Cultural and Physiological Studies

2001 Research Trials
San Luis Valley Research Center
Center, Colorado

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Research Horticulturist - Potatoes

CULTURAL AND PHYSIOLOGICAL STUDIES

Trials in 2001 are located on the northwest corner of the San Luis Valley Research Center. The site was mainly in barley in 2000. A soil test taken on about April 1, indicated loamy sand texture, low lime, a pH of 6.9, 1.1% organic matter, 5 ppm N, 15.5 ppm P, 180 ppm K, 5.0 ppm Zn, 14.7 ppm Fe, 4.3 ppm Mn and 2.8 ppm Cu. Seven cultural trials are growing at this location with the primary objective of identifying proper and/or improved production practices, particularly for new cultivars.

The cultural regime (to date) for the northwest corner in 2001:

Fertility: In response to the pre-plant soil test, liquid fertilizer (80-60-40) was banded pre-plant. About 10 pounds nitrogen per acre (40 lbs. total as 28-0-0-5S as of July 23) has been applied weekly from tuberization.

Plant population: All trials, with the exception of the seed piece spacing trial, were set up on a 12-inch within row spacing, with 34-inches between rows.

Irrigation: Irrigation is by solid set sprinkler. Amounts are determined by the average ET for Russet Norkotah, Russet Nugget and Centennial Russet.

Weed control: Dual Magnum (1.33 pints/acre) and Matrix (1.5 ounces/acre) were applied just prior to emergence, with a ground-rig on June 1. Herbicide was not applied to the metribuzin screening trial.

Fungicide applications: About a 10 to 14 day schedule has been maintained after the early blight growing degree-day threshold was attained. If late blight is identified in the San Luis Valley this will go to approximately a 5-7 day schedule. Bravo WeatherStik (0.75 pts. /acre) was chemigated on July 6. Quadris was chemigated on July 23 (15.4 fluid oz./a).

Insecticide applications: Leverage was chemigated on July 17 (3.75 oz./a).

Vine kill: Sulfuric acid is scheduled for application on August 31 (28 gals. per acre).

Cultivar Specific Management

Tailoring cultural and storage practices for new and existing cultivars is the definition of cultivar specific management. A more successful experience for producers and industry personnel may be achieved by having a cultivar specific management profile when trying a new cultivar for the first time. During the evaluation and development processes, shortcomings of advanced selections and cultivars may be recognized and appropriate management strategies explored and identified. Cultivar specific management profiles consist of cultivar specific information pertinent to production, such as nutrient management, plant population, pest susceptibilities, water requirements, storage considerations, processing and marketing information, and are designed to supplement general potato production recommendations.

Since 1997, nine profiles (see table below) have been developed and made available to producers and potato industry personnel in the San Luis Valley, as well as in many states, provinces and other countries. In 2001, three profiles have been released to producers. They include Durango Red (CO86218-2), Fremont Russet (CO85026-4) and BCO894-2, a chipper.

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
Durango Red (CO86218-2)	2001
Fremont Russet (CO85026-4)	2001
BCO894-2	2001

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BCO894-2	2001

DURANGO RED

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.

Durango Red is a medium maturing potato cultivar. Release is pending by the Colorado Agricultural Experiment Station. Durango Red is an attractive dark red-skinned cultivar, suitable for the fresh market. It was tested as CO86218-2. Parentage of Durango is Sangre x NDTX9-1068-11R. It has low to medium specific gravity and attractive tuber type. Plant Variety Protection will be applied for.

Plants/roots Durango Red emerges rapidly and has a small to medium and upright vine. Foliage is heavily pigmented and Durango has red-purple flowers. It has a determinate growth habit and a moderate to shallow and concentrated root system.

Tubers are round to slightly oval, with very dark red skin, which is smooth, but not waxy. Flesh is white. Eyes are shallow and more prevalent on the apical end. Specific gravity is low to medium (1.076 average).

Yield potential is medium to high, exceeding 400 cwt./acre.

GROWING SEASON MANAGEMENT

Pre-planting considerations Tubers have medium dormancy. Single drop or cut seed is acceptable. When using cut seed, utilize practices that enhance suberization and prevent decay by pathogens. A 9-inch spacing may optimize total yield, while maintaining a small tuber size profile, although grade components have had similar percentages at a 12-inch spacing. Plant seed about 4 inches deep with a good cover.

Fertility Apply total fertilizer in the range: N(140-160#), P(100-200#), K(0-60#). Pre-plant incorporated N should be from 70 to 90#. Side-dress and sprinkler applied N should be in the 60 to 90# range at a rate of not more than 20# per application. Pear shaped tubers may result if Durango is over-fertilized and adequate or excessive water available. Stolon detachment problems may result if plants are immature due to excessive or late-season nitrogen applications.

Irrigation Interval at the maximum ET is 2.5 days. Drought tolerance is moderate. Water usage will decline as vines mature, so monitor fields to prevent over watering late in the season and potential decay by pathogens such as *Pythium* or *Phytophthora*. Enlarged lenticels have frequently been observed when over watered.

Pest control

Weeds Due to small vine size, weed competition may be a problem for some producers. Durango Red has shown sensitivity to metribuzin. Adverse reactions to other commonly utilized herbicides for potato production have not been noted in grower experiences.

Insects Standard insect control measures generally are effective. Use of Di-Syston may result in some foliar phytotoxicity symptoms.
Fungicides Control of foliar early blight usually requires 3 to 4 applications.

Tuber/bulking Durango Red consistently sets about 9 tubers per plant on about 2.8 stems. Tubers are set mid hill. Tuber initiation and bulking rate are medium. Few internal and external defects have been noted. Tubers have moderate resistance to hollow heart and blackspot bruise.

Vine kill Average days from planting to vine kill are 105-110. Sulfuric acid use for vine kill may be warranted to aid stolon breakdown, particularly if plants are immature due to excessive or late-season nitrogen applications or if maturity is delayed due to warm conditions. Adequate skin set occurs at about 18 days.

STORAGE MANAGEMENT

Durango Red stores well and maintains color in storage.

DISEASE REACTION*

Overall disease problems are minimal. Bacterial ring rot foliar symptom expression is adequate and occurs within 90 days after planting. Bacterial soft rot, caused by *Erwinia*, may be a problem in storage, and in the field as seed piece decay and blackleg. Major potato viruses usually do not present a problem; Durango is similar to Sangre in this regard.

Field

Foliar early blight	Susceptible
Verticillium wilt	Unknown
Blackleg	Susceptible
Seedpiece decay	Susceptible
Leafroll virus	Susceptible
Leafroll net necrosis	Unknown
PVY	Susceptible
PVX	Unknown
Common scab	Unknown
Powdery scab	Moderate to Moderately Susceptible
Bacterial ring rot	Susceptible

Storage

Tuber early blight	Moderately resistant
Bacterial soft rot	Susceptible
Fusarium dry rot	Unknown
Leak (*Pythium*)	Unknown
Pink rot (*Phytophthora*)	Unknown
Silver scurf	Unknown
Rhizoctonia scurf	Moderately resistant

**Disease reaction ratings = susceptible, moderately susceptible, moderate, moderately resistant and resistant.*
February 2001

FREMONT 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.

Fremont Russet is a medium yielding, medium-late maturing, fresh market russet cultivar. Tubers are oblong to long, with medium specific gravity. Due to excellent late-season storage capabilities, Fremont is suitable to fill the Centennial Russet niche as a late storage potato. It performs well in rocky soils. Release is pending by the Colorado Agricultural Experiment Station. Fremont Russet was tested as CO85026-4 and is the result of a cross between Century Russet x WNC630-2. Plant variety protection will be pursued.

Plants/roots: Emergence is uniform, with a medium-sized vine, similar to Century Russet in color and vine architecture. Flowers are white. It has a determinate growth habit and a moderate to shallow root system.

Tubers: Tubers are oblong to long, with a dark, medium-heavy russet skin. Eyes are shallow and most prevalent on the apical end. Tuber flesh is white. Specific gravity is medium (1.084 avg.).

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

GROWING SEASON MANAGEMENT

Pre-planting considerations: Tubers have medium dormancy. Whole or cut seed is acceptable. A seed spacing of 12-inches may optimize total yield and desired tuber size for the commercial market. Wider plant spacing often increases tuber yield, however due to rough and misshapen tubers, more culls are produced.

Fertility: Apply total fertilizer in the following range N(140-150#), P(80-190#), K (0-100#). Fertility needs are very minimal compared to many other major russet cultivars. Pre-plant N applications should be in the range of 50-70#. Timing of tuberization is affected by N applications. Tuberization does not seem to be delayed, however tubers tend to grow extremely rapidly and misshapen in the process. Spoon-feed remaining N at the rate of 7-10# per application (do not exceed 20# per application).

Irrigation: Interval at the maximum ET is 3 days. Drought tolerance is moderate. Enlarged lenticels have been noted when water applications were excessive, particularly late in the season.

Pest Control

Weeds: Fremont Russet is resistant to metribuzin (Sencor, Lexone) applications.
Insects: Standard insect control measures generally are effective but timing and rotation of appropriate control is important.

Fungicides: Fremont is susceptible to late blight, thus if the pathogen is present, utilize an appropriately timed preventative program.

Tuberization/bulking: Fremont sets about 7 tubers per plant, on about 2.5 stems per plant. Tubers are set mid to low in the hill. Tuber initiation and bulking rate are medium. Tubers are moderately susceptible to blackspot bruise and shatter bruise. In trials and grower evaluation, Fremont has exhibited a low incidence of internal and external defects. Deep eyes, growth cracks, enlarged lenticels and alligator hide have occasionally been noted.

Vine Kill: Average days from planting to vine kill are 115 to 120. Vine killing is required most years. Adequate skin set occurs within 14 days.

STORAGE MANAGEMENT

Fremont Russet is an excellent long-term storage cultivar.

DISEASE REACTION

Overall, disease problems are minimal. Bacterial ring rot foliar expression is adequate with typical symptoms and occurs at or slightly past 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
Powdery scab	Unknown
Bacterial ring rot	Susceptible

Storage

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

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

February 2001

Field Trials - 2001

Cultivar and Advanced Selection Observations – Four hill plots of forty-three cultivars and advanced selections were planted on May 8. This observation trial provides vines and tubers for photographs and an opportunity to note vine characteristics, including flower color, and tuber traits for potato materials important to the Southwest.

Hail Timing Evaluation – Russet Norkotah and Russet Nugget are being evaluated for response to hail at 3 growth stages (R-2, R-5 and R-7) during the season. Hail is simulated with a weed eater. Plots are defoliated 50% at the appropriate growth stage. The R-2 defoliation event was done on June 27, when the primary inflorescence was present and tubers were very small. The R-5 defoliation treatment occurred on July 19 when plants were fully flowering and tubers 2-3 inches. The R-7 defoliation treatment took place on July 30, when tubers were about 3.5 to 4 inches. The trial is conducted in cooperation with National Crop Insurance Services.

Metribuzin Screening Trial – A cooperative trial with Dr. Scott Nissen. In 2001, 24 cultivars and advanced selections are being screened for sensitivity to metribuzin (Sencor, Lexone). An untreated check is compared to a post-emergent application of 1 lb./acre active ingredient of metribuzin when plants are about 8 inches tall. The treatment was applied on June 23. Foliar damage was assessed 21 days following the application (July 13). Plant height and total yield will be evaluated. The three parameters are then utilized in assessing the predictive model to determine potential yield loss due to sensitivity.

Zinc Response Trial – This is a new trial initiated in 2000 in cooperation with Dr. Jessica Davis and Katy Watts. The objective is to determine if supplemental zinc applications result in a yield or quality response. Two rates, 0.2 and 0.4 lbs. Zn/acre (applied as ZnEDTA), were applied foliarly on July 20. The trial also includes an untreated check. Cultivars included in the evaluation are Russet Nugget and Russet Norkotah.

Growth Analysis – Six advanced selections and newly released cultivars are included in this trial, AC87079-3, AC87138-4, AC87340-2, AC91014-2Ru, CO89097-2 and German Butterball. Weekly destructive harvests are conducted to investigate canopy, root/stolon (underground plant parts), and tuber development and characteristics. Destructive harvests began on June 5 in 2001. 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, in addition to many other yield and development parameters.

Seed Piece Spacing Trial – An ongoing trial, changing as new selections become available from the Colorado potato breeding program, directed by Dr. David Holm. In 2001, six selections are being evaluated at three within-row spacings, 9, 12, and 15 inches. Entries include AC87079-3, AC87138-4, AC87340-2, AC89536-5, CO89097-2, and AC91014-2Ru. Information is utilized in the development of cultivar specific

management profiles and in guiding producers in order to optimize tubers of desired market size.

Nitrogen Rate Evaluation – In 2001, twelve advanced selection and cultivars are being evaluated for yield and quality response at three nitrogen rates (about 150, 200 and 300 lbs. per acre). Entries include Russet Norkotah and Colorado Selections 3 and 8, TXNS112, TXNS223, TXNS278 and TXNS296, AC87079-3, AC87138-4, AC87340-2, AC89536-5 and CO89097-2.

New Cultivar Demonstration Trial - This year a Demonstration trial was planted on the farm of Lynn McCullough, in cooperation with Lynn, Doug Messick and David Holm. Nine new cultivars from around the US are included in the trial. Red entries are CalRed, Durango Red, W84-75R, IdaRose and Winema. Russet and processing cultivars are Fremont Russet, Klamath Russet, Alturas and Wallowa Russet. The trial was planted on May 10. A weekly evaluation of canopy and tuber development is conducted. The site is located on the NE corner of the circle at the corner of County Road 6 North and 3 East, in a field of TXNS278.

Acknowledgements

2001 Crew:

Andrew Houser, Research Associate
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- Jose DeHerrera
- Justin Fricke
- Ty Hemmerling
- Chris Morgan
- Heather Messick (Tater Tot Intern)

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Gunnels Farms – Doug Gunnels
Summit Farms – Steve Myers
Peterson Farms – Ron, Greg and Mark
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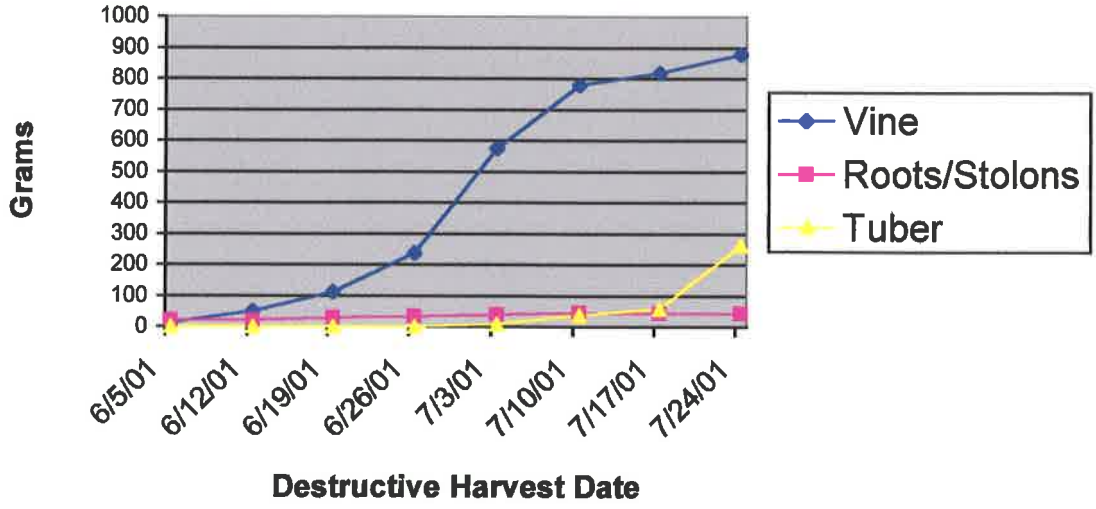
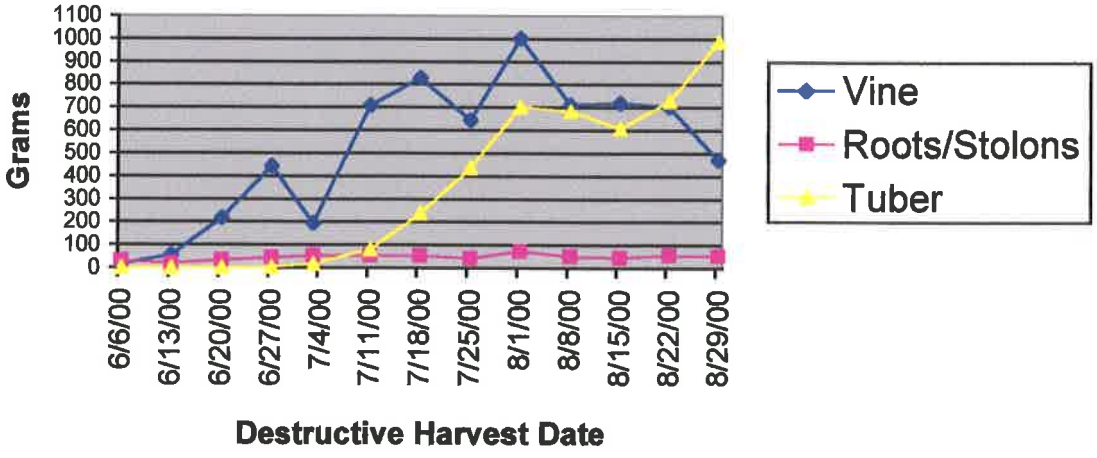
Katy Watts, Rocky Mountain Research and Consulting
National Crop Insurance Services – Dr. Mark Zarnstorff
CSREES

AC87079-3 Development



AC87079-3 Development
2000



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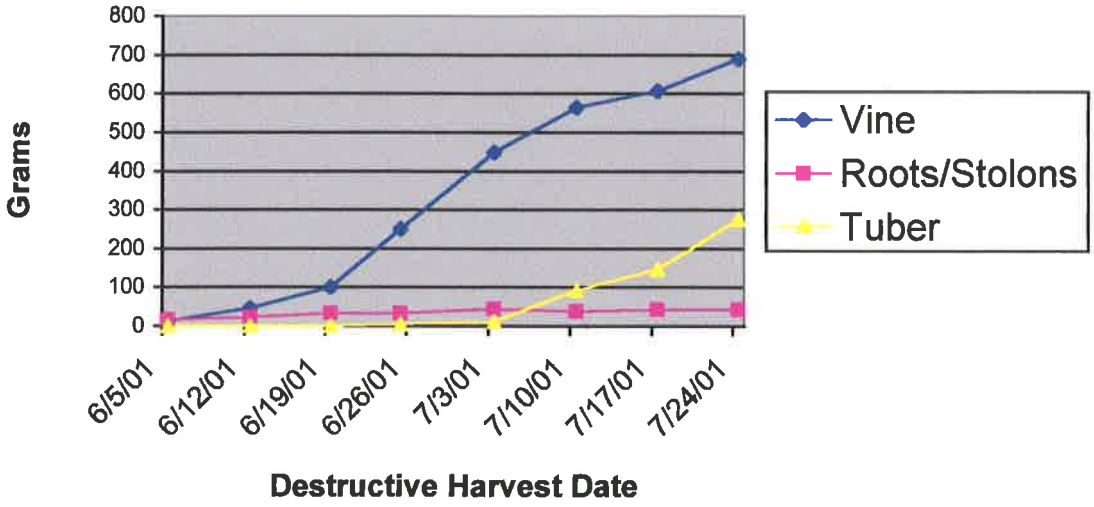
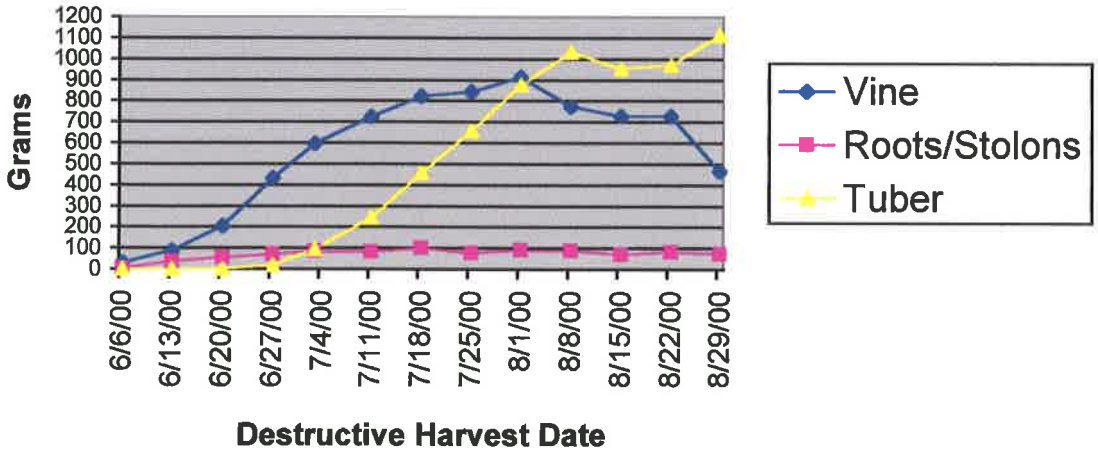
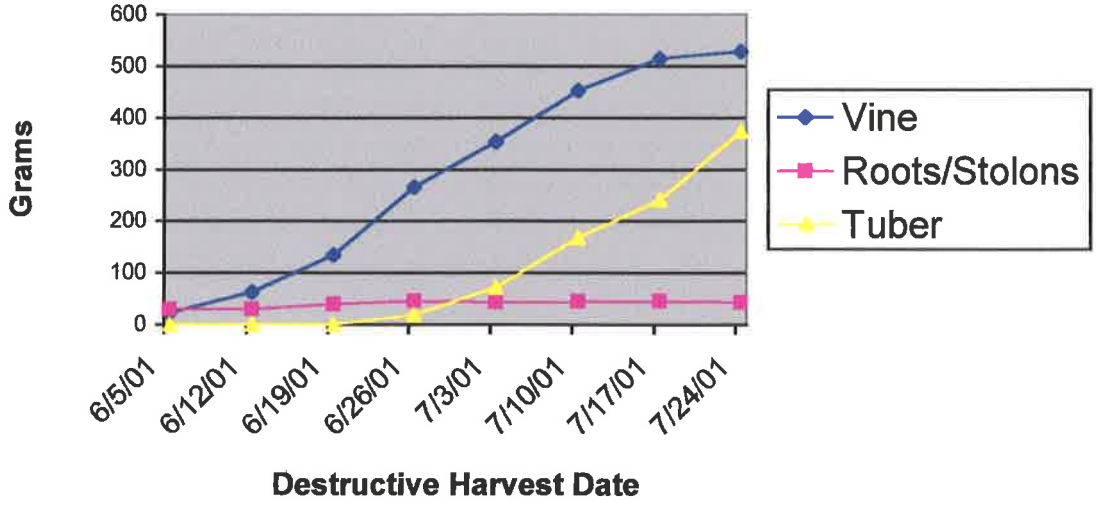


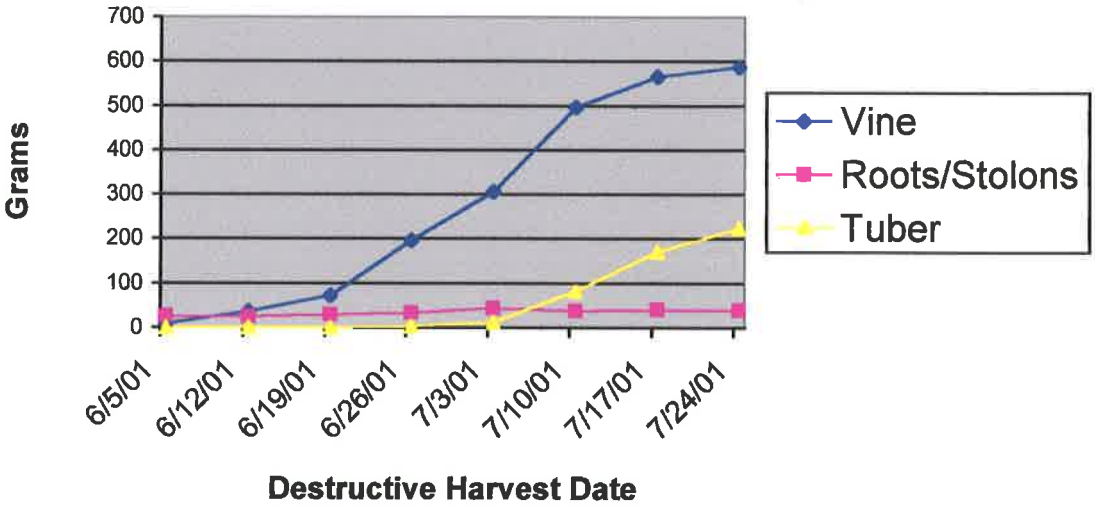
AC87138-4 Development 2000



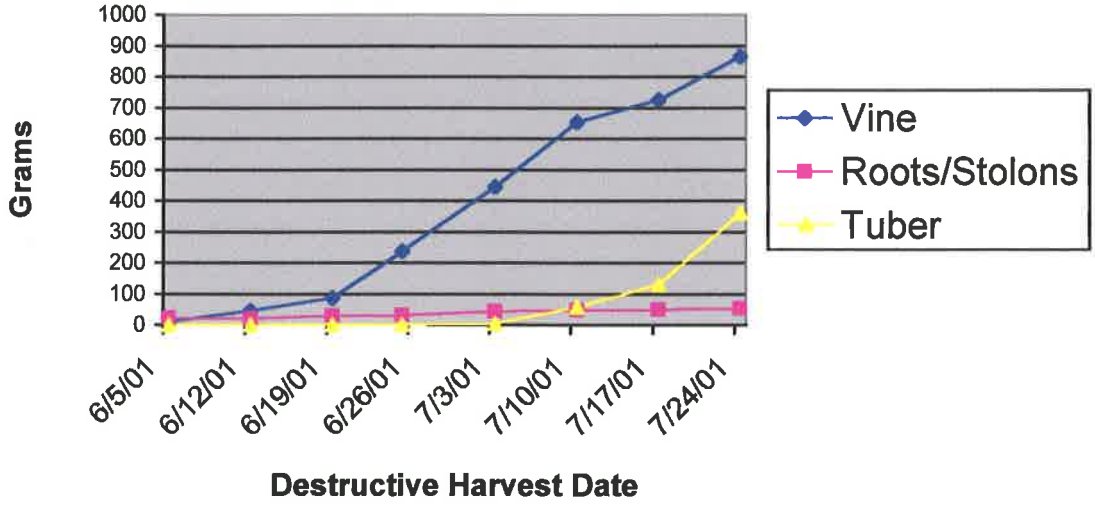
AC87340-2 Development



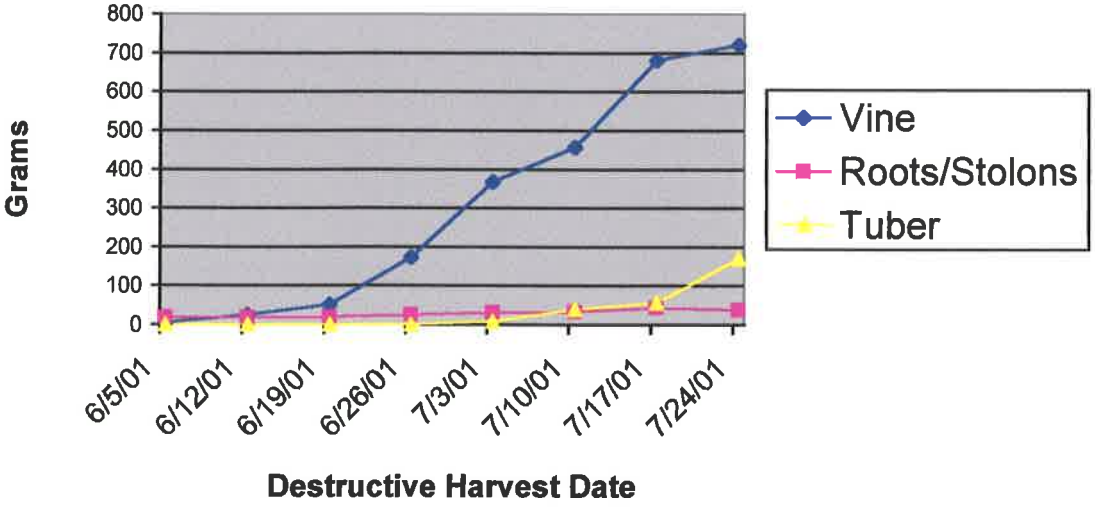
AC91014-2 Development

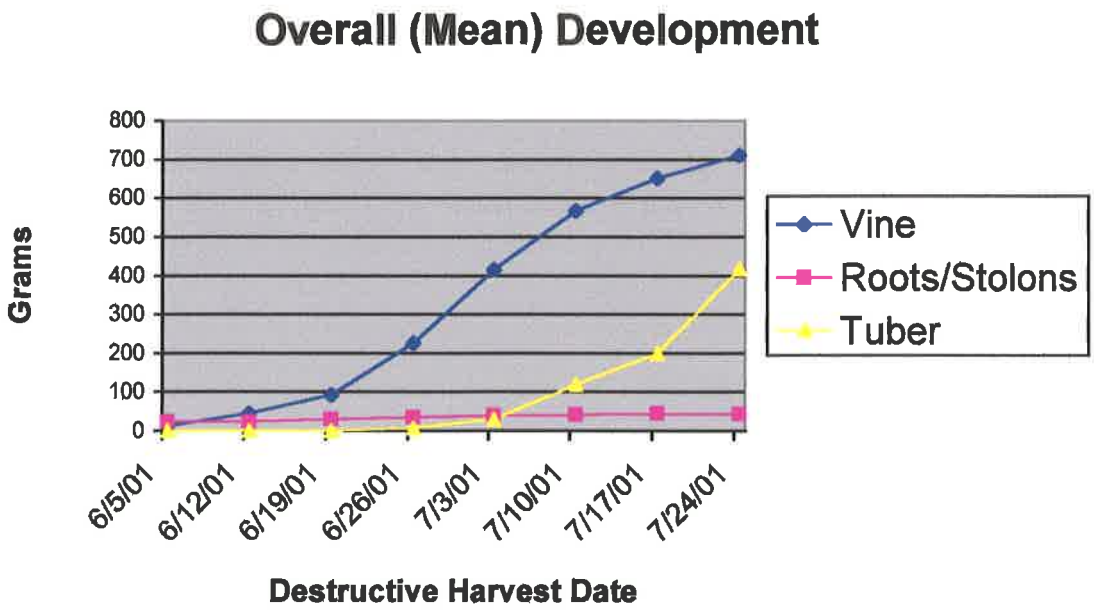


CO89097-2 Development



German Butterball Development




Overall (Mean) Development
Grams
800
700
600
500
400
300
200
100
0
6/5/01
6/12/01
6/19/01
6/26/01
7/3/01
7/10/01
7/17/01
7/24/01
Destructive Harvest Date
Vine
Roots/Stolons
Tuber

New Cultivar Demonstration Trial

Cooperators: Lynn McCullough, Doug Messick and David Holm
Location: Southwest corner at junction of 3 East and 6 North, Monte Vista, Colorado. Trial is located in a field of TXNS278.
Objective: To provide San Luis Valley producers an opportunity to observe new cultivars released from US breeding programs, in order to gain some experience with growth habit, production characteristics in our environment and yield information.

Cultural Information

Cultivars:	CalRed, Durango, W84-75R, IdaRose, Winema, Fremont Russet, Klamath Russet, Alturas and Wallowa Russet	
Planting Date:	May 10, 2001 (assist-feed cup planter)	
Plot Size:	Two rows, approximately 100 feet long	
Spacing:	12 inches within row, 34 inches between rows	
Irrigation:	Center pivot	
Fertilizer:		
	Broadcast preplant:	21-0-120-50
	Band at plant:	100-180-15-30-3Zn-1Cu
	Chemigated:	76-0-0-15
Weed Control:	Dual Magnum and Sencor	
Fungicide:	SuperTin, Quadris, SuperTin and Ridomil	
Insecticide:	Ambush	

Descriptions

CalRed – A medium yielding, medium maturing, red-skinned cultivar, released from California. CalRed was tested as A79543-4R and is the result of a cross between Bison and Sangre. It produces a large percentage of 'B' sized tubers of uniform round shape with shallow eyes. Strengths include bright red skin color, high set of uniform tubers, few external and internal defects, little skinning, good storability and few skin defects. Weaknesses include mediocre yields and occasional hollow heart.

Durango – A medium to high yielding, medium maturing dark red-skinned cultivar, released from Colorado. Durango was tested as CO86218-2 and is the result of a cross between Sangre and NDTX9-1068-11R. Tubers are round to slightly oval, smooth and with shallow eyes. Strengths include dark red skin color that is maintained in storage, attractive tuber type, few internal and external defects, minimal disease problems. Weakness include pear shaped tubers and potential stolon detachment problems if immature due to excessive or late-season nitrogen applications.

W84-75R – A new release from Wisconsin. Produces a high set of 'B' sized tubers with bright red skin color.

IdaRose – A high yielding, medium to late maturing cultivar with bright red skin color, released from Idaho. IdaRose was tested as A82705-1R and resulted from a cross of Sange and TXA218-7. Tubers have excellent eye appeal, are round and have good

culinary quality. It has long dormancy and can be used directly from the field or following storage. Strengths include high yield potential, attractive appearance and lack of internal defects. Weaknesses include skin russetting in light soils and a tendency to skin when immature.

Winema – A medium yielding, early maturing, red skinned cultivar, released from Oregon. Winema was tested as NDO2438-6R and resulted from a cross between Redsne and ND1196-2R. Tubers are round to oval with a high percentage of small, high value tubers and low percentage of culls. Strengths include uniform bright skin color that does not fade in storage, shallow eyes, high percentage of small tubers and resistance to most internal defects. Weaknesses include moderate to low yields, very susceptible to and symptomless carrier for potato virus Y.

Fremont Russet – A medium yielding, medium-late maturing fresh market russet cultivar released from Colorado. Fremont was tested as CO85026-4 and is the result of a cross between Century Russet and WNC630-2. Tubers are oblong to long with dark, medium-heavy russet skin and shallow eyes. Strengths include excellent long-term storage capabilities, attractive tuber type, pretty vine, and low incidence of internal and external defects. Weaknesses include occasional enlarge lenticels and alligator hide.

Klamath Russet – A high yielding, late maturing cultivar released from Oregon. Klamath was tested as AO85165-1 and resulted from a cross between Russet Norkotah and A79172-6. It has blocky tuber type, is useful for the fresh market and has a very good pack-out. Strengths include very high yields, few external defects, excellent dormancy and storability. Weaknesses include susceptibility to blackspot bruise, vascular discoloration and a high sugar content which restricts processing.

Alturas – A very high yielding, late maturing cultivar released from Idaho. Alturas was tested as A82360-7 and is a cross between A77182-1 and A75188-3. It was selected for dehydration purposes. Tubers are lightly russetted, with dual-purpose possibilities. Strengths include exceptionally high yield, high specific gravity, low sugar accumulation in storage, and resistance to most internal and external defects. Weaknesses include short tuber shape, high tuber set and occasional growth cracks.

Wallowa Russet – A high yielding, medium maturing selection from Oregon. Wallowa was tested as AO87277-6 and resulted from a cross of A82758-3 and Ranger Russet. It has long tuber type, medium russet skin and dual-purpose capabilities. Strengths include high yield, attractive appearance, a high percentage of US No. 1 tubers, high specific gravity and excellent fry color. Weaknesses include susceptibility to shatter bruise, tendency for pointed ends and very short dormancy.

Agronomic and yield information based upon 5 plants harvested on July 30,2001.

Clone	Stems/Plant	Vine Height (inches)	Total Tuber Number	Total Weight (lbs.)	Average Tuber Size (oz.)
CalRed	4.8	28	56	5.9	1.7
Durango	2.4	21.7	32	6.8	3.4
W84-75R	6.2	21	88	3.1	0.6
IdaRose	4.4	25.8	64	5.9	1.5
Winema	2.2	25	38	6.5	2.7
Fremont Russet	1.8	23.7	26	3.8	2.3
Klamath Russet	2.2	26.7	43	4.4	1.7
Alturas	3.6	30.3	47	2.5	0.8
Wallowa Russet	3.4	31	37	8.9	3.9
TXNS278	2.0	25.3	29	5.5	3.7