Russet Burbank

Management

Profile

A summary of the main management inputs used by successful Russet Burbank producers in southern Alberta

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Introduction

This factsheet describes some of the main management practices and inputs used in 1998 by southern Alberta potato growers who produce Russet Burbank potatoes for processing. The information summarized here was supplied by 14 growers who provided details on 18 Russet Burbank fields that were both high yielding and of good quality.

Note that not all results in this factsheet total 18 as not all questions were answered by all growers.

Special thanks to those growers who participated in this project.

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Where necessary, comments have been added to various sections of this factsheet and appear in boxes like this.

Yield and quality of surveyed fields

This factsheet describes inputs for 18 fields with an average marketable yield of between 20 and 21 tons per acre. Responding growers reported marketable yields ranging from 18 to 23 tons per acre. (Marketable yield was defined as the yield the growers would be paid for if they were shipped to a french fry plant at the time of the survey in January.)

Growers were asked to rate the overall quality as fair, good or very good. All growers described the quality as good (10) or very good (8) and none as fair quality.

The specific gravity of the 18 lots ranged from 1.093 to 1.103 with a mean specific gravity of 1.097.

French-fry processors pay a premium for Russet Burbank potatoes with a specific gravity of 1.090 or higher. Specific gravity is the density of potatoes compared to water (1.0) and is an accurate measure of the dry matter of potatoes. Generally the higher the dry matter, the better the quality of the resulting frozen french fries. Very high specific gravities (above 1.100) are not as desirable as those between 1.090 and 1.099.

Summary of management inputs

Following is a description of how a typical Russet Burbank field was grown for french fry processing in 1998. ***The following descriptions are based on averages, and in some cases "the majority" input is described belo These may not reflect management in a significant number of fields. (For example, the majority of grower do not use micronutrients, however just under half do.) The descriptions may not apply to a specific field in the future and they may not conform to current recommendations.***

Input	*Description*
Rotation and previous crop	The potatoes were planted in a field where no potatoes had been grown since 1994 and the previous crop was soft wheat.
Seed	Elite 3 seed was cut and treated with preventative fungicidal seed treatment to prevent seed-piece decay. (Use of seed treatments was not determined in the survey.)
Nitrogen fertility	A total of 190 pounds of nitrogen was applied: 120 pounds were broadcast and worked in prior to planting; 35 pounds were top-dressed and worked in at hilling; and an additional 35 pounds were added with the irrigation water. The resulting *lowest* fourth-petiole, nitrate-nitrogen level in August was 8,000 ppm.
Phosphorous fertility	A total of 100 pounds of phosphorus (P_2O_5) were broadcast and cultivated in prior to planting. The resulting *lowest* fourth-petiole total-P level in August was 0.21 percent which is considered marginal.
Potassium fertility	70 pounds of potassium were broadcast and worked in prior to planting.
Sulphur	30 pounds of sulphur were broadcast and worked in prior to planting.
Micronutrients	No micronutrients were added.
Planting	The field was planted with a six-row pick planter traveling 3.5 mph. Planting took three days starting on April 27 and was complete on April 29. Seed pieces were spaced at 12 inches in the row and final stand was 92 percent.
Cultivation/hilling	The first hilling (dammer dyking) was done before the plants emerged and the second hilling was done when the plants were about 4 inches high.
Irrigation	A total of 16 to 18 inches of water was applied during the growing season in 16 or 18 revolutions of the pivot.
Weed control	Two or three herbicides were used to control a wide range of broadleaf and grassy weeds plus volunteer wheat.
Blight prevention	Four different fungicides were applied a total of eight times starting in late June at 2-week intervals and every week in August through to top kill.
Insect control	Thimet was applied at planting and the field was sprayed once in mid summer with a pyrethroid insecticide for Colorado beetle control.
Top killing	The field was sprayed with 1.25 L of Reglone once on September 13.

Cultivation

Participating growers were asked to describe the field preparation/cultivation practices between taking off the previous crop in the fall of 1997 and planting in the spring of 1998. Information was reported for 16 of the 18 fields. Few growers prepare land exactly the same way, however, common practices include:

- Fall and spring bedding was reported for 9 fields
- Fall irrigation was reported for 13 fields
- Grain straw was chopped and harrowed in 10 fields prior to other tillage
- In either the fall or spring, all fields had at least one deep-tillage operation (paraplow, bedding or plowing).

Following are nine different cultivation sequences reported in the fall.

Soil preparation/cultivation method	**Sequence**								
Chop and harrow grain straw	1	1	1	1		1			1
Deep chisel		3	2						2
Double disc		2			2		2	3	
Cultivate			3	3			4		
Plow								2	
Paraplow	2	4					3		
Fall bed				4	3	3			3
Fall irrigate	3		4	2	1	2	1/5	1/4	4

Fall applied fertilizers are applied prior to the first field tillage operation. Most growers using fall and spring bedding equipment apply some nitrogen and most (or all) phosphorous and potassium fertilizer prior to fall bedding. In virtually all cases growers work in fertilizers by discing or cultivation prior to bedding.

Common spring practices include:

- Where fall bedding was done, the only spring operation is typically the spring bedding.
- Growers who are not fall or spring bedding are universally rototilling (or rotovating).

Following are common cultivation sequences reported in the spring.

Soil preparation/cultivation	**Sequence**				
Cultivate		1			1
Disc					
Fall/spring bed	1				
Rotovating/rototilling		2	2	1	3
Paratill			1		
Plow					2
Spring applied fertilizers are applied prior to the first field tillage operation.					

Fertility

Following is a summary of the amounts of actual fertilizers added to the fields. No attempt was made to determine soil residues.

Nitrogen

Nutrient description	*Average (mean)*	*Range of all growers*	*Normal range*[1]	*Comments*
	Pounds per acre			
Total nitrogen applied	188	140 to 225	160 to 210	Does not include soil residues based on soil analysis
Pre-planting nitrogen	120	70 to 200	90 to 150	
After planting and/or at hilling topdressed nitrogen	35	8 to 60	20 to 50	14 of 17 fields had N applied at hilling
N applied with irrigation (fertigation)	38	20 to 65	25 to 50	All growers fertigated
Minumum petiole nitrate nitrogen levels for August	8,300	800 to 17,100	4,100 to 12,500	Data reported for 14 of the 18 fields

Note 1. ***Normal range*** is defined as the range withing one standard deviation from the mean. In simple terms, it is the range in which the majority fall, and excludes those at the high and low ends.

Phosphorous

Nutrient description	*Average (mean)*	*Range of all growers*	*Normal range*[1]	*Comments*
	Pounds per acre			
Total P all sources	96	20 to 150	60 to 135	***Growers should plan to add all of the projected P needs prior to or at planting.*** Tissue P should be monitored and more added if it appears P will be deficient in two or three weeks.
Pre-planting broadcast P	82	20 to 150	45 to 115	
Banded P	-	-	30 to 60	Two growers reported banding three fields
At hilling P	-	-	20 to 40	Two growers reported adding P to three fields at hilling
P applied with irrigation (fertigation)	17	5 to 40	-	Extra P was applied to 7 of 18 fields in the irrigation water.
Minimum petiole total P levels for August	0.21	.11 to .31	.15 to .27	Data reported for 10 of 18 fields

Note 1. ***Normal range*** is defined as the range withing one standard deviation from the mean. In simple terms, it is the range in which the majority fall, and excludes those at the high and low ends.

The accepted threshold minimum for petiole total P is 0.22 percent. Five of the ten fields for which data were received were above this level. These data indicate that some fields may require more P applied before or at planting. Soil residue P was not asked for in this survey so it is not possible to report total available P. There appeared to be no relationship between the minimum P level in August and the amount of P applied to the crop. For example, one field with only 90 pounds applied had a minimum August petiole P of 0.31 percent. Another field had 120 pounds applied and the P declined to 0.13 percent.

Phosphorous fertilization of potatoes in Alberta is currently under review. As yields continue to increase it is reasonable to expect that application rates of phosphorous will have to increase beyond the averages that growers are currently reporting. Manure will likely play a more significant role in P management in the future. Young potato plants require a readily available supply of phosphorus when they are small and before the main feeder roots start taking phosphorus from deeper in the hill and root zone. For this reason growers are being encouraged to consider attaching banding equipment to their planters. Phosphorous should be banded 2 inches above and 2 to 4 inches to the side of seed pieces.

Potassium

Nutrient description	*Average (mean)*	*Range of all growers*	*Normal range*[1]	*Comments*
	Pounds per acre			
Pre-planting broadcast K	68	0 to 120	40 to 95	K added to 16 of 17 fields

Note 1. ***Normal range*** is defined as the range withing one standard deviation from the mean. In simple terms, it is the range in which the majority fall, and excludes those at the high and low ends.

Dr. Ross McKenzie, AAFRD fertility specialist, feels that if potassium is indicated on the soil test then growers should add a minimum of 100 pounds per acre.

Sulphur

Nutrient description	*Average (mean)*	*Range of all growers*	*Normal range*[1]	*Comments*
	Pounds per acre			
Sulphur added pre-plant or at hill	32	10 to 70	20 to 40	Sulphur was applied to 11 of 16 fields

Note 1. ***Normal range*** is defined as the range withing one standard deviation from the mean. In simple terms, it is the range in which the majority fall, and excludes those at the high and low ends.

Foliar feeding

- Some N, P, K was foliar applied to 4 fields (of 15 fields reporting)
- Foliar micros were applied 8 of 18 fields

Micro nutrients

- Micronutrients were applied pre-plant to 1 of 18 fields
- Foliar micronutrients were applied 8 of 18 fields
- Micronutrients were applied with irrigation water to 2 of 18 fields

Other management inputs

Rotation

	Rotation years[1]					
	1	*2*	*3*	*4*	*5*	*New land*
Number of fields	0	1[2]	1	7	4	5
16 of 18 crops were planted in a 4 or more year rotation.						

Note 1: The number of potato crops in the number of years specified. For example, 4 years = 1 crop in 4 years.
Note 2: This was new land and the grower reported a normal rotation of three or four years.

Previous crop

	Previous crop				
	Wheat[1]	*Barley*	*Corn*	*Sugar beets*	*Alfalfa*[1]
Number of fields	10	3	3	2	1

Note 1: One field was half alfalfa and half wheat the previous year.

Fall irrigation

Of the 17 fields for which data were obtained, 14 were fall irrigated in 1997.

Seed

	Class			*Cut or whole*	
	Elite 3	*Elite 4*	*Foundation or certified*	*Cut*	*Whole*
Number of fields	16	1	0	14	2
The survey neglected to ask growers of they used seed treatments on cut seed. However, based on observation cut is always treated.					

Seed cutters

Those growers cutting seed reported using Better Built and Milestone cutters. Cutter widths were 24, 30, 36 and 60 inches.

Although not established in this survey, growers strive to cut seed pieces that average 2 ounces. Pieces smaller than 1.5 ounces and greater than 3 ounces should not total more than 20 percent of the cut seed lot.

Planting

Field sizes were not determined, but typically most fields are one full pivot circle (130 acres), with a few half fields of 65 acres.

Start date		*End date*		*Days to complete*	
Range from/to	*Average start date*	*Range from/to*	*Average end date*	*Range*	*Average (includes start and end day which may be part days)*
April 20 to May 4	April 27	April 22 to May 7	April 29	1 to 8	3

Planter description and speed

Pick planters were used to plant all fields except one. Two fields were planted with four-row planters and the res with six-row planters. One grower used an air planter.

Planter speed (mph)			
Slowest	*Fastest*	*Average speed*	*Normal range*
2.5	4.2	3.5	3.0 to 4.0

All planters have an optimum speed at which they preform best with any given seed lot. Planter performance must be established for each seed lot planted. The object is to plant pieces as close to the target spacing as possible with few misses or doubles. 80 percent of seed pieces should be within 2 inches of the target in-row spacing.

Target in-row spacing

	11 inches	*12 inches*	*13 inches*	*14 inches*
Number of fields	6	10	1	1 (whole seed)

Final plant stand

Growers estimated the final stands as follows:

Percent stand			
Lowest	*Highest*	*Average stand*	*Normal range*
85	98	91.5	88 to 94

Stands in about one half of the fields were estimated at 90 percent. This may indicate that the actual stand was not measured and 90 percent sounded like a nice round number. Based on casual observation of fields in 1998 the actual final stands were likely higher than reported.

Hilling frequency and timing

A wide range of commercial hillers and dammer dikers were used for hilling and reservoir tillage. Growers reported using equipment made by Dammer Diker, Kirshner, Allaway, Harriston, Grimme and Struik. One grower had manufactured his own dammer diker.

	Timing of first hilling			*Total number of times hilled or dammer diked*			*Total number of times hilled or dammer diked AFTER emergence only*			
	Before emergence	Before 4" high	After 4" high	1	2	3	0	1	2	3
Number of fields	8	9	1	3	9	4	1	8	7	2

Irrigation

Following is the reported frequency and amounts of irrigation water applied:

	Reported number of irrigations					*Estimated amount of water applied (inches)*					
	10	11	12	13	14+	10	12	14	16	18	20+
Number of fields	3	2	4	0	8	1	2	3	6	1	3

Potatoes require high uniform levels of water throughout the growing season. Typically during hot weather when the crop is at maximum demand (in July and early August) growers apply 0.6 to 1.00 inches of water two or three times a week to keep up with the needs of the crop. Contrary to historical belief, short- term moisture deficits when Russet Burbank potatoes are setting tubers in mid to late June results in significant yield reductions because tuber numbers are reduced.

Casual observation in 1997 and in 1998 indicates that fields are often too dry in early July and growers are applying too much water in early August.

Pest control

Herbicides used

Growers reported using the following herbicides.

	Eptam	*Sencor*	*Gramoxone*	*Linuron*	*Prism*	*Poast Ultra*	*Fusilade II*
Number of fields in which products were used	2	11	6	4	11	8	1

Herbicidal programs

Following are *all* of the different herbicidal programs reported by growers.

Sencor Prism	Sencor Poast Ultra	Sencor Gramoxone Fusilade II	Sencor Gramoxone Poast Ultra Prism	Sencor Gramoxone	Gramoxone Poast Ultra Prism	Prism	Eptam Sencor Poast Ultra Prism	Eptam Sencor Prism	Linuron Poast Ultra	Linuron

Blight control fungicides used

Growers reported using the following fungicides for control of early and late blight:

	Bravo 500	*Bravo/ Ridomil*	*Manzate 200*	*Ridomil MZ 72 WP*	*Polyram 16D/DF*	*Dithane DG*	*Tatto C*
Number of fields in which products were used	15	12	11	9	7	7	6

	Number of times fields sprayed with blight products						
	2	*3*	*4*	*5*	*6*	*7*	*8 or more*
Number of fields	1	0	0	2	1	7	7

Fungicidal combinations used

Following are ***all*** of the different fungicide combinations reported by growers:

Bravo Dithane Polyram Ridomil MZ	Bravo Dithane Polyram	Bravo Manzate Bravo/Ridomil Ridomil MZ	Bravo Bravo/Ridomil	Bravo Manzate Bravo/Ridomil	Dithane Polyram Ridomil MZ	Bravo Dithane Manzate Polyram Bravo/Ridomil Ridomil MZ Tatto
Bravo Dithane Manzate Polyram Bravo/Ridomil Ridomil MZ	Bravo Manzate Polyram Bravo/Ridomil Ridomil MZ Tatto	Bravo Dithane Manzate Polyram Ridomil MZ	Bravo Manzate Ridomil MZ	Bravo Manzate Bravo/Ridomil Tatto C	Polyram Bravo/Ridomil Ridomil MZ Tatto	

Late blight occurred in southern Alberta for the first time since 1993. It was found in 17 of an estimated 150 to 200 fields in southern Alberta. The first diagnosis was made on August 6. After that date spray intervals were reduced to about 7 days from 10 to 14 days.

For the first time ever the race of late blight fungus was determined to be US 8, an A2 mating type, that is resistant to metalaxyl (Ridomil). In 1992 and 1993, when late blight was first and last seen in southern Alberta, the late blight strains were all metalaxyl resistant. Tatto C, a new partially systemic fungicide effective against US 8, was used by a few growers. Acrobat, also a new partially systemic fungicide, was not sprayed as it was considered to be too late in the season. Prior to the registration of these new systemics, Ridomil was the only systemic fungicide available, however US 8 is resistant to the active ingredient metalaxyl. Unlike the partially systemic fungicides, which only move upward in plants, metalaxyl moves in both directions including down into roots and tubers. Therefore, growers continue to use metalaxyl as they feel it is effective against storage rots caused by Pythium leak and pink rot.

Insect control

Most planters were equipped with granular insecticide applicators (Gandy, Valmar, Beeline and Microband) for the application of insecticides used for early season Colorado beetle control or wireworm control.

	At-plant insecticide not used	*Thimet applied*	*Dyfonate[1] applied*
Number of fields	4	9	4

Note: Dyfonate for wireworm control is no longer available.

Mid-season Colorado potato beetle control

Growers apply mid-season insecticides for the control of spot outbreaks of Colorado potato beetles. Insecticides are tank mixed with blight fungicides and applied at the same time.

	Field not sprayed for CPB	*Sprayed once with Cymbush or Ripcord*	*Sprayed twice with Cymbush or Ripcord*
Number of fields	4	10	4

Colorado potato beetles are not a major problem in potato fields in southern Alberta. Growers reported using only two mid-season chemicals for controlling spot outbreaks of CPBs. Both are pyrethroids and there is a risk of the CPBs developing resistance to these products in a few years. Thimet (an organophosphate) will tend to eliminate strains of beetles that are developing resistance, however all growers are urged to also use organophosphates, carbamates and organochlorines in combinaiton with pyrethroids. Consult the AAFRD Crop Protection 1999 manual for selection of registered products.

Top killing of vines

Reglone application dates

Average date of first top application	*Range of all first application dates*	*Normal range*	*Number of fields Sprayed once only*	*Number of fields sprayed twice*
September 13	Sept. 2 to 26	Sept. 7 to 19	11	7

Reglone rates (L/acre)

Average rate for single application	*Range of rates for single application*	*First application rate when two applications made*		*Second application rate*	
		Average	*Range*	*Average*	*Range*
1.2	0.75 to 1.5	1.0	.75 to 1.25	0.7	0.5 to 1.0

Harvesting

All fields were harvested with 2-row harvesters and all fields were windrowed with two or four-row windrowers. One potato farm uses a three-row windrower and three-row harvester.