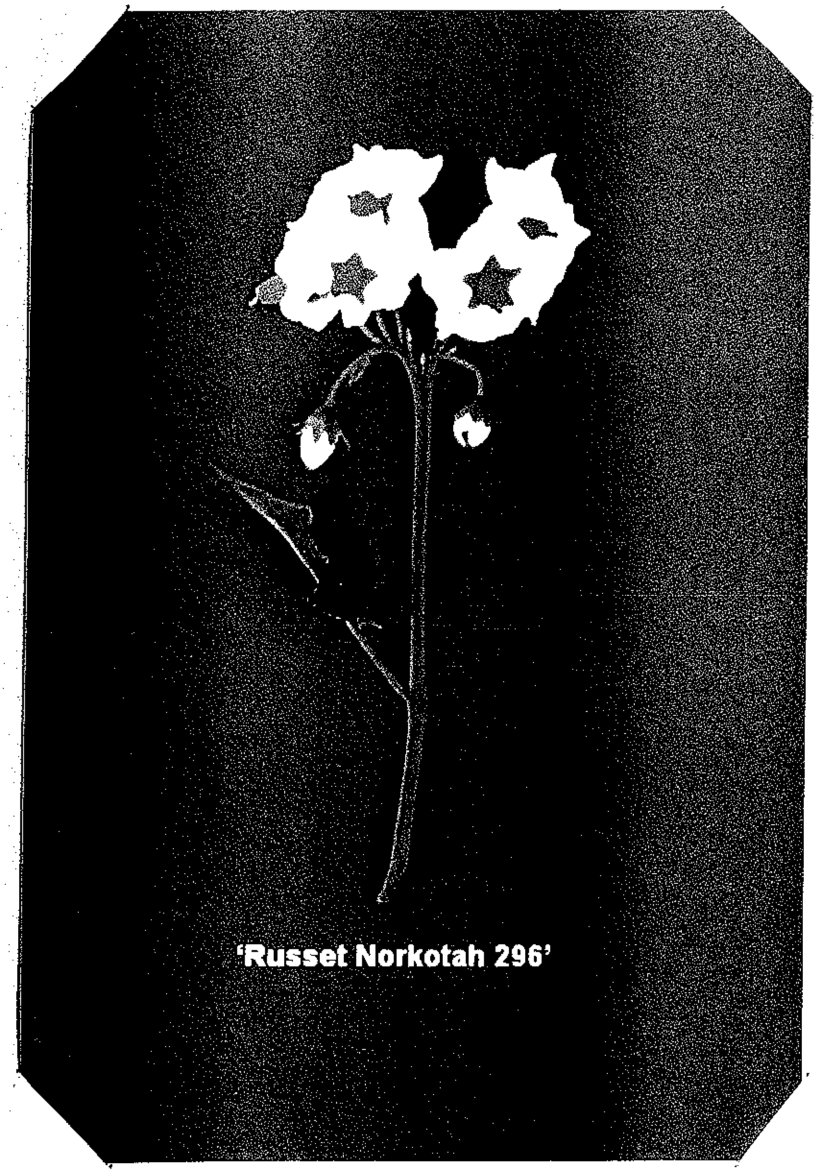


Fig. 3 Leaves of 'Russet Norkotah 296' and standard Russet Norkotah

- Leaf Characteristics – 'Russet Norkotah 296' is most similar to Russet Norkotah in leaf characteristics, however, 'Russet Norkotah 296' leaves tend to be a shade darker and leaf stipule size is larger. Both have an open leaf silhouette, no petiole anthocyanin coloration, and similar leaflet shapes and counts.
- Stems Per Hill (Plant) – 'Russet Norkotah 296' is most similar to standard Russet Norkotah however, 'Russet Norkotah 296' tends to have more stems per hill than standard Russet Norkotah. The stems of 'Russet Norkotah 296' are also larger and longer than those of standard Russet Norkotah.
- Maturity – 'Russet Norkotah 296' is most similar to standard Russet Norkotah for maturity except 'Russet Norkotah 296' is later by about 7-10 days. (Exhibit D, Attachment 1, Tables 2).

- Flowering – 'Russet Norkotah 296' is most similar to standard Russet Norkotah, for flower morphology. 'Russet Norkotah 296' has a longer flowering period than standard Russet Norkotah.



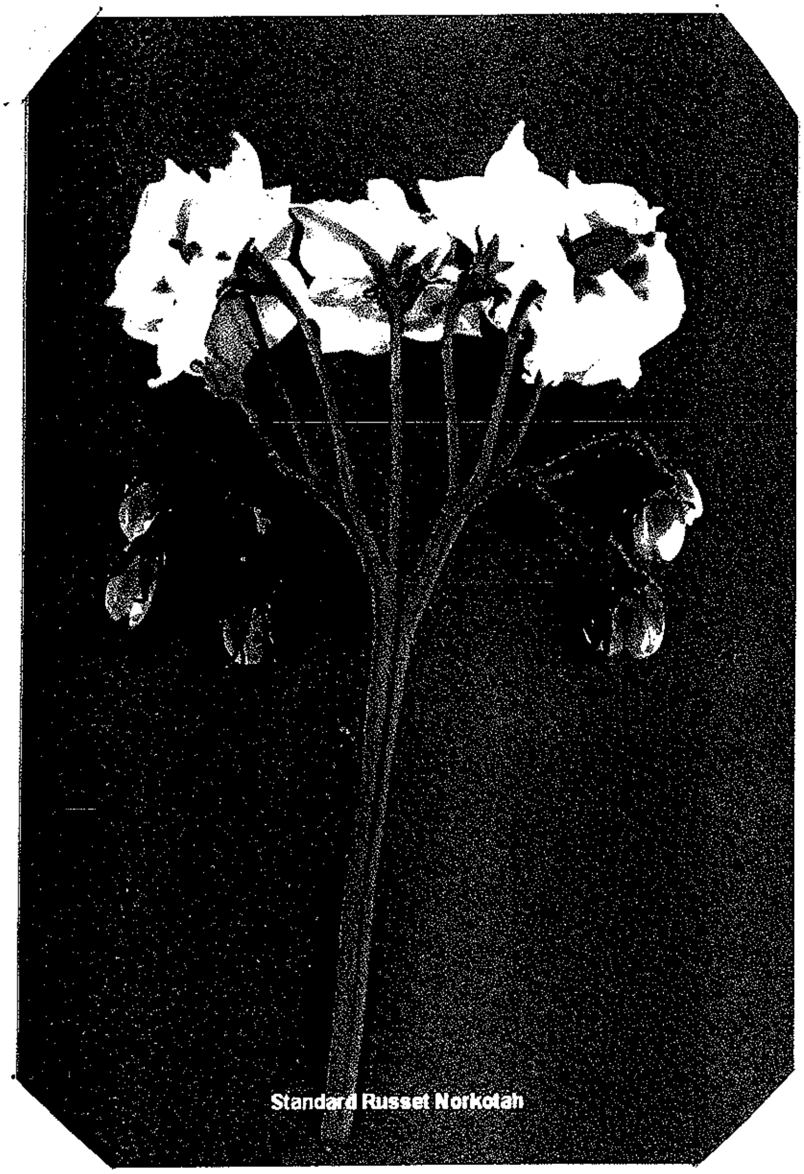
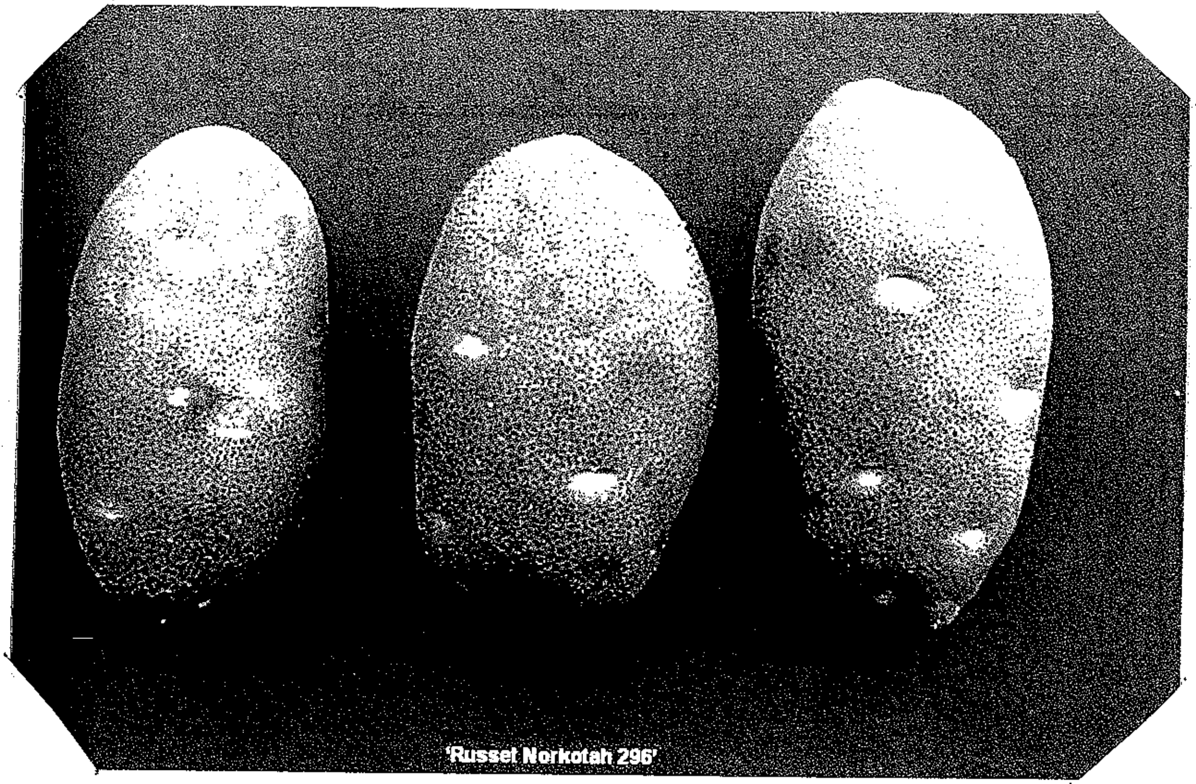


Fig. 4 Flowers of 'Russet Norkotah 296' and standard Russet Norkotah

- **Tuber Characteristics**



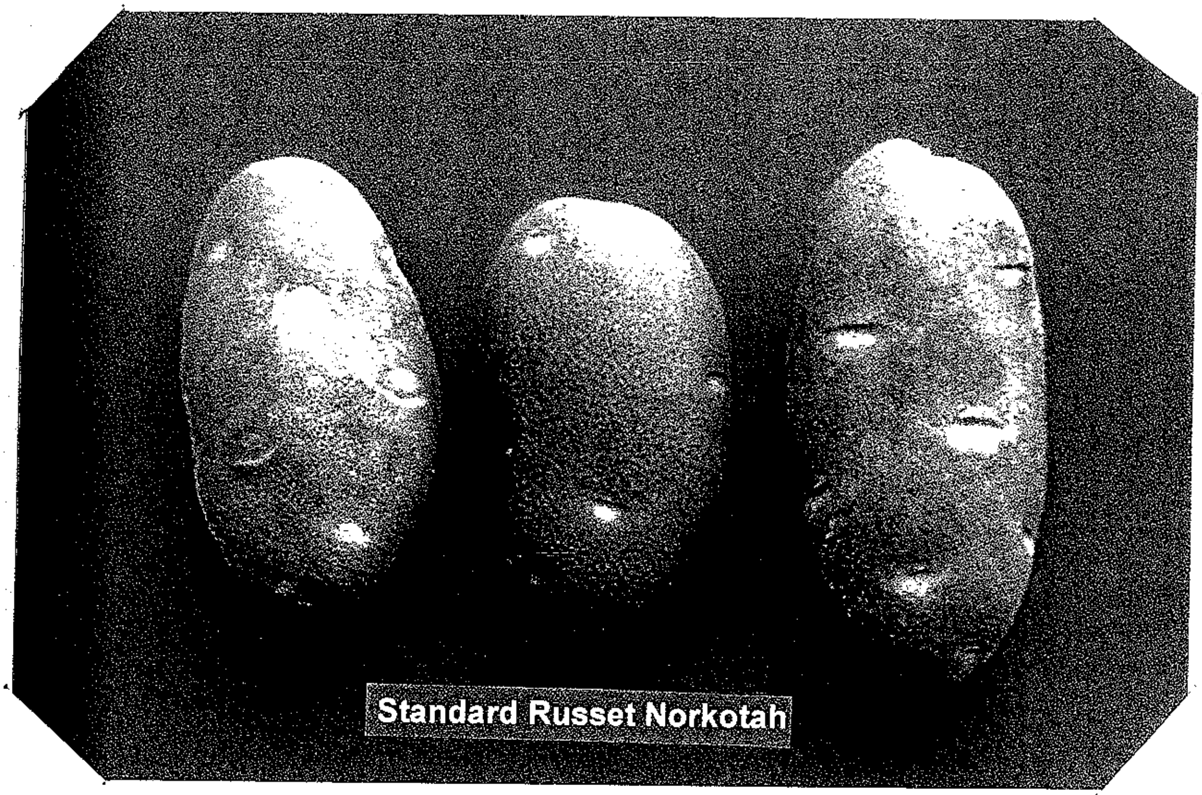


Fig. 5 Tubers of 'Russet Norkotah 296' and standard Russet Norkotah

- Tuber Length - The length/width ratio of the 'Russet Norkotah 296' is most similar to standard Russet Norkotah except 'Russet Norkotah 296' is higher. 'Russet Norkotah 296' clearly has a higher length/width ratio than standard Russet Norkotah (Exhibit D, Attachment 1, Tables 2 and Tables 8).

- Average Tuber Size – 'Russet Norkotah 296' is most similar to standard Russet Norkotah except it tends to be larger (Exhibit D, Attachment 1, Tables 8

- Eye Depth – 'Russet Norkotah 296' is most similar to standard Russet Norkotah for eye depth.

- Degree of Russeting – 'Russet Norkotah 296' is most similar to standard Russet Norkotah except it tends to have slightly heavier russeting.

- Specific Gravity – 'Russet Norkotah 296' is most similar to standard Russet Norkotah, however, 'Russet Norkotah 296' tends to have a slightly higher specific gravity than standard Russet Norkotah (Exhibit D, Attachment 1, Tables 7, 15-16).

- Light Sprouts – The light sprouts of 'Russet Norkotah 296' are most similar to Russet Norkotah except those of 'Russet Norkotah 296' have a conical shape and standard Russet Norkotah are more of a broad cylindrical shape. Both have weak pubescence at the base as well as a strong red-violet anthocyanin basal coloration. Both have a closed tip habit, medium tip pubescence, weak red-violet tip anthocyanin coloration, and short root initials.

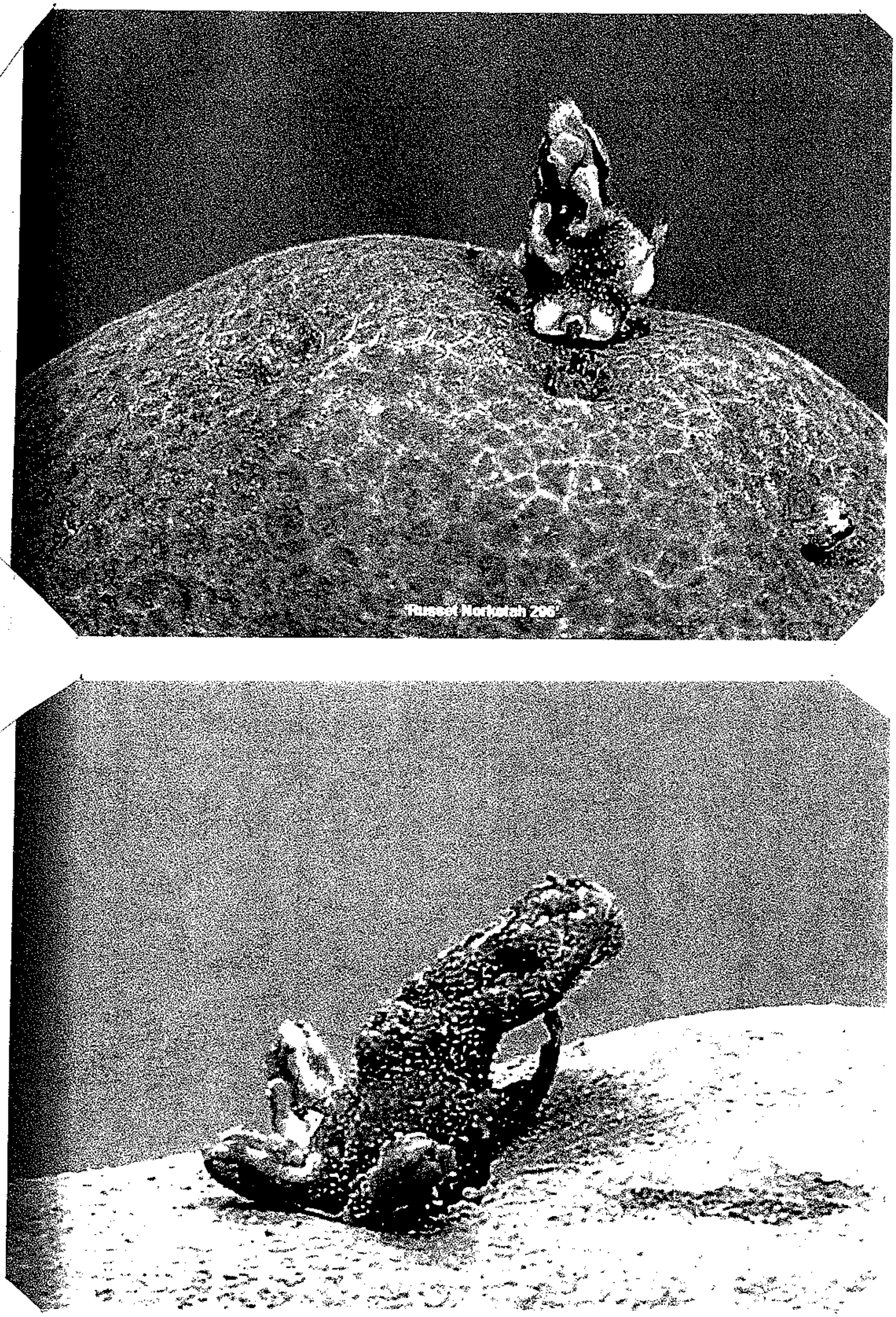


Fig. 6 Sprouts of 'Russet Norkotah 296' and standard Russet Norkotah

- Tuber Dormancy – 'Russet Norkotah 296' is most similar to standard Russet Norkotah except 'Russet Norkotah 296' tends to have a slightly longer dormancy.

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- **Plant and Tuber Diseases**

  - Late Blight – No conclusive differences in late blight susceptibility/resistance were noted for 'Russet Norkotah 296' and standard Russet Norkotah in evaluations conducted in Corvallis, Oregon 1999-2001 (Table 2), while in Wisconsin (data not shown), 'Russet Norkotah 296' was found to be slightly more resistant to late blight than standard Russet Norkotah.

Table 2. Foliar late blight disease ratings, percent tuber infection at harvest and percent tuber decay at Corvallis, Oregon, 1999, 2000 and 2001.

Clone	Foliar Rating [1]	% Tuber Infected[2]	% Tuber Decay[3] S.I.[4]
1999			
Standard Russet Norkotah	7.5	2.5	5.0[3]
'Russet Norkotah 296'	6.2	0.0	0.0
2000			
Standard Russet Norkotah	9.0	13.0	7.2[4]
'Russet Norkotah 296'	9.0	28.0	7.0
2001			
Standard Russet Norkotah	8.8	50.0	
'Russet Norkotah 296'	8.8	37.5	

[1]Ratings are averages for 2 reps (1999) or 4 reps (2000): 1=no foliar injury; 2=1-5% injury; 3=5-10%; 4=10-20% 5=25-40%; 6=40-60%; 7=60-75%; 8=75-90%; 9=90-100% injury
[2]Percent of tubers showing late blight infection based on 10 randomly selected tubers/plot.
[3]Percent tuber decay based on 10 randomly selected tubers after 1 month of storage under room temperature.
[4]Values Decay severity index (S.I.) (includes secondary infection): 1=minor decay, 5=moderate decay, 10=severe decay.

  - Early Blight – 'Russet Norkotah 296' appears to be more resistant to early blight than standard Russet Norkotah (Exhibit D, Attachment 1, Tables 12).

- Verticillium Wilt – 'Russet Norkotah 296' is clearly more resistant to Verticillium Wilt than standard Russet Norkotah based on data from Aberdeen, ID and Hermiston, OR (Exhibit D, Attachment 1, Tables 12). This appears to be a result of its increased vigor
- Potato Virus Y (PVY) - Standard Russet Norkotah and 'Russet Norkotah 296', are both susceptible to PVY.
- Hollow Heart – Standard Russet Norkotah exhibits a high level of resistance to hollow heart. 'Russet Norkotah 296' (Exhibit D, Attachment 1, Tables 10), tends to exhibit slightly higher levels of susceptibility to hollow heart.
- Translucent Ends (Sugar ends) – 'Russet Norkotah 296' tends to have a higher susceptibility than standard Russet Norkotah to sugar ends (Exhibit D, Attachment 1, Tables 11).
- Common Scab - 'Russet Norkotah 296' is most similar to standard Russet Norkotah (Exhibit D, Attachment 1, Tables 12), in that they both appear to be moderately resistant to common scab.
- Potato Leaf Roll Virus (PLRV) Foliar - 'Russet Norkotah 296' appears to be slightly more susceptible to foliar PLRV than standard Russet Norkotah (Exhibit D, Attachment 1, Tables 12).
- Vitamin C – 'Russet Norkotah 296' vitamin C content is higher than Russet Burbank and about the same as standard Russet Norkotah (Exhibit D, Attachment 1, Tables 13).
- Protein – 'Russet Norkotah 296' appears to have slightly higher protein content than standard Russet Norkotah (Exhibit D, Attachment 1, Tables 13).
- Glycoalkaloids – Glycoalkaloid content for 'Russet Norkotah 296' is well within acceptable ranges and do not differ appreciably from standard Russet Norkotah but are lower than Russet Burbank (Exhibit D, Attachment 1, Tables 13).
- Sustainability of Potato Production - Soil fertility investigations have demonstrated that 'Russet Norkotah 296' responds to increasing levels of fertilizer nitrogen, however, a reasonable crop can be expected from nitrogen levels somewhat lower than those customarily applied to

standard Russet Norkotah. In addition, higher levels of resistance to diseases such as early blight, Verticillium wilt, and common scab can result in reduced production costs because fewer applications of pesticides are required. Weed control is more easily achieved with 'Russet Norkotah 296' because of earlier row closure with more dense foliage than can be obtained with standard Russet Norkotah.

- Yield Potential – With the increased yield potential of 'Russet Norkotah 296', returns to the producer are substantially increased. (Exhibit D, Attachment 1, Tables 15-16). 'Russet Norkotah 296' produces significantly more total and marketable yield than standard Russet Norkotah.
- Merit Score – This score is an overall reflection of the acceptability of an entry in the Western Regional Trials. From 1999-2001 'Russet Norkotah 296' not only received significantly higher fresh market scores than standard Russet Norkotah (Exhibit D, Attachment 1, Tables 16), but also received the highest fresh market merit scores of all entries over each of the three years it was entered in the Western Regional Trials.
- Appendices - Several popular articles and scientific publications have appeared discussing 'Russet Norkotah 296'. They are cited below and selected articles included as appendices.

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Exhibit D, Attachment 1

1999, 2000, and 2001 WESTERN REGIONAL POTATO VARIETY TRIAL REPORT

California
Colorado
Idaho
New Mexico
Oregon
Texas
Washington

State Experiment Stations and
USDA-ARS Cooperating

#200300288

1999 WESTERN REGIONAL POTATO VARIETY TRIAL REPORT

TABLE

Compiled by Brian Schneider

Revision - 3/5/2008

TABLE 1: 1999 Western Regional Potato Variety Trial - LOCATIONS, COOPERATORS, AND CULTURAL INFORMATION

No.	Locations	Cooperators	Trial	Irrigation	Fertilizer N-P-K-S(lb/A)	Planting Date	Harvest Date	Days to Vine Kill	Days to Harvest	Herbicides	Insecticides	Fungicides
1	Kern Co. California **(KRN)**	R. Voss, H. Phillips, J. Nunez	Early	Sprink.	400-110	23-Feb	28-Jun	-	125			Bravo W.S., Champ2 GreenStar Pennco Zeb, Rovral
2	Tulelake California **(TUL)**	R. Voss, H. Phillips, D. Kirby, H. Carlson	Late	Sprink.	160-200	18-May	5-Oct	129 Diquat	140	Matrix Sencor		Bravo, Dithane Tattoo C
3	San Luis Valley Colorado **(SLV)**	D. Holm	Late	Pivot	130-100	19-May	23-Sep	105 Sulf Acid	127	Dual II Magnum Sencor DF	Thiodan 3 EC	Bravo Ultrex, Champ2 Dithane DF, Curzate Quadris, Super Tin
4	Aberdeen Idaho **(AB)**	S. Love, R. Novy, D. Corsini	Late	Sprink.	240-150-80-44+	5-May	23-Sep	126 Diquat	141	Eptam Matrix Metribuzin	Admire Monitor	Bravo Fullfill
5	Kimberly Idaho **(KIM)**	S. Love, R. Novy, D. Corsini	Late	Sprink.	220-130	26-Apr	12-Oct	137 Diquat	169	Lexone Matrix	Pounce Sevin Temik	Acrobat Bravo Dithane
6	Clovis New Mexico **(CLV)**	R. D. Baker, W. Laing	Early	Furrow	84-120-72-0+	30-Mar	1-Sep	136 Mech.	155	Prowl		
7	Farmington New Mexico **(FRM)**	C. Owen	Late	Sprink.	182-104-120	20-Apr	18-Oct	-	181	Turbo		
8	Hermiston Oregon **(HRM)**	D. Hane, A. Mosley	Early Late	Pivot Pivot	290-80-200-40+	31-Mar 12-Apr	16-Aug 30-Sep	120 155	138 171	Ad-Wet, Eptam Matrix, Sencor Vapam	Admire,Gaucho Mocap, Monitor Phorate,Temik	Bravo, Break-thru Curzate, Dithane Ridomil, Rovral WP
9	Klamath Falls Oregon **(KLM)**	K. Rykbost, B. Charlton	Late	Sprink.	160-80-80-140	19-May	1-Oct	110 Diquat	135	Dual Matrix Prowl	DiSyston	Bravo Dithane Tops 2.5
10	Malheur Oregon **(MAL)**	C. Shock, A. Mosley, E. Eldredge	Early Late	Furrow	91 91	19-Apr 21-Apr	11-Aug 27-Sep	113 149 Mech.	114 159	Dual Prowl	Thimet	Bravo Dithane
11	Springlake Texas **(SPR)**	J. C. Miller Jr., J. Koym, D. Schuering	Early	Pivot	177-30-30	12-Mar	17-Aug	144	158	Roundup Sencor Trifluralin		Maxim
12	Othello Washington **(OTH)**	R. Thornton, N. Fuller, J. Rupp, G. Newberry	Early Late	Sprink. Pivot	262-455-245 321-486-400	6-Apr 19-Apr	24-Aug 27-Sep	121 151 Mech. Diquat	140 161	Eptam Prowl Sencor	Admire, Comite Dimethoate Furadan, Monitor Success, Sevin	Bravo, Chlorothalonil EDBC, Polyram Quadras, Ridomil MZ Rovral, Super Tin

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TABLE 1: 2000 Western Regional Potato Variety Trial - LOCATIONS, COOPERATORS, AND CULTURAL INFORMATION

Locations	Cooperators	Trial	Irrigation	Fertilizer I-P-K-S(lb/A	Planting Date	Vine Kill Date	Harvest Date	Days to Vine Kill	Days to Harvest	Herbicides	Insecticides	Fungicides
Kern Co. California **(KRN)**	R. Voss, H. Phillips, J. Nunez	Early	Sprink.	245	22-Feb	-	28-Jun		127	Eptam, Prowl		Bravo W.S.
Tulelake California **(TUL)**	R. Voss, H. Phillips, D. Kirby, H. Carlson	Late	Sprink.	160-20	10-May	11-Sep	26-Sep	124 Diquat	139	Lexone, Matrix	Pounce	Curzate, Dithane Bravo, Kocide
San Luis Valley Colorado **(SLV)**	D. Holm	Late	Pivot	160-150-6C	17-May	31-Aug	27-Sep	106 Sulfuric Acid	133	Dual Magnum + Sencor, Poast	Fulfill, Asana XL Thiodan 3 EC	Dithane F-45, Quadris Bravo (Ultrex, Weather Stik) Super Tin 80WP
Aberdeen Idaho **(AB)**	S. Love, R. Novy, D. Corsini	Late	Sprink.	240-150-50-	27-Apr	8-Sep	19-Sep	134 Diquat	145	Sencor DF + Matrix, Eptam 7E	Admire, Fulfill	Bravo WeatherStik
Kimberly Idaho **(KIM)**	S. Love, R. Novy, D. Corsini	Late	Sprink.	221-26	25-Apr	11-Sep	28-Sep	139 Mech.	156	Eptam Lexon + Matrix	Mocap 10G Success Sevin 4F	Bravo Ultrex
Farmington New Mexico **(FRM)**	M. O'Neil, C. Owen	Late	Sprink.	224-104-12(	27-Apr	-	?		?	Turbo		
Hermiston Oregon **(HRM)**	D. Hane, A. Mosley	Early Late	Pivot Pivot	90-80-200- 2-178-278-	28-Mar 13-Apr	24-Jul 11-Sep	7-Aug 25-Sep	118 151	132 165	**Matrix**, Eptam **Prowl**, Vapam	Mocap, Admire, Monitor **Temik, Asana, Comite** **Phorate, Lannate**	Bravo, **Dithane** **Botran,** Quadris Curzate
Klamath Falls Oregon **(KLM)**	K. Rykbost, B. Charlton	Late	Sprink.	50-80-80-1	17-May	15-Sep	29-Sep	121	135	Dual, Prowl	DiSyston Monitor	Tops MZ, Bravo Dithane, NuCop Ridomil-MZ
Malheur Oregon **(MAL)**	C. Shock, A. Mosley, E. Eldredge	Early Late	Furrow Furrow	110 110	20-Apr 1-May	21-Aug 29-Aug	23-Aug 5-Sep	123 120 Mech	125 127	Roundup Ultra **Prowl + Dual**	**Thimet**	**Telone II, Bravo** **Dithane** **Sulfer Powder**
Dalhart Texas **(DAL)**	J. C. Miller Jr., J. Koym, D. Schuering	Early	Pivot	305	18-May	28-Aug	10-Sep	102	115	Prowl, Sencor Poast, Matrix	Admire, Baythroid Asana, Provado	Maxim, Quadris Supertin, Ridomil
Springlake Texas **(SPR)**	J. C. Miller Jr., J. Koym, D. Schuering	Early	Pivot	160-33-63	11-Mar	18-Jul	13-Aug	129	155	Prowl, Sencor Roundup	Admire	Tops MZ
Eltopia **(ELT)** Warden **(WRD)** Washington	R. Thornton, N. Fuller, J. Rupp, G. Newberry	Early Late	Pivot Pivot	268-120-20(393-355-37(	16-Mar 17-Apr	- 14-Sep	1-Aug 25-Sep	150 Diquat	138 161	Sencor DF Sencor, Prowl	Asana Temik, 2 Monitor Comite	3 Manzate 75DF Ridomil, Royal Bravo, Super Tin

Bold indicates use in both early and late trial.

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TABLE 1: 2001 Western Regional Potato Variety Trial - LOCATIONS, COOPERATORS, AND CULTURAL INFORMATION

No.	Locations	Cooperators	Trial	Irrigation	Fertilizer N-P-K-S(lb/A)	Planting Date	Vine Kill Date	Harvest Date	Days to Vine Kill	Days to Harvest	Pesticides Applied[1] Herbicides	Pesticides Applied[1] Insecticides	Pesticides Applied[1] Fungicides
1	Kern Co. California **(KRN)**	R. Voss, H. Phillips, J. Nunez	Early	Sprink.	245-196-0-0+	22-Feb		28-Jun	-	126	Eptam, Prowl		Bravo W.S.
2	Tulelake California **(TUL)**	R. Voss, H. Phillips, D. Kirby, H. Carlson	Late	Sprink.	160-20	10-May	29-Aug	14-Sep	111 Diquat	127	Lexone, Matrix	Pounce	Curzate, Dithane, Bravo, Dithane, Kocide
3	San Luis Valley Colorado **(SLV)**	D. Holm, F. Popiel	Late	Pivot	118-60-40-87	16-May	31-Aug	25-Sep	107 Sulfuric Acid	132	Sencor+Eptam	Leverage 2.7	Quadris, Agri Tin 80 WP, Super Tin 80 WP, Bravo WS
4	Aberdeen Idaho **(AB)**	S. Love, R. Novy, D. Corsini	Late	Sprink.	220-120-40	2-May	6-Sep	21-Sep	127 Diquat+Kicker	142	Sencor DF 75% +Matrix, Eptam 7E	Admire	Dithane
5	Kimberly Idaho **(KIM)**	S. Love, R. Novy, D. Corsini	Late	Sprink.	130-120-60	30-Apr	10-Sep	9-Oct	133 Machine	162	Eptam 7E, Sencor DF 75% +Matrix	Admire	Dithane
6	Farmington New Mexico **(FRM)**	M. O'Neil, C. Owen	Late	Sprink.	350-104-120	26-Apr		4-Oct	-	161	Turbo		
7	Hermiston Oregon **(HRM)**	D. Hane, A. Mosley	Early Late	Pivot Pivot	300-100-250-50+ 335-80-250-40+	23-Mar 16-Apr	19-Jul 24-Sep	2-Aug 8-Oct	118 161	132 175	**Eptam, Gramoxone, Matrix**	MoCap, Admire MoCap, Admire, Comite, Monitor	**Vapam** Ridimil Gold, Dithane, Bravo/Quadris
8	Klamath Falls Oregon **(KLM)**	K. Rykbost, B. Charlton	Late	Sprink.	160-80-80-140	24-May	7-Sep	27-Sep	106 Diquat	126			Tops MZ, Dithane, Quadris
9	Malheur Oregon **(MAL)**	C. Shock, A. Mosley, E. Eldredge	Early Late	Sprink. Sprink.	161-100-50-60+ 161-100-50-60+	12-Apr 19-Apr	13-Aug 14-Sep	21-Aug 27-Sep	123 148 Machine	131 161	**Roundup, Prowl+Dual, Matrix**	**Tops-MZ- Goucho**	**Telone II, Ridomil+ Bravo, Dithane+ Mn, Cu, Sulfer**
10	Springlake Texas **(SPR)**	J. C. Miller Jr., J. Koym, D. Schuering	Early	Pivot	160-33-63	21-Mar	27-Jul	14-Aug	128	146	Dual, Sencor, Matrix, Roundup	Genisis, Admire	Tops MZ, Bravo, Quadris
11	Pasco **(PAS)** Othello **(OTH)** Washington	R. Thornton, N. Fuller, E. Driskill, R. Knowles G. Newberry	Early Late	Pivot Sprink.	275-180-150 351-389-241	21-Mar 3-Apr	4-Jul 21-Sep	24-Jul 3-Oct	105 171 Gramoxone Extra	125 183	Dual II, Sencor Eptam, Sencor, Matrix	Thimet, Asana, **Fulfill**, Success Comite	Quadris, Bravo Bravo, Dithane Quadris

[1] Bold indicates use in both early and late trial.

TABLE 2: 1999 Western Regional Potato Variety Trial - CLONE, PARENTAGE, FLOWER COLOR, ENTRY SUBMISSION, USE, TRIAL, YEARS IN TRIAL, SEED SOURCE, STAND, TUBER AND VINE CHARACTERISTICS

Clone	Parents	Flower Color[1]	Entered by	Use	Trial	Year in Trial	Seed Source	Stand[2]	Tuber Shape (1-5)[3]		Tuber Skin (1-5)[4]		Vine Size (1-5)[5]		Vine Maturity (1-5)[6]	
R NORKOTAH	ND9526-4Russ ND9687-5Russ	W	Ck	Fresh	E/L	-	OR	**96**	Long	**4.1**	Med Russet	**4.0**	Medium	**2.6**	Early	**2.2**
RUSSET BURBANK		W	Ck	Dual	E/L	-	OR	**98**	Long	**4.5**	Med Russet	**3.6**	Med-large	**3.5**	Medium	**3.4**
TXNS 296	Norkotah Strain	W	TX	Fresh	E/L	1	TX	**99**	Long	**4.3**	Med Russet	**3.9**	Med-large	**3.1**	Med-early	**2.7**

Tuber and Vine Descriptions[2] cover Tuber Shape, Tuber Skin, Vine Size and Vine Maturity.

[1] P=Purple, R=Red, W=White.
[2] Numerical values are means of all trial locations.
[3] 1.0-2.0=Round, 2.1-2.5=Round-Oblong, 2.6-3.5=Oblong, 3.6-4.0=Oblong-Long, 4.1-5.0=Long
[4] 1.0-2.0=White, 2.1-3.0=Light Russet, 3.1-4.0=Medium Russet, 4.1-4.5=Medium Heavy Russet, 4.6-5.0 Heavy Russet
[5] 1.0-2.5=Small, 2.6-3.0=Medium, 3.1-4.0=Medium-Large, 4.1-4.5=Large, 4.6-5.0=Very Large
[6] 1.0-2.5=Early, 2.6-3.0=Medium-Early, 3.1-3.5=Medium, 3.6-4.0= Medium-Late, 4.1-4.5=Late, 4.6-5.0=Very Late
* 28% in Kern County, California.

TABLE 2: 2000 Western Regional Potato Variety Trial - CLONE, PARENTAGE, FLOWER COLOR, ENTRY SUBMISSION, USE, TRIAL, YEARS IN TRIAL, SEED SOURCE, STAND, TUBER AND VINE CHARACTERISTICS

Clone	Parents	Flower Color[1]	Entered by	Use	Trial	Year in Trial	Seed Source	Stand[2]	Tuber Shape (1-5)[3]		Tuber Skin (1-5)[4]		Vine Size (1-5)[5]		Vine Maturity (1-5)[6]	
RUSSET NORKOTAH	ND9526-4Russ ND9687-5Russ	W	Ck	Fresh	E/L	-	OR	**95**	Long	**4.2**	Med-Hvy Rus	**4.1**	Small	**2.4**	Early	**1.8**
RUSSET BURBANK		W	Ck	Dual	E/L	-	OR	**97**	Long	**4.4**	Med Russet	**3.9**	Med-large	**3.4**	Medium	**3.2**
TXNS 296	Norkotah Strain	W	TX	Fresh	E/L	2	TX	**96**	Long	**4.4**	Med-Hvy Rus	**4.2**	Med-large	**3.3**	Early	**2.2**

Tuber and Vine Descriptions[2] cover Tuber Shape, Tuber Skin, Vine Size and Vine Maturity.

[1] P=Purple, R=Red, W=White.
[2] Numerical values are means of all trial locations.
[3] 1.0-2.0=Round, 2.1-2.5=Round-Oblong, 2.6-3.5=Oblong, 3.6-4.0=Oblong-Long, 4.1-5.0=Long
[4] 1.0-2.0=White, 2.1-3.0=Light Russet, 3.1-4.0=Medium Russet, 4.1-4.5=Medium Heavy Russet, 4.6-5.0 Heavy Russet
[5] 1.0-2.5=Small, 2.6-3.0=Medium, 3.1-4.0=Medium-Large, 4.1-4.5=Large, 4.6-5.0=Very Large
[6] 1.0-2.5=Early, 2.6-3.0=Medium-Early, 3.1-3.5=Medium, 3.6-4.0= Medium-Late, 4.1-4.5=Late, 4.6-5.0=Very Late

TABLE 2: 2001 Western Regional Potato Variety Trial - CLONE, PARENTAGE, FLOWER COLOR, ENTRY SUBMISSION, USE, TRIAL, YEARS IN TRIAL, SEED SOURCE, STAND, TUBER AND VINE CHARACTERISTICS

Clone	Parents	Flower Color[1]	Entered by	Use	Trial	Year in Trial	Seed Source	Stand[2]	Tuber Shape (1-5)[3]		Tuber Skin (1-5)[4]		Vine Size (1-5)[5]		Vine Maturity (1-5)[6]	
RUSSET NORKOTAH	ND9687-5Russ ND9526-4Russ	W	Ck	Fresh	E/L	-	OR	**96**	Long	**4.3**	Med Russet	**3.9**	Small	**2.4**	Early	**2.3**
RUSSET BURBANK		W	Ck	Dual	E/L	-	OR	**97**	Long	**4.4**	Med Russet	**3.4**	Med-large	**3.7**	Medium	**3.5**
TXNS 296	Norkotah Strain	W	TX	Fresh	E/L	3	TX	**92**	Long	**4.3**	Med Russet	**3.8**	Medium	**3.0**	Early	**2.5**

Tuber and Vine Descriptions[2] cover Tuber Shape, Tuber Skin, Vine Size and Vine Maturity.

[1] P=Purple, R=Red, W=White.
[2] Numerical values are means of all trial locations.
[3] 1.0-2.0=Round, 2.1-2.5=Round-Oblong, 2.6-3.5=Oblong, 3.6-4.0=Oblong-Long, 4.1-5.0=Long
[4] 1.0-2.0=White, 2.1-3.0=Light Russet, 3.1-4.0=Medium Russet, 4.1-4.5=Medium Heavy Russet, 4.6-5.0 Heavy Russet
[5] 1.0-2.5=Small, 2.6-3.0=Medium, 3.1-4.0=Medium-Large, 4.1-4.5=Large, 4.6-5.0=Very Large
[6] 1.0-2.5=Early, 2.6-3.0=Medium-Early, 3.1-3.5=Medium, 3.6-4.0= Medium-Late, 4.1-4.5=Late, 4.6-5.0=Very Late

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TABLE 3: 1999 Western Regional Potato Variety Trial - TOTAL YIELD (CWT/A) - EARLY AND LATE HARVEST

	Total Yield - Early Harvest (CWT/A)							Total Yield - Late Harvest (CWT/A)									
	CA	NM	OR		TX	WA	Entry	CA	CO	ID		NM	OR			WA	Entry
Clone	KRN[1]	CLV	HRM	MAL	SPR	OTH	Mean	TUL	SLV[1]	AB	KIM	FRM	HRM	KLM	MAL	OTH	Mean
R NORKOTAH	774	206	437	502	260	667	**415**	375	367	304	284	335	523	533	464	705	**440**
R. BURBANK	687	223	435	531	245	553	**397**	528	471	429	469	434	783	559	545	806	**569**
TXNS 296	-	248	575	573	272	647	**463**	544	436	392	391	401	679	597	612	805	**553**
Location Means	**731**	**226**	**482**	**535**	**259**	**622**	**425**	**482**	**425**	**375**	**381**	**390**	**662**	**563**	**540**	**772**	**521**

[1]Excluded from means due to missing entries.

TABLE 3: 2000 Western Regional Potato Variety Trial - TOTAL YIELD (CWT/A) - EARLY AND LATE HARVEST

	Total Yield - Early Harvest (CWT/A)							Total Yield - Late Harvest (CWT/A)									
	CA	OR		TX		WA	Entry	CA	CO	ID		NM	OR			WA	Entry
Clone	KRN	HRM	MAL	DAL	SPR	ELT	Mean	TUL	SLV[1]	AB	KIM	FRM	HRM	KLM	MAL	WRD	Mean
R. NORKOTAH	385	333	363	226	308	443	**343**	354	409	299	232	398	441	459	327	506	**377**
R. BURBANK	319	512	420	203	247	546	**375**	605	430	487	344	600	671	564	466	803	**568**
TXNS 296	320	525	442	269	371	553	**413**	611	453	400	349	461	527	538	-	-	**481**
Location Means	**341**	**457**	**408**	**233**	**309**	**514**	**377**	**523**	**431**	**395**	**308**	**486**	**546**	**520**	**396**	**654**	**475**

[1]Excluded from means due to missing entries.

TABLE 3: 2001 Western Regional Potato Variety Trial - TOTAL YIELD (CWT/A) - EARLY AND LATE HARVEST

	Total Yield - Early Harvest (CWT/A)						Total Yield - Late Harvest (CWT/A)									
	CA	OR		TX	WA	Entry	CA	CO	ID		NM	OR			WA	Entry
Clone	KRN	HRM	MAL	SPR	PAS	Mean	TUL	SLV	AB	KIM	FRM	HRM	KLM	MAL	OTH	Mean
R NORKOTAH	321	535	472	258	531	**423**	389	389	273	445	296	560	525	477	632	**443**
R. BURBANK	338	414	568	329	441	**418**	554	462	405	552	328	912	508	601	651	**553**
TXNS 296	358	683	532	326	575	**495**	448	429	352	474	269	832	608	602	755	**530**
Location Means	**339**	**544**	**524**	**304**	**516**	**445**	**464**	**427**	**343**	**490**	**298**	**768**	**547**	**560**	**679**	**509**

were not included in Duncan's analyses due to incomplete representation at all sites.

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TABLE 4: 1999 Western Regional Potato Variety Trial - YIELD OF U.S. #1'S (CWT/A & %) - EARLY AND LATE HARVEST

U.S. No. 1's - Early Harvest (CWT/A)

	CA	NM	OR		TX	WA	Entry
Clone	KRN[1]	CLV	HRM	MAL	SPR	OTH	Mean
R NORKOTAH	720	65	355	393	165	540	**373**
	93	32	81	78	63	81	**71**
R. BURBANK	371	44	237	359	41	290	**194**
	54	19	55	67	17	52	**42**
TXNS 296	-	92	447	446	142	481	**322**
	-	37	78	78	62	74	**66**
Location Means	545	67	346	399	116	437	**296**
	73	29	71	74	48	69	**60**

U.S. No. 1's - Late Harvest (CWT/A)

	CA	CO	ID		NM	OR			WA	Entry
Clone	TUL	SLV[1]	AB	KIM	FRM[2]	HRM	KLM	MAL	OTH	Mean
R NORKOTAH	252	297	222	197	260	361	493	360	544	**331.8**
	67	81	73	69	78	69	92	78	77	**76**
R. BURBANK	343	245	286	242	368	409	398	284	510	**355**
	65	52	67	52	85	52	71	52	63	**63**
TXNS 296	449	359	303	246	301	395	529	461	562	**400.5**
	82	82	77	63	75	58	89	75	70	**74.62**
Location Means	348	300	270	228	310	388	473	368	539	**362.4**
	72	72	72	61	79	60	84	68	70	**71.21**

[1]Excluded from means due to missing entries.
[2]FRM graded by size: > 1 7/8".

TABLE 4: 2000 Western Regional Potato Variety Trial - YIELD OF U.S. #1'S (CWT/A & %) - EARLY AND LATE HARVEST

U.S. No. 1's - Early Harvest (CWT/A)

	CA	OR		TX		WA	Entry
Clone	KRN	HRM	MAL	DAL	SPR	ELT	Mean
R. NORKOTAH	354	259	292	166	260	377	**284.8**
	92	78	81	73	85	85	**82.34**
R. BURBANK	266	313	204	88	79	306	**209**
	83	61	48	43	32	56	**54**
TXNS 296	291	393	300	170	280	435	**311.5**
	91	75	67	63	75	79	**75.08**
Location Means	304	322	265	141	206	373	**268.4**
	89	71	65	60	64	73	**70.47**

U.S. No. 1's - Late Harvest (CWT/A)

	CA	CO	ID		NM	OR			WA	Entry
Clone	TUL	SLV[1]	AB	KIM	FRM[2]	HRM	KLM	MAL	WRD	Mean
R. NORKOTAH	303	332	242	174	357	306	402	260	419.3	**307.9**
	86	81	81	75	90	69	88	79	82.9	**81.48**
R. BURBANK	436	308	274	88	505	427	378	187	349	**330**
	73	72	56	26	84	64	67	41	43	**57**
TXNS 296	468	405	342	245	413	358	476	-	-	**383.7**
	76	89	86	70	90	68	88	-	-	**79.66**
Location Means	545	545	545	545	545	545	545	545	545.4	**545.4**
	73	73	73	73	73	73	73	73	73.48	**73.48**

[1]Excluded from means due to missing entries.
[2]FRM graded by size: > 1 7/8".

TABLE 4: 2001 Western Regional Potato Variety Trial - YIELD OF U.S. #1'S [CWT/A (upper) and % (lower)] - EARLY AND LATE HARVEST

U.S. No. 1's - Early Harvest (CWT/A) and %

	CA	OR		TX	WA	Entry
Clone	KRN	HRM	MAL	SPR	PAS	Mean/Rank
R NORKOTAH	286	449	313	217	412	**335**
	89	84	67	84	78	**80**
R. BURBANK	216	291	181	46	226	**192**
	63	70	32	14	51	**46**
TXNS 296	323	547	307	294	424	**379**
	89	80	58	90	74	**78**
Location Means	275	429	267	186	354	**302**
	80	78	52	63	67	**68**

U.S. No. 1's - Late Harvest (CWT/A) and %

	CA	CO	ID		NM	OR			WA	Entry
Clone	TUL	SLV	AB	KIM	FRM[1]	HRM	KLM	MAL	OTH	Mean
R NORKOTAH	352	307	196	368	223	456	438	393	521	**361**
	90	79	72	83	75	82	83	83	82	**81**
R. BURBANK	340	302	221	219	200	545	328	338	388	**320**
	63	65	55	40	61	60	65	56	60	**58**
TXNS 296	388	359	234	369	209	648	500	461	594	**418**
	86	84	66	78	78	78	82	77	79	**79**
Location Means	360	323	217	319	211	550	422	398	501	**366**
	80	76	64	67	71	73	77	72	74	**73**

were not included in Duncan's analyses due to incomplete representation at all sites.
[1]FRM graded by size: > 1 7/8".

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TABLE 5: 1999 Western Regional Potato Variety Trial - YIELD > 10/12 OZ (CWT/A & %) - EARLY AND LATE HARVEST

U.S. No. 1's > 10/12 OZ - Early Harvest (CWT/A)

Clone	CA KRN[1]	NM CLV	OR HRM	OR MAL	TX SPR	WA OTH	Entry Mean
R NORKOTAH	302	3	50	19	14	207	99
	39	1	11	4	5	31	15
R. BURBANK	133	0	18	9	0	43	14
	19	0	4	2	0	8	3
TXNS 296	-	15	45	47	4	131	48
	-	6	8	8	1	20	8.8
Location Means	217	6	38	25	6	127	54
	29	2	8	5	2	20	9

U.S. No. 1's > 10/12 OZ - Late Harvest (CWT/A)

Clone	CA TUL	CO SLV[1]	ID AB	ID KIM	NM FRM[2]	OR HRM	OR KLM	OR MAL	WA OTH	Entry Mean
R NORKOTAH	125	90	19	8	3	80	229	81	228	95.9
	33	24	6	3	1	15	43	18	32	19.6
R. BURBANK	69	31	46	29	36	153	78	42	111	70
	13	7	11	6	8	20	14	8	14	12
TXNS 296	159	159	42	38	13	90	259	99	204	118
	29	36	11	10	3	13	43	16	25	20.9
Location Means	118	93	36	25	17	108	189	74	181	94.7
	25	23	9	6	4	16	33	14	24	17.5

[1]Excluded from means due to missing entries.
[2]FRM graded by size: > 3".

TABLE 5: 2000 Western Regional Potato Variety Trial - YIELD > 10/12 OZ (CWT/A & %) - EARLY AND LATE HARVEST

U.S. No. 1's > 10/12 OZ - Early Harvest (CWT/A)

Clone	CA KRN	OR HRM	OR MAL	TX DAL	TX SPR	WA ELT	Entry Mean
R. NORKOTAH	67	31	87	24	90	47	57.6
	17	9	24	11	29	11	16.8
R. BURBANK	39	23	34	11	8	16	22
	12	4	8	5	3	3	6
TXNS 296	41	71	163	7	130	114	87.6
	13	14	37	2	35	21	20.2
Location Means	49	42	94	14	76	59	56
	14	9	23	6	22	11	14

U.S. No. 1's > 10/12 OZ - Late Harvest (CWT/A)

Clone	CA TUL	CO SLV[1]	ID AB	ID KIM	NM FRM[2]	OR HRM	OR KLM	OR MAL	WA WRD	Entry Mean
R. NORKOTAH	77	102	44	48	18	87	118	56	96.1	68.1
	22	25	15	21	5	20	26	17	19	18
R. BURBANK	75	88	117	28	9	170	76	28	122	78
	12	20	24	8	1	25	13	6	15	13
TXNS 296	269	248	67	90	37	167	222	-	-	142
	44	55	17	26	8	32	41	-	-	28
Location Means	140	146	76	55	22	141	139	42	109	96
	26	33	19	18	5	25	27	12	17	19.7

[1]Excluded from means due to missing entries.
[2]FRM graded by size: > 3".

TABLE 5: 2001 Western Regional Potato Variety Trial - YIELD > 10/12 OZ [CWT/A (upper) & % (lower)] - EARLY AND LATE HARVEST

U.S. No. 1's > 10/12 OZ - Early Harvest (CWT/A) and %

Clone	CA KRN	OR HRM	OR MAL	TX SPR	WA PAS	Entry Mean
R NORKOTAH	55	63	53	70	119	72
	17	12	11	27	22	18
R. BURBANK	36	69	29	1	23	32
	11	17	5	0	5	8
TXNS 296	21	178	88	108	92	97
	6	26	16	33	16	19
Location Means	37	103	57	60	78	67
	11	18	11	20	14	15

U.S. No. 1's > 10/12 OZ - Late Harvest (CWT/A) and %

Clone	CA TUL	CO SLV	ID AB	ID KIM	NM FRM[1]	OR HRM	OR KLM	OR MAL	WA OTH	Entry Mean
R NORKOTAH	159	89	34	170	14	129	225	104	268	132
	41	23	12	38	5	23	43	22	42	28
R. BURBANK	92	47	79	83	12	214	57	123	112	91
	17	10	20	15	4	23	11	20	17	15
TXNS 296	193	107	88	167	12	342	243	175	330	184
	43	25	25	35	4	41	40	29	44	32
Location Means	148	81	67	140	13	228	175	134	237	136
	34	19	19	29	4	29	31	24	34	25

were not included in Duncan's analyses due to incomplete representation at all sites.
[1]FRM graded by size: > 3".

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TABLE 6: 1999 Western Regional Potato Variety Trial - YIELD < 4 OZ (CWT/A & %) - EARLY AND LATE HARVEST

Yield < 4 OZ - Early Harvest (CWT/A)

Clone	CA KRN[1]	NM CLV[2]	OR HRM	OR MAL	TX SPR	WA OTH	Entry Mean
R NORKOTAH	21	68	68	89	82	45	**62**
	3	33	16	18	32	7	**18**
R. BURBANK	32	58	116	109	66	86	**87**
	5	26	27	21	27	15	**23**
TXNS 296	-	72	81	95	97	76	**84**
	-	29	14	17	30	12	**20**
Location Means	**27**	**66**	**88**	**98**	**82**	**69**	**78**
	4	**29**	**19**	**18**	**30**	**11**	**20**

Yield < 4 OZ - Late Harvest (CWT/A)

Clone	CA TUL	CO SLV[1]	ID AB	ID KIM	NM FRM[3]	OR HRM	OR KLM	OR MAL	WA OTH	Entry Mean
R NORKOTAH	24	65	77	71	75	81	20	60	66	**60**
	6	18	25	25	22	15	4	13	9	**15**
R. BURBANK	46	202	89	102	66	109	66	87	80	**81**
	9	43	21	22	15	14	12	16	10	**15**
TXNS 296	28	57	73	68	100	119	18	88	83	**70**
	5	13	19	17	25	18	3	14	10	**14**
Location Means	**33**	**108**	**80**	**80**	**80**	**103**	**35**	**78**	**76**	**70**
	7	**25**	**22**	**21**	**21**	**16**	**6**	**14**	**10**	**15**

[1]Excluded from means due to missing entries.
[2]CLV: < 6 oz shown. [3]FRM graded by size: <1 7/8".

TABLE 6: 2000 Western Regional Potato Variety Trial - YIELD < 4 OZ (CWT/A & %) - EARLY AND LATE HARVEST

Yield < 4 OZ - Early Harvest (CWT/A)

Clone	CA KRN	OR HRM	OR MAL	TX DAL	TX SPR	WA ELT	Entry Mean
R. NORKOTAH	19	55	8	55	28	60	**37.6**
	5	17	2	25	9	13	**11.8**
R. BURBANK	23	88	18	34	54	111	**54**
	7	17	4	17	22	20	**15**
TXNS 296	19	52	10	74	45	75	**45.8**
	6	10	2	27	12	14	**11.9**
Location Means	**21**	**65**	**12**	**54**	**42**	**82**	**46**
	6	**14**	**3**	**23**	**14**	**16**	**13**

Yield < 4 OZ - Late Harvest (CWT/A)

Clone	CA TUL	CO SLV[1]	ID AB	ID KIM	NM FRM[2]	OR HRM	OR KLM	OR MAL	WA WRD	Entry Mean
R. NORKOTAH	14	59	49	33	41	63	29	24	53	**38**
	4	14	16	14	10	14	6	7	10	**10**
R. BURBANK	32	88	30	56	96	88	54	61	92	**64**
	5	20	6	16	13	10	13	11	11	
TXNS 296	20	27	38	29	48	50	15	-	-	**33**
	3	6	10	8	10	9	3	-	-	**7**
Location Means	**22**	**58**	**39**	**39**	**62**	**67**	**33**	**43**	**72**	**45**
	4	**13**	**11**	**13**	**11**	**11**	**7**	**9**	**11**	**9**

[1]Excluded from means due to missing entries.
[2]FRM graded by size: <1 7/8".

TABLE 6: 2001 Western Regional Potato Variety Trial - YIELD < 4 OZ [CWT/A (upper) & % (lower)] - EARLY AND LATE HARVEST

Yield < 4 OZ - Early Harvest (CWT/A) and %

Clone	CA KRN	OR HRM	OR MAL	TX SPR	WA PAS	Entry Mean
R NORKOTAH	25	73	23	28	54	**41**
	8	14	5	11	10	**9**
R. BURBANK	34	70	58	53	57	**54**
	10	17	10	16	13	**13**
TXNS 296	35	69	32	31	83	**50**
	10	10	6	9	14	**10**
Location Means	**31**	**71**	**38**	**37**	**65**	**48**
	9	**14**	**7**	**12**	**13**	**11**

Yield < 4 OZ - Late Harvest (CWT/A) and %

Clone	CA TUL	CO SLV	ID AB	ID KIM	NM FRM[1]	OR HRM	OR KLM	OR MAL	WA OTH	Entry Mean
R NORKOTAH	16	70	47	13	74	67	16	31	35	**41**
	4	18	17	3	25	12	3	7	6	**10**
R. BURBANK	42	151	38	30	129	118	58	47	78	**77**
	8	33	9	5	39	13	11	8	12	**15**
TXNS 296	18	60	43	14	60	65	33	31	57	**42**
	4	14	12	3	22	8	5	5	8	**9**
Location Means	**26**	**94**	**43**	**19**	**87**	**83**	**36**	**36**	**57**	**53**
	5	**22**	**13**	**4**	**29**	**11**	**6**	**7**	**8**	**11**

were not included in Duncan's analyses due to incomplete representation at all sites.
[1]FRM graded by size: <1 7/8".

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TABLE 7: 1999 Western Regional Potato Variety Trial - SPECIFIC GRAVITY - EARLY AND LATE HARVEST

Specific Gravity - Early Harvest (CWT/A)

Clone	CA KRN[1]	OR HRM	OR MAL	TX SPR	WA OTH	Entry Mean
R. NORKOTAH	1.075	1.069	1.074	1.056	1.073	**1.069**
R. BURBANK	1.087	1.076	1.077	1.061	1.075	**1.072**
TXNS 296		1.068	1.076	1.059	1.072	**1.069**
Location Means	**1.081**	**1.071**	**1.076**	**1.059**	**1.073**	**1.070**

Specific Gravity - Late Harvest (CWT/A)

Clone	CA TUL	CO SLV[1]	ID AB	ID KIM	NM FRM	OR HRM	OR KLM	OR MAL	WA OTH	WA	Entry Mean
R. NORKOTAH	1.072	1.082	1.074	1.072	1.089	1.067	1.068	1.075	1.070	1.074	**1.074**
R. BURBANK	1.072	1.085	1.080	1.083	1.088	1.078	1.084	1.080	1.087	1.083	**1.082**
TXNS 296	1.071	1.085	1.077	1.073	1.088	1.065	1.069	1.076	1.072	1.075	**1.075**
Location Means	**1.072**	**1.084**	**1.077**	**1.076**	**1.088**	**1.070**	**1.074**	**1.077**	**1.076**	**1.077**	**1.077**

[1]Excluded from means due to missing entries.

TABLE 7: 2000 Western Regional Potato Variety Trial - SPECIFIC GRAVITY - EARLY AND LATE HARVEST

Specific Gravity - Early Harvest

Clone	CA KRN	OR HRM	OR MAL	TX DAL	TX SPR	WA ELT	Entry Mean
R. NORKOTAH	1.083	1.068	1.073	1.062	1.063	1.071	**1.070**
R. BURBANK	1.092	1.081	1.082	1.063	1.066	1.078	**1.077**
TXNS 296	1.086	1.068	1.079	1.066	1.063	1.069	**1.072**
Location Means	**1.087**	**1.072**	**1.078**	**1.064**	**1.064**	**1.073**	**1.073**

Specific Gravity - Late Harvest

Clone	CA TUL	CO SLV[1]	ID AB	ID KIM	NM FRM	OR HRM	OR KLM	OR MAL	WA WRD	Entry Mean
R. NORKOTAH	1.076	1.083	1.074	1.066	1.082	1.066	1.066	1.070	1.072	**1.073**
R. BURBANK	1.085	1.084	1.084	1.072	1.085	1.079	1.085	1.077	1.079	**1.081**
TXNS 296	1.072	1.079	1.077	1.07	1.084	1.067	1.067	-	-	**1.074**
Location Means	**1.078**	**1.082**	**1.078**	**1.069**	**1.083**	**1.071**	**1.073**	**1.074**	**1.076**	**1.076**

[1]Excluded from means due to missing entries.

TABLE 7: 2001 Western Regional Potato Variety Trial - SPECIFIC GRAVITY - EARLY AND LATE HARVEST

Specific Gravity - Early Harvest

Clone	CA KRN	OR HRM	OR MAL	TX SPR	WA PAS	Entry Mean
R NORKOTAH	1.085	1.062	1.078	1.059	1.077	**1.072**
R. BURBANK	1.087	1.067	1.088	1.055	1.083	**1.076**
TXNS 296	1.058	1.064	1.077	1.061	1.077	**1.068**
Location Means	**1.077**	**1.064**	**1.081**	**1.059**	**1.079**	**1.072**

Specific Gravity - Late Harvest

Clone	CA TUL	CO SLV	ID AB	ID KIM	NM FRM	OR HRM	OR KLM	OR MAL	WA OTH	Entry Mean
R NORKOTAH	1.066	1.077	1.071	1.067	1.076	1.058	1.072	1.074	1.075	**1.071**
R. BURBANK	1.083	1.088	1.078	1.081	1.081	1.075	1.085	1.081	1.079	**1.081**
TXNS 296	1.068	1.084	1.073	1.068	1.0765	1.060	1.074	1.077	1.072	**1.073**
Location Means	**1.072**	**1.083**	**1.074**	**1.072**	**1.078**	**1.064**	**1.077**	**1.077**	**1.075**	**1.075**

were not included in Duncan's analyses due to incomplete representation at all sites.

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TABLE 8: 1999 Western Regional Potato Variety Trial - AVERAGE TUBER SIZE, AND TUBER SHAPE

Average Tuber Size (oz)

Clone	Early Trial OR HRM	Early Trial TX SPR	Early Trial WA OTH	Early Trial **Mean**	Late Trial ID AB	Late Trial ID KIM	Late Trial OR HRM	Late Trial WA OTH	Late Trial **Mean**
R NORKOTAH	6.0	3.7	8.2	**6.0**	4.8	4.3	6.1	7.7	**5.7**
R. BURBANK	4.8	3.0	6.0	**4.6**	5.4	4.9	7.0	7.1	**6.1**
TXNS 296	6.1	3.4	6.7	**5.4**	5.5	5.3	6.1	7.4	**6.1**
Location Means	**5.6**	**3.4**	**7.0**	**5.3**	**5.2**	**4.8**	**6.4**	**7.4**	**6.0**

Tuber Shape (1-5 length/width ratio: 1=round, 5=long)

Clone	Early Trial CA KRN	Early Trial OR HRM	Early Trial OR MAL	Early Trial TX SPR	Early Trial WA OTH	Early Trial **Mean**	Late Trial CA TUL	Late Trial CO SLV	Late Trial ID AB	Late Trial ID KIM	Late Trial OR HRM	Late Trial OR KLM	Late Trial OR MAL	Late Trial WA OTH	Late Trial **Mean**
R NORKOTAH	4.0	4.5	3.8	4.0	4.0	**4.1**	4.0	5.0	4.0	4.3	5.0	5.0	3.3	3.0	**4.2**
R. BURBANK	4.0	5.0	5.0	5.0	4.0	**4.6**	4.0	5.0	4.0	4.0	5.0	5.0	5.0	3.7	**4.5**
TXNS 296	-	4.5	4.5	4.5	3.5	**4.3**	4.0	5.0	4.3	4.8	5.0	4.5	4.0	3.0	**4.3**
Location Means	**4.0**	**4.7**	**4.4**	**4.5**	**3.8**	**4.3**	**4.0**	**5.0**	**4.1**	**4.4**	**5.0**	**4.8**	**4.1**	**3.2**	**4.3**

TABLE 8: 2000 Western Regional Potato Variety Trial - AVERAGE TUBER SIZE, AND TUBER SHAPE

Average Tuber Size (oz)

Clone	Early Trial OR HRM	Early Trial TX DAL	Early Trial TX SPR	Early Trial WA ELT	Early Trial **Mean**	Late Trial ID AB	Late Trial ID KIM	Late Trial OR HRM	Late Trial WA WRD	Late Trial **Mean**
R. NORKOTAH	5.8	2.9	6.9	6.1	**5.43**	5.8	6.1	6.6	6.7	**6.3**
R. BURBANK	6.0	3.5	4.4	5.5	**4.8**	8.8	6.1	7.3	7.8	**7.5**
TXNS 296	7.2	3.5	7.1	6.4	**6.06**	6.4	6.2	7.7	-	**6.8**
Location Means	**6.6**	**3.5**	**5.8**	**6.0**	**5.4**	**7.6**	**6.2**	**7.5**	**7.8**	**7.1**

Tuber Shape (1-5 length/width ratio: 1=round, 5=long)

Clone	Early Trial CA KRN	Early Trial OR HRM	Early Trial OR MAL	Early Trial TX SPR	Early Trial WA ELT	Early Trial **Mean**	Late Trial CA TUL	Late Trial CO SLV	Late Trial ID AB	Late Trial ID KIM	Late Trial OR HRM	Late Trial OR KLM	Late Trial OR MAL	Late Trial WA WRD	Late Trial **Mean**
R. NORKOTAH	4.0	4.9	3.0	4.1	4.0	**4.0**	2.3	5.0	4.0	4.0	5.0	4.0	3.0	5.0	**4.0**
R. BURBANK	5.0	5.0	5.0	3.6	4.0	**4.5**	4.3	5.0	4.5	4	5.0	5.0	3.5	3.7	**4.4**
TXNS 296	4.0	5.0	3.5	4.5	4.0	**4.2**	4.0	5.0	4.0	4.8	5.0	4.8	-	-	**4.6**
Location Means	**4.5**	**5.0**	**4.3**	**4.1**	**4.0**	**4.4**	**4.2**	**5.0**	**4.3**	**4.4**	**5.0**	**4.9**	**3.5**	**3.7**	**4.5**

TABLE 8: 2001 Western Regional Potato Variety Trial - AVERAGE TUBER SIZE, AND TUBER SHAPE

Average Tuber Size (oz)

Clone	Early Trial OR HRM	Early Trial TX SPR	Early Trial WA PAS	Early Trial **Mean**	Late Trial ID AB	Late Trial ID KIM	Late Trial OR HRM	Late Trial WA OTH	Late Trial **Mean**
R NORKOTAH	5.6	6.3	7.2	**6.4**	5.6	9.7	7.1	9.5	**8.0**
R. BURBANK	5.5	4.5	6.6	**5.5**	7.4	10.3	7.5	7.3	**8.1**
TXNS 296	6.4	6.6	6.3	**6.4**	7.2	9.8	8.8	9.1	**8.7**
Location Means	**5.8**	**5.8**	**6.7**	**6.1**	**6.7**	**9.9**	**7.8**	**8.6**	**8.3**

Tuber Shape (1-5 length/width ratio: 1=round, 5=long)

Clone	Early Trial CA KRN	Early Trial OR HRM	Early Trial OR MAL	Early Trial TX SPR	Early Trial WA PAS	Early Trial **Mean**	Late Trial CA TUL	Late Trial CO SLV	Late Trial ID AB	Late Trial ID KIM	Late Trial OR HRM	Late Trial OR KLM	Late Trial OR MAL	Late Trial WA OTH	Late Trial **Mean**
R NORKOTAH	3.7	5.0	3.5	5.0	4.7	**4.4**	4.3	5.0	4.0	4.3	4.6	5.0	3.3	4.0	**4.3**
R. BURBANK	3.5	5.0	4.3	5.0	3.3	**4.2**	4.0	5.0	4.8	4.0	5.0	5.0	4.3	4.0	**4.5**
TXNS 296	4.0	5.0	3.0	5.0	4.7	**4.3**	4.3	5.0	3.8	3.8	4.9	5.0	3.0	4.0	**4.2**
Location Means	**3.7**	**5.0**	**3.6**	**5.0**	**4.2**	**4.3**	**4.2**	**5.0**	**4.2**	**4.0**	**4.8**	**5.0**	**3.5**	**4.0**	**4.3**

TABLE 9: 1999 Western Regional Potato Variety Trial - EXTERNAL DEFECTS MEANS OF LOCATIONS - GROWTH CRACKS, SECOND GROWTH, SHATTER BRUISE, AND SCAB[1]

	Growth Cracks		Second Growth		Shatter Bruise			Scab	
Clone	Early Trial	Late Trial	Early Trial	Late Trial	Early Trial	Late Trial	AB[2]	Early Trial	Late Trial
R. NORKOTAH	4.5	5.0	5.0	4.9	5.0	4.6	2.5	4.9	4.6
R. BURBANK	4.2	3.8	4.4	3.7	5.0	4.5	3.2	5.0	5.0
TXNS 296	5.0	4.8	5.0	4.7	5.0	4.6	2.5	4.8	4.7
Entry Means	**4.6**	**4.5**	**4.8**	**4.4**	**5.0**	**4.6**	**2.7**	**4.9**	**4.8**

[1]All scores [1-5(none)]. Individual trial sites with extreme values are listed to the right of the entry means.
[2]Aberdeen shatter scores reflect dropping from shatter chamber [1-5(none)].

TABLE 9: 2000 Western Regional Potato Variety Trial - EXTERNAL DEFECTS MEANS OF LOCATIONS - GROWTH CRACKS, SECOND GROWTH, SHATTER BRUISE, AND SCAB[1]

	Growth Cracks		Second Growth		Shatter Bruise			Scab	
Clone	Early Trial	Late Trial	Early Trial	Late Trial	Early Trial	Late Trial	AB[2]	Early Trial	Late Trial
R. NORKOTAH	5.0	4.9	5.0	4.8	5.0	4.9	3.9	4.7	5.0
R. BURBANK	3.9	3.5	3.6	2.1	5.0	5.0	3.4	4.8	5.0
TXNS 296	4.9	4.7	3.8	4.7	5.0	5.0	3.8	4.6	4.9
Entry Means	**4.6**	**4.4**	**4.1**	**3.9**	**5.0**	**5.0**	**3.7**	**4.7**	**5.0**

[1]All scores [1-5(none)]. Individual trial sites with extreme values are listed to the right of the entry means.
[2]Aberdeen shatter scores reflect dropping from shatter chamber [1-5(none)].

TABLE 9: 2001 Western Regional Potato Variety Trial - EXTERNAL DEFECTS MEANS OF LOCATIONS - GROWTH CRACKS, SECOND GROWTH, SHATTER BRUISE, AND SCAB[1]

	Growth Cracks		Second Growth		Shatter Bruise			Scab	
Clone	Early Trial	Late Trial	Early Trial	Late Trial	Early Trial	Late Trial	AB[2]	Early Trial	Late Trial
R NORKOTAH	5.0	4.7	4.5	4.9	4.9	4.6	3.5	5.0	5.0
R. BURBANK	3.9	3.5	4.0	2.8	4.8	4.7	2.8	5.0	4.9
TXNS 296	4.9	4.8	4.7	4.6	4.8	4.8	3.1	5.0	4.9
Entry Means	**4.6**	**4.3**	**4.4**	**4.1**	**4.8**	**4.7**	**3.1**	**5.0**	**4.9**

[1]All scores [1-5(none)]. Individual trial sites with relatively extreme values are listed to the right of the entry means.
[2]Aberdeen shatter scores reflect dropping from shatter chamber [1-5(none)].

TABLE 10: 1999 Western Regional Potato Variety Trial - INTERNAL DEFECTS MEANS OF LOCATIONS - HOLLOW HEART/BROWN CENTER, INTERNAL BROWN SPOT, VASCULAR DISCOLORATION/NET NECROSIS, AND BLACKSPOT[1]

	Percent Hollow Heart Plus Brown Center		Percent Internal Brown Spot		Percent Net Necrosis/ Vascular Discoloration		Blackspot Bruise [1-5(none)]		
Clone	Early Trial	Late Trial	Early Trial	Late Trial	Early Trial	Late Trial	Early Trial	Late Trial	ID[1]
R. NORKOTAH	0	4	0	0	4	2	5.0	4.9	2.7
R. BURBANK	12	7	4	1	1	3	4.5	4.2	2.8
TXNS 296	1	5	0	1	1	1	5.0	5.0	2.6
Entry Means	**4**	**5**	**1**	**1**	**2**	**2**	**4.8**	**4.7**	**2.7**

[1]Individual trial sites with extreme values are listed to the right of the entry means.
[2]Aberdeen and Kimberly Idaho blackspot scores reflect abrasive peel test [1-5(none)].

TABLE 10: 2000 Western Regional Potato Variety Trial - INTERNAL DEFECTS MEANS OF LOCATIONS - HOLLOW HEART/BROWN CENTER, INTERNAL BROWN SPOT, VASCULAR DISCOLORATION/NET NECROSIS, AND BLACKSPOT[1]

	Percent Hollow Heart Plus Brown Center		Percent Internal Brown Spot		Percent Net Necrosis/ Vascular Discoloration		Blackspot Bruise [1-5(none)]		
Clone	Early Trial	Late Trial	Early Trial	Late Trial	Early Trial	Late Trial	Early Trial	Late Trial	ID[1]
R. NORKOTAH	2	3	2	3	1	1	4.5	4.4	2.0
R. BURBANK	16	15	3	5	2	0	3.3	3.1	2.3
TXNS 296	0	3	0	0	1	0	3.9	4.5	2.2
Entry Means	**6**	**7**	**2**	**3**	**1**	**0**	**3.9**	**4.0**	**2.1**

[1]Individual trial sites with extreme values are listed to the right of the entry means.
[2]Aberdeen and Kimberly Idaho blackspot scores reflect abrasive peel test [1-5(none)].

TABLE 10: 2001 Western Regional Potato Variety Trial - INTERNAL DEFECTS MEANS OF LOCATIONS - HOLLOW HEART/BROWN CENTER, INTERNAL BROWN SPOT, VASCULAR DISCOLORATION/NET NECROSIS, AND BLACKSPOT[1]

	Percent Hollow Heart Plus Brown Center		Percent Internal Brown Spot		Percent Net Necrosis/ Vascular Discoloration		Blackspot Bruise [1-5(none)]		
Clone	Early Trial	Late Trial	Early Trial	Late Trial	Early Trial	Late Trial	Early Trial	Late Trial	ID[2]
R NORKOTAH	0	4	6	0	4	1	4.8	4.5	3.0
R. BURBANK	13	10	3	2	1	1	5.0	3.7	2.7
TXNS 296	3	5	3	0	12	1	5.0	4.6	3.0
Entry Means	**5**	**6**	**4**	**1**	**6**	**1**	**4.9**	**4.3**	**2.9**

[1]Individual trial sites with relatively extreme values are listed to the right of the entry means.
[2]Aberdeen and Kimberly Idaho, blackspot scores reflect abrasive peel test [1-5(none)].

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TABLE 11: 1999 Western Regional Potato Variety Trial - FRENCH FRY COLOR (00-4.0(darkest)), AND PERCENT SUGAR ENDS

	Field Fry				Fry 45							Fry 40			% Sugar Ends				
	CO	OR	OR	Entry	CO	ID		OR			Entry	ID		Entry	ID		OR		Entry
	SLV	HRM	MAL	Mean	SLV	AB	KIM	HRM	KL M	MAL	Mean	AB	KIM	Mean	AB	KIM	HRM		Mean
Clone	L	E	E		L	L	L	L	L	L		L	L		L	L	E	L	
R NORKOTAH	1.0	0.2	0.5	**0.6**	2	1.8	1.8	1.1	1.0	1.0	**1.5**	3.9	4.0	**4.0**	25.0	29.0	0	0	**14**
R. BURBANK	2.0	0.5	0.5	**1.0**	2	1.1	0.8	0.9	1.0	1.0	**1.1**	3.7	3.5	**3.6**	13.0	21.0	0	3	**9**
TXNS 296	3.0	0.5	1.5	**1.7**	2	2.3	1.6	0.8	1.0	0.5	**1.4**	3.8	4.0	**3.9**	58.0	25.0	0	3	**21**
Location Means	**2.0**	**0.4**	**0.8**	**1.1**	**2.0**	**1.7**	**1.4**	**0.9**	**1.0**	**0.8**	**1.3**	**3.8**	**3.8**	**3.8**	**32.0**	**25.0**	**0**	**2**	**15**

TABLE 11: 2000 Western Regional Potato Variety Trial - FRENCH FRY COLOR (0-4.0(darkest)), AND PERCENT SUGAR ENDS

	Field Fry				Fry 45							Fry 40			% Sugar Ends					
	CO	OR	OR	Entry	CO	ID		OR			Entry	ID		Entry	ID		OR			Entry
	SLV	HRM	MAL	Mean	SLV	AB	KIM	HRM	KLM	MAL	Mean	AB	KIM	Mean	AB	KIM	HRM		KLM	Mean
Clone	L	E	E		L	L	L	L	L	L		L	L		L	L	E	L	L	
R. NORKOTAH	2.0	0.3	2.5	**1.6**	2	1.5	1.1	2.1	2.0	3.0	**2.0**	**4.0**	4.0	**4.0**	42.0	38.0	0	10	20	**23**
R. BURBANK	2.0	0.2	1.5	**1.2**	2	1.1	1.2	1.6	1.0	1.5	**1.4**	**3.5**	3.8	**3.7**	62.0	25.0	0	3	40	**23**
TXNS 296	2.0	0.3	2.5	**1.6**	2	1.4	1.7	2.1	2.0	-	**1.8**	**3.9**	3.8	**3.9**	42.0	29.0	0	15	30	**22**
Location Means	**2.0**	**0.3**	**2.2**	**1.5**	**2.0**	**1.3**	**1.3**	**1.9**	**1.7**	**2.3**	**1.7**	**3.8**	**3.9**	**3.9**	**48.7**	**30.7**	**0**	**9**	**30**	**22**

TABLE 11: 2001 Western Regional Potato Variety Trial - FRENCH FRY COLOR (00-4.0(darkest)), AND PERCENT SUGAR ENDS

	Field Fry					Fry 45							Fry 40												
	CO	OR		WA	Entry	CO	ID		OR		WA	Entry	ID		OR	WA	Entry	ID		OR					Entry
	SLV	HRM	MAL	PAS	Mean	SLV	AB	KIM	HRM	MAL	OTH[1]	Mean	AB	KIM	KL M	OTH	Mean	AB	KIM	HRM		KL M	MAL		Mean
Clone	L	E	E	E		L	L	L	L	L	L		L	L	L	L		L	L	E	L	L	E	L	
R NORKOTAH	2.0	0.1	0.5	2.0	**1.2**	3.0	1.2	1.5	1.3	2.0	-	**1.8**	3.7	3.3	4.0	-	**3.7**	54	25	0	0	0	3	23	**15**
R. BURBANK	2.0	0.2	0.5	0.0	**0.7**	1.0	1.1	1.2	1.3	1.5	4.0	**1.7**	3.2	3.0	1.0	4.0	**2.8**	67	25	0	0	50	10	45	**28**
TXNS 296	2.0	0.1	0.5	2.0	**1.2**	3.0	1.3	1.7	1.3	1.5	-	**1.8**	3.5	3.8	3.5	-	**3.6**	62	50	0	0	0	5	30	**21**
Location Means	**2.0**	**0.2**	**0.5**	**1.3**	**1.0**	**2.3**	**1.2**	**1.5**	**1.3**	**1.7**	**4.0**	**1.8**	**3.5**	**3.4**	**2.8**	**4.0**	**3.4**	**61**	**33**	**0**	**0**	**17**	**6**	**33**	**21**

[1]Samples stored @ 44F.

Storage protocol prior to frying
Aberdeen - ~5 weeks to 40F and 45F from 55F, and ~7 weeks @ 40F and 45F.
Hermiston - ~2 weeks to 45F, and ~6 weeks @45F.
Kimberly - ~3 weeks to 40F and 45F from 55F, and ~7 weeks @ 40F and 45F.
Klamath Falls - 1 week @ 48F, 1 week to 40F, and 3 weeks @ 40F.
Malheur (Early) - ~8 weeks @ 53F, and ~2 weeks @ 45F.
Malheur (Late) - ~1 week @ 53F, and ~3 weeks @ 45F.
Othello - ~7 weeks @ 44F; ~8 weeks @40F.
San Luis Valley - ~3 weeks @ 50F, and ~ 8 weeks @ 44F.

* Comprehensive post harvest evalutations of entries can be found in the 2001 Potato Cultivar Yield & Post Harvest Quality Evalutions - Washinton State University.
Contact: Drs. Bob Thornton or Rick Knowles.

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TABLE 12: 1999 Western Regional Potato Variety Trial - DISEASE EVALUATION AND METRIBUZIN REACTION

Clone	Vert. Wilt/Early Dying AB[1] (0-9)	Vert. Wilt/Early Dying HRM[2] (1-9)	Early Blight[1] (0-9)	Common Scab[1] (0-5)	Late Blight[3] Foliar (1-9)	Late Blight[3] Tuber % by Wt.	Severe Leafroll Net Necrosis AB[1](%)	Severe Leafroll Net Necrosis HRM[2](1-5)	% Severe Tuber Early Blight[1]	Fusarium Dry Rot[1] (0-5)	Erwinia Soft Rot[1] (0-5)	Metribuzin Reaction[4] AB
R NORKOTAH	8.7	8.8	8.7	1.0	8	2.5	4	2.1	0.0	1.8	3.8	MR
R. BURBANK	5.7	5.4	7.3	2.0	4	7.5	8	3.3	0.0	4.3	3.7	MS
TXNS 296	6.8	7.7	8.0	2.0	-	-	-	-	-	-	4.1	-
Entry Means	**7.1**	**7.3**	**8.0**	**2**	**6**	**5.0**	**18**	**2.7**	**10.5**	**3.5**	**2.9**	**-**

[1] Evaluations made at Aberdeen, Idaho by Dennis Corsini; scale as indicated with highest number being most severe.
[2] Evaluations made at Hermiston, Oregon by Dan Hane; scale as indicated with highest number being most severe.
[3] Evaluations made at Corvallis, Oregon by Al Mosley; scale as inidicated with highest number being most severe.
[4] Evaluations made at Aberdeen, Idaho by Steve Love: R=resistant, MR=moderately resistant, MS=moderately susceptible, S=suceptible.

TABLE 12: 2000 Western Regional Potato Variety Trial - DISEASE EVALUATION AND METRIBUZIN REACTION

Clone	Vert. Wilt/Early Dying AB[1] (0-9)[5]	Vert. Wilt/Early Dying HRM[2] (0-9)[5]	Early Blight[1] (0-9)[5]	Late Blight[3] Foliar (0-9)[5]	Late Blight[3] Tuber % by Wt.	Common Scab[1] Percent[6]	Severe Leafroll % Net Necrosis[6] AB (99)	Severe Leafroll % Net Necrosis[6] HRM[2]	Early Blight[1] Tuber (0-5)[7]	Fusarium Dry Rot[1] (0-5)[7]	Erwinia Soft Rot[1] (0-5)[7]	Metribuzin Reaction[4] % Injury
R. NORKOTAH	8.7	8.0	7.5	9.0	13	8.0	3	5.0	1.3	3.9	3.3	40.0
R. BURBANK	7.7	7.0	5.7	9.0	18	0.0	12	30.0	1.0	4.6	4.3	30.0
TXNS 296	8.3	7.0	7.3	9.0	28	3.0	6	19.0	1.0	-	3.4	-
Entry Means	**8.2**	**7.3**	**6.8**	**9**	**20**	**3.7**	**7**	**18.0**	**1.1**	**4.3**	**3.7**	**35.0**

[1] Evaluations made at Aberdeen, Idaho by Dennis Corsini.
[2] Evaluations made at Hermiston, Oregon by Dan Hane.
[3] Evaluations made at Corvallis, Oregon by Al Mosley.
[4] Evaluations made at Aberdeen, Idaho by Steve Love; % of foliage showing typical symptoms after 1.0 lb ai/A metribuzen applied post emergence.
[5] 0 - 9 scale 0 = none 9 = >90% dead or dying.
[6] % serious tuber defect = greater than 10% of tuber involved.
[7] 0 - 5 scale 0 = none 5 = most of tuber rotted.

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TABLE 12: 2001 Western Regional Potato Variety Trial - DISEASE EVALUATION AND METRIBUZIN REACTION

Clone	Vert. Wilt/Early Dying AB[1] (0-9)	Vert. Wilt/Early Dying HRM[2] (1-9)	Early Blight[1] (0-9)	Late Blight Corvallis[3] Foliar (1-9)	Late Blight Corvallis[3] Tuber % by Wt.	Late Blight Mount Vernon[4] Foliar AUDPC	Late Blight Mount Vernon[4] Tuber % by Wt.	Commo Scab[1] %	% Leafroll Net Necrosis AB[1]	% Leafroll Net Necrosis HRM[2]	Prosser[5] Corky Rngspt	Prosser[5] Root-knot	EB Tuber %	Fusarium Dry Rot[1] $F_{s(0-5)}$	Fusarium Dry Rot[1] F_c	Erwinia Soft Rot[1] (0-5)	Metribuzin Reaction[6] AB
R NORKOTAH	9.0	9.0	9.0	8.8	50.0	-	-	0	2	20.0	S	S	0	1.0	3.9	4.1	R
R. BURBANK	8.8	6.5	6.0	8.0	10.0	578	0.0	0	6	45.0	S	S	0	2.1	4.3	3.7	R
TXNS 296	7.5	8.7	8.0	8.8	37.5	428	0.6	0	8	27.5	-	-	0	1.0	1.8	3.7	-
Entry Means	**8.4**	**8.1**	**7.7**	**8.5**	**33**	**503**	**0.3**	**0.0**	**5**	**30.8**			**0**	**1.4**	**3.3**	**3.8**	

[1] Evaluations made at Aberdeen, Idaho by Dennis Corsini; scale as indicated with highest number being most severe.
[2] Evaluations made at Hermiston, Oregon by Dan Hane; scale as indicated with highest number being most severe.
[3] Evaluations made at Corvallis, Oregon by Al Mosley; scale as indicated with highest number being most severe.
[4] Evaluations made at Mount Vernon, Washington by Debbie Inglis; AUDPC = area under disease progress curve.
[5] Evaluations made at Prosser, Washington by Chuck Brown: R=resistant, MR=moderately resistant, MS=moderately susceptible, S=suceptible.
[6] Evaluations made at Aberdeen, Idaho by Steve Love: R=resistant, MR=moderately resistant, MS=moderately susceptible, S=suceptible.

TABLE 13: 1999 Western Regional Potato Variety Trial - SOLIDS, DEXTROSE, SUCROSE, PROTEIN, VITAMIN C, AND GLYCOALKALOIDS - ABERDEEN

Clone	Solids Oven Dry (%)	Sugars Dextrose (%FWB)[1]	Sugars Sucrose (%FWB)[1]	Protein (%DWB)[1]	Vitamin C (mg/100g FWB)[1]	Glycoalkaloids[2] (mg/100gFWB)[1]
R NORKOTAH	21.4	0.18	0.16	4.6	23.5	3.7
R. BURBANK	23.2	0.07	0.18	4.8	22.4	8.2
TXNS 296	21.7	0.19	0.20	5.2	26.5	3.5
Entry Means	**22.1**	**0.14**	**0.18**	**4.9**	**24.1**	**5.1**

DWB = Dry Weight Basis; FWB = Fresh Weight Basis
Glycoalkaloids: The 1999 Lenape check from Aberdeen was 28.8 mg/100g

TABLE 13: 2000 Western Regional Potato Variety Trial - SOLIDS, DEXTROSE, SUCROSE, PROTEIN, VITAMIN C, AND GLYCOALKALOIDS - ABERDEEN

Clone	Solids Oven Dry (%)	Sugars Dextrose (%FWB)[1]	Sugars Sucrose (%FWB)[1]	Protein (%DWB)[1]	Vitamin C (mg/100g FWB)[1]	Glycoalkaloids[2] (mg/100gFWB)[1]
RUSSET NORKOTAH	21.0	0.09	0.17	5.1	26.7	2.1
R. BURBANK	21.9	0.08	0.18	5.1	22.7	6.3
TXNS 296	20.3	0.10	0.18	5.8	24.3	3.1
Entry Means	**21.1**	**0.09**	**0.18**	**5.4**	**24.5**	**3.8**

DWB = Dry Weight Basis; FWB = Fresh Weight Basis
Glycoalkaloids: The 2000 Lenape check from Aberdeen was 22.9 mg/100g

TABLE 13: 2001 Western Regional Potato Variety Trial - SOLIDS, DEXTROSE, SUCROSE, PROTEIN, VITAMIN C, AND GLYCOALKALOIDS - ABERDEEN

Clone	Solids Oven Dry (%)	Sugars Dextrose (%FWB)[1]	Sugars Sucrose (%FWB)[1]	Protein (%DWB)[1]	Vitamin C (mg/100g FWB)[1]	Glycoalkaloids[2] (mg/100gFWB)[1]
R NORKOTAH	19.7	0.08	0.13	5.7	23.5	3.3
R. BURBANK	20.0	0.08	0.16	5.9	18.6	2.7
TXNS 296	21.1	0.09	0.15	5.9	20.7	2.6
Entry Means	**20.3**	**0.08**	**0.15**	**5.8**	**20.9**	**2.9**

DWB = Dry Weight Basis; FWB = Fresh Weight Basis
Glycoalkaloids: The 2001 Lenape check from Aberdeen was 25.7 mg/100g

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TABLE 14: 1999 Western Regional Potato Variety Trial - MERIT SCORES [1-5(best)]

	Process						Fresh								
	CO	ID		OR			CA		CO	ID		OR		TX	
	SLV	AB	KIM	HRM		Entry	KRN	TUL	SLV	AB	KIM	HRM		SPR	Entry
Clone	L	L	L	E	L	Mean	E	L	L	L	L	E	L	E	Mean
R. NORKOTAH	4.0	2.0	1.0	2.0	1.0	**2.0**	3.5	3.0	3.0	3.3	3.3	4.0	3.0	3.2	**3.3**
R. BURBANK	3.0	3.5	3.5	1.0	3.0	**2.8**	1.0	2.9	2.0	2.5	2.5	1.0	2.0	2.4	**2.0**
TXNS 296	3.0	2.0	1.5	2.0	2.0	**2.1**	-	3.8	5.0	3.8	3.0	5.0	2.0	3.2	**3.7**
Location Means	**3.3**	**2.5**	**2.0**	**1.7**	**2.0**	**2.3**	**2.3**	**3.2**	**3.3**	**3.2**	**2.9**	**3.3**	**2.3**	**2.9**	**3.0**

TABLE 14: 2000 Western Regional Potato Variety Trial - MERIT SCORES [1-5(best)]

	Process						Fresh								
	CO	ID		OR			CA	CO	ID		OR		TX		
	SLV	AB	KIM	HRM		Entry	TUL	SLV	AB	KIM	HRM		DAL	SPR	Entry
Clone	L	L	L	E	L	Mean	L	L	L	L	E	L	E	E	Mean
R. NORKOTAH	4.0	1.0	1.5	1.0	1.0	**1.7**	4.0	4.0	3.5	4.0	4.0	3.0	3.2	3.5	**3.7**
R. BURBANK	4.0	3.0	3.0	4.0	3.0	**3.4**	3.8	2.0	2.0	1.8	2.0	3.0	2.0	2.2	**2.3**
TXNS 296	3.0	1.0	1.5	1.0	1.0	**1.5**	4.3	5.0	4.5	3.3	4.5	4.0	3.2	3.5	**4.0**
Location Means	**3.7**	**1.7**	**2.0**	**2.0**	**1.7**	**2.2**	**4.0**	**3.7**	**3.3**	**3.0**	**3.5**	**3.3**	**2.8**	**3.1**	**3.3**

TABLE 14: 2001 Western Regional Potato Variety Trial - MERIT SCORES [1-5(best)]

	Process						Fresh								
	CO	ID		OR			CA		CO	ID		OR		TX	
	SLV	AB	KIM	HRM		Entry	KRN	TUL	SLV	AB	KIM	HRM		SPR	Entry
Clone	L	L	L	E	L	Mean	E	L	L	L	L	E	L	E	Mean
R NORKOTAH	2.0	2.0	1.8	2.0	2.0	**2.0**	3.8	4.0	2.0	3.3	4.0	4.0	4.0	3.4	**3.6**
R. BURBANK	4.0	3.0	3.5	2.0	2.0	**2.9**	2.0	2.3	3.0	2.0	2.0	1.0	1.0	2.0	**1.9**
TXNS 296	1.0	2.2	1.8	2.0	2.0	**1.8**	-	3.5	3.0	2.5	4.3	5.0	4.0	3.6	**3.7**
Location Means	**2.3**	**2.4**	**2.4**	**2.0**	**2.0**	**2.2**	**2.9**	**3.3**	**2.7**	**2.6**	**3.4**	**3.3**	**3.0**	**3.0**	**3.1**

TABLE 15: 1999 Western Regional Potato Variety Trial - ENTRY SUMMARY[1]

Clone	Use	Total Yield[2]	US#1's Yield[2]	% US#1's[2]	Tuber Size (oz) Early	Tuber Size (oz) Late	Tuber Shape	Specific Gravity[2]	Fry 45 Color	Merit Score Process	Merit Score Fresh	Noted Problems
R NORKOTAH	Fresh	440	332	76	6.0	5.7	Long	1.074	1.5	2.0	3.3	
R. BURBANK	Dual	569	355	63	4.6	6.1	Long	1.830	1.1	2.8	2.0	
TXNS 296	Fresh	553	401	75	5.4	6.1	Long	1.075	1.4	2.1	3.7	Erwinia
Entry Means		**521**	**362**	**71**	**5.3**	**6.0**		**1.326**	**1.3**	**2.3**	**3.0**	

[1] Numeric values represent means across all trial locations.
[2] Data shown from late trial results, unless the entry was in the early trial only.

TABLE 15: 2000 Western Regional Potato Variety Trial - ENTRY SUMMARY[1]

Clone	Use	Total Yield[2]	US#1's Yield[2]	% US#1's[2]	Tuber Size (oz) Early	Tuber Size (oz) Late	Tuber Shape	Specific Gravity[2]	Fry 45 Color	Merit Score Process	Merit Score Fresh	Noted Problems
R. NORKOTAH	Fresh	377	308	81	5.4	6.3	Long	1.071	2.0	1.7	3.7	
R. BURBANK	Dual	568	330	57	4.8	7.5	Long	1.081	1.4	3.4	2.3	
TXNS 296	Fresh	481	384	80	6.1	6.8	Long	1.073	1.8	1.5	4.0	Early die, EB, Tuber LB
Entry Means		**475**	**341**	**73**	**5.4**	**6.9**		**1.075**	**1.7**	**2.2**	**3.3**	

[1] Numeric values represent means across all trial locations.
[2] Data shown from late trial results, unless the entry was in the early trial only.

TABLE 15: 2001 Western Regional Potato Variety Trial - ENTRY SUMMARY[1]

Clone	Use	Total Yield[2]	US#1's Yield[2]	% US#1's[2]	Tuber Size (oz) Early	Tuber Size (oz) Late	Tuber Shape	Specific Gravity[2]	Fry 45 Color	Merit Score Process	Merit Score Fresh	Noted Weaknesses
R NORKOTAH	Fresh	443	361	81	6.4	8.0	Long	1.071	1.8	2.0	3.6	
R. BURBANK	Dual	553	320	58	5.5	8.1	Long	1.081	1.7	2.9	1.9	
TXNS 296	Fresh	530	418	79	6.4	8.7	Long	1.073	1.8	1.8	3.7	
Entry Means		**509**	**366**	**73**	**6.1**	**8.3**		**1.075**	**1.8**	**2.2**	**3.1**	

[1] Numeric values represent means across all trial locations.
[2] Data shown from late trial results, unless the entry was in the early trial only.

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TABLE 16: 2001 Western Regional Potato Variety Trial - 3 YEAR SUMMARY OF GRADUATING ENTRIES

	1999						2000						2001					
Clone	Total Yield[1] &(rank)	US #1 Yield[1] & %	SG	Fry 45	Merit Score Fresh	Merit Score Proc	Total Yield[1] &(rank)	US #1 Yield[1] & %	SG	Fry 45	Merit Score Fresh	Merit Score Proc	Total Yield[1] &(rank)	US #1 Yield[1] & %	SG	Fry 45	Merit Score Fresh	Merit Score Proc
R. NORKOTAH	440	336	1.073	1.5	3.3	2.0	377	308	1.071	2.0	3.7	1.7	443	361	1.071	1.8	3.6	2.0
	(12/14)	75					(14/14)	81					(15/16)	81				
R. BURBANK	569	355	1.083	1.1	2.0	2.8	568	330	1.086	1.5	3.2	3.2	553	320	1.081	1.2	1.9	2.9
	(6/14)	63					(5/14)	59					(11/16)	58				
TXNS 296	553	406	1.074	1.4	3.7	2.1	481	384	1.073	1.8	4.0	1.5	530	418	1.073	1.8	3.7	1.8
	(8/14)	74					(11/14)	80					(13/16)	79				
Trial Mean	**521**	**366**	**1.0767**	**1.33**	**3.0**	**2.3**	**475**	**341**	**1.07667**	**1.8**	**3.6**	**2.1**	**509**	**366**	**1.075**	**1.6**	**3.1**	**2.2**
		71						**73**						**73**				

3 Year Average (1999-2001)

Clone	Total Yield[1] &(%ile)[2]	US #1 Yield[1] & %	SG	FRY 45	Merit Score Fresh	Merit Score Proc	Noted Weaknesses (all three years)
R. NORKOTAH	420	335	1.072	1.8	3.5	1.9	
	(7)	79					
R. BURBANK	563	335	1.082	1.2	2.1	3.0	
TXNS 296	521	403	1.073	1.7	3.8	1.8	
	(28)	78					
Trial Mean[3]	**501**	**358**	**1.076**	**1.5**	**3.1**	**2.2**	
		78					

[1] (CWT/A)

[2] Percent of entries with lower yields;
e.g. 59% of all late trial entries over three years, yielded lower than A8893-1.

[3] Late trial mean of all late trial entries 1999-2001

Selection, Evaluation, and Identification of Improved Russet Norkotah Strains

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ABSTRACT

Strain (sub-clonal, line, or intraclonal) selection for certain characteristics within some potato varieties has been very successful e.g. improved skin type (Russet Burbank from Burbank), improved skin color (Red LaSoda from LaSoda; Red Norland and Dark Red Norland from Norland), and improved vine vigor and yield (Norgold Russet M from Norgold Russet). In 1989, strain selection with Russet Norkotah was initiated by the Texas Potato Variety Development Program. Some 192 giant hill and/or tall type plants were selected from seedsmen and/or commercial Russet Norkotah fields in Colorado, while 183 were selected from commercial fields in Texas. Replicated yield trials with the final 13 of the original strain selections and Russet Norkotah were conducted in 1992, 1993, and 1994 in both Colorado and Texas. A mixed model analysis of variance was performed followed by disjoint cluster analysis in order to group strains into high, medium, and low yielding classes or clusters. Canonical discriminant analysis was performed to confirm the three clusters and to determine the extent to which various yield attributes are related and can be used to separate the three clusters. Several strains including TXNS (Texas Norkotah Strain) 112, TXNS 134, and TXNS 278 were identified as superior in Colorado, while TXNS 223, TXNS 249, and TXNS 296 were similarly identified for Texas growing conditions. These strains usually outyielded Russet Norkotah by 20-30%.

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ADDITIONAL KEY WORDS: Genotype x environment interaction, disjoint cluster analysis, canonical discriminant analysis.

INTRODUCTION

Potato improvement through strain (sub-clonal, intraclonal, or line) selection within a variety has been practiced for years with several notable successes, including Russet Burbank from Burbank (Miller, 1954). Other examples include Red LaSoda from LaSoda (Miller, 1954) and Red Norland and Dark Red Norland from Norland. This form of potato improvement was thoroughly reviewed recently by Miller *et al.* (1995). The potato industry in Texas, as well as several other states, benefited from strain selection within Norgold Russet with the introduction in the 1970s of Norgold Russet Strain M. (Lever *et al.*, 1994). Norgold Russet M possesses stronger vines and produces yields more than 20% higher than the standard Norgold Russet; therefore, it became the predominant russet variety grown in Texas (Miller *et al.*, 1995). Because of its stronger vines, Norgold Russet M was better able to withstand the hot desiccating winds and hail commonly encountered in West Texas, the primary production area in Texas.

With the introduction of Russet Norkotah in 1987 (Johansen *et al.*, 1988), it quickly became apparent that Russet Norkotah would replace Norgold Russet as the early market russet variety of choice in the United States. The rapid acceptance of Russet Norkotah was due to many factors, including its attractive uniform tubers and high percentage of count carton tubers, as well as good storability for an early russet and resistance to second growth and hollow heart. Also, this new variety was superbly marketed to the industry. For these reasons, buyers began to demand Russet Norkotah rather than Norgold Russet. Therefore, if the early russet producing areas, including Texas, were to remain competitive they needed to grow the Russet Norkotah variety.

While Russet Norkotah has many desirable features, it is not perfect. Most notably, it possesses weak vines and is susceptible to PVY and verticillium wilt. Based on the

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Norgold Russet experience, it was obvious that improved Russet Norkotah strains with stronger vines would be required. Furthermore, the urgency of the situation dictated that if this task were to be accomplished in a timely manner, it could not simply be left for seedsmen, but that the Texas Potato Variety Development Program must take leadership in the strain development effort. The objectives of this investigation were to select, evaluate, and identify improved strains of Russet Norkotah with superior yield potential.

MATERIALS AND METHODS

Plant Material and Cultural Practices

A Russet Norkotah strain selection project was initiated as a component of the Texas Potato Variety Development Program in 1989. In that year, 192 giant hill and/or tall type plants were selected from seedsmen or commercial Russet Norkotah fields in Colorado, and 183 were selected from commercial fields in Texas. In 1990, the 375 clones (hills) were divided and half of the seed were planted near Springlake, TX, with the other half planted some 100 miles to the south near Seminole, TX. Dramatic differences in vine size were observed and mechanical seed mixtures were eliminated. Selection pressure in 1990 was primarily for tuber type and yield, virtually ignoring plant vigor. The growing season in Seminole was marked by exceptionally high temperatures and hot desiccating winds, accompanied by drought stress. The plants at Springlake, while also grown in a hot environment, received adequate moisture. Based on performance at both Seminole and Springlake, some 58 of the 375 selections were kept for planting in 1991. In 1991, the seed of the surviving clones was divided, with half planted near Springlake, TX, and half planted near Hooper, CO. Again, selection was primarily for yield and tuber-type, and 43 of the 58 clones were retained based on performance at both locations. In 1992, the 43 clones, 26 originally selected in Colorado in 1989 and 17 originally selected in Texas in 1989, were planted. Based on their performance in both Colorado and Texas, 13 clones were kept, 4 originally from Colorado (TXNS 410, TXNS 439, TXNS 507, and TXNS 551) and 9 originally from Texas (TXNS 102, TXNS 106, TXNS 112, TXNS 118, TXNS 134, TXNS 223, TXNS 249, TXNS 278, and TXNS 296). Replicated trials were first conducted in 1992 and continued through 1997. Both sites were sandy loam soils, with a Tivoli fine sand in Texas and a Gunbarrel slightly sandy loam in Colorado. Hooper, CO is located at a latitude of 37.7°N with an elevation of 7,700 feet (2,348m), while Springlake, TX is at 34.1°N with an elevation of 3,682 feet (1,123m), but both are considered mid-latitudes climactically. Because both sites are at relatively high elevations, there is considerable day/night temperature variation, especially in Hooper. Average daytime temperatures during the latter part of the growing season are about 10 F (6 C) higher at the Texas site. Planting occurred between March 15 - April 10 in Texas and between May 10 - 20 in Colorado. Harvest dates were between August 10 - 20 in Texas and between September 25 - October 10 in Colorado.

Row spacing was 36 in (91 cm) and 34 in (86 cm) between rows, with 9 in (23 cm) and 12 in (30 cm) within rows in Texas and Colorado, respectively. All plantings were in commercial fields under center pivot sprinkler irrigation, with four replications, and standard cultural practices for the respective areas were used. Details for each year's planting can be found in the West Texas Vegetable Breeding Newsletter, Potatoes (Miller and Smallwood, 1976-1996).

Beginning in 1992, virus eradication procedures were initiated on the retained clones, which by this time were contaminated with several viruses including PVS, PVY, PVX, and PLRV (Zapata *et al.*, 1995). Even though the Russet Norkotah seed had been certified as virus free these selections consistently outyielded standard Russet Norkotah. All seed was grown in Colorado. Several clones, including TXNS (Texas Norkotah Strain) 112, TXNS 118, TXNS 134, TXNS 223, TXNS 249, TXNS 278, and TXNS 296 were freed of virus and provided to Valley Tissue Culture, Halstad, MN, for commercial increase and subsequent distribution to selected commercial seed growers in Colorado.

TXNS 112 and 278 were entered in the Western Regional Trials (Pavek *et al.*, 1997) in 1996 and again in 1997 along with TXNS 223. These trials consist of an early harvest at six sites (Kern County, CA; Kimberly, ID; Clovis, NM; Hermiston, OR; Springlake, TX; and Othello, WA) and a late harvest at nine sites (Tulelake, CA; Center, CO; Aberdeen and Kimberly, ID; Farmington, NM; Hermiston, Klamath Falls, Malheur, OR; and Othello, WA).

Variables Measured

The variables measured included general rating, plant type, vigor, maturity, tuber yield, tuber number, and specific gravity. A general rating of 1 to 5, with 1=very poor, 2=poor, 3=good, 4=very good, and 5=excellent, was assigned and is an index that includes such factors as yield and tuber shape, size, and appearance. Plant type ratings included 1=upright, 2=semi-prostrate, and 3=prostrate. Plant vigor ratings ranged from one to five, with 1=poor or weak, 2=fair, 3=medium, 4=vigorous, and 5=very vigorous. Plant maturity ratings also ranged from 1 to 5, with 1=very late, 2=late, 3=medium, 4=early, and 5=very early. Harvested potatoes were graded and separated into 4 categories, <4 oz. (114g), 4-6 oz. (114-170g), 6-10 oz. (170-284g), >10 oz. (284g), and tuber number and weights were recorded for each group. Specific gravity was determined by the weight in air/weight in water method, using 10 to 15 tuber samples of >6 oz. (170g) tubers.

The following yield attributes were estimated from the measured variables:

a) Total yield (TY) = (wt1+wt2+wt3+wt4)
b) Total Marketable Yield (>4 oz) (TMY) = (wt2+wt3+wt4)
c) Yield >6 oz (T6Y) = (wt3+wt4)
d) Yield >10 oz (T10Y) = (wt4)
e) Percent Marketable Yield (>4 oz) (PMY) = (TMY/TY)x100
f) Percent Yield >6 oz (P6Y) = (T6Y/TY)x100
g) Percent Yield >10 oz (P10Y) = (T10Y/TY)x100
h) Number of tubers / plant (ATNP) = (n1 + n2 + n3 + n4)/no. of hills
i) Average Tuber weight (ATW) = TY/(n1 + n2 + n3 + n4)x16

Statistical Analysis

A mixed model analysis of variance (ANOVA) was performed on the yield data and related horticultural attributes. Data were evaluated for 14 genotypes, 2 sites (Springlake, TX; Hooper, CO) and 3 years (1992, 1993, 1994). The genotypes and sites were treated as fixed, with years treated as random. The SAS procedure MIXED (Littell *et al.*, 1996) was used to perform the mixed model ANOVA. The appropriate F-tests as determined by the "SATTERTH" option in the MIXED procedure were used to test the significance of the fixed effects. Genotypic and genotype x site means were computed using LSMEANS. Within a site, 13 strain selections were compared with the standard clone, Russet Norkotah.

Disjoint cluster analyses were performed on genotypic means of yield attributes and vigor ratings at each site to group the 14 genotypes into 3 distinct groups namely, high yielding, moderately high yielding, and low yielding, based on total and marketable yield attributes. Similar genotypes were grouped using the SAS procedure FASTCLUS (SAS, 1989). Canonical discriminant analysis was performed for each site, to confirm that these 3 clusters are different and determine the relationships among attributes and to what extent these yield attributes can be used to separate the 3 clusters.

RESULTS AND DISCUSSION

The mixed model ANOVA for 14 genotypes, 2 sites, and 3 years (random effect) indicated that the two-factor interactions (genotype x site) were significant at the 5% level for total yield (P=0.001), yield >4oz (P=0.0003), yield >6oz (P=0.0004), yield > 10oz (P=0.0001) , percent yield >10oz (P=0.006) and average tuber weight (P=0.0006) (Table 1). The significant interactions for these yield attributes indicate that genotypes responded differently at these two sites; therefore, strain selection should be carried out within each site. The main effects of genotype were significant for percent yield of >6 oz tubers (P=0.013) and vigor (P=0.0001). Both genotype and site x genotype effects were not significant for percent yield >4 oz, number of tubers /plant, and specific gravity. Because data were not available for plant type, maturity, and general rating in 1994 for Springlake, TX, for maturity and general rating in 1993 for Hooper, CO, and for plant type and maturity in 1994 in Hooper, CO, these variables were not analyzed using the mixed model ANOVA.

Genotypic and cluster means within each site for total yield and yield of different grades, percent yield of different

TABLE 1.—*P-values from the tests of fixed factors in a mixed model ANOVA for potato yield and horticultural attributes.*

Source	NDF	DDF	P-values										
			Total Yield (cwt/acre)	Yield >4 oz.	Yield >6 oz.	Yield >10 oz.	%Yield >4 oz.	%Yield >6 oz.	%Yield >10 oz.	Tubers /Plant	Average tuber weight (oz)	Specific gravity	Vigor
Site(s)	1	4	0.96	0.794	0.431	0.31	0.019	0.040	0.049	0.268	0.054	0.07	0.30
Genotype(G)	13	53	0.018	0.011	0.009	0.02	0.101	0.013	0.019	0.121	0.024	0.18	0.0001
Site x genotype	13	53	0.001	0.0003	0.0004	0.0001	0.148	0.101	0.006	0.214	0.0006	0.49	0.552

NDF: Numerator degrees of freedom; DDF: Denomiantor (error) degrees of freedom

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TABLE 2.—*Means for potato yield attributes of 13 Texas Norkotah strain selections (TXNS) and Russet Norkotah (RN) evaluated at two sites and averaged over three years, 1992-94.*

Cluster Group	Genotype	Total Yield (cwt/acre)	Yield > 4 oz.	Yield > 6 oz.	Yield > 10 oz.	%Yield > 4 oz.	%Yield > 6 oz.	%Yield > 10 oz.	Tubers/ Plant	Average tuber weight (oz.)
				Site: Hooper, CO[1]						
Low	RN	258.4	203.9	134.9	42.1	79.1	51.4	16.2	4.7	4.6
Medium	TXNS102	316.8	280.8*	210.2*	129.7*	87.5*	64.1*	36.9*	4.5	5.8*
Medium	TXNS106	297.8	255.0	193.8*	91.6*	85.8*	64.3*	31.0*	4.4	5.8*
High	TXNS112	377.8*	328.8*	255.0*	139.8*	86.8*	64.6*	34.07*	5.4	5.8*
Low	TXNS118	263.8	226.1	170.9	83.0	86.1*	64.3	30.8*	4.2	5.4
High	TXNS134	381.5*	322.3*	234.7*	105.6*	83.3*	59.4*	25.9*	5.9	5.3
Medium	TXNS223	307.8	268.4*	219.1*	102.2*	87.0*	70.5*	31.9*	4.3	6.2*
Low	TXNS249	242.4	204.2	134.0	46.5	83.8	52.3	17.4	3.9	5.1
High	TXNS278	370.8*	323.1*	235.2*	118.6*	86.2*	60.9*	29.6*	5.1	6.1*
Medium	TXNS296	311.0	272.5*	214.2*	103.0*	87.6*	67.9*	33.0*	4.4	6.1*
High	TXNS410	360.2*	332.4*	275.2*	157.7*	91.4*	74.9*	41.8*	4.4	6.9*
Low	TXNS439	254.2	202.3	141.7	49.8	79.6	52.5	16.7	4.2	5.0
Medium	TXNS507	339.7*	303.5*	239.3*	138.2*	89.2*	67.7*	38.4*	4.4	6.6*
Medium	TXNS551	344.2*	307.3*	257.0*	163.5*	89.5*	74.6*	47.6*	4.4	6.7*
Low	Cluster mean	254.7	209.1	145.4	55.4	82.1	55.1	20.3	4.3	5.1
Medium	Cluster mean	319.6	281.3	222.3	121.4	87.8	68.2	36.5	4.4	6.2
High	Cluster mean	372.6	326.7	250.0	130.4	86.9	65.0	32.8	5.2	6.1
				Site: Springlake, TX[2]						
Low	RN	278.0	212.6	117.6	54.3	74.9	38.7	17.3	4.8	5.0
Medium	TXNS102	362.5*	290.8	180.8*	70.5	80.0	49.9	18.4	5.9	5.1
Medium	TXNS106	323.0	257.8	165.1	71.3	79.3	50.1	21.2	5.0	5.4
Medium	TXNS112	337.7	271.7	173.2	68.7	80.9*	51.2	20.1	5.4	5.3
Medium	TXNS118	327.3	253.0	160.1	69.2	76.4	47.8	19.6	5.3	5.1
Medium	TXNS134	322.7	262.8	171.3	68.9	80.2*	52.3	20.3	5.2	5.3
High	TXNS223	388.1*	339.1*	237.9*	111.2*	86.9*	60.6*	27.0	5.5	5.9*
High	TXNS249	406.5*	347.8*	249.3*	111.7*	84.6*	59.3*	24.6	5.5	6.1*
Medium	TXNS278	332.0	260.4	165.6	66.2	78.1	49.9	18.9	5.3	5.1
High	TXNS296	365.4*	313.1*	225.5*	117.0*	82.4*	59.2*	27.3	5.1	5.8*
Low	TXNS410	275.5	200.4	120.9	44.9	69.9	40.7	13.7	5.1	4.5
Medium	TXNS439	279.1	218.7	140.8	66.3	74.7	45.5	20.5	4.7	5.1
Low	TXNS507	235.6	187.3	108.9	42.5	79.1	46.5	17.4	4.3	4.8
Medium	TXNS551	261.4	210.8	146.1	60.1	80.9*	56.5	22.1	4.4	5.1
Low	Cluster mean	263.0	200.1	115.8	47.2	74.6	42.0	16.1	4.7	4.9
Medium	Cluster mean	318.2	253.3	162.9	67.7	78.8	50.4	20.1	5.2	5.2
High	Cluster mean	386.7	333.3	237.6	113.3	84.6	59.7	26.3	5.4	5.9

*Represents genotypes that significantly (at 5%) out yielded the standard genotype, Russet Norkotah (RN).

[1]Hooper, CO: Using both First dimension (Total yield) and Second dimension (Percent of large tubers): High yielding (High), Moderately high yielding and large tubers (Medium), and Low yielding (Low)

[2]Springlake, TX: Using First dimension (Total and Marketable yield): High yielding (High), Moderately high yielding (Medium), and Low yielding (Low)

grades, number of tubers/plant, and average tuber size are presented in Table 2. The yield means are expressed in cwt/acre.

Genotypic and cluster means for the horticultural attributes are presented in Table 3. The strains were statistically compared only for specific gravity and vigor. The strains which outperformed standard Russet Norkotah are indicated by an * beside the means in Tables 2 and 3. Relatively, more strains outyielded Russet Norkotah in Colorado than in Texas.

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It is difficult to group these strains into high-yielding, moderately high-yielding, and low-yielding categories based on the various attributes reported in Table 2, because summarizing patterns in highly correlated multi-attribute data is a complex process. Thus, the disjoint cluster analysis multivariate technique was used to extract the pattern in the multi-attribute data, with the strains grouped into 3 clusters based on total and marketable yield attributes. Because these yield attributes were highly correlated (>0.5), the cluster analyses were able to condense the information into fewer dimensions and group them into the three clusters. The significance of the three cluster separations was evaluated by the squared canonical correlation and found to be highly significant (>0.90). The three clusters were discriminated using canonical discriminant analysis, and the first dimension (total yield) accounted for more than 60% of the variation in the data structure at both sites. The cluster means for each of the yield and horticultural attributes illustrates the importance of these attributes and their contribution to increased productivity of the medium and high-yielding strains.

In Hooper, CO, the first dimension (function 1) had higher loadings for yield attributes such as total yield, yield of marketable tubers, and vigor, and the second dimension (function 2) had higher loadings for tuber size attributes such as percent yield of large tubers and average tuber weight. The first dimension separated the three clusters into high yielding (Clusters 2 and 3), and low yielding (including the standard genotype - Cluster 1). The second dimension separated Cluster 2 (large size tubers) and Cluster 3 (medium size tubers) (Figure 1). The vigor rating and yield attributes correlated positively in Colorado. The genotypes belonging to each cluster are also presented in Tables 2 and 3.

In Springlake, TX, the first dimension (function 1) accounted for more than 90% of the variability and had higher positive loadings for total yield, percent yield of large tubers and tuber size attributes. The second dimension was not significant. The first dimension separated the 14 genotypes into high-yielding genotypes that produced a higher percentage of larger tubers (Cluster 3), moderately- yielding genotypes (Cluster 2) and a low-yielding group (Cluster 1) (Figure 1). In Texas, unlike Colorado, the vigor rating was negatively correlated with other yield attributes. This would seem to indicate that extreme plant vigor did not correlate well with tuber yield at the Texas site. This is consistent with the observation that while some enhancement of vine size is beneficial, extreme vigor (giant hill selections) is counter productive since very vigorous cultivars typically do not per-

TABLE 3.—*Means for horticultural attributes of 13 Texas Norkotah strain selections (TXNS) and Russet Norkotah (RN) evalauted at two sites and averaged over three years.*

Cluster Group[1]	Genotype	Specific Gravity	Plant Type[2]	Vigor[3]	Maturity[4]	General Rating[5]
		Site: Hooper, CO[6]				
Low	RN	1.074	1.8	2.8	3.3	2.9
Medium	TXNS102	1.073	2.0	3.5*	2.0	2.8
Medium	TXNS106	1.075	2.0	3.4	2.8	3.5
High	TXNS112	1.075	2.0	3.8*	2.3	4.6
Low	TXNS118	1.074	2.3	3.5	2.3	3.5
High	TXNS134	1.075	2.5	3.6*	2.2	4.0
Medium	TXNS223	1.070	2.3	3.4	3.0	4.0
Low	TXNS249	1.074	2.0	2.6	3.7	3.4
High	TXNS278	1.074	2.5	4.0*	2.0	4.2
Medium	TXNS296	1.074	2.5	3.8*	1.8	4.1
High	TXNS410	1.078	1.5	4.3*	1.3	3.9
Low	TXNS439	1.071	2.3	2.6	3.0	3.2
Medium	TXNS507	1.075	2.3	4.2*	1.3	3.6
Medium	TXNS551	1.075	2.0	4.0*	1.0	3.6
Low	Cluster mean	1.073	2.1	2.9	3.1	3.3
Medium	Cluster mean	1.074	2.2	3.7	2.0	3.6
High	Cluster mean	1.076	2.1	3.9	2.0	4.2
		Site: Springlake, TX[7]				
Low	RN	1.064	2.5	3.5	4.0	3.0
Medium	TXNS102	1.060	2.0	3.6	3.0	3.2
Medium	TXNS106	1.061	2.0	3.7	2.9	3.0
Medium	TXNS112	1.063	2.0	3.9	3.6	4.1
Medium	TXNS118	1.060	2.0	3.6	3.6	3.3
Medium	TXNS134	1.062	2.0	3.9	2.7	3.3
High	TXNS223	1.060	2.0	3.6	2.8	3.9
High	TXNS249	1.059	2.0	3.4	3.6	3.6
Medium	TXNS278	1.059	2.0	3.8	3.5	3.0
High	TXNS296	1.060	2.5	3.6	2.9	3.2
Low	TXNS410	1.058	1.7	4.7*	1.4	2.4
Medium	TXNS439	1.058	1.9	3.5	2.3	2.8
Low	TXNS507	1.059	2.0	4.2	2.6	2.7
Medium	TXNS551	1.058	2.0	4.6*	2.4	2.8
Low	Cluster mean	1.060	2.1	4.1	2.7	2.7
Medium	Cluster mean	1.060	2.0	3.8	3.0	3.2
High	Cluster mean	1.060	2.2	3.5	3.1	3.6

*Represents genotypes that significantly (at 5%) outperformed the standard genotype, Russet Norkotah (RN).

[1]Cluster groupings based on disjoint cluster analysis:

[2]Plant type: 1=upright, 2=semi-prostrate, 3=prostrate

[3]Vigor: 1=poor or weak, 2=fair, 3=medium, 4=vigorous, 5=very vigorous

[4]Maturity: 1=very late, 2=late, 3=medium, 4=early, 5=very early

[5]General rating: 1=very poor, 2=poor, 3=good, 4=very good, 5=excellent

[6]Hooper, CO:Using both first dimension, funtion 1 (Total Yield) and second dimension, function 2 (Percent of large tuber attributes). High yielding (High), moderately high yielding and large tubers (Medium), and low yielding (Low)

[7]Springlake,TX:Using first dimension, function 1 (Total and Marketable yield): High yielding (High), Moderately high yielding (Medium), and Low yielding (Low)

Genotypic differences within sites were not significant for specific gravity. Statistical mean comparisons on plant type, maturity, and general rating were not performed since data were not available for 1994 in Texas and 1993-1994 in Colorado.

2003002 88

Cluster Separation by Canonical Discriminant Analysis

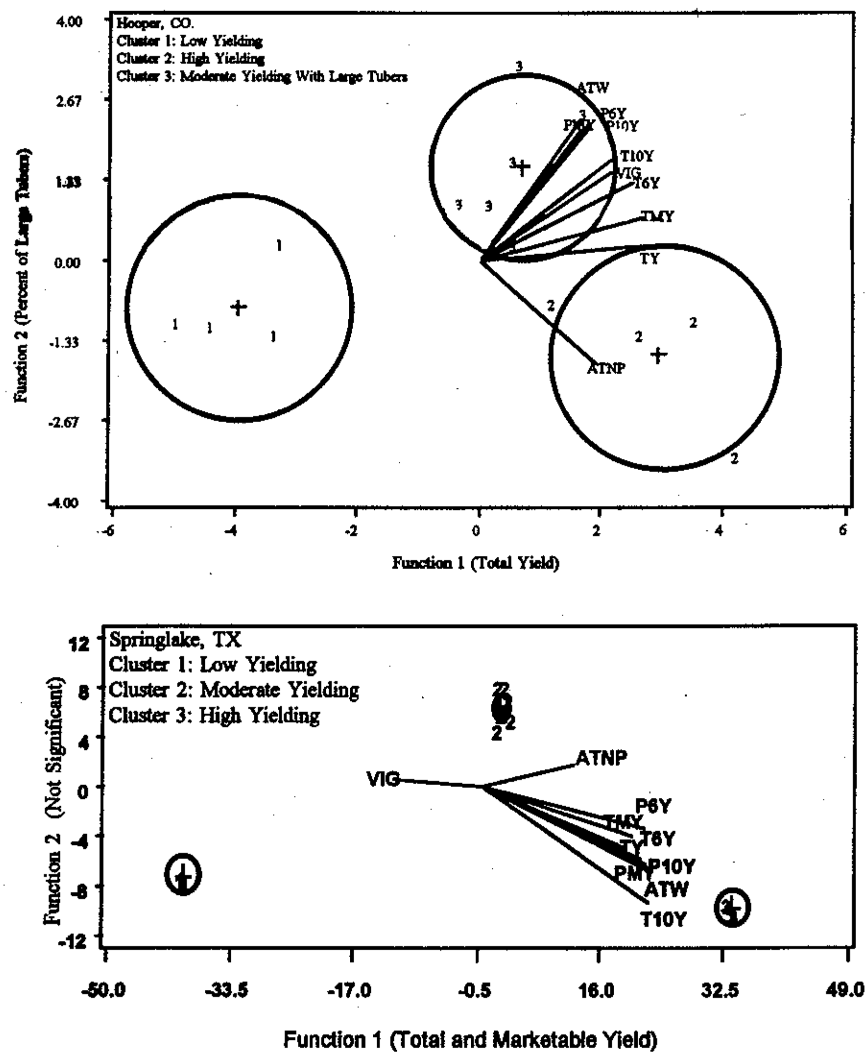

FIGURE 1
Separation of high, moderate, and low-yielding clusters of Russet Norkotah Strains grown in Hooper, CO (Top) and Sprinklake, TX (Bottom) using canonical discriminant analysis to illustrate the cluster groupings and relationships among variables measured (TY = total yield, TMY = total marketable yield, T6Y = yield >6 oz, T10Y = yield >10 oz, PMY = %yield >4 oz, P6Y = %yield >6 oz, P10Y = %yield >10 oz, ATW = average tuber weight, ATNP = tubers/plant, VIG = vigor). The relative angle between any two attribute vectors illustrates the degree and the sign of correlations between those two attributes. The smaller the angle, the larger the correlation. Positive perfect correlations (r=1), no correlation (r=0), and perfect negative correlations (r=-1) are represented by 0, 90, and 180 degree angles respectively, between any two attributes.

form well in Texas. The strains belonging to each cluster are also presented in Tables 2 and 3.

The strains TXNS 112, TXNS 134, TXNS 278 and TXNS 410 were grouped into the high-yielding cluster in Colorado, while TXNS 223, TXNS 249 and TXNS 296 were in the high-yielding cluster in Texas. While none of the strains were in the high-yielding cluster at both sites, most were in the high end of the medium-yielding cluster at the other site. The strains TXNS 249 and TXNS 410 are very site specific because their performances were completely reversed at the two sites (Table 2). Russet Norkotah was grouped into the low-yielding cluster at both sites.

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Regarding a possible relationship between selection site and performance, one of the four Colorado selections (TXNS 410) was in the high-yielding cluster, one in the low-yielding cluster (TXNS 439) and two (TXNS 507 and TXNS 551) were in the moderately-high yielding cluster in Colorado. However, three of the four were significantly higher yielding than standard Russet Norkotah with regard to total yield and seven other yield attributes. That TXNS 439 was selected in Colorado was not reflected in its yield. Three of the nine Texas selections (TXNS 112, TXNS 134, and TXNS 278) were in the high-yielding cluster in Colorado.

Of those selected in Texas, three (TXNS 223, TXNS 249, and TXNS 296) were in the high yielding cluster in Texas, with the remaining six in the moderately-high yielding cluster. Two of the original Colorado selections (TXNS 410 and TXNS 507) along with standard Russet Norkotah comprised the low-yielding cluster in Texas. While not absolute, there appeared to be a general relationship between selection site and performance.

Two of the strains, TXNS 112 and TXNS 278, that were in the high-yielding cluster in Colorado and in the moderately-high yielding cluster in Texas were entered in the 1996 Western Regional Trials where they outperformed standard Russet Norkotah by about 100 cwt/acre (Table 4). This further confirmed the validity of our selection, evaluation, and identification procedure. Results from these trials also showed that these two strains had a slight increase in number of stems per hill, vine size, lower percentage of dead vines at harvest, some increased resistance to verticillium wilt, slight increase in average tuber size and length and higher merit scores (Pavek *et al.*, 1997).

Results from more than a dozen replicated trials conducted in both Texas and Colorado from 1992-1996 (Miller and Smallwood, 1976-1996), as well as results from the Western Regional Trials conducted at 15 locations in 7 western states (Pavek *et al.*, 1997), have demonstrated that the Texas Russet Norkotah strains consistently outyielded standard Russet Norkotah, usually by 20 to 30%. This increased yield seems to be related to increased vine vigor and some resistance to early dying (verticillium wilt), and is usually accompanied by an increase in average tubers per plant and tuber size. The Texas Russet Norkotah strains are an outstanding early market alternative to the standard Russet Norkotah variety.

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U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE

EXHIBIT E
STATEMENT OF THE BASIS OF OWNERSHIP

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

1. NAME OF APPLICANT(S)	2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER	3. VARIETY NAME
Texas Agricultural Experiment Station	TXNS 296	Russet Norkotah 296
4. ADDRESS *(Street and No., or R.F.D. No., City, State, and ZIP, and Country)*	5. TELEPHONE *(Include area code)*	6. FAX *(Include area code)*
Office of the Director, TAES 2147 TAMU College Station, TX 77843-2147	(979) 845-4747	(979) 458-4765
	7. PVPO NUMBER **#200300288**	

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 <u>one</u> 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)*:

Dr. J. Creighton Miller, a TAES employee located at TAES' facilities in College Station, Texas, directed the final selections that led to development of the 'Russet Norkotah 296' cultivar. TAES policy and handbook manual provide that all germplasm and varieties developed by its employees in the course of their duties are owned by TAES. A copy of this policy is provided for your records.

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.

Exhibit E. Statement of the Basis of Applicant's Ownership. "Texas Russet Norkotah 296"

Texas Russet Norkotah 296 was selected and developed by Dr. J. Creighton Miller, Jr., Professor of Horticulture and Genetics, with assistance from Douglas C. Scheuring, Senior Research Associate, and Jeff Koym, Research Associate, Texas Potato Variety Development Program, Department of Horticultural Sciences, Texas A&M University and the Texas Agricultural Experiment Station (TAES). They are employees of TAES. Colleagues from other Experiment Stations throughout the Western United States and the U.S. Department of Agriculture, Agriculture Research Service (USDA-ARS) assisted in the evaluation of the clone. The TAES, by virtue of employing the personnel and providing facilities, is the owner of Texas Russet Norkotah 296

#200300288

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STANDARD PROCEDURE

MANAGEMENT AND RELEASE OF NEW PLANT MATERIALS

1.00 PURPOSE AND BACKGROUND

The purpose of this document is to outline guidelines for the management and transfer of plant materials developed by the Texas Agricultural Experiment Station (Experiment Station) recognizing diversity in agronomic, horticultural, and industrial plant programs. The terms "plant material" and "seed" are intended to be all-inclusive, including vegetatively propagated plant materials, such as sprigs, rhizomes, or buds.

The Experiment Station, as part of the Texas A&M University System (System), and in cooperation with the Texas Agricultural Extension Service (Extension), conducts research in crop breeding and genetic improvement to benefit the public and support the educational mission of Texas A&M University (TAMU), including the development and release of improved germplasm and new crop cultivars.

The Experiment Station, part of the public agricultural research system, has a broad mission to serve agriculture, particularly farmers and the general public. Farm, commodity, and trade organizations are encouraged to provide suggestions to enhance crop improvement and the distribution of new plant materials. Plant materials are considered as intellectual property and are owned and managed by the Experiment Station, under System policies.

Three basic goals are summarized in Section 2.00 to guide release decisions. General guidelines and methods are outlined in Section 3.00 for transferring plant material for private and commercial uses. The classification of plant materials and types of releases is intended to assist both the breeder and seed users in understanding some alternatives in managing releases. Partnerships, joint incentives, and sharing of research materials are encouraged.

DISTRIBUTION:	APPROVAL:
ALL HANDBOOKS	Edward A. Hiler EDWARD A. HILER

2.00 GOALS IN PLANT MANAGEMENT AND RELEASE

Three general goals provide the basic criteria for the management of plant materials and release decisions. These goals include:

A. Maximize Public Benefit. Plant material must be utilized by farmers and consumers to benefit the public. Plant material must be increased and managed to retain genetic purity. Variety or designated names provide identity and recognition to the originator of the improved plant materials. Commercial production and the distribution of plant releases are essential for both large and small acreage crops. Protection agreements and licensing provisions are frequently necessary to complete research and assure transfer of materials to the private sector.

B. Assure Technology Transfer to the Private Sector. The Experiment Station serves as a primary producer and distributor of new plant materials and depends upon the private sector to increase and market seed. State and federal plant protection provisions, protected names, trademarks, and/or markers (such as biochemical identification) may be useful in transferring technology to the private sector.

C. Recover Costs and Generate Revenue. The generation of funds through seed sales, fees, and other business terms is essential to recover some development costs and protection expenses, maintain competitive science, and enhance future crop improvement research. Financial terms and license provisions on plant materials must be realistic and consistent with the biological potentials and business environment.

3.00 GENERAL GUIDELINES AND KEY PARTICIPANTS

A. General Guidelines are outlined below for the orderly equitable release, distribution, and protection of plant materials.

Partnerships and Cooperation. The Experiment Station is responsible for research in crop breeding and genetic enhancement and assuring the timely transfer of this work to agricultural, scientific and industrial communities. Cooperation among the faculty and between faculty and external scientific and industrial interests is essential. Private interests are increasingly providing resources for research, in return for some preferential access to plant products and new technology. The commercialization of research had been encouraged both by Legislative mandates to the Experiment Station and through actions by the Board of Regents to provide financial incentives to faculty and staff to develop products or services of commercial usefulness.

Plant Release Proposals - Early discussion with Texas Foundation Seed Service (TFSS), the Plant Review Committee (PRC), and the System Technology Licensing Office (TLO) is encouraged in planning a new release. The breeder generally assumes a lead responsibility for preparing and submitting the Release Proposal (outlined in Section 5.00). Plant material is considered to be owned and under the stewardship of the Experiment Station. If a decision is made to not release particular plant materials, then the disposition and use of that material remains the discretion of the Experiment Station.

Exchange and Distribution. Exchange of plant material for breeding and genetic research is encouraged for public institutions and private industry and may include regional testing, Extension trials, and cooperative evaluations. "Selected Plant Materials" (see Section 4.00) may be provided to private firms, public breeders, grown on private lands, or placed with a private producer for further commercial evaluation before it is formally released.

Transfer and Protection - The formal release and transfer of new plant materials will usually involve public notices of availability and may involve Requests for Proposals or expressions of interest from private firms and/or the transfer of intellectual property rights through the use of licenses and agreements. The Experiment Station, in conjunction with the Breeder and the TLO, will consider applications for the appropriate intellectual property protection such as Certificates of Plant Variety Protection, Plant Patents, or Utility Patents in facilitating the transfer and protection of new plant materials. Additionally, in some instances individual firms and/or industrial groups may enter into research or partnership agreements on intellectual property, to gain access to genetic products.

Distribution of any plant material should be documented to avoid premature release, unauthorized distribution, misunderstandings over ownership, or loss of intellectual property rights. Protection agreements during research help assure that private firms can acquire rights and marketing opportunities later and/or protect their investment in marketing new products. Material Transfer Agreements (MTAs) are to be used in providing material to private firms and public agencies for evaluation (with copies filed with Texas Foundation Seed Service and the Technology Licensing Office).

B. Roles of Key Participants

Scientific quality, summary of research, review of proposals, and technology transfer involve several individuals and groups working together. Successful plant release includes institutional flexibility to meet the needs of each crop or release. Roles of primary participants are outlined as follows:

Plant Breeders and other scientists provide the major leadership in research and the release of plant materials. Responsibilities include research planning, periodic reviews on future releases, assuring materials are adequately protected, preparation of release proposals, and suggesting ways to implement release. A team is frequently involved with a release and may involve several disciplines and recognition of co-worker contributions.

Cooperative evaluations are encouraged, particularly with Extension Specialists. The Plant Review Committee commonly looks for Extension participation on new variety releases. Breeders maintain Breeder Seed and may provide technical or advisory assistance to TFSS, TLO or commercial firms.

Department Heads and Resident Directors provide a key role in crop improvement programs by guiding coordination between disciplines, and helping assure the TFSS, TLO and others are aware of potential releases. These Administrative Heads provide a vital linkage in planning, implementation and guidance for the total crop improvement program.

Program Coordinators provide communication among the developers of plant materials, the seed industry, and crop producers on scientific progress and the transfer of new materials into crop productions. The Head of the Department of Soil and Crop Sciences and Resident Director of Research at the Texas A&M Agricultural Research and Extension Center at Beaumont serve as Program Coordinators for all field crops and turfgrass, while the Head of the Department of Horticultural Sciences serves as the Program Coordinator for fruit, vegetable, and nut crops, including emphasis on industry relationships. Activities of Program Coordinators include:

1. Effective communication among breeders, department heads, resident directors, and with industry and producer interests;
2. Development of new partnerships between the Experiment Station and industry/producer interests, plus industry relationships and liaison with industry associations;
3. Advising the Director on release and licensing issues, and interacting with the Technology Licensing Office as appropriate. The Coordinators will report to the Director of the Experiment Station in these roles.

The Texas Foundation Seed Service, located at Vernon, will be responsible for the production of foundation seed and assisting breeders in the production of breeder's seed, as requested, and/or where required by a contract or license agreement managed by the TLO. The operation is expected to be largely self-sufficient.

TFSS works with TLO, other Foundation Seed organizations, Crop Improvement Associations in other states, the Texas Department of Agriculture, USDA, and other state and federal agencies. When plant materials are licensed or managed under an agreement, TFSS works closely with the TLO.

TFSS works with a lead Extension Specialist to coordinate seed for county and regional field tests, manages the increase and distribution of foundation seed stock and handles revenues from seed sales and nonlicensed products.

The Plant Review Committee (PRC) is a standing internal committee appointed by the Director of the Experiment Station to oversee the orderly release of plant materials, provide guidance to TFSS and TLO, and to make recommendations to the Director of the Experiment Station on plant materials. Activities of the PRC include:

1. Establish technical review panels to evaluate release proposals.
2. Hold quarterly meetings to review release proposals and meet with breeders who are planning releases, and act on release proposals.
3. Provide recommendations to the TFSS, TLO and Director's Office on release proposals, cultivar names, and agreements on licensing and advise the Director of the Experiment Station on release and licensing issues. If a question arises between faculty on "proportional creativity" or royalty sharing, the PRC may make recommendations to the Experiment Station Director.

The Technology Licensing Office is involved in initial discussions and planning with breeders, unit heads, Program Coordinators, and TFSS on planned releases suitable for licensing. In conjunction with the Program Coordinators and breeders, the TLO provides leadership and initiative for the protection and management of intellectual property for new releases including the following services:

1. Management of license and royalty agreements;
2. Marketing of new selected plant materials to commercial firms;
3. Development and negotiation of license and evaluation agreements;
4. Management of intellectual property protection;
5. Advice on business strategies and intellectual property protection issues; and
6. Advises and keeps the Assistant Vice Chancellor for Administration (Agriculture) who represents the Experiment Station apprised of all services provided by the TLO in the management of new plant materials.

4.00 TYPES OF RELEASES AND PROTECTION

A. Classes of Material - Improved plant materials may result from genetic manipulation by plant breeding and/or molecular and cellular biology. For purposes of management and release, plant materials are classified as follows:

1. Genetic Stocks: Research in plant breeding, genetic and/or cellular and molecular biology may produce unique genetic characteristics or distinct genetic materials useful to other researchers. Examples include specific genetic characters, genes or gene constructs involving vectors, and promoters. An essential characteristic of genetic stocks is that they have no immediate commercial value.

2. Germplasm: Germplasm is commonly used to further research, with little value for increase or direct commercial use in its present form. However, some desirable characters may be immediately useful to breeders and industry in developing improved varieties in other research programs.

3. Breeding Lines: Breeding lines may contain useful characteristics of unique traits with apparent commercial value. Breeding lines may be increased in their present form, used for selection, or tested further before commercialization. The Experiment Station may choose to release some advanced materials as "breeding lines" rather than continue research for commercial applications as varieties or inbred lines.

4. Selected Plant Material: Selected plant materials may be transferred to public or private firms for cooperative research, usually under a protection agreement, for further development, feasibility studies, or commercial exploration.

5. Commercial Varieties or Parental/Inbred Line: These plant materials are released for direct commercialization as new varieties or production of hybrids; release depends on clear demonstration of performance or traits in several experiments over several years, locations and/or conditions.

B. Types of Releases and Transfer

Release of plant materials is based on several factors (such as crop species, means of propagation, and commercial potential). Flexibility is essential to meet specific economic, biological or industry needs. Alternatives for release and distribution of plant materials include:

1. Unrestricted Unlimited Release - An Unrestricted Unlimited Release is intended for general uses of those plant materials with undefined uses or low commercial potential, without any restrictions on research or commercialization uses. One-time fees may be requested to recover costs.

2. Restricted Release - A Restricted Release designates specific uses for plant material, with an agreement with recipients, noting restrictions, applications, and mutual interests.

3. Limited Release - A Limited Release involves specific recipients, to enable selected firms to use plant materials. Agreements may be developed with a small number of firm(s), firms selected on the basis of their proposal, and/or provide a protected position for a single firm or organization to complete research and/or assume commercial development. Limited Releases are usually managed under a license or option agreement, with financial terms and performance expectations.

4. Unreleased Transfer - Some plant materials may not be immediately released but simply provided to others for additional research or commercial feasibility studies. "Selected Plant Materials" may be managed under a Material Transfer Agreement or an Option Agreement, until specific traits and usefulness are determined and a formal release is proposed.

C. Pre-release Protection is essential to clarify ownership and transfer uses and rights to others later. Material Transfer Agreements (MTAs) and other sample documents are available from TLO. A copy of all pre-release documentation (MTA's and other documents) should be provided by the breeders to the Technology Licensing Office, Foundation Seed Service and Program Coordinators.

Exchange of plant materials for research uses with other public breeders may be handled directly by the breeders, through an MTA with the (1) identification and quantity of materials being provided to a co-worker, (2) clarifying the anticipated uses for breeding and research purposes, (3) stating that the Experiment Station retains its ownership, and (4) obtaining written acknowledgment from the recipient.

Field testing and commercial scale evaluations are encouraged, involving other breeders, Extension Specialists, farmers or others. Most commonly seed for one season is provided for field trials and is not to be retained or transferred to others. An MTA should be completed with farms or cooperators to clarify expectations.

5.00 THE RELEASE PROPOSAL AND PROCESS

A. Release proposals are prepared by the breeders and summarize the background, current facts, and plant performance/traits. The release proposal may vary in detail, depending on the class of plant material (please see Section 4), however all release proposals should include these sections:

1. Background - information on the source, origin, or breeding history.
2. Performance and Traits - summary of key features, data, anticipated usefulness, and/or disclosure limitations or unknown features. This section may be brief for germplasm and more detailed for a variety (including details on yields, statistics, quality, host plant resistance, and regions of adaptation).
3. Seed production and availability - type and quantity of seed availability for increase or distribution.
4. Implementation - breeder's suggestion on notifications, release and distribution, and guidance for outreach (including protection as appropriate) and revenue sharing (for royalties, if others were involved in the creative development).

The Release Proposal should be prepared for internal review with sufficient data and information for a peer group to evaluate merits and make decisions. Alternatively, the Release Proposal may be prepared (or later converted) as a Station publication, to document research and provide technical information for others.

B. Registration Article (for submission to a professional journal) should be with the proposal for a new variety or germplasm release. Include a draft of the Experiment Station Leaflet for new varieties. The original and 15 copies of the entire package Release proposal, Registration Article, and Leaflet (as appropriate) should be submitted through the administrative head and Program Coordinator to the PRC (with one copy to the Foundation Seed Office) eight weeks before the quarterly PRC meetings. Additional information on preparing and submitting releases is available from the PRC Chair.

C. Revenue Distribution

Royalties or income generated form the commercialization of plant materials will be distributed to the inventors on all types of plant material, according to the TAMU System policy on intellectual property (System Policy 17.02, Patents). Scientists involved in the development of plant materials that generate royalties or income under a license or option agreement must agree in advance regarding proportionate contributions and sharing of expected income prior to the distribution of such income.

(This revision replaces Standard Procedure 1250A, dated August 3, 1992)

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

EXHIBIT F
DECLARATION REGARDING DEPOSIT

NAME OF OWNER (S)	ADDRESS *(Street and No. or RD No., City, State, and Zip Code and Country)*	TEMPORARY OR EXPERIMENTAL DESIGNATION / VARIETY NAME
Texas Agricultural Experiment Station	Office of the Director, TAES 2147 TAMU College Station, TX 77843-2147	TXNS 296 VARIETY NAME Russet Norkotah 296
NAME OF OWNER REPRESENTATIVE (S)	**ADDRESS** *(Street and No. or RD No., City, State, and Zip Code and Country)*	FOR OFFICIAL USE ONLY
Mark A. Hussey	Office of the Director, TAES 2147 TAMU College Station, TX 77843-2147	PVPO NUMBER #200300288

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.

Jamie Hussey 08/20/07

Signature Date