CULTURAL

AND

PHYSIOLOGICAL STUDIES

Potatoes - 2000

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Cultural and Physiological Studies - 2000

Trials in 2000 were located on the southwest corner of the San Luis Valley Research Center. The site was mainly in spring wheat in 1999. A soil test taken on about April 1, indicated sandy loam texture, low lime, a pH of 7.6, 1.2% organic matter, 8 ppm N, 17.3 ppm P, 202 ppm K, 3.0 ppm Zn, 15.2 ppm Fe, 9.8 ppm Mn and 3.3 ppm Cu. Eight trials were grown at this locale. The overall objective of them is to aid in identifying improved production practices, particularly for new cultivars.

The cultural regime for the southwest corner in 2000:

Fertility: In response to the pre-plant soil test, 104-130-52 was banded pre-plant (liquid). About 10 pounds nitrogen per acre (50 lbs. total as 28-0-0-5S) was applied weekly from tuberization through August 1, on all trials without specific fertilization treatments.

Plant population: All trials except for the seed piece spacing study were set up on a 12-inch within row spacing and 34-inches between rows.

Irrigation: Irrigation was by solid set sprinkler. Amount determined by ET average for Russet Norkotah, Russet Nugget and Centennial Russet.

Weed control: Dual Magnum (1.33 pints/acre) and Matrix (1.5 ounces/acre) were applied at about emergence, with a ground-rig on June 3. Herbicide was not applied to the metribuzin screening trial.

Fungicide applications: About a 10 day schedule was maintained after the early blight growing degree-day threshold was attained. Bravo Weather Stik (1.5 pts./acre) was applied (ground-rig) on June 23 and chemigated on August 18, Quadris (6.2 ounces/acre) was applied on June 30 via ground-rig and chemigated on July 21. Dithane DF was chemigated on July 14 and August 3.

Insecticide applications: Provado was applied on June 23 via ground-rig.

Vine kill: Sulfuric acid was applied on August 31 at 28 gals. per acre.

Climatological data for Center, CO, 2000.

	April	May	June	July	August	September
Precipitation (inches)						
	1.59	0.1	0.42	0.51	0.87	0.41
Monthly Mean Temperatures (F)						
Day	62	73	78	82	82	75
Night	28	36	42	46	43	41

Growth Analysis of Advanced Selections

Six advanced selections and newly released cultivars were evaluated, including Keystone Russet, AC87084-3, CO85026-4 (Fremont Russet), AC87079-3, AC87138-4 and CO89036-10. The trial was planted on May 8 using an assist-feed cup planter. Weekly destructive harvests were conducted to investigate canopy, root/stolon (underground plant parts), and tuber development and characteristics. Destructive harvests began on June 6. This information is helpful in identifying rate and uniformity of emergence, time of tuberization, number of tubers set per hill and/or stem, rate of tuber bulking and timing of senescence. Development curves are presented in graphs on the following three pages. Final harvest was conducted on September 12. Plots were dug with a two-row digger and picked up by hand. Grading took place on October 10. Results are presented in Tables 1 and 2. Yield and grade may have been compromised for AC87084-3, AC87079-3, CO89036-10 and Keystone Russet (slightly), due to herbicide (Dual Magnum and Matrix tank mix) sensitivity.

Table 1. Agronomic and quality evaluations for six advanced selections and new cultivars, 2000.

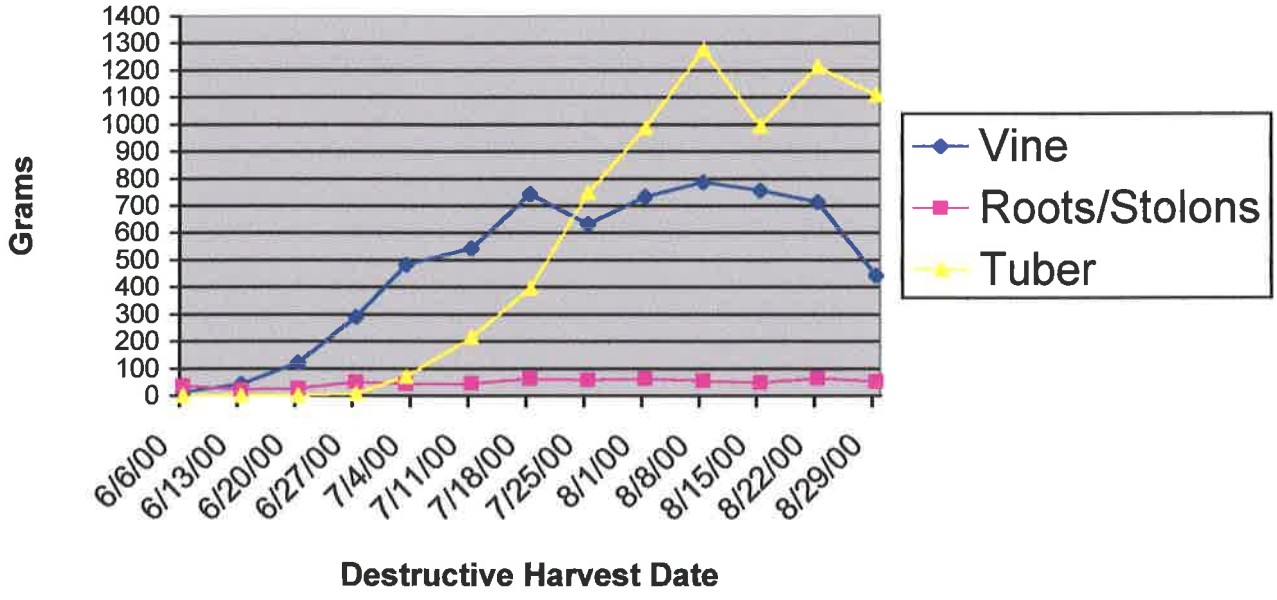
Clone	Vine Size[1]	Vine Maturity[2]	Tubers per plant	Hollow heart %	Black-spot Bruise[3]	Shatter Bruise[4]	Specific Gravity[5]
AC87079-3	3.8ab	3.0c	9.9ab	10	3.3bc	2.6bc	1.0879b
AC87084-3	4.0a	4.0a	8.6bc	0	4.3ab	4.0a	1.0937a
AC87138-4	3.5ab	3.3bc	11.3a	0	4.7a	2.1c	1.0794c
CO89036-10	3.3bc	3.3bc	7.5cd	3	2.9cd	3.6a	1.0713d
Fremont Russet	2.8c	3.8ab	5.8d	0	3.4bc	3.2ab	1.0841bc
Keystone Russet	3.3bc	3.3bc	6.9cd	0	2.0d	3.3ab	1.0677d
Mean	3.4	3.4	8.3	2.1	3.4	3.1	1.0807
LSD (∝=0.05)	0.7	0.6	1.8		1.1	1.0	0.0055

[1] Vine size – scale 1-5, 1=small, 5=very large.
[2] Vine maturity – scale 1-5, 1=early, 5=late.
[3] Blackspot bruise determined by the abrasive peel method, scale 1-5, 1=none, 5=severe.
[4] Shatter bruise scale 1-5, 1=none, 5=severe.
[5] Specific gravity determined by weight-in-air, weight-in-water method.

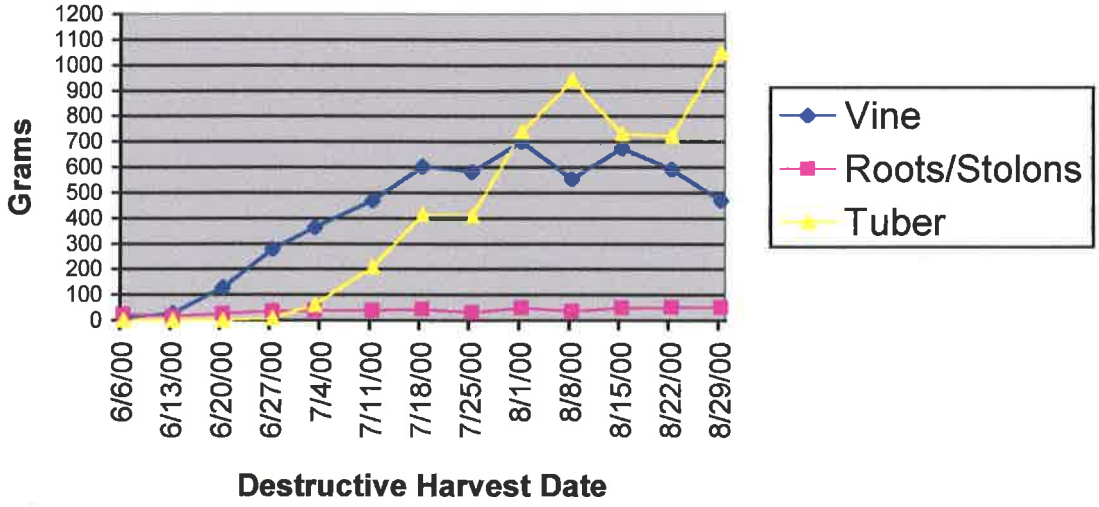
Table 2. Yield and grade for six advanced selections and new cultivars, 2000.

Clone	Total Yield cwt./a	US No. 1's cwt./a	US No. 1's %	>12 oz. %	6-12 oz. %	4-6 oz. %	<4 oz. %	No. 2's %	Culls %
AC87079-3	400ab	155b	39	1	15	23	60	0	1
AC87084-3	473a	306a	65	4	40	21	34	0	1
AC87138-4	410ab	123b	28	0	8	21	71	0	1
CO89036-10	378ab	186b	49	2	27	20	47	4	1
Fremont Russet	310b	177b	55	3	24	27	45	0	0
Keystone Russet	437a	304a	69	3	44	22	30	0	0
Mean	401	209	50	2	26	22	48	1	1
LSD (∝=0.05)	101	95							

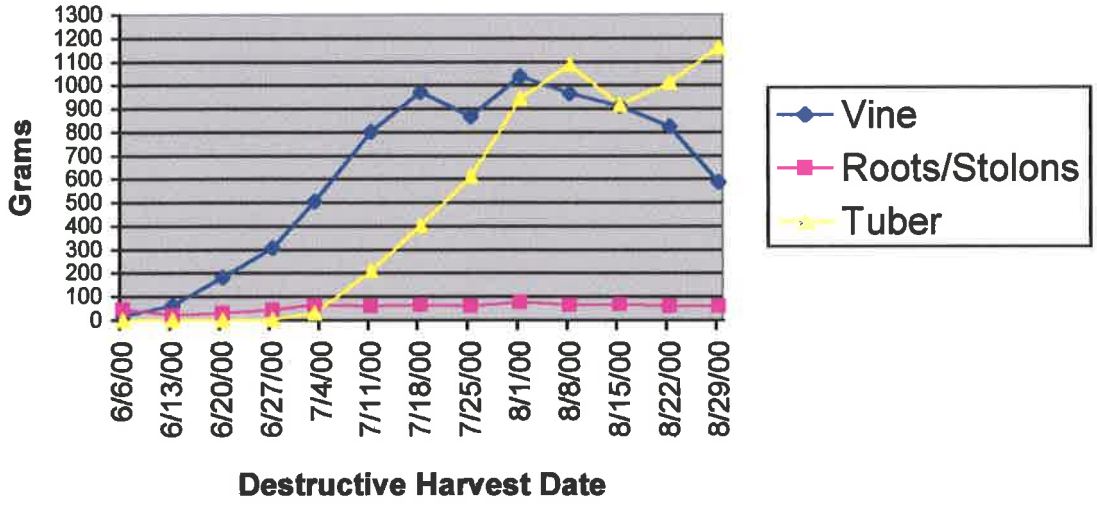
Keystone Russet Development



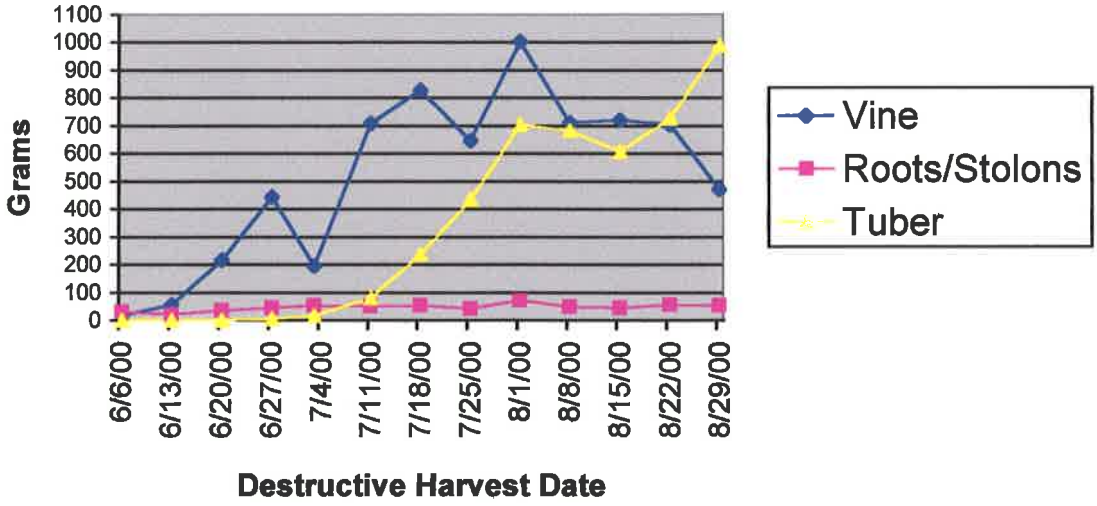
CO85026-4 Development



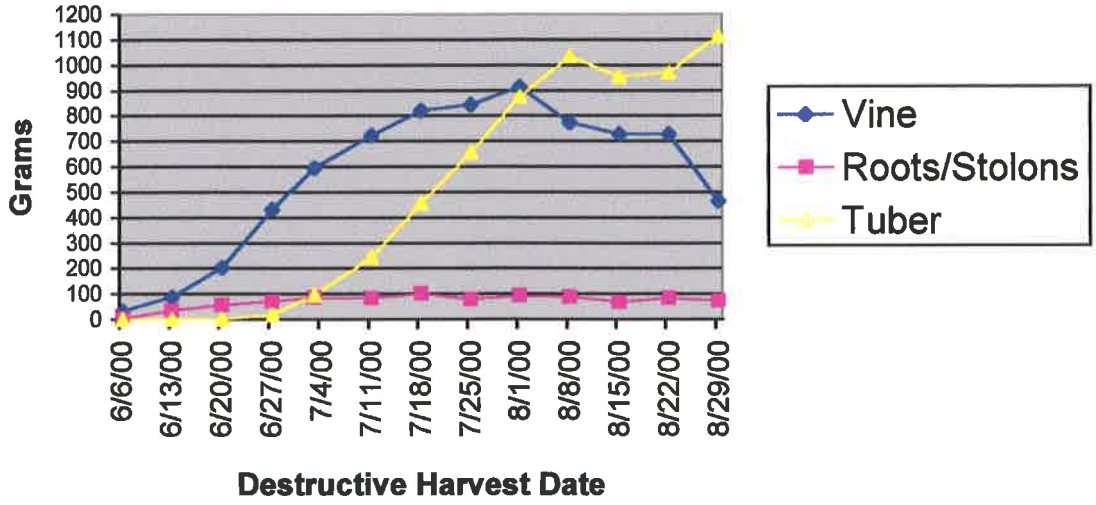
AC87084-3 Development



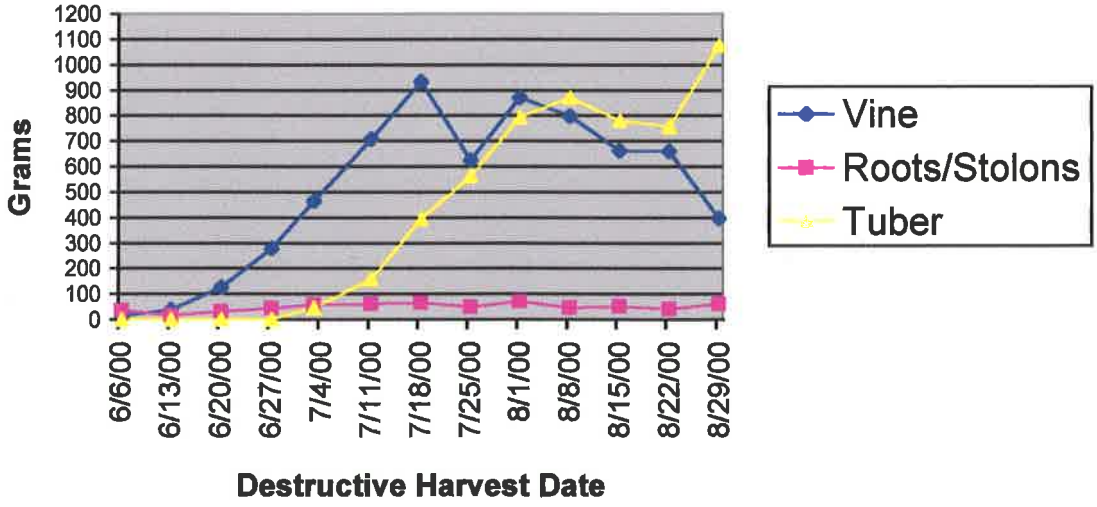
AC87079-3 Development



AC87138-4 Development



CO89036-10 Development



Metribuzin Sensitivity and Model Evaluation

Forty-three advanced selections and cultivars have been screened between 1996 through 2000, for sensitivity to metribuzin, the active ingredient in the widely used herbicides Sencor® and Lexone®. Metribuzin is a photosynthetic inhibitor and controls many broadleaf weeds. Unfortunately, some potato cultivars are sensitive, which may result in significant yield loss if unknown. Foliar symptoms of sensitivity include chlorosis, leaf margin necrosis and veinal clearing. The predictive model of Love, Shaffii, Haderlie and Eberlein, where [1-(1.142+1.076(log(plant height treated/plant height control))-0.00796(percent foliar injury))]x100 = percent yield loss, has been used in evaluating sensitivity of advanced selections and cultivars from Colorado and the southwest, in addition to being evaluated for appropriateness in this high altitude production area. A split-block design and two replications were utilized each year. Standard production practices, except for the herbicide treatment, have been adhered to. The post emergent treatment is applied when plants are 8-10 inches tall at two rates, a control of 0 lbs. per acre active ingredient, or 1 lb. ai/acre. Foliar damage is assessed 21 days following application and plant height is determined prior to senescence. Total yield is obtained following harvest. Statistical analysis of the relationship between predicted yield loss and actual yield loss resulted in a range of R-square values from 0.40 in 1999 to 0.85 in 1997, indicative of moderate to strong correlation. The overall R-square value for 33 selections and cultivars evaluated from 1996 to 1999 was 0.71, resulting in a correlation coefficient of 84%. Therefore, the predictive model appears to adequately assess sensitivity in the San Luis Valley.

In 2000, 21 cultivars and advanced selections were screened; Shepody serves as the sensitive check and Russet Norkotah the resistant check. The trial was planted on May 9 with an assist feed cup planter. The herbicide treatment was applied on June 30. Weather conditions at time of treatment were wind speed of 2.9 mph, air temperature of 62F, and 42% RH. Foliar damage was assessed July 21. Plots were harvested on September 11 with a 2-row digger, picked up by hand and weighed for total yield. Results are presented in Table 3. The R-square value for the 21 entries was 0.596, resulting in a correlation coefficient of 77%, in 2000. This trial is conducted in cooperation with Dr. Scott Nissen.

Table 3. Reaction of twenty-one advanced selections and cultivars to metribuzin, 2000.

	Plant Injury[1]	Predicted Yield Reduction[2]	Actual Yield Loss[3]	Susceptibility Rating[4]
Clone	~ % ~			
AC87079-3	2.5	-12.08	-33.92	VR
AC87138-4	0	-10.96	-38.99	VR
AC87340-2	20.0	3.97	19.27	MS
AC89653-3	6.5	-13.08	-19.50	VR
CO89097-2	20.0	-3.52	-43.59	MR
AC89536-5	0	-12.44	-16.47	VR
AC91014-2	0	-13.86	-11.65	VR
AC90636-3	5.0	-11.61	-56.13	VR
AC91365-1	0	-14.50	-30.18	VR
AC92009-4	0	-15.22	-56.19	VR
CO92027-2	4.0	-11.11	-10.77	VR
CO92059-8	35.0	10.46	-10.90	MR
CO92077-3	7.5	-9.24	9.40	MR
NDC5281-2	60.0	32.04	54.12	S
TC1675-1	0.0	-13.74	10.17	MR
NDC4069-4	87.5	59.36	79.32	VS
Pike	0	-16.83	-5.95	VR
Silverton Russet	15.0	-5.05	-35.99	MR
Centennial Russet	11.5	-5.80	-46.32	MR
Shepody	20.0	1.19	12.12	MR
Russet Norkotah	0	-13.74	-11.24	VR

[1]Foliar damage assessed 21 days after herbicide application

[2]Negative yield reduction equal an enhancement of yield, or at least not a loss.

[3]Yield loss equals ((untreated yield minus treated yield)/untreated yield)*100. Negative values indicate an enhancement in yield, or at least not a loss.

[4]Reaction ratings=very susceptible, susceptible, moderately susceptible, moderately resistant, resistant and very resistant.

Nitrogen Rate Evaluation

Twelve advanced selections and cultivars were evaluated for yield and quality response at three nitrogen rates (154, 194 and 234 lbs. per acre). Entries included Russet Norkotah, Colorado Selections 3 and 8, TXNS112, TXNS223, TXNS278 and TXNS296, AC87084-3, AC87079-3, AC87138-4, CO89036-10 and AC87340-2. The trial was planted on May 15 with an assist-feed cup planter. Ammonium sulfate was side-dressed at the rate of 40 and 80 lbs. N per acre for the mid and high plots respectively. Additional nitrogen was fertigated in 10 lb. increments of N beginning at tuberization through August 1. Plots were harvested on September 18 with a 2-row digger, picked up by hand, and graded October 19. Petioles were pulled weekly beginning June 28, dried and ground, however they have not been analyzed yet, so results are not reported here. A sample was fried from 45F storage on December 26. Yield results and agronomic characteristics are reported in Tables 4 and 5.

Seed Piece Spacing Trial

The seed piece spacing trial is an ongoing trial, changing as new selections become available from the potato breeding program. In 2000, seven selections were evaluated at three within-row spacings, 9, 12, and 15 inches, on 34-inch centers. Entries included AC87079-3, AC87138-4, CO89036-10, CO89097-2, AC87340-2, AC89536-5 and AC89653-3. The trial was hand planted on May 16. It was harvested with a 2-row digger and plots were picked up by hand on September 13. Information is utilized in the development of cultivar specific management profiles and in guiding producers in order to optimize tubers of desired market size. Results are summarized in Tables 6 and 7.

Zinc Response Trial

This is a new trial initiated in 2000 in cooperation with Dr. Jessica Davis. The objective is to determine if supplemental zinc applications result in a yield or quality response. Two cultivars are included in the evaluation, Russet Nugget and Russet Norkotah. The trial was planted on May 16 with an assist-feed cup planter. Two rates, 0.2 and 0.4 lbs. Zn/acre, and an untreated check, were applied foliarly on July 24. The trial was harvested on September 13 with a 2-row digger and plots were picked up by hand. Results are presented in Tables 8 and 9.

Table 4. Agronomic and quality evaluations for twelve clones grown with three rates of nitrogen, 2000.

Clone	N Rate lbs/a	Vine Size[1]	Vine Maturity[2]	% Stand	Stems per plant	Tubers per plant	% Hollow heart	Specific Gravity[3]	French Fry 45F[4]
AC87079-3	154	3.8	2.5	100	3.2	8.4	0	1.0804	1.20
	194	3.9	2.8	94	3.1	10.5	5	1.0795	1.68
	234	4.0	3.3	93	3.0	8.9	8	1.0738	1.75
Mean		3.8ab	2.8d	96ab	3.1a	9.4a	4	1.0779b	1.54c
AC87084-3	154	4.0	4.0	94	3.2	8.2	0	1.0829	1.88
	194	4.0	4.0	90	3.1	9.3	0	1.0884	1.70
	234	4.0	4.0	89	3.0	9.9	0	1.0829	1.45
Mean		4.0a	4.0a	91c	3.1a	9.1ab	0	1.0847a	1.68bc
AC87138-4	154	3.5	3.5	98	3.1	9.9	0	1.0784	1.18
	194	3.3	3.3	95	3.2	9.7	3	1.0727	1.50
	234	3.4	3.8	95	2.9	8.8	3	1.0727	1.25
Mean		3.4bcd	3.5b	96a	3.0a	9.5a	2	1.0746b	1.31cd
AC87340-2	154	2.5	3.5	92	3.0	8.9	0	1.0739	1.25
	194	2.5	3.3	95	3.0	9.6	0	1.0645	0.88
	234	2.5	3.8	92	3.1	10.4	0	1.0680	0.75
Mean		2.5fg	3.5b	93abc	3.0a	9.6a	0	1.06877cd	0.96d
CO89036-10	154	3.5	2.9	93	3.1	8.4	0	1.0711	2.50
	194	2.8	3.5	87	3.1	9.7	0	1.0713	2.50
	234	3.8	3.8	95	2.8	7.6	0	1.0687	2.45
Mean		3.3cd	3.4bc	92bc	3.0a	8.5bc	0	1.0703c	2.48a
R. Norkotah S3	154	4.0	3.8	95	3.2	7.3	0	1.0731	2.30
	194	3.5	3.5	94	3.2	6.6	3	1.0714	2.45
	234	3.8	3.5	90	2.9	8.9	3	1.0626	2.03
Mean		3.8abc	3.6b	93abc	3.1a	7.6de	2	1.0690cd	2.26a
R. Norkotah S8	154	3.5	3.0	91	3.2	7.9	0	1.0697	2.15
	194	2.8	2.8	93	2.8	7.8	3	1.0673	2.90
	234	3.0	3.3	90	3.0	8.6	0	1.0665	2.28
Mean		3.1de	3.0d	91c	3.0a	8.1cd	1	1.0678cd	2.44a

Table 4. Continued.

Clone	N Rate lbs/a	Vine Size[1]	Vine Maturity[2]	% Stand	Stems per plant	Tubers per plant	% Hollow heart	Specific Gravity[3]	French Fry 45F[4]
TXNS112	154	3.0	3.0	94	2.9	7.5	0	1.0704	2.33
	194	3.0	3.0	93	3.3	8.0	0	1.0711	2.63
	234	3.0	3.0	96	3.2	7.3	3	1.0634	2.58
Mean		3.0de	3.0d	94abc	3.2a	7.6de	1	1.0683cd	2.51a
TXNS223	154	3.0	2.5	93	3.1	7.1	0	1.0658	2.45
	194	2.5	2.8	93	3.3	8.1	0	1.0684	2.50
	234	3.0	3.3	90	3.0	7.4	0	1.0639	1.75
Mean		2.8ef	2.8d	92abc	3.1a	7.5def	0	1.0660d	2.23a
TXNS278	154	3.3	3.3	97	2.7	8.0	0	1.0708	1.70
	194	2.8	2.8	91	3.1	7.5	3	1.0690	2.45
	234	3.0	3.3	91	3.2	6.2	0	1.0654	2.38
Mean		3.0de	3.1cd	93abc	3.0a	7.2ef	1	1.0684cd	2.08ab
TXNS296	154	2.8	3.0	97	3.1	7.1	0	1.0695	2.03
	194	2.5	3.0	95	3.2	6.8	0	1.0677	2.08
	234	3.0	3.3	95	2.8	6.2	0	1.0643	2.15
Mean		2.8ef	3.1cd	96ab	3.0a	6.7f	0	1.0672cd	2.18a
R. Norkotah	154	2.3	2.0	95	3.2	7.5	0	1.0662	2.38
	194	2.0	2.0	91	3.1	7.7	0	1.0668	2.30
	234	2.5	2.3	92	3.1	8.2	0	1.0648	2.43
Mean		2.3g	2.1e	93abc	3.1a	7.8cde	0	1.0660d	2.37a
Mean		3.1	3.2	93	3.1	8.2	1	1.0707	2.00
Lsd (α = 0.05)		0.4	0.3		0.3	0.8		0.0034	0.46

[1] Vine size – scale 1-5, 1=small, 5=very large.
[2] Vine maturity – scale 1-5, 1=early, 5=late.
[3] Specific gravity determined by weight-in-air, weight-in-water method.
[4] Rated on scale of 0-4, with 0=very white and 4= very dark.

Table 5. Yield and grade for twelve clones grown with three rates of nitrogen, 2000.

Clone	N Rate	Total Yield cwt./a	US No. 1's cwt./a	US No. 1's %	>12 oz. %	6-12 oz. %	4-6 oz. %	<4 oz. %	No. 2's %	Culls %
AC87079-3	154	371	189	50	4	25	21	47	1	2
	194	426	210	49	4	25	20	50	1	0
	234	412	235	58	6	30	21	41	1	1
Mean		403def	211de	52	5	27	21	46	1	1
AC87084-3	154	422	281	66	5	40	21	33	1	1
	194	455	317	70	6	42	22	29	1	0
	234	487	318	65	6	40	20	33	0	1
Mean		455abc	305bc	67	5	41	21	32	1	1
AC87138-4	154	430	188	44	6	22	16	49	0	1
	194	421	210	49	4	26	19	54	0	
	234	445	258	58	6	33	19	39	1	2
Mean		432cde	219de	50	5	27	18	47	0	2
AC87340-2	154	376	283	55	5	27	23	44	0	1
	194	362	211	53	2	24	28	46	0	0
	234	441	192	64	3	32	29	36	0	0
Mean		393ef	228d	58	3	28	27	42	0	0
CO89036-10	154	353	172	48	3	29	17	50	1	0
	194	389	192	49	3	30	16	49	1	0
	234	352	188	53	3	29	21	45	2	0
Mean		365f	184e	50	3	29	18	48	1	0
R. Norkotah S3	154	470	343	73	15	40	17	25	1	2
	194	437	314	70	16	39	15	27	0	2
	234	517	377	72	18	36	19	25	0	3
Mean		475abc	345ab	72	16	38	17	25	0	2
R. Norkotah S8	154	473	326	69	11	37	21	29	1	2
	194	454	300	66	9	39	18	32	0	2
	234	545	406	74	13	45	16	24	1	1
Mean		491a	344ab	70	11	40	18	28	1	2

Table 5. Continued.

Clone	N Rate	Total Yield Cwt/a	US No. 1's cwt/a	US No. 1's %	>12 oz. %	6-12 oz. %	4-6 oz. %	<4 oz. %	No. 2's %	Culls %
TXNS112	154	464	333	71	10	44	18	27	0	1
	194	468	339	72	10	41	21	26	1	1
	234	496	379	76	17	44	15	23	0	1
Mean		476ab	350a	73	12	43	18	25	0	1
TXNS223	154	410	247	61	8	35	18	35	1	3
	194	461	320	69	13	37	20	29	0	1
	234	441	317	72	13	39	20	25	1	2
Mean		437bcd	295c	67	11	37	19	30	1	2
TXNS278	154	489	345	70	13	39	18	26	1	3
	194	482	383	80	16	46	18	19	1	1
	234	447	371	83	19	48	16	15	0	2
Mean		473abc	366a	77	16	44	17	20	1	2
TXNS296	154	493	368	75	14	42	18	22	1	2
	194	430	300	70	12	41	17	29	1	1
	234	465	365	79	16	47	16	18	0	3
Mean		462abc	345ab	74	14	43	17	23	1	2
R. Norkotah	154	386	212	55	6	31	17	42	1	2
	194	326	149	43	3	21	19	56	0	1
	234	422	259	61	6	40	16	36	1	1
Mean		378f	2.7de	53	5	31	17	45	1	1
Mean		437	283	64	9	36	19	34	1	1
Lsd ($\alpha = 0.05$)		43	44							

Table 6. Agronomic evaluations for seven clones grown at within-row spacings of 9, 12 and 15 inches, 2000.

Clone	Space Inches	Vine Size[1]	Vine Maturity[2]	Percent Stand	Stems per plant	Tubers per plant	% Hollow heart	Specific Gravity[3]
AC87079-3	9	3.8	3.3	93	2.9	7.8	3	1.0739
	12	3.0	3.0	96	3.8	9.1	0	1.0779
	15	3.8	2.5	98	3.9	9.0	8	1.0775
Mean		3.5	2.9	96	3.5	8.6	3	1.0764
AC87138-4	9	3.8	3.8	96	3.1	9.8	3	1.0799
	12	4.0	4.0	99	3.7	11.4	3	1.0753
	15	3.5	3.5	100	3.5	14.4	0	1.0720
Mean		3.8	3.8	98	3.4	11.9	2	1.0757
AC87340-2	9	2.5	3.8	89	3.0	10.9	3	1.0688
	12	2.8	3.0	98	3.3	11.5	3	1.0690
	15	2.5	4.0	100	3.7	11.8	5	1.0678
Mean		2.6	3.6	96	3.3	11.4	3	1.0685
AC89653-3	9	3.0	2.8	97	2.8	9.0	0	1.0828
	12	2.8	2.8	100	3.7	11.3	0	1.0768
	15	3.0	3.3	100	3.0	12.1	0	1.0785
Mean		2.9	2.9	99	3.2	10.8	0	1.0794
CO89036-10	9	3.8	3.8	92	2.9	7.9	0	1.0642
	12	3.5	4.0	100	3.2	9.0	0	1.0692
	15	3.3	3.8	100	4.0	8.9	3	1.0675
Mean		3.5	3.8	97	3.3	8.6	1	1.0670
CO89097-2	9	3.0	2.8	90	3.0	8.7	0	1.0679
	12	2.5	3.0	98	3.3	10.1	0	1.0697
	15	2.8	3.0	98	3.0	10.7	0	1.0697
Mean		2.8	2.9	95	3.1	9.9	0	1.0691
AC89536-5	9	3.3	3.3	94	2.9	8.7	0	1.0674
	12	3.5	4.0	100	3.1	10.0	0	1.0748
	15	3.3	4.0	100	3.6	10.6	3	1.0744
Mean		3.3	3.8	98	3.2	9.7	1	1.0722
Mean		3.2	3.4	98	3.3	10.1	1	1.0726
Lsd ($\alpha = 0.05$)		0.4	0.4		0.4	1.3		0.0045

[1] Vine size – scale 1-5, 1=small, 5=very large.
[2] Vine maturity – scale 1-5, 1=early, 5=late.
[3] Specific gravity determined by weight-in-air, weight-in-water method.

Table 7. Yield and grade for seven clones grown at within-row spacings of 9, 12 and 15 inches, 2000.

Clone	Space inches	Total Yield cwt./a	US No. 1's cwt./a	US No. 1's %	>12 oz. %	6-12 oz. %	4-6 oz. %	<4 oz. %	No. 2's %	Culls %
AC87079-3	9	382	145	38	1	18	19	61	1	0
	12	366	159	43	3	21	19	55	0	1
	15	294	142	47	1	28	18	52	0	0
Mean		348	148	43	2	22	19	56	1	0
AC87138-4	9	512	189	37	3	15	20	62	0	1
	12	463	179	39	4	15	20	61	0	1
	15	494	206	41	2	18	21	59	0	0
Mean		489	191	40	3	16	20	60	0	0
AC87340-2	9	523	290	55	0	22	34	44	1	0
	12	454	243	53	0	23	30	47	0	0
	15	441	268	60	1	29	30	39	0	0
Mean		473	267	56	0	24	31	43	0	0
AC89653-3	9	456	180	40	0	13	27	59	0	1
	12	409	158	38	0	12	26	61	1	0
	15	393	177	43	1	20	23	55	1	0
Mean		419	172	40	0	15	25	59	1	0
CO89036-10	9	380	140	37	2	13	21	63	0	1
	12	352	123	35	3	15	17	64	1	0
	15	299	135	46	3	25	17	53	1	1
Mean		344	132	39	3	18	19	60	1	0
CO89097-2	9	484	294	60	4	31	26	38	1	1
	12	464	262	56	4	33	20	41	1	2
	15	437	293	67	3	37	28	31	1	1
Mean		462	283	61	3	33	24	37	1	1
AC89536-5	9	472	246	52	5	24	23	47	1	1
	12	469	258	55	5	27	23	44	0	1
	15	426	251	58	7	32	20	38	0	4
Mean		456	252	55	5	28	22	43	0	2
Mean		427	207							
Lsd ($\alpha = 0.05$)		44	37							

Table 8. Agronomic and quality evaluations for Russet Norkotah and Russet Nugget grown with or without supplemental zinc, 2000.

Clone	N Rate lbs/a	Vine Size[1]	Vine Maturity[2]	% Stand	Stems per plant	Tubers per plant	% Hollow heart	Specific Gravity[3]	French Fry 45F[4]
R. Norkotah	0	2.3	2.0	92	3.5	7.5	0	1.0639	2.2
	0.2	2.8	2.2	91	3.1	7.2	3	1.0670	2.8
	0.4	2.0	2.0	96	3.2	6.9	0	1.0648	1.5
Mean		2.4	2.1	93	3.3	7.2	1	1.0653	2.2
R. Nugget	0	4.0	4.0	93	2.8	7.0	3	1.0716	1.5
	0.2	3.8	4.0	91	3.2	8.0	0	1.0690	2.2
	0.4	4.0	4.0	94	2.9	8.4	0	1.0775	1.7
Mean		3.9	4.0	93	3.0	7.8	1	1.0727	1.8
Combination	0	3.2	3.0	93	3.2	7.3	1.7	1.0677	1.8
	0.2	3.3	3.1	91	3.1	7.6	1.7	1.0680	2.5
	0.4	3.0	3.0	95	3.1	7.7	0	1.0712	1.6
Mean		3.2	3.0	93	3.1	7.5	1	1.0690	2.0
Lsd ($\alpha = 0.05$)		0.4	0.2	6	0.6	1.0	4.5	0.0086	1.1

[1] Vine size – scale 1-5, 1=small, 5=very large.
[2] Vine maturity – scale 1-5, 1=early, 5=late.
[3] Specific gravity determined by weight-in-air, weight-in-water method.
[4] Rated on scale of 0-4, with 0=very white and 4= very dark.

Table 9. Yield and grade for Russet Norkotah and Russet Nugget grown with or without supplemental zinc, 2000.

Clone	N Rate	Total Yield Cwt./a	US No. 1's cwt./a	US No. 1's %	>12 oz. %	6-12 oz. %	4-6 oz. %	<4 oz. %	No. 2's %	Culls %
R. Norkotah	0	386	228	59	7	29	24	38	1	1
	0.2	379	234	62	7	29	26	36	1	1
	0.4	374	220	59	6	29	24	39	1	2
Mean		379	227	60	7	29	24	38	1	1
R. Nugget	0	292	136	45	3	18	23	54	1	0
	0.2	322	154	47	4	21	23	52	0	0
	0.4	326	139	42	4	15	24	57	0	0
Mean		313	143	45	4	18	23	54	0	0
Combination	0	339a	182a	52	5	24	23	46	1	1
	0.2	350a	194a	55	6	25	24	44	1	1
	0.4	350a	180a	51	5	22	24	48	1	1
Mean		346	185	52	5	23	24	46	1	1
Lsd ($\alpha = 0.05$)		54	51							

Calcium Nitrate Response

This trial was initiated in 1999 in cooperation with Katy Watts, Rocky Mountain Research and Consulting, and Andy Hancock and Rick Speilman, HydroAgri. Russet Norkotah was hailed on two dates, July 12 and July 26. The following day, either calcium nitrate or 32-0-0 was applied to aid in determining if a yield response difference results from one treatment or another following a hail event. Destructive harvests were conducted periodically to observe tuber bulking. Final yield and grade were determined following harvest for the six replications. As in 1999, no significant differences were found for yield or grade components for the two post-hail treatments, for either of the hail timing events.

Table 10. Agronomic and quality evaluations for response to nitrogen source following simulated hail damage at two stages of growth, Russet Norkotah, 2000.

Treatment	Vine Size[1]	Vine Maturity[2]	Tubers per plant	Hollow heart %	Specific Gravity[5]
Early Hail					
Ca Nitrate	2.0a	3.33a	7.39a	0	1.0663a
32-0-0	2.0a	3.83a	7.35a	0	1.0657a
Late Hail					
Ca Nitrate	2.0a	1.83b	7.67a	0	1.0580b
32-0-0	2.0a	2.00b	7.27a	0	1.0595b
Mean	2.0	2.75	7.42	0	1.0624
LSD (∝=0.05)	0	0.50	0.84	0	0.0032

[1] Vine size – scale 1-5, 1=small, 5=very large.
[2] Vine maturity – scale 1-5, 1=early, 5=late.
[3] Blackspot bruise determined by the abrasive peel method, scale 1-5, 1=none, 5=severe.
[4] Shatter bruise scale 1-5, 1=none, 5=severe.
[5] Specific gravity determined by weight-in-air, weight-in-water method.

Table 11. Yield and grade response to nitrogen source for Russet Norkotah following simulated hail at two growth states, 2000.

Treatment	Total Yield cwt./a	US No. 1's cwt./a	US No. 1's %	>12 oz. %	6-12 oz. %	4-6 oz. %	<4 oz. %	No. 2's %	Culls %
Early Hail									
Ca Nitrate	355a	175a	49a	4a	24a	21a	50a	1a	1a
32-0-0	459a	280a	52a	2ab	21a	29a	48a	0a	1a
Late Hail									
Ca Nitrate	354a	155a	44a	1b	23a	20a	55a	1a	1a
32-0-0	514a	165a	40a	1b	21a	19a	60a	0a	0a
Mean	420	194	46	2	22	22	53	0	0
LSD (∝=0.05)	327	197							

Other trials...

Cultivar and Advanced Selection Observations – Four hill plots of forty-one cultivars and advanced selections important to the southwest were planted on May 9. This observation trial provides vines and tubers for photographs and an opportunity to note vine characteristics, including flower color, and tuber traits.

Hail Timing Evaluation – Russet Norkotah and Russet Nugget were evaluated for response to hail at 3 growth stages (R-2, R-5 and R-7) during the season in 1999 and 2000. Hail events are simulated using a weedeater. Treated plots were defoliated 50%. The trial is conducted in cooperation with National Crop Insurance Services.

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CSREES

Cultivar Specific Management

Cultivar specific management may be defined as tailoring cultural and storage practices for new and existing cultivars. Development of cultivar specific management profiles may result in a more successful experience for producers and industry when trying a new cultivar. In the evaluation process and during the development process, shortcomings of selections and cultivars may be recognized and appropriate management strategies explored and identified. Management profiles consist of cultivar specific information pertinent to production such as nutrient management, plant population, pest susceptibilities, and water requirements, storage considerations, processing and marketing, and are designed to supplement general production recommendations.

Since 1997, seven profiles (see table below) have been developed and made available to producers and potato industry personnel in the San Luis Valley, but also in many states and even foreign countries. In 2000, three profiles were released to producers. They include Yukon Gold, Keystone Russet (AC83064-1) and Alpha. They are provided in the following pages.

Management profile and year released to industry	
Cherry Red (DT6063-1R)	1997
Russet Legend (COO83008-1)	1998
Russet Norkotah and Selections 3 and 8	1999
Silverton Russet (AC83064-6)	1999
Yukon Gold	2000
Keystone Russet (AC83064-1)	2000
Alpha	2000

YUKON GOLD

Prepared by Susie Thompson, Ph.D. and Robert D. Davidson, Ph.D., Department of Horticulture & Landscape Architecture, San Luis Valley Research Center, Colorado State University

This profile was developed for production in the San Luis Valley. While some guidelines may be appropriate regardless of growing area, fine-tuning for specific production locales is recommended.

Yukon Gold is an early maturing cultivar, released in 1980 by Agriculture Canada, University of Guelph and the Ontario Ministry of Agriculture (American Potato Journal 58:241-244, 1981). Yukon Gold was tested as G666-4Y. It is the result of a cross between Norgleam and W5279-4. Yukon Gold is an attractive, yellow-fleshed, potato cultivar. Primary use is for the fresh market. It is particularly suited for baking, salad and soup. Yukon Gold may process if fried directly from the field, but not following cold storage. It is widely adapted in North America and performs very well in the San Luis Valley.

Plant/roots: Plants emerge quickly with a medium, upright vine, and a slight tendency to spread as maturity approaches. Vines exhibit a purplish pigmentation, particularly in lower foliage. Flowers are pale, red-purple and not overly abundant. Yukon Gold has a determinate growth habit. The root system is somewhat compact.

Tubers: Tubers have light yellow flesh, are round to oval, smooth and slightly flattened, with pale yellow skin. Eyes are shallow, pink and tend to be distributed near the bud end. Specific gravity levels are medium (1.080).

Yield potential: Yield potential is medium, with a range of about 380 to 400 cwt. per acre, with proper management. A very high percentage of marketable tubers are produced if high plant density and low nitrogen rates are utilized.

GROWING SEASON MANAGEMENT

Pre-plant considerations: Tubers have medium dormancy. Yukon Gold characteristically produces few stems and tuber set tends to be low. Whole or cut seed is acceptable, however, cut seed may increase stem numbers, aiding in limiting oversized tubers late in the season. Eyes tend to be most prevalent on the bud end and often one side of the stem end has no eyes. Eye distribution is light (about 8 per tuber), thus avoid large seed, which may result in blind seed pieces or few stems per plant. Tuber size is also controlled through closer within-row seed spacing. Avoid prolonged warming of seed to minimize excessive sprouting and physiological aging (no more than two weeks at 60 F). Precutting may age seed physiologically, as well, but research in Colorado indicates this may not be a significant problem if proper storage conditions after cutting are utilized. Avoid planting seed in cool soils, since delayed emergence may aggravate *Rhizoctonia* stem canker and result in reduced fertilizer uptake. Plant 4 inches deep in a broad, well-shaped hill to minimize late season greening.

Fertility: Apply total fertilizer in the range: N(120-180#), P(100-200#), K(0-60#). Pre-plant N applications are critical for early vine growth necessary to support maximum yields. This should be in a range of 70-120#, do not exceed 80# on lighter soils. Sprinkler applied N should be in the range of 60-70#. Do not exceed 20# per application.

Irrigation: The interval at the maximum ET is approximately 2.5 to 3 days. Drought tolerance is low. Mid season this cultivar wilts easily. Producers should closely monitor late season irrigation, to prevent creating ideal conditions for expression of diseases such as blackleg, pink rot and leak.

Pest Control
Weeds: Weed competition is moderate for Yukon Gold. It is not sensitive to major potato herbicides.
Insects: Standard insect control measures are suitable, however timing and rotation of pesticides is important due to preference by aphids and virus spread.
Fungicides: Three to five fungicide applications may be necessary to control foliar early blight.

Tuberization/bulking: Tuber set is light to medium (about 7 tubers per plant) and high in the hill. Greening may be a problem without proper hill conformation. Tuber bulking occurs in a short interval during early to mid-season at an extremely rapid rate.

Vine Kill: Average days from planting to vine senescence is 90 to 100. Adequate skin set occurs in 14 to 21 days. Tubers may become excessively large late in the season, so close monitoring of size is warranted by 90 days from planting.

STORAGE MANAGEMENT

Yukon Gold stores well and generally develops few problems early. However, leak, pink rot, soft rot and silver scurf may become serious when proper field and storage management are not practiced. Rough handling may increase the potential for *Fusarium* dry rot infections. Yukon Gold has traditionally not been considered a long-term storage cultivar.

DISEASE REACTION

Potato early dying, caused by *Verticillium dahliae* is a problem in some years, but can be easily confused with natural vine senescence. Bacterial ring rot symptom expression is adequate with symptoms showing within 90 days after planting. Yukon Gold is susceptible to PVY infection and infected plants are easy to detect. However, virus spread is rarely a major problem.

Field	
Foliar early blight	Susceptible*
Verticillium wilt	Susceptible
Blackleg	Susceptible
Seedpiece decay	Susceptible
Leafroll virus	Moderately Resistant
Leafroll net necrosis	Moderately Resistant
PVY	Susceptible
PVX	Tolerant/Resistant to mild mosaic
Common scab	Moderately Susceptible
Powdery scab	Susceptible
Bacterial ring rot	Susceptible
Late blight	Susceptible
Storage	
Tuber early blight	Susceptible
Bacterial soft rot	Susceptible
Fusarium dry rot	Susceptible
Pythium leak	Susceptible
Pink rot (*P. erythroseptica*)	Susceptible
Silver scurf	Susceptible
Rhizoctonia scurf	Susceptible

**Disease reaction ratings = susceptible, moderately susceptible, moderate, moderately resistant and resistant.*

January 2000

KEYSTONE RUSSET

Prepared by Susie Thompson, Ph.D. and Robert D. Davidson, Ph.D., Department of Horticulture & Landscape Architecture, San Luis Valley Research Center, Colorado State University.

This profile was developed for production in the San Luis Valley. While some guidelines may be appropriate regardless of growing area, fine-tuning for specific production locales is recommended.

Keystone Russet is a very high yielding, medium russet-skinned, fresh market cultivar. Release is scheduled for 1999, by the Colorado and Idaho Agricultural Experiment Stations and the USDA. Keystone was tested as AC83064-1 and is the result of a cross between CalWhite (A76147-2) x A7875-5. It has low specific gravity and attractive tuber type. Plant variety protection is being pursued.

Plants/roots: Emergence is uniform, with a medium-sized, somewhat spreading vine and white flowers. It has a determinate growth habit and a moderate to shallow root system. Tuber initiation and bulking rate are medium.

Tubers: Tubers have white flesh, are oblong to long, with medium russet skin. Eyes are shallow and most prevalent on the bud end. Specific gravity is low (1.078).

Yield potential: Yield potential may exceed 500 cwt. per acre, with a high percentage of US No. 1 tubers produced.

GROWING SEASON MANAGEMENT

Pre-planting considerations: Tubers have a medium dormancy. Whole or cut seed is acceptable. Monitor size of seed, as sparse eye distribution on larger seed may result in "blind" seed pieces and stand problems. A seed spacing of 10 to 12 inches may optimize yield and desired tuber size for the commercial market. Plant this cultivar at about a 5-5.5 inch depth, which will reduce the potential for green tubers.

Fertility: Apply total fertilizer in the following range N(120-140#), P(80-190#), K (0-100#). Fertility needs are very minimal compared to other major russet cultivars. Pre-plant N applications should be in the range of 60-80#. Timing of tuberization is not affected by N applications. Spoon-feed remaining N at the rate of 7-10# per application (do not exceed 20# per application). Skin set may be difficult to achieve if nitrogen levels are high prior to vine desiccation. This may perpetuate skinning and tuber early blight problems in storage. Keystone's performance on alkali soils has been diminished.

Irrigation: Interval at the maximum ET is 3 days. Drought tolerance is moderate.

Pest Control

Weeds: Keystone Russet competes well with weeds. It is sensitive to metribuzin (Sencor, Lexone) applications.

Insects: Standard insect control measures generally are effective but timing and rotation of appropriate control is important due to high aphid preference and virus spread.

Fungicides: Begin application of appropriate fungicides for foliar early blight control when plants are 8 to 10 inches tall, and/or growing degree thresholds are met. This will result in 2 to 5 applications per season. Keystone is susceptible to late blight, thus if the pathogen is present, utilize an appropriately timed preventative program.

Tuberization/bulking: Keystone sets about 7 tubers per plant, and tubers are set in the middle of the hill. Tuber initiation and bulking rate are medium. Heat sprouts may occur when growing temperatures are high. Tubers are moderately resistant to blackspot bruise. Few internal or external defects have been noted during evaluation of this cultivar.

Vine Kill: Average days from planting to vine kill are 115 to 120. Vine killing is required, particularly if nitrogen applications have exceeded requirements. Adequate skin set occurs within 21 to 28 days.

STORAGE MANAGEMENT

Keystone Russet stores well with few problems, however, if tubers are immature or bruised during harvest and handling operations, *Fusarium* dry rot and early blight tuber decay may quickly become problems in storage.

DISEASE REACTION

Overall, disease problems are minimal. Bacterial ring rot foliar expression is adequate with typical symptoms and occurs within 90 days after planting.

Field	
Foliar early blight	Susceptible*
Verticillium wilt	Unknown
Blackleg	Susceptible
Seedpiece decay	Susceptible
Leafroll virus	Susceptible
Leafroll net necrosis	Unknown
PVY	Susceptible
PVX	Susceptible
Common scab	Unknown
Bacterial ring rot	Susceptible

Storage	
Tuber early blight	Susceptible
Bacterial soft rot	Susceptible
Fusarium dry rot	Susceptible
Pythium leak	Unknown
Pink rot (*Phytophthora*)	Unknown
Silver scurf	Unknown
Rhizoctonia scurf	Unknown

**Disease reaction ratings = susceptible, moderately susceptible, moderate, moderately resistant and resistant.*

12/99, revised 3/2000

ALPHA

Prepared by Susie Thompson, Ph.D. and Robert D. Davidson, Ph.D., Department of Horticulture & Landscape Architecture, San Luis Valley Research Center, Colorado State University

This profile was developed for production in the San Luis Valley. While some guidelines may be appropriate regardless of growing area, fine-tuning for specific production locales is recommended.

Alpha is a late maturing cultivar released in 1925 by Professor Ir. J.C. Dorst of Leeuwarden, Holland. Primary use is for the fresh market, and it is particularly suited for boiling.

Plant/roots: Plants emerge uniformly and quickly, with a large, upright vine and light red-purple flowers. If dormant (seed tubers not warmed, eyes not peeping) tubers are used, emergence may be quite erratic. Alpha has a determinate growth habit, with a medium sized root system.

Tubers: Tubers have yellow flesh, are round to slightly oval, with a buff to pale yellow, slightly flaky skin. Eyes are shallow and well distributed. Specific gravity levels are medium (1.080).

Yield potential: Yield potential is medium (350 cwt./acre).

GROWING SEASON MANAGEMENT

Pre-planting considerations: Tuber dormancy is strong. Whole or cut seed is acceptable, however, precut seed may be preferred, as the increased stem number aids in limiting oversized tubers late in the season. Chitting (green sprouting) may be advantageous if whole seed is utilized. A 6 to 8-inch within-row spacing maximizes production of small tubers desired by the tablestock industry. Plant 4 inches deep in a broad, well-shaped hill to minimize late season greening.

Fertility: Apply total fertilizer in the range: N(120#), P(80-190#), K(0-100#) for Alpha. Pre-plant N should be in a range of 60-80#. Sprinkler applied N should be in the range of 40-60#. There may be a benefit from applications at a rate of 7-10# per application, but not exceeding 20# per application. All nitrogen should be applied prior to July 31 in the San Luis Valley. Vines may become quite large if excessive nitrogen is used early in the season. Tuberization may also be delayed.

Irrigation: The interval at the maximum ET is approximately 3 days. Drought tolerance is moderate. Due to the large vine size, monitor moisture closely during extended periods of hot weather.

Pest Control

Weeds: Alpha competes well with weeds. It is not sensitive to common potato herbicides.
Insects: Standard insect control measures are suitable.
Fungicides: Apply first application in conjunction with the early blight degree-day model. Utilize a typical spray program for the San Luis Valley.

Tuberization/bulking: Tuber set is medium to high and in the middle of the hill. Greening may be a problem without proper hill conformation. Tuber bulking occurs rapidly mid to late season. Growth cracks, misshapen tubers and deeper eyes may result if plants are stressed during tuber bulking.

Vine Kill: The average number of days from planting to vine kill is about 110. Adequate skin set occurs in 14 days. Tubers may become excessively large late in the season; close monitoring is warranted by early August.

STORAGE MANAGEMENT

Alpha generally has few storage problems. Alpha is somewhat susceptible to blackspot bruise.

DISEASE REACTION

Overall, disease problems are minimal. Bacterial ring rot symptom expression is adequate. Symptoms appear later in the season, 90+ days after planting. Reaction to PVY infection is normal, and infected plants are easily detected.

Field	
Foliar early blight	Moderate
Verticillium wilt	Unknown
Blackleg	Susceptible
Seedpiece decay	Susceptible
Leafroll virus	Moderate
Leafroll net necrosis	Unknown
PVA	Resistant
PVY	Susceptible
PVX	Susceptible
Tobacco Rattle Virus	Susceptible
Common scab	Moderately resistant
Powdery scab	Moderately susceptible
Bacterial ring rot	Susceptible
Late blight	Moderately resistant

Storage	
Tuber early blight	Moderately resistant
Bacterial soft rot	Unknown
Fusarium dry rot	Unknown
Pythium leak	Moderate
Pink rot (*P. erythroseptica*)	Moderate
Silver scurf	Susceptible
Rhizoctonia scurf	Susceptible

Disease reaction ratings = susceptible, moderately susceptible, moderate, moderately resistant and resistant.

April 2000