

## CLEARWATER RUSSET CHARACTERISTICS

Proposed name: **Clearwater Russet**  
Experimental designation: AOA95154-1  
Botanical name: Solanum tuberosum L.  
Intended Market: Fresh and Processing Markets

### **General Description:**

Clearwater Russet is a product of the cooperative USDA/ARS, University of Idaho breeding program in Aberdeen. It resulted from a 1995 cross between Bannock Russet and A89152-4 and has been evaluated for 12 years in public and industry trials in the Western U.S. It is medium-late maturing, with oblong-long tubers that have medium-russet skin. Tubers of Clearwater Russet exhibit excellent fry color out of storage and their attractiveness make this variety suitable for both processing and fresh market usage. It has high specific gravity and is resistant to sugar ends as well as most internal and external tuber defects. Clearwater Russet also is notable for having a higher protein content than those of standard potato varieties. The release will be made jointly by the USDA/ARS and the experiment stations of Idaho, Washington, and Oregon.

### **Plant Characteristics:**

Clearwater Russet has an erect, medium vine with medium-late maturity. It produces red-purple flowers with male-fertile pollen.

Table 1. Foliage characteristics of Clearwater Russet compared with those of Russet Burbank. Comparisons were made on plants growing in Aberdeen, Idaho in 2006-2007.

Characteristic	Clearwater Russet	Russet Burbank
Maturity	Medium-Late	Late
Flower color	Purple/white tips	White
Pollen production	Male-fertile	None

### **Tuber Characteristics:**

Clearwater Russet produces oblong tubers with brown, medium-heavy russet skin. The eyes are shallow in depth and intermediate in number and are evenly distributed. Tuber set is low, and tuber size is medium (Table 2).

Table 2. Physical tuber characteristics of Clearwater Russet compared with those of Russet Burbank. Comparisons were made using tubers grown at Aberdeen, Idaho in 2006-2007.

Characteristic	Clearwater Russet	Russet Burbank
Skin Color	Brown	Tan
Skin texture	Russet	Russet
Size <sup>1</sup>	Medium(Ave. 7.3 oz)	Medium (Ave. 7.2 oz)
Shape	Oblong-long (3.6)	Long (4.3)
Thickness	Medium thick	Slightly flattened
Length to width ratio	1.67	1.92
Length to depth ratio	1.75	2.07
Eye depth	Shallow	Intermediate
Eye number	Intermediate	High
Eye distribution	Evenly distributed	Evenly distributed
Eyebrow prominence	Slight prominence	Slight prominence
Flesh color	Cream-white	Cream-white
Tuber set	Low (5.8 <sup>2</sup> )	Low (6.0)
Dormancy	Medium short	Long

<sup>1</sup> Tuber size data were collected from 18 trials grown in Idaho, Oregon and Washington in 2005-2007.

<sup>2</sup> Tuber Set; data taken from 3 trials between 2005 and 2007.

### **Tuber Yield:**

Total yields for Clearwater Russet ranged from about 92 to 97% of Ranger Russet and 88 to 105% of Russet Burbank in 26 yield trials conducted in eastern Idaho, central and western Idaho, Washington and Oregon (Table 3). U.S. No. 1 yields for Clearwater Russet ranged from 105 to 111% of Ranger Russet in Idaho and Oregon but only 86% of Ranger Russet in Washington. By comparison, U.S. No. 1 yields for Clearwater Russet were 47, 25, 51 and 20% higher than Russet Burbank in eastern Idaho, western and central Idaho, Oregon, and Washington, respectively.

Table 3. Clearwater Russet total and U.S. No. 1 yields as compared to those of Ranger Russet and Russet Burbank in late harvest trials.

Location	Variety	Total Yield (cwt/A)	U.S. No. 1 Yield (cwt/A)
Eastern Idaho <sup>1</sup>	Clearwater	461	396
	Russet		
	Ranger Russet	478	377
	Russet Burbank	441	270
Western and Central Idaho <sup>2</sup>	Clearwater	469	400
	Russet		
	Ranger Russet	505	359
	Russet Burbank	536	320
Oregon <sup>3</sup>	Clearwater	706	590
	Russet		
	Ranger Russet	726	541
	Russet Burbank	732	390
Washington <sup>4</sup>	Clearwater	606	479
	Russet		
	Ranger Russet	657	559
	Russet Burbank	590	397

<sup>1</sup> Data from 9 trials conducted from 2001-2007 in Aberdeen, Shelley, and Rexburg, Idaho.

<sup>2</sup> Data from 5 trials conducted from 2001-2007 in Kimberly, Idaho.

<sup>3</sup> Data from 9 trials conducted from 2005-2007 in Hermiston, Malheur, and Klamath Falls, OR.

<sup>4</sup> Data from 3 trials conducted from 2005-2007 in Othello, WA.

### **Tuber Quality Characteristics**

In 18 trials grown in Idaho, Oregon, and Washington, average specific gravity and percent solids for Clearwater Russet was high, similar to Ranger Russet but substantially higher than Russet Burbank (Table 4). Clearwater Russet also produced fries with much lighter color than either Ranger Russet or Russet Burbank out of 45°F storage.

Table 4. Tuber specific gravity French fry color of Clearwater Russet as compared with Ranger Russet and Russet Burbank.

Characteristic	Clearwater Russet	Ranger Russet	Russet Burbank
Specific gravity <sup>1</sup>	1.088	1.089	1.081
Fry color (45° F storage) <sup>2</sup>	0.6	1.3	1.4
Solids (%)	22.0	22.1	19.8

<sup>1</sup> Specific gravity data from 18 trials grown in Idaho, Oregon and Washington.

<sup>2</sup> French fry color data from 15 (45°F) trials grown in Idaho, Oregon and Washington. USDA color chart [00 – 4.0(darkest)]

### **Internal and External Defects:**

Clearwater Russet has demonstrated less susceptibility to growth cracks and secondary growth than either Ranger Russet or Russet Burbank (Table 5), particularly under high stress conditions. Clearwater Russet is less susceptible to blackspot bruise than Ranger Russet, with bruise susceptibility similar to that of Russet Burbank. Hollow heart susceptibility is also similar to Russet Burbank but greater than Ranger Russet.

Table 5. Internal and external defects of Clearwater Russet tubers compared with those of Ranger Russet and Russet Burbank. Data taken are from trials grown in Idaho, Oregon and Washington from 2005-2007.

Defect	Clearwater Russet	Ranger Russet	Russet Burbank
Growth cracks <sup>1</sup>	4.9	4.5	3.7
Second growth <sup>1</sup>	4.8	4.6	3.8
Blackspot bruise <sup>1</sup>	2.5	2.1	2.5
Hollow heart/Brown Center <sup>2</sup>	6%	0.1%	7%

<sup>1</sup> Growth cracks, second growth, and blackspot bruise rated on a scale 1-5 where 1 = severe occurrence of the defect and 5 = no occurrence of the defect.

<sup>2</sup> Hollow heart/Brown Center measured as percent of >12 oz tubers with the defect.

### **Biochemical Composition:**

Clearwater Russet tubers have lower glycoalkaloid and reducing sugar concentrations than Ranger Russet and Russet Burbank (Table 6). Protein concentrations are 14% to 38% greater than Ranger Russet and Russet Burbank, respectively, indicating that Clearwater Russet can provide an enhanced level of dietary protein relative to standard potato varieties. Sucrose concentrations are intermediate between the two standard varieties. Vitamin C concentrations are intermediate, similar to Russet Burbank but lower than Ranger Russet, a variety known for its high vitamin C content.

Table 6. Biochemical composition of Clearwater Russet tubers compared with those from Ranger Russet and Russet Burbank. Data was taken from three trials grown in 2005-2007 at Aberdeen, Idaho.

Component	Clearwater Russet	Ranger Russet	Russet Burbank
Glycoalkaloids (mg/100g)	1.6	3.4	3.5
Reducing sugars (% FWB)	0.06	0.09	0.11
Sucrose (% FWB)	0.18	0.19	0.16
Protein (%DWB)	6.5	5.7	4.7
Vitamin C (mg/100g)	24.8	34.2	23.2

### **Storage Characteristics:**

The dormancy of Clearwater Russet is relatively short, about 60 days shorter than Russet Burbank (RB). At 42°F, Clearwater Russet has a dormancy of 85 days, 90 days at 45°F and 110 days at 42°F. Clearwater Russet had high susceptibility to Fusarium dry rot. The two year means were 30% decay and 73% incidence compared to 11% decay and 48% incidence for RB. Weight loss was higher in Clearwater Russet than RB at 42°F (9.2% and 5.6%). At 45 and 48F, there were no significant differences between the cultivars in the two year means and values ranged from 5 to 6% for the total weight loss. In the first year of the study weight loss was significantly higher in Clearwater Russet than RB, but in the second year few differences were measured. Percent glucose in storage was very low, <0.05% fresh weight (fwt) at 42, and <0.03% fwt at 45 and 48°F. Percent sucrose was similar in Clearwater Russet to RB, values ranged from a high of 0.15% to a low of 0.07% fwt. Stem end fry color remained at ≤ USDA 1 throughout the 9-month storage period at the three temperatures in both storage seasons. Mottling, a dark, uneven coloration which can occur in fried products, scored at a mild level at 42°F, and mild to none at 45 and 48°F. This selection performed similar to Premier Russet in storage.

## Disease Reactions:

Clearwater Russet is more resistant to *Verticillium* wilt than Russet Burbank, and has similar resistance to common scab (Table 7). It has similar susceptibility to foliar and tuber early blight, foliar late blight, dry rot and soft rot. However, it is more resistant to tuber late blight infections than Russet Burbank and is also more resistant to PVX and PVY<sup>o</sup>.

Table 7. Disease reactions of Clearwater Russet tubers compared with those of Russet Burbank.

Disease Response <sup>1</sup>	Clearwater Russet	Russet Burbank
Verticillium Wilt	MR	S
Foliar Early blight	S	S
Tuber Early blight	MS	MS
Late blight (foliar)	S	S
Late blight (tuber)	R	S
Common Scab	MR	MR
(PLRV) Net necrosis/serious defect	S	S
Corky ring spot	S	S
Root knot nematode	S	S
Dry rot ( <i>F. sam</i> )	S	S
Dry rot ( <i>F. sol. var. coer.</i> )	MS	S
<i>Pectobacterium</i> soft rot	S	S
PVX <sup>2</sup>	R	VS
PVY <sup>o</sup>	MR	S
PLRV	VS	VS

1 Responses of Clearwater Russet to diseases were based on a minimum of two years of controlled field evaluations. Responses were defined as very resistant (VR), resistant (R), moderately resistant (MR), moderately susceptible (MS), susceptible (S), and very susceptible (VS).

#PLRV necrosis/serious defect readings are from a percentage of tubers with net necrosis that extends more than ¼ inch into the tuber resulting in a “serious defect.”

Disease evaluations were conducted at the following locations:

Verticillium wilt: Aberdeen, ID and Hermiston, OR;

Common scab: Early blight, *Pectobacterium* (*Erwinia*) soft rot, Fusarium dry rot: Aberdeen, ID;

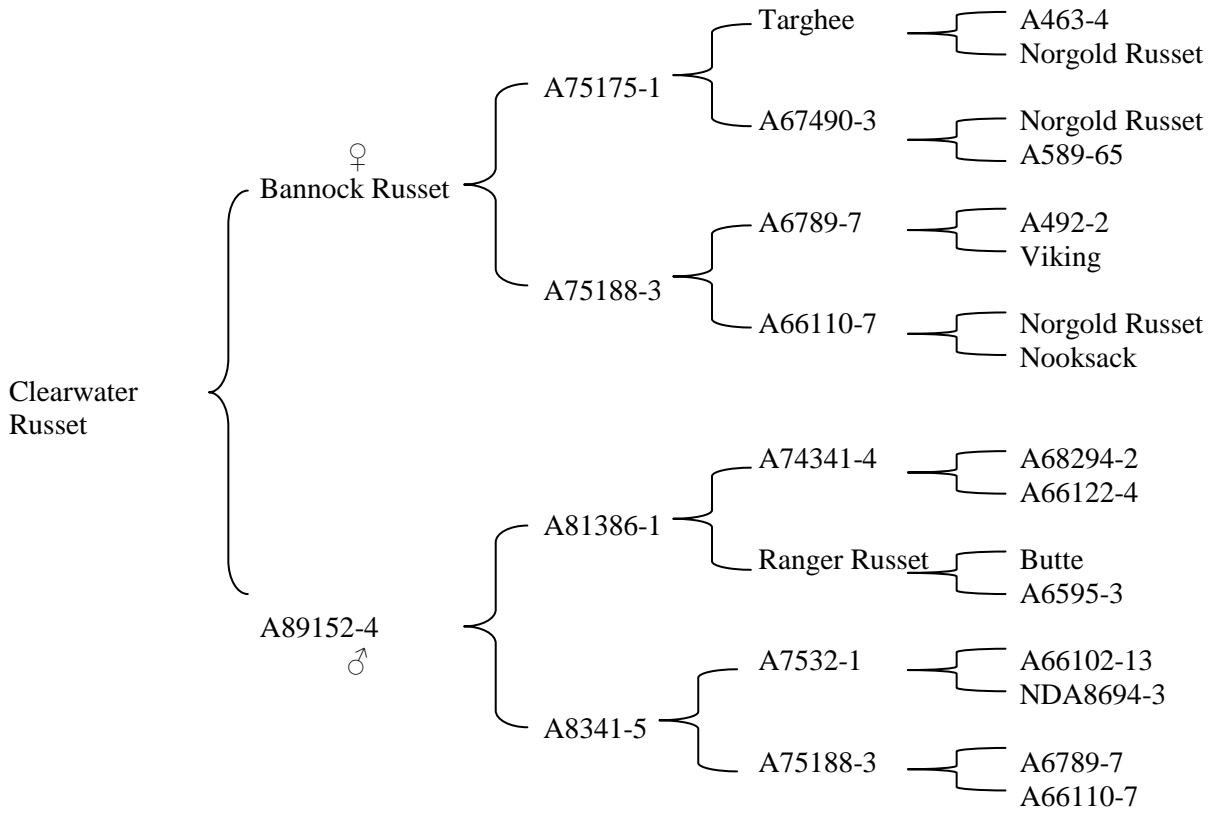
Viruses and PLRV net necrosis: Kimberly, ID, Hermiston, OR;

Late blight: Corvallis, OR;

Corky ringspot: Prosser, WA.

2 Virus responses are based on seed borne infections as determined by ELISA, following field infection with PLRV from aphid vectored sources of inter-planted virus infected potato, mechanical inoculation and aphid vectored PVY, and mechanical inoculation with PVX.

**Pedigree of Clearwater Russet**



CLEARWATER RUSSET

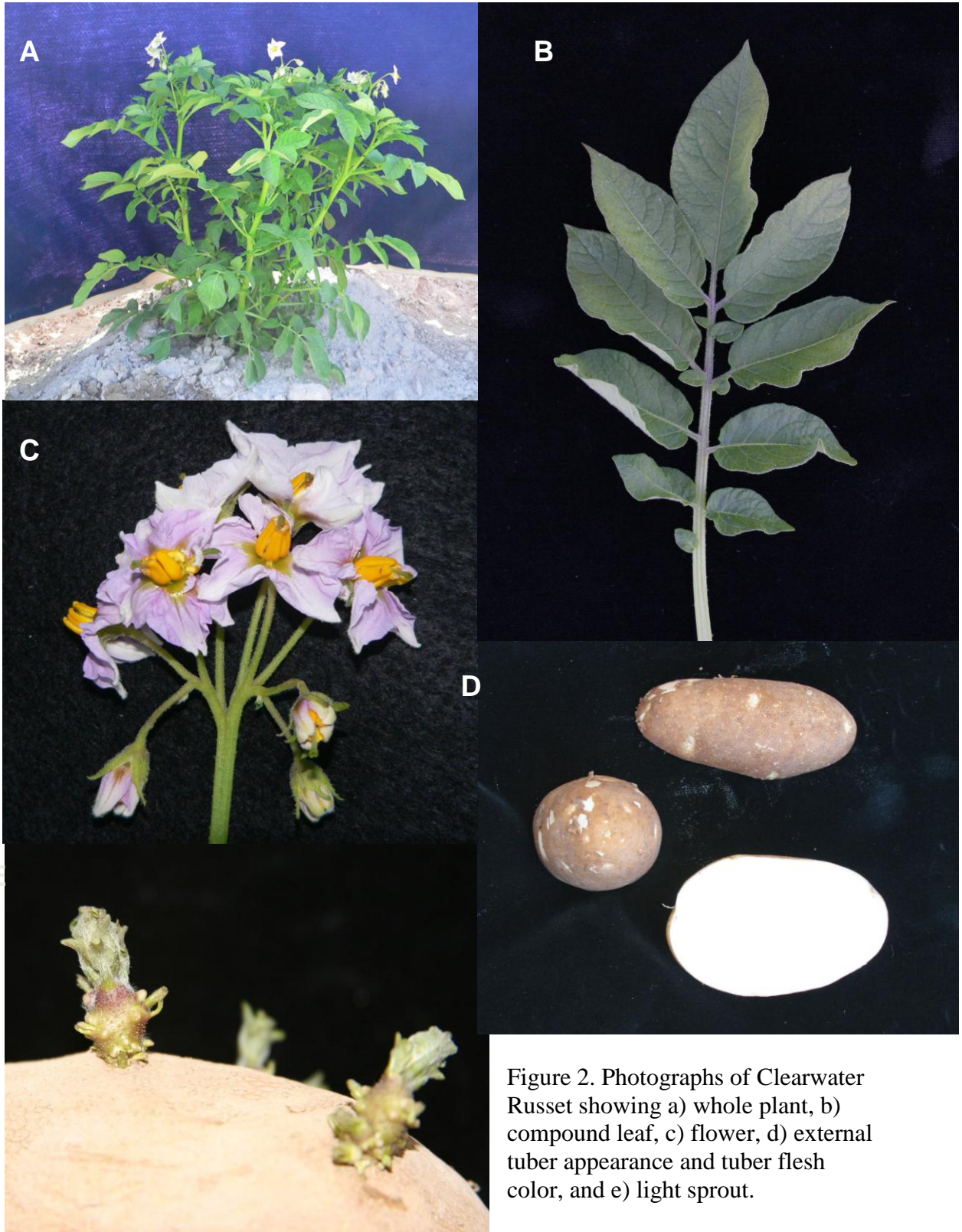


Figure 2. Photographs of Clearwater Russet showing a) whole plant, b) compound leaf, c) flower, d) external tuber appearance and tuber flesh color, and e) light sprout.