POTATO DISEASE CONTROL PROJECT

ANNUAL REPORT

1984 - 1988

PREPARED BY
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FEBRUARY 1989

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Potatoes are grown throughout the world in areas with a temperate climate. Potato farming is a major component of Alaska's vegetable industry, with cash receipts approaching $2,000,000 annually. The potato has proven to be a well-adapted crop for Alaska over the last 50 years.

Potato diseases cause significant economic losses in all areas where potatoes are grown. Large sums of money are spent each year on fungicides and insecticides and other pest control measures. The most commonly referred to disease control measure is to start with seed potatoes believed to be free of disease.

Alaskan growers were experiencing severe losses caused by diseases in the late 1970s. The practice of using undersize tubers from the previous years commercial crop for seed was contributing to this problem. At the request of the growers, a project was established at the Alaska Plant Materials Center to develop a source of disease-tested seed stock for distribution to seed potato growers.

Potatoes are usually propagated by planting pieces of tubers, and because many diseases are borne in or on potatoes, this method of propagation is considered the principal source of disease transmission. Potato seed certification programs have been developed to help identify disease problems in seed lots. Potato fields designated for use as seed are monitored by an inspector who walks through the fields looking for disease symptoms at least twice during the growing season. Fields in which the number of diseased plants found is less than the maximum allowed tolerance, are eligible to be labeled certified.

These programs, however, work only to the extent that disease symptoms can be observed. Recent advances in disease detection and diagnosis coupled with tissue culture production methods, have allowed for the development of laboratory potato propagation systems. Starting with material in which no diseases have been detected, thousands of plants can be produced in the laboratory isolated from disease-causing organisms. Seed tubers derived from these plants can then be replanted and grown under the guidelines of the certification program to help assure minimal disease problems. Seed improvement programs which limit the number of times the progeny tubers can be replanted have greatly improved seed quality in the last decade.

The tissue culture phase of the potato seed production system requires the maintenance of sterile conditions. A piece of a plant, preferably an axillary bud, is surface sterilized in 10% chlorox water to eliminate surface contaminants. The tissue piece is then rinsed in sterile distilled water and placed in a test tube containing growth media. Usually within two weeks, the bud has rooted and begins to grow. When the plant reaches the top of the tube, it is removed. The top node is cut off and placed in another tube to continue growing. The middle portion is taken and tested for six viral diseases using ELISA tests. The bottom portion, approximately 1/2 inch, is crushed and placed in a flask containing Richardson's media. This flask is placed on a rotary shaker and observed over a period of twenty days. Bacterial contaminants, if present, grow and cause the contents of the flask to become cloudy. Plants which are negative in these tests, are used for producing the seed potatoes.

Disease testing of the potato plants grown at the PMC, is an integral part of quality control. Each year, all clonal material is tested for six virus diseases as well as bacterial and fungal contaminants prior to the expansion used for planting in the greenhouse. Field-grown material is observed each week during the growing season for evidence of disease, while a minimum of 25% of the plant population of each variety is tested for six viruses. Each pot in the greenhouses is also tested for the same six viruses just prior to harvest. Seed grower lots are tested for Potato Virus X (PVX) and Potato Virus S (PVS).

Alaska Seed Growers, Inc. is responsible for the certification of all seed potatoes in Alaska. The inspection of potato fields being grown for use as certified seed has been performed by Alaska Division of Agriculture personnel. The potato plant and its tubers are susceptible to many diseases. Seed quality is primarily determined by the relative freedom from these diseases. Field inspectors assist growers by identifying diseased plants and appropriate control measures. A minimum of two field inspections are made on each lot.

Farmers everywhere strive to find varieties with special advantages. Potato breeding programs introduce new lines bred for specific purposes. Yield, skin color, disease resistance and processing qualities are a few of the characteristics by which various selections are made. Alaskan growers realize the possibilities a new variety could provide. They also realize that presently they have only minor disease problems in relation to other potato growing areas and by indiscriminately importing potato seed, they could introduce diseases that are not now known to occur in Alaska.

The potato project has assisted growers by obtaining potato varieties from reputable labs and growers. These acquisitions are tested for diseases prior to being released to growers. This cooperative effort lessens the risk of introducing diseases into Alaska.

Many potato varieties of interest to Alaskan gardeners are not available as disease-tested clones. Methods have been employed to free plants from disease. Four varieties in demand by Alaskan growers were cleansed of disease and made available as plants in 1988. The varieties Alaska Frostless, Alaska Red, Peanut, and Rote Erstling have been added to the clone bank. Seven varieties are still in therapy.

	1984	1985	1986	1987	1988
Number of tissue culture plants produced	10,000	11,000	12,800	14,000	16,820
Number of tissue culture varieties	9	20	27	34	52
Pounds of greenhouse tubes	1,370	4,014	3,230	1,924	1,600
Total number of varieties	12	34	75	97	104
Number of commercial seed lots inspected	30	40	79	106	104
Seed lot acreage	29	44	34	42	30
Number of virus tests - PMC	4,500	8,000	14,000	18,000	18,000
Number of virus tests - commercial growers	1,000	1,500	1,000	3,500	1,500

Projects secondary to the main goals of the disease project have been undertaken as time and money allow. The Potato project has been able to reprioritize efforts to help explore solutions to problems that require immediate attention. The donation of uncompensated overtime by employees has allowed many of these projects to be completed.

1985
Nitrogen Rate Observation Plot

Nitrogen containing fertilizer added to soil used to raise potatoes has long been known to increase yield. High nitrogen fertilizer rates are also known to delay tuber set as well as the maturation of the crop. Alaska grown potatoes do not have well developed skins at harvest time. Mechanized harvesting damages the skins of the crop, reducing the grade and allowing an entry post for pathogens. A plot was designed to allow for the observation of the effects eight rates of Ammonium Nitrate had on yield, specific gravity, and petiole concentration.

1986
Variety Demonstration Plot

Alaska's potato growers are constantly looking for a better variety of potato. An economic advantage exists if a russet or red-skinned variety can be found that will produce sufficient yield. At the request of growers, potato varieties are obtained, however, the introduction of new material to the Plant Materials Center's variety collection poses some risk of accidentally introducing disease. All newly acquired material is isolated until sufficient testing can reasonably assure no diseases are present.

Six to eight tubers of 41 varieties requested by growers for trials, were obtained from the Agriculture Canada Virus Free Program in Vancouver, Canada. The tubers were planted May 22, 1986, at a site near Palmer. This quarantine allowed observation and testing of the cultivars prior to commingling with the existing disease-tested clone bank.

An area approximately 0.1 acre was cleared of existing brome grass turf using a front end loader. The area was fertilized at a rate equivalent to 1,000 pounds of 10-20-20, sprayed with Eptam at a rate equivalent to one quart per acre, and then rototilled in. Seed tubers were cut into four seed pieces and the tuber units planted. Observations were made weekly. Tests for six virus diseases were made in late August. Local growers were invited to observe the harvest on September 17. Production was used to initiate clonal material and for further testing.

1986 Seed Size and Spacing

Seed size and uniformity of placement at planting can have significant effect on overall yield. Several growers requested assistance in determining their performance in relation to theoretical standards.

Samples consisting of a five-gallon bucket of cut seed were obtained. The seed pieces were weighed and counted into five groupings; i.e., less than 1 oz., 1 to 1.5 oz., 1.5 to 2 oz., 2 oz. to 2.5 oz., and greater than 2.5 oz. The percentage in each category was computed. The optimum seed piece size is purported to be 1.5 oz. Seed pieces less than 1 oz. and greater than 2.5 oz. are undesirable.

The uniform placement of seed pieces in the row, maximizes production capability. Plant stands and consistency of spacing were monitored on five farms. The number of plants in six 25-foot lengths of row, were counted and compared to the desired population. An estimation of percent stand was calculated.

1986 Cooperative National Plant Pest Survey Program

The Alaska Plant Materials Center Potato Disease Control Project joined the National Plant Pest Survey Program in 1984. The program is designed to conduct surveys and improve methods for the detection and evaluation of important plant pests and enter data into a computer based national plant pest survey and detection program.

The program assists in upgrading the quality of plant pest information and enables participation in a national plant pest data collection, storage and retrieval system. Participation in this program will facilitate research, extension and regulatory agencies in making decisions concerning plant pest protection.

The potato project submits information on pests and diseases found in Alaskan potato fields during the growing season. This program has been continued through 1988.

1987 Copper Center Native Corporation Trial

The Copper Center Native Corporation agriculture project wanted to explore the potential of producing virus-free seed potatoes in the Copper Center area. Seed potatoes from the Plant Materials Center disease-tested stock were made available for this purpose. Twenty seed pieces of ten varieties were planted at the Copper Center Native Corporation garden in late May. Leaf samples were collected by PMC staff in late August and tested for the presence of six viruses using the ELISA method. No virus diseases were detected. Yield and quality of the harvest was deemed acceptable by the agriculture project manager.

1987 Herbicide Evaluation Project

On October 7, 1986, the EPA announced an emergency order suspending the registration and prohibiting the distribution, sale and use of all products containing Dinoseb. This action caused the loss of the main weed control chemical used by Alaskan potato growers. Problems with herbicide carry-over had been noted with the alternative weed control chemicals Metribuzin and Linuron.

At the request of growers, a plot was established at Pyrah's Pioneer Peak Farm to observe and quantify the effect of Metribuzen and Linuron on potatoes and subsequent crops. Three rates of Linuron and three rates of Metribuzin were applied across eight rows planted to different potato varieties. The Metribuzin was applied pre-plant with one split application treatment being applied post-emergence. Soil samples were taken prior to herbicide application and just before harvest. Weed growth and identity was noted as was any herbicide damage to the crop. The plot was harvested in September. Total yield was recorded.

This plot was planted with seed of mixed vegetables, oats, and bluegrass, as well as transplants of broccoli, cabbage, and lettuce in 1988 to observe the effect of herbicide carry-over. Problems with the seeder and weed growth prevented obtaining verifiable information. Lettuce, broccoli, cabbage, and zucchini seeded rows did poorly on the Metribuzin treated areas of the plot.

1987 Fairground Plot

The Alaska State Fairground was selected as a site where cultivars from the Plant Materials Center could be exhibited to a large audience.

The potato project planted 20 feet of row of 22 potato varieties in a plot just inside the west entrance. During the fair, personnel were on-hand to answer questions and explain the various qualities of the plant materials being exhibited. This project has been continued through 1988.

1987 Harvester Adjustment

Mechanical harvesting of potatoes exposes the crop to damage that can cause economic loss. Potato growers in Washington and Idaho recognized that modifications to harvesters could be made that would reduce the amount of damage incurred during harvest. The research they initiated, found several solutions to the harvest injury problem.

Simple adjustments of the primary and secondary chain speed, as well as ground speed, can reduce harvest damage. Structural changes such as reducing the distance potatoes drop, or replacing link chain with belted chain, require a greater investment.

Alaskan potatoes do not have a well-developed skin at harvest. This condition predisposes the crop to mechanical damage. Reducing the amount of damage at harvest increases the value of the crop.

Dr. Gary Beaver, Extension Potato Specialist in Idaho, was president of the Potato Association of America Anti-bruise Committee. The Potato Project, with financial assistance from growers, was able to bring Dr. Beaver to Alaska. Dr. Beaver was able to provide technical expertise about harvester adjustments that reduced bruise damage in Alaska.

1988 Potato Scab Plot

Potato scab is a disease caused by an organism named Streptomyces scabies. The organism causes problems that affect grade quality, thereby lessening the value of the crop. Potato scab is probably responsible for most of the disease-caused economic losses incurred by Alaskan potato growers.

Potato scab resistance is usually incorporated into the genetic make-up of newly released potato varieties. In order to gain more understanding of the disease in Alaska, potato varieties deemed scab-resistant or scab-susceptible in other states, were planted in areas of fields known to be infested with with scab. Fields at two sites were planted with four seed pieces of 14 different varieties. Observations of the progeny tubers in September, revealed no scab on any of the potatoes. The reason no scab was found on the susceptible cultivars is unknown.

1988 Shepody Spacing Trial

The variety 'Shepody' has been shown to yield well in Alaska. One problem noted is the propensity for the potatoes to get too large. The distance between seed pieces has a direct effect on tuber size. To determine the effect of in-row spacing, a plot was established on the Mulligan farm next to an existing field planted to the variety 'Shepody'. Spacings of 6, 8, 10 and 12 inches were used. The plot was vandalized prior to the intended harvest date of September 20. The spacing of six inches appeared too close, as tubers were protuding from the hill. The 12 inch spacing appeared too long as many potatoes were over one pound. The 8 and 10 inch spacing has better uniformity of size.

Matanuska Valley Potato Variety Observations Plot

A potato variety demonstration plot was planted at Nugen's Ranch on May 20, 1988. The project was intended to allow area growers the opportunity to observe and compare 27 cultivars for tuber shape, skin set and other quality factors.

The plot was comprised of 9 russet, 3 red and 15 white/buff-skinned varieties. The plot was fertilized at a rate equivalent to 1,200 pounds 10-20-20 per acre one week prior to planting. Two replications of 30 seed pieces per variety were planted on 12" centers with 3' between rows. Adequate weed control was accomplished with a Roundup/Sencor mix (1 quart Roundup plus 1 pint Sencor per acre) applied on June 9.

Emergence was observed June 13. Plant stand counts were made July 7. All varieties had 100% emergence at that time.

Local growers were notified of the harvest on September 20 and several attended the field day.

Tuber size was large for all varieties. Defects in shape, growth cracks hollow heart, and general appearance were observed with some varieties. Disease problems with scab and Rhizoctonia were also noted.

The yield weights were much higher than expected and should only be considered relative to one another within the trial.

1988

Nugen's Ranch Potato Variety Observations

Variety	Pounds 60 Hills	Tons Acre	Comments
Acadia	279.6	33.8	russet, poor net
Superior	269.8	32.6	white, smaller tuber size
Columbia Russet	258.6	31.3	russet, poor shape
Norland	246.4	29.8	pink, uniform set
Kennebec	245.4	29.7	white, large tubers
Onaway	234.2	28.3	white, size O.K., early
Bakeking	228.4	27.6	white, large tubers
Norgold M	223.2	27.0	russet, poor net, shape O.K.
Norgold	222.6	26.9	russet, poor net, shape O.K.
Agassiz	221.4	26.8	russet, poor net, small size
Sable	212.2	25.7	white, good size and shape
Shepody	200.8	24.3	white, 16 oz. plus tubers
Green Mountain	200.8	24.3	white
Allagash	196.0	23.7	russet, good net, some shatter
Sangre	194.6	23.5	red, size O.K.
AK 114	185.6	22.5	white, good skin set
Snowchip	184.0	22.3	white
Jemseg	181.8	22.0	white, uniform size, skin set
Lemhi	180.2	21.8	russet, good shape, fair net
Denali	172.4	20.9	white
Yukon Gold	171.4	20.7	white, large tubers, yellow flesh
Katahdin	167.6	20.3	white, size O.K.
Conestoga	167.4	20.3	white, good size, skin tough
Redsen	159.6	19.3	red, feather, size O.K.
Belrus	142.0	17.2	russet, good net, small
Bintje	133.0	16.1	white, many small tubers, yellow

Delta Potato Variety Observation Project Report

A potato variety demonstration project was planted at the University of Alaska Experiment Station farm in Delta Junction on May 22, 1988. The project was intended to provide area growers the opportunity to compare 44 varieties and to give Delta High School Future Farmers of America (FFA) students experience in growing potatoes.

The plot was comprised of 12 russet, 8 red, 23 white/buff and one purple-skinned cultivars. The plot was fertilized at a rate equivalent to 1,400 pounds of 10-20-20 one week prior to planting. Two replications of 30 seed pieces per variety were planted on 12" centers with 2 marker plants between each variety. Rows were spaced 5' apart to minimize between row competition. Excellent weed control was accomplished with a Round Up/Lorox mix at a rate of one quart each per acre, applied ten days after planting. No evidence of herbicide injury was noted during the growing period although vine growth was stunted.

Stand counts were made on July 12. All varieties had 100% emergence. Growth was noted to be less than that observed in area commercial potato fields.

Harvest was conducted on September 13, 1988. Local growers were notified of the harvest and six attended the field day. Tuber size was small for all varieties. The maximum size attained was six ounces. Water stress or herbicide carryover is suspected of causing the small tuber size. No disease problems were observed.

The project was funded with a grant from the Applied Agricultural Research Account. Special thanks to: Don Quarberg, University of Alaska Extension Service; Ron Riesgaard, University of Alaska Experiment Station; Mike Carlson, Delta High School; Barney Hollembaek, Alamasu; and Brasier Farms for assistance with the project.

1988

Variety	Yield 0 Hill Rep 1	Yield 30 Hill Rep 2	Total 60 Hill	Tons Acre	Comments
RUSSETS					
Butte	51.6	43.2	94.8	11.5	high vitamin C
Lemhi	49.8	44.0	93.8	11.3	skin/size O.K.
Columbia Russet	43.6	49.2	92.8	11.2	poor shape
Targee	46.6	45.0	91.6	11.1	good skin
Norgold "M"	39.4	48.2	87.6	10.6	larger tubers
Acadia	41.8	42.0	83.8	10.1	many small, fai
Alagash	42.8	37.4	80.2	9.7	skin good/crack
Norgold	30.2	45.4	75.6	9.1	smaller tubers
AK Russet	30.6	43.2	73.8	8.9	
Agassiz	27.6	43.4	71.0	8.6	poor net
Belrus	28.6	42.0	70.6	8.5	good net, small
Russet Burbank	31.2	33.2	64.4	7.8	slight net
Goldrus Russet	31.6	24.8	56.4	6.8	poor net
REDS					
Red Pontiac	59.2	59.2	118.4	14.3	standard varietv
Red Lasoda	52.8	51.8	104.6	12.7	feathered
Batoche	58.2	44.4	102.6	12.4	feathered
Chieftain	44.0	49.8	93.8	11.3	feathered
Redsen	37.2	47.6	84.8	10.3	feathered, smal
Sangre	40.6	43.8	84.4	10.2	feathered, pale
Norland	39.8	43.2	83.0	10.0	feathered, pink
Caribe	42.8	39.6	82.4	10.0	purple skin
Red McLure	39.2	42.6	81.8	9.9	feathered
WHITES					
Irish Cobbler	64.2	53.6	117.8	14.3	deep eyes
Katahdin	61.4	48.6	110.0	13.3	standard in N.E
Epicure	59.4	48.4	107.8	13.0	early
Bintje	62.8	42.6	105.4	12.8	yellow flesh
Warba	56.8	46.4	103.2	12.5	deep, red eyes
AK 114	53.4	48.8	102.2	12.4	
Snowchip	50.2	51.2	101.4	12.3	
Denali	54.4	41.4	95.8	11.6	
Green Mountain	49.0	44.4	93.4	11.3	good skin
Onaway	39.4	52.8	92.2	11.2	good skin, earl
Kennebec	36.4	54.8	91.2	11.0	some green
Hampton	49.0	40.2	89.2	10.8	
Yukon Gold	51.8	29.8	81.6	9.9	yellow flesh
Alpha	45.8	34.2	80.0	9.7	yellow flesh
Jemseg	39.0	40.4	79.4	9.6	good skin, ear
Shepody	40.8	38.2	79.0	9.6	light set
Conestoga	36.0	40.8	76.8	9.3	hollow heart
Tolaas	28.8	46.4	75.2	9.1	
Monona	40.0	32.0	72.0	8.7	
Sable	36.0	27.0	63.0	7.6	good looking
Bakeking	33.0	27.0	60.0	7.3	
Superior	24.8	33.2	58.0	7.0	stunted vine

1988

Variety	Yield 30 Hill Rep 1	Yield 30 Hill Rep 2	Total 60 Hill	Tons Acre	Comments
RUSSETS					
Butte	51.6	43.2	94.8	11.5	high vitamin C
Lemhi	49.8	44.0	93.8	11.3	skin/size O.K.
Columbia Russet	43.6	49.2	92.8	11.2	poor shape
Targee	46.6	45.0	91.6	11.1	good skin
Norgold "M"	39.4	48.2	87.6	10.6	larger tubers
Acadia	41.8	42.0	83.8	10.1	many small, fair
Alagash	42.8	37.4	80.2	9.7	skin good/crack
Norgold	30.2	45.4	75.6	9.1	smaller tubers
AK Russet	30.6	43.2	73.8	8.9	
Agassiz	27.6	43.4	71.0	8.6	poor net
Belrus	28.6	42.0	70.6	8.5	good net, small
Russet Burbank	31.2	33.2	64.4	7.8	slight net
Goldrus Russet	31.6	24.8	56.4	6.8	poor net
REDS					
Red Pontiac	59.2	59.2	118.4	14.3	standard variety
Red Lasoda	52.8	51.8	104.6	12.7	feathered
Batoche	58.2	44.4	102.6	12.4	feathered
Chieftain	44.0	49.8	93.8	11.3	feathered
Redsen	37.2	47.6	84.8	10.3	feathered, small
Sangre	40.6	43.8	84.4	10.2	feathered, pale
Norland	39.8	43.2	83.0	10.0	feathered, pink
Caribe	42.8	39.6	82.4	10.0	purple skin
Red McLure	39.2	42.6	81.8	9.9	feathered
WHITES					
Irish Cobbler	64.2	53.6	117.8	14.3	deep eyes
Katahdin	61.4	48.6	110.0	13.3	standard in N.E.
Epicure	59.4	48.4	107.8	13.0	early
Bintje	62.8	42.6	105.4	12.8	yellow flesh
Warba	56.8	46.4	103.2	12.5	deep, red eyes
AK 114	53.4	48.8	102.2	12.4	
Snowchip	50.2	51.2	101.4	12.3	
Denali	54.4	41.4	95.8	11.6	
Green Mountain	49.0	44.4	93.4	11.3	good skin
Onaway	39.4	52.8	92.2	11.2	good skin, early
Kennebec	36.4	54.8	91.2	11.0	some green
Hampton	49.0	40.2	89.2	10.8	
Yukon Gold	51.8	29.8	81.6	9.9	yellow flesh
Alpha	45.8	34.2	80.0	9.7	yellow flesh
Jemseg	39.0	40.4	79.4	9.6	good skin, early
Shepody	40.8	38.2	79.0	9.6	light set
Conestoga	36.0	40.8	76.8	9.3	hollow heart
Tolaas	28.8	46.4	75.2	9.1	
Monona	40.0	32.0	72.0	8.7	
Sable	36.0	27.0	63.0	7.6	good looking
Bakeking	33.0	27.0	60.0	7.3	
Superior	24.8	33.2	58.0	7.0	stunted vine

Potato Sucrose Project

Alaskan potatoes are sold almost exclusively through the fresh market. The ability to process potatoes for use as french fries or chips would allow the market to expand. Potatoes used for processing must meet certain quality requirements. One of the basic factors defining processing quality is the sugar content. Sucrose is the major free sugar present in all growing potato plants. The sucrose level drops as the potato approachesphysical maturity. The amount of sucrose in the harvested potato is a significant factor in its ability to be processed.

Research conducted at the Red River Valley Potato Research Laboratory has shown good correlation between sucrose content at harvest, and length of storage time chipping quality is maintained. Alaska grown potatoes are physically immature at harvest. A study of the sucrose content of 20 potato varieties at harvest and during the first twelve weeks of storage, was undertaken to help define the chemical maturity of Alaska grown potatoes. The parameters measured were specific gravity, fry color and sucrose content.

Potatoes were harvested September 12, 1988 and placed in storage at 55° F. On September 26 and on bi-weekly intervals, tuber samples were checked for specific gravity and fry color. Samples were also juicerated and stored for later chemical analysis.

The results indicate several varieties had reached a chemically mature state by harvest time and could be used for chips though November.

Sucrose Rating mg/gm

Variety	9/26	10/12	10/25	11/8	11/19	12/3
Kennebec	.165	.655	.405	0.000	.897	.520
Monona	5.726	1.367	.969	.474	1.478	1.137
Alaska Russet	1.714	.516	.599	.109	.148	.489
Butte	1.433	0.000	.179	.327	1.341	.437
Allagash	.461	.173	.461	.218	.763	.881
Bakeking	.168	0.000	.110	.015	.369	.614
Denali	2.900	1.284	.853	.734	1.696	1.054
AK 114	.762	0.000	.163	.192	.186	.107
Campbell 13	6.244	1.864	1.178	2.070	2.717	1.307
Norchip	3.373	1.947	.873	1.257	2.366	1.845
Superior	.166	0.000	.043	.457	.176	.056
Snowchip	1.653	.840	.622	2.242	1.154	.700
Lemhi	6.244	1.709	1.469	2.831	1.400	1.307
Russet Burbank	.172	0.000	.764	.471	.344	.113
Katahdin	3.056	1.438	.046	1.295	1.372	1.045
Green Mountain	2.691	.779	.820	.832	.951	.945
Atlantic	1.054	1.450	.953	2.123	1.774	1.672
Yukon Gold	3.967	.915	.518	1.073	.643	.102
Shepody	.132	.124	.767	.380	1.060	.776
Norland	.860	0.000	.073	0.000	.091	0.000
Known	2.150	2.150	2.150	2.150	2.150	2.150

Fry Color

Variety	9/26	10/12	10/25	11/8	11/19	12/3
Kennebec	3.000	3.000	2.500	2.000	2.500	4.000
Monona	2.000	1.000	2.000	2.000	2.500	2.000
Alaska Russet	1.000	1.000	2.500	2.000	2.000	4.000
Butte	4.000	4.000	5.000	3.500	5.000	4.000
Allagash	1.000	1.000	1.000	2.000	1.000	1.000
Bakeking	4.000	3.500	5.000	4.000	4.000	4.000
Denali	3.000	2.000	3.000	2.000	2.000	3.000
AK 114	3.000	3.000	3.000	3.000	4.500	5.000
Campbell 13	2.000	2.000	3.000	2.000	3.500	3.000
Norchip	3.000	2.500	4.000	4.000	5.000	5.000
Superior	2.000	4.000	3.000	3.500	3.500	4.000
Snowchip	1.000	1.500	1.000	2.500	2.000	1.000
Lemhi	4.000	2.000	4.000	5.000	5.000	4.500
Russet Burbank	4.000	4.000	5.000	5.000	5.000	5.000
Katahdin	2.000	3.000	4.000	4.000	3.500	3.500
Green Mountain	4.000	4.000	4.000	5.000	5.000	4.500
Atlantic	3.000	2.000	2.500	3.000	3.000	3.500
Yukon Gold	3.000	3.000	4.000	3.500	3.000	4.500
Shepody	2.000	3.000	3.000	4.000	3.000	3.000
Norgold	2.000	2.000	4.000	3.500	2.500	3.000

Fry Color is based on the Potato Chip Snack Food Association's fry color chart. Oil temperature was 375° F with a three minute fry time. A rating of 3 or less indicates acceptable color.

Change in Specific Gravity

Variety	9/29	10/11	10/25	11/7	11/19	12/3
Kennebec	1.065	1.068	1.068	1.066	1.072	1.071
Monona	1.063	1.062	1.063	1.063	1.065	1.064
Alaska Russet	1.087	1.085	1.086	1.095	1.090	1.089
Butte	1.079	1.081	1.082	1.080	1.083	1.083
Allagash	1.070	1.068	1.069	1.067	1.071	1.071
Bakeking	1.064	1.067	1.069	1.068	1.070	1.082
Denali	1.074	1.075	1.081	1.077	1.082	1.081
AK 114	1.064	1.062	1.063	1.066	1.064	1.064
Campbell 13	1.071	1.069	1.072	1.070	1.073	1.069
Norchip	1.053	1.056	1.058	1.057	1.058	1.059
Superior	1.066	1.066	1.069	1.065	1.070	1.072
Snowchip	1.075	1.075	1.076	1.076	1.079	1.079
Lemhi	1.074	1.073	1.074	1.074	1.078	1.079
Russet Burbank	1.078	1.078	1.082	1.079	1.080	1.083
Katahdin	1.056	1.058	1.058	1.063	1.063	1.062
Green Mountain	1.056	1.058	1.058	1.059	1.062	1.061
Atlantic	1.063	1.067	1.070	1.067	1.072	1.071
Yukon Gold	1.061	1.062	1.064	1.063	1.066	1.064
Shepody	1.050	1.052	1.052	1.052	1.055	1.056
Norland	1.055	1.066	1.062	1.078	1.060	1.061