



Nuclear Seed Potato Propagation Facility

2014 - 2015 Final Report



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EXECUTIVE SUMMARY

Newfoundland and Labrador Nuclear Seed Potato Propagation Facility (NLNSPPF)

A major component of the provincial seed potato certification system is the ability to obtain Canadian Food Inspection Agency (CFIA) certified nuclear tubers for planting at the Glenwood Seed Potato Farm. On April 17, 2012 the Canadian Government announced the closure of the CFIA Plant Health Facility in St. John's. This decision resulted in the loss of an in-province source for nuclear seed stock which impacts the entire seed potato industry in Newfoundland and Labrador. In an effort to fill the void left in the certification system by the withdrawal of the federal government, the Forest Ecology Centre (FEC) in Mount Pearl was transferred to the Agrifoods Development Branch of the Forestry and Agrifoods Agency. Agrifoods Development Branch then formally established the Newfoundland and Labrador Nuclear Seed Potato Propagation Facility (NLNSPPF) as the site for the production of nuclear seed potato stock for the Provincial Seed Potato Program. The research initiative at the Newfoundland and Labrador Nuclear Seed Potato Propagation Facility for the 2014 growing season was to produce nuclear class tubers of all established Newfoundland potato varieties as well as three new varieties, "Superior", "Chaleur" and "Chieftan" to be utilized at the Glenwood Seed Potato Farm.

BACKGROUND AND INTRODUCTION

Newfoundland and Labrador Nuclear Seed Potato Propagation Facility (NSPPF)

The production of nuclear seed potato stock is critical to the ongoing support and growth of the potato industry in this province. The seed potato producers and their clients rely heavily on the seed potato program provided by the government of Newfoundland and Labrador. Now that the responsibility has fallen upon the province to ensure that the potato industry maintains the ability to produce nuclear seed stock, the province has established a nuclear seed potato propagation facility in St. John's. The ongoing production of traditional Newfoundland specific varieties as well as the evaluation of new varieties is crucial to the overall success of the potato industry in this province.

After the closure of the CFIA plant health lab in St. John's the Agri-foods Development branch stepped in and established the NLNSPPF at the former Forest Ecology Center on Brookfield Road in St. John's. The facility itself was originally constructed in 1963 as an experimental facility with the permanent structures built in 1977 with an upgrade and expansion taking place in 1988. At the time occupation was transferred to the Agrifoods branch the facility consisted of two greenhouses with approximately 3000 square feet each, a header house/garage, three offices, a full kitchen area and boardroom.

The purpose in establishing a provincial source of nuclear seed potato was two-fold. The single and most important reason was that the Newfoundland potato industry deals with a number of problematic growing conditions, pests and viruses which all negatively impact harvest yields. In response, a number of cultivars have been developed through breeding programs at Agri-foods and Agriculture Canada and elsewhere which are unique to our province. These cultivars have been used with great success by producers and their customers in Newfoundland for a number of years. Unfortunately, there is no central repository in Newfoundland where this genetic material is maintained. Currently it is only available at the Agri-foods and Agriculture Canada laboratory in Fredericton, New Brunswick and this lab was scheduled to be closed due to a lack of funding as of January 2014. If this were to occur, the nuclear source of this genetic material for the Newfoundland specific varieties would be lost. With the construction of a new tissue culture lab at the NLNSPPF the government of Newfoundland and Labrador has guaranteed that the potato industry of Newfoundland will be able to continue to use well suited, well known Newfoundland potato varieties for years to come.

The second major purpose in establishing the NLNSPPF is food security. A major concern after the exposure of the Glenwood Seed Potato Farm to pink rot bacteria from a load of imported seed is the issue of possible importation of viruses and pests that have not previously existed in Newfoundland. Historically, there was not enough nuclear stock produced by the CFIA at the St. John's facility to satisfy the demand at Glenwood and there will only be a need for more seed potato as new land is cleared and new fields established in Glenwood. By establishing a production facility where nuclear stock can be produced in large quantities, the need to source nuclear stock or lower from outside Newfoundland is eliminated for both Glenwood and the individual producers. This benefits the province in multiple ways. It ensures biosecurity by minimizing the possibility of harmful pests or viruses on imported material. It creates a closed

loop in commercial seed potato production allowing for a higher level of traceability should an issue of biosecurity violation occur and also develops a stronger relationship between government and seed producers as it gives them a source where they can request new varieties that we can bring in and produce in large quantities that will be CFIA certified disease and pest free and provided at a cheaper cost to them than purchasing it themselves from alternate sources.

PROJECT PROCEDURE

Newfoundland and Labrador Nuclear Seed Potato Propagation Facility (NSPPF)

Planting for the 2014 growing season took place over the course of 5 days during the week of May 26th, 2014. After a review of the 2013 growing season and discussions with CFIA inspectors and experts within the division, it was decided that we would lower the number of plants in each bench to 48 from 60 in an effort to increase tuber yield. The varieties and numbers planted are listed below in Table 1.

Table 1: 2014 varieties and number of plantlets planted at NLNSPPF.

Variety	Number of plantlets
AC Blue Pride	255
Exploits	144
Frontier Russet	240
Mirton Pearl	384
Atlantic	240
Yukon Gold	144
Goldrush	432
AR-2010-12	240
AC Red Island	288
Glenwood Red	288
Blue Pride	336
Superior	288
Chieftan	96
Chaleur	192

The 2013 growing season results offered some challenges that would need to be overcome in the 2014 growing season. One of these challenges was the prevalence of aerial stolons on a number of varieties and the severe compaction of the bottom 3 to 4 inches of growing medium at the bottom of the planting benches. To reduce the chance of this situation in the 2014 growing season, planting benches were filled approximately half-way of the maximum depth with an 300g per bench granular fertilizer mix of 12-18-12 and sterile growth medium prior to planting. As the plants increased in height, additional growth medium was added to cover the plants to their bottom leaves. This continued throughout the growing season until the growth medium had reached the maximum height of the planting benches.

There was also an assessment done on 3 varieties to assess whether plant development, tuber size or quantity was increased or decreased with plants grown from nuclear tuber vs. nuclear plantlet.

Assessment was conducted by planting one bench of previously grown and harvested nuclear tubers from the 2013 season of each variety next to the benches of plantlets of the same variety.

RESULTS AND DISCUSSION

Newfoundland and Labrador Nuclear Seed Potato Propagation Facility (NSPPF)

All varieties were disease tested and passed during the growing season as required by the CFIA and were subsequently classified nuclear class seed potato. The yields are listed below in Table 2.

Table 2: 2014 tuber yield per variety at the NLNSPPF.

Variety	Number of tubers
AC Blue Pride	675
Exploits	500
Frontier Russet	250
Mirton Pearl	805
Atlantic	625
Yukon Gold	300
Goldrush	710
AR-2010-12 (Fortune)	450
AC Red Island	0
Glenwood Red	0
Chieftan	305
Kennebec	308
Superior	450
Chaleur	250

It was noted that while plant stalks of those plants started from nuclear tubers were large on average, the number and size of tubers harvested was not statistically increased over those plants started from nuclear plantlets.

As can be seen, both AC Red Island and Glenwood Red had no tubers harvested. In addition, the total tubers harvested and average tuber size for all varieties was less than hoped for. This poor harvest result can be attributed to several factors.

The first issue relates to the fertilizer program used and the amount of fertilizer applied. Following the 2013 growing season, a soil analysis was conducted on the growing medium and it was decided that the amount of fertilizer used per bench would be decreased from 400g in 2013 to 300g in 2014. In addition, the fertilizer purchased did not include the trace elements required for maximal crop growth and development. Following discussions with CFIA inspectors and crop development officers the conclusion was made that the lack of trace elements and a less than ideal fertilizer schedule negatively impacted the crop development and subsequent harvest. For the 2015 season it has been proposed to increase fertilizer amounts to 500g per bench as well

as to add additional 2 to 3 liquid fertilizer applications of 10-20-20 fertilizer during the growing season.

A second issue that emerged is the difficulty in finding a “sweet spot” in regards to watering. In the 2013 growing season, overwatering led to a suspected fungal growth on the top layer of growing medium. In the 2014 growing season, in an effort to minimize the fungal growth, the watering schedule was changed so that there were fewer watering sessions per week, but each watering was more substantial in the amount of water applied. This led to a problem with edema emerging on a large number of the plants. The edema was a result of the quick uptake of large quantities of water by the plants and an inability to dispose of excess moisture through the stomata due to poor air flow in the greenhouses. This resulted in the death of a large amount of plant tissue and may have affected the amount of available energy the plant had to put into tuber formation.

A third issue that emerged was the evidence of poor air flow throughout the length of the greenhouse. While there is a three stage cooling system in place in both greenhouses, it is insufficient to move the required amount of air throughout the full length of the structure. There are pockets of hot air within the greenhouse that do not move quickly enough and as a result the plants become stressed in the hot air. This leads to decreased nutrient uptake and a poor overall tuber development. While the addition of small, free standing fans did help slightly, it did not fully alleviate the issue or the associated plant symptoms. There is a plan to replace both greenhouses in the long term with a better suited structure that should eliminate the problems of poor air flow.

While the number of tubers harvested was less than was hoped for, the growing season was still considered a success. Given the overall poor condition of the greenhouse structures and air flow and challenges with heat, fertilizer and crop nutrition the harvest was about as successful as could be hoped for.

Figure 1: Seed Potato plants in the NLNSPPF greenhouse.



During post-harvest discussions with management, crop development officers and contacts within the CFIA and Agriculture Canada it was noted that several changes for the 2015 growing season and the future may help to increase tuber yield. These include but are not limited to:

- Only filling planting benches half-way with growing medium at the start of the season and filling in periodically throughout the growing season as a form of artificial hilling. This worked well in the 2014 growing season and will become the new standard practice in the greenhouses.
- Larger spacing. In the 2014 growing season, a spacing of at least 10 inches between plants to encourage more tuber formation seemed to be successful. Larger row spacing may be tested in future growing seasons.
- Several moderate watering sessions per week instead of 1-2 major watering sessions. The tissue loss to edema is a greater risk to the overall health of the plant than the potential substrate fungal growth.
- More granular fertilizer with the required trace elements is to be added during planting bench preparation and additional 2-3 liquid fertilizer applications to take place during the growing season.
- Replacement of the greenhouse structures is a priority. The current structures are far best their useful life span and new structures are a necessity to continue to receive CFIA accreditation as a nuclear tuber production facility and to ensure the climate can be controlled to maximize crop production.

CONCLUSIONS

Seed potato production has contributed significantly to the Newfoundland and Labrador potato industry during the past 30 years. The supply of seed has reduced the incidence of potato wart disease, increased potato yields, improved product quality and added greatly to the marketability of locally grown potato crops. This contributes to greater financial return to producers and created a new industry which previously did not exist. The production and sale of locally grown seed potatoes provides a new market for potato producers in the Province, which was previously supplied by farms in the Maritime Provinces. The Glenwood Seed Potato Farm and Newfoundland and Labrador Nuclear Seed Potato Propagation Facility play a major role in supporting the potato industry and compliment the work of CFIA and the other stakeholders to suppress potato diseases.

New varieties, knowledge and technologies are important in maintaining economically and environmentally sustainable potato production systems. As markets change and new improved varieties become registered, the Farm will continue to evaluate new seed varieties not previously used in this province to further enhance the potato industry in Newfoundland and Labrador.

APPENDIX A

Seed Potato Varieties Grown at Glenwood Seed Potato Farm

AC Blue Pride



GENERAL

Origin & Breeding: bred by Agriculture and Agri-Food Canada Research Center in St. John's, Newfoundland, from the cross (N713-16 x N889-78-3). Released in 1994.

Year registered in Canada: 1997

Registration No.: 4576

Maturity: mid-season

BOTANICAL FEATURES

Plants: medium size, erect, spreading at maturity; stems slightly pigmented, especially at base and in leaf axils; inconspicuous wings; nodes slightly swollen and slightly pigmented.

Leaves: medium green, dull, smooth, closed; midribs and petioles slightly pigmented. Terminal leaflets: ovate; tip cuspidate; base slightly asymmetrical. Primary leaflets: three pairs; ovate.

Secondary and tertiary leaflets: numerous.

Flowers: frequent; white corolla, medium sized; yellow anthers; green buds; long calyx lobes, slightly hairy; medium berry production.

Tubers: oval to long; smooth blue purple skin; shallow eyes; white flesh, occasional coloration in vascular ring.

Sprouts: purple; scattered long basal hairs.

AGRICULTURAL FEATURES

Medium high yielding variety; excellent storability, long dormancy period; medium specific gravity.

REMARK: susceptible to post emergence application of the herbicide metribuzin.

Utilization: none to some after cooking discolouration; good for boiling.

Chief Market: fresh market.

REACTION TO DISEASES

Resistant: potato wart (race 2, 8).

Moderately susceptible: rhizoctonia, leaf roll, common scab.

Susceptible: potato cyst nematode.

AC Red Island



GENERAL

Origin & Breeding: bred by K.G. Proudfoot from the cross (Brigus x Redsen) at the Agriculture and Agri-Food Canada Atlantic Cool Climate Crop Research Center in St. John's, Newfoundland. Selected in 1987.

Year registered in Canada: 2000

Registration number: 5098

Maturity: mid-season

BOTANICAL FEATURES

Plants: medium size; upright; stems have purple pigmentation, more intense in younger foliage, especially in side shoots in leaf axils; nodes not swollen; wings prominent.

Leaves: dark green, smooth, open; midribs purple, very slightly pubescent; petioles very slightly pigmented and very slightly to not pubescent.

Terminal leaflets: ovate; tip cuspidate, base asymmetrical.

Primary leaflets: three to four pairs widely separated; oval.

Secondary leaflets: few, variable in size, usually large.

Tertiary leaflets: variable in number, small.

Flowers: numerous; lavender corolla, medium size; buds purple, pubescent; yellow anthers; infrequent berries.

Tubers: round to oval; bright red skin; shallow eyes, predominantly apical; creamy white flesh.

Sprouts: slightly pubescent; red-pink pigmented base; apex green.

AGRICULTURAL FEATURES

High yielding variety of medium size tubers. Tubers have very good red colour which is retained during storage. High specific gravity.

Utilization: good for boiling, baking and french frying.

Chief Market: fresh market for red skinned variety.

REACTION TO DISEASES

Resistant: potato wart (pathotype 2, 8).

Good resistance: late blight.

Moderately resistant: common scab.

Atlantic



GENERAL

Origin & Breeding: bred and selected by the USDA from the cross (B5141-6 (Lenape) x Wauseon) in 1969. Released in 1976.

Year registered in Canada: 1983

Registration number: 2300

Maturity: mid-season

BOTANICAL FEATURES

Plants: medium large, upright; stems thick, purple at the base with an irregular pigmentation pattern upward; nodes slightly swollen; wings prominent.

Leaves: close, smooth, bright green, moderately pubescent.

Terminal leaflets: large, ovate; tip cuspidate; base obtuse, asymmetrical.

Primary leaflets: large, ovate; tip cuspidate; base obtuse, mostly asymmetrical; three pairs.

Secondary and tertiary leaflets: numerous.

Flowers: numerous, pale lavender; heavily pubescent buds having diffuse lavender pigmentation on a green background.

Tubers: oval to round, smooth; lightly netted to heavily scaled white skin; shallow white eyes; white flesh.

Sprouts: purple.

AGRICULTURAL FEATURES

High yielding variety, attractive appearance; good tuber set and uniform tuber size and shape. Widely adapted but not recommended for dry sandy soils. Moderate fertilization, close spacing between plants and proper timing of overhead irrigation will prevent the production of oversized tubers that might have hollow heart. Low total glycoalkaloids and high total solids. Medium dormancy period.

Atlantic is the standard for potato chip quality in Canada and United States.

Utilization: good for boiling and baking, excellent for chipping and french frying.
Chief Markets: fresh market, chipping.

REACTION TO DISEASES

Immune: tuber net necrosis, PVX.

Resistant: golden nematode (*Globodera rostochiensis* Ro1).

Moderately resistant: common scab, late blight, bacterial pink eye disease, verticillium wilt.

Exploits



General

Origin & Breeding: bred by Kenneth G. Proudfoot from the cross (N1614-5 x N69-478) made in 1993, at the Agriculture and Agri-Food Canada St. John's Research Center, Newfoundland.

Year registered in Canada: 2008

Registration number: 6460

Maturity: medium late

Botanical Features

Plants: medium height, erect; stems very weakly pigmented; straight single wings; nodes not swollen, very weakly pigmented.

Leaves: medium green, semi-open; midribs and petioles not pigmented. Terminal leaflets: medium ovate; tip acuminate; base cordate and strongly asymmetrical; weakly wavy margins.

Primary leaflets: four pairs; medium ovate; tip acuminate; base cordate, strongly asymmetrical.

Flowers: few inflorescences per plant, numerous flowers; medium size white corolla with prominent star; orange anthers; flower buds and peduncles not pigmented.

Tubers: round; smooth light yellow skin; few moderately deep eyes, predominantly apical; slightly prominent eyebrows; cream coloured flesh.

Sprouts: spherical; red-violet; base weakly pubescent, strongly pigmented; tip medium to strongly pubescent, weakly pigmented, semi-open habit.

Agricultural Features

Moderate to high yields of uniform and attractive round tubers; medium dormancy period; moderately high specific gravity.

Utilization: good for boiling, acceptable to good for baking.

Chief Market: fresh market.

Reaction to Diseases

Resistant: potato wart (*Synchytrium endobioticum*, race 2 and 8), golden nematode (*Globodera rostochiensis*, Ro1)

Highly resistant: PVY

Moderately resistant: common scab, fusarium dry rot.

Frontier Russet



GENERAL

Origin & Breeding: bred by J.J. Pavék at the USDA Research Station in Aberdeen, Idaho (USA) from (A66102-16 x WN330-L). Tested as A74114-4; released in 1990.

Year registered in Canada: 1996

Registration number: 4389

Maturity: medium early

BOTANICAL FEATURES

Plants: medium small, upright and moderately compact; medium thick stems with varying light brownish-purple pigment; narrow, straight, inconspicuous wings; nodes slightly swollen.

Leaves: medium green, open, narrow to medium width; mid-rib and petioles are light green.

Terminal leaflets: broadly ovate; acuminate tip; obtuse to truncate base.

Primary leaflets: four pairs, ovate, acuminate tip, obtuse base.

Secondary leaflets: few, small.

Flowers: few, medium size white corolla, bright yellow anther; buds are green with purple pigmentation at the base and on tip and edge of calix lobes.

Tubers: oblong to long, cylindrical with blocky ends; tannish-brown skin with diffuse brown spotting; medium to light russet; shallow eyes, well distributed; white flesh.

Sprouts: ovoid to cylindrical; moderately pubescent with a dark red-purple pigmentation.

AGRICULTURAL FEATURES

Moderately high yielding variety that produce high quality tuber. Adapted to both irrigated and dryland conditions in northern United States. Good resistance to hollow heart and blackspot; susceptible to growth cracks and internal brown spot. Medium specific gravity. Long dormancy period.

Avoid overwatering late in season. Since tubers may have a high reducing sugar content out of storage, storage temperature for potatoes intended for frying must be above 8°C. Store seed potatoes at 4°C.

Utilization: excellent for french frying directly from the field and for the first few month in storage; very good for baking.

Chief Market: fresh market, processing.

REACTION TO DISEASES

Good resistance: common scab, Fusarium dry rot.

Moderately resistant: leafroll, Verticillium wilt.

Susceptible: all common potato viruses, foliar and tuber early blight.

Glenwood Red



GENERAL

Origin & Breeding: bred by Kenneth G. Proudfoot from the cross (N637-6 x N1653-7) made in 1991 at the Agriculture and Agri Food Canada Research Centre in St. John's, Newfoundland.

Year registered in Canada: 2004

Registration number: 5794

Maturity: late

BOTANICAL FEATURES

Plants: medium size, spreading; stems moderately pigmented; straight single wings; nodes slightly swollen and slightly pigmented.

Leaves: grey green, closed; midribs and petioles moderately pigmented.

Terminal leaflets: broadly ovate; tip acuminate; base lobed and slightly asymmetrical; wavy margins.

Primary leaflets: four pairs; broadly ovate; tip acuminate; base lobed and slightly asymmetrical.

Secondary and tertiary leaflets: numerous (13-15)

Flowers: medium flowering; strongly pigmented red-violet corolla; orange anthers; flower buds moderately pigmented; peduncles weakly pigmented.

Tubers: round; smooth light red to red skin; shallow eyes, few to intermediate in number, predominantly apical; slightly prominent eyebrows; white to cream coloured flesh.

Sprouts: broad cylindrical; red-violet; base weakly pubescent, strongly pigmented; tip weakly pubescent, green with red-violet undertone, closed habit.

AGRICULTURAL FEATURES

High yields of small, uniform tubers; many tubers per plant; short dormancy period; medium specific gravity.

Glenwood Red is well adapted to the growing conditions in Newfoundland for which it was selected.

Utilization: good for boiling and baking.

Chief Market: fresh market.

REACTION TO DISEASES

Highly resistant: potato wart (*Synchytrium endobioticum*) pathotypes 2 and 8.

Moderately resistant: late blight, common scab, fusarium dry rot.

Susceptible: golden nematode (*Globodera rostochiensis*)

Goldrush



General

Origin & Breeding: bred by North Dakota State University from (ND450-3Russ x Lemhi Russet) in Fargo, North Dakota (USA). Released in 1992.

Year registered in Canada: 1999

Registration number: 4905

Maturity: mid-season

Botanical Features

Plants: medium to large, upright growth; stems have purple pigmentation at the base, medium size waved wings and no prominent nodes.

Leaves: medium green to dark green, open, moderately pubescent; midribs and petioles are light green, sparsely pigmented and slightly pubescent.

Terminal leaflets: elliptical; tip acuminate; base lobed and asymmetrical.

Primary leaflets: three to four pairs, ovate, tip acuminate; asymmetrical base.

Flowers: few, large, off-white to light lavender, orange anthers; long, strait and pubescent calix.

Tubers: oblong to long; dark brown russeted skin; eyes are numerous, shallow and well distributed; they may show a reddish blush after storage; very white flesh.

Sprouts: white with purple tips.

Agricultural Features

High yielding variety; tubers are usually smooth and quite uniform with very few external or internal defects. Very good resistance to hollow heart. Medium specific gravity. Good storability; medium dormancy period.

Utilization: excellent for baking and boiling; very good for French frying if processed from harvest or short term storage. Its very white flesh, texture and excellent flavour make it particularly suitable for home and restaurant.

Chief Markets: fresh market, count carton trade, processing.

Reaction to Diseases

Good resistance : common scab.

Moderately resistant : verticillium wilt, silver scurf.

Susceptible : most potato virus, early blight, late blight, soft rot, fusarium dry rot.

Leaf roll expression: light rolling of bottom leaves only; infected plants have normal size and colour.

Mirton Pearl



GENERAL

Origin & Breeding: bred by Agriculture Canada (MIRA x F5318) and selected at the St. John's West Research Station, Newfoundland, in 1966.

Year registered in Canada: 1975.

Registration number: 1606.

Maturity: early to mid-season.

BOTANICAL FEATURES

Plants: medium-sized, upright to spreading; nodes slightly swollen; wings not prominent.

Leaves: close, smooth.

Terminal leaflets: symmetrical.

Primary leaflets: slightly asymmetrical, three pairs.

Secondary leaflets: large, two to three pairs.

Tertiary leaflets: numerous.

Flowers: numerous, white, on slightly bronzed green buds.

Tubers: round, uniform, smooth white skin; evenly distributed medium-deep eyes, occasionally very deep at the bud end; white flesh.

Sprouts: reddish purple, non-pubescent.

AGRICULTURAL FEATURES

High yielding, some resistance to damage from mechanical harvesting. Low total glycoalkaloids and high total solids. Good storability.

Remarks: space 18 to 20 cm in the row to avoid oversize tubers. This variety has very high yield performance in Atlantic Canada.

Utilization: good for boiling and baking.

Chief Market: fresh market

REACTION TO DISEASES

Resistant : potato wart (pathotypes 2 and 8)

Moderately resistant: common scab, fusarium dry rot, late blight.

Susceptible: black leg, powdery scab, potato cyst nematode.

Yukon Gold



General

Origin & Breeding: bred from the cross (Norgleam x W5279-4) at the University of Guelph and selected jointly by Agriculture Canada, the University of Guelph and the Ontario Ministry of Agriculture and Food, Guelph, Ontario (Canada) in 1966.

Year registered in Canada: 1980

Registration number: 2047

Maturity: mid-season

Botanical Features

Plants: medium large, upright with little tendency to spread; lower three-quarters of stems purplish with the upper quarter faintly purple.

Leaves: open, moderately shiny, olive green, stiffly pubescent; nodes not swollen.

Terminal leaflets: obovate, gradually tapered to the base; tip slightly acuminate.

Primary leaflets: ovate; tip acute to slightly acuminate; four pairs.

Secondary leaflets: broadly ovate, varying from two on the lower leaves to six or eight on the upper leaves.

Tertiary leaflets: small, varying from none on the lower leaves to twenty on the mid and upper leaves.

Flowers: light violet; star yellow-green at the base becoming light violet towards the edges; buds light green to purplish green.

Tubers: oval, slightly flattened; finely flaked yellowish white skin; shallow pink eyes; light yellow flesh.

Sprouts: reddish purple.

Agricultural Features

Medium to high yielding variety of attractive appearance. Large tubers are slightly susceptible to hollow heart. Excellent storability; long dormancy period. High specific gravity.

Remark: often sold under its variety name.

Utilization: very good for boiling, baking, and French frying; unsuitable for chipping; retains its yellow flesh color when cooked.

Chief Markets: fresh market and seed export potential.

Reaction to diseases

Highly resistant: PVA

Moderately resistant: leaf roll.

Susceptible: common scab, PVY, air pollution.

AC Chaleur



GENERAL

Origin & Breeding: bred at the Agriculture Canada Research Station in Fredericton, New Brunswick, from the cross (Belleisle x N457). Released in 1988.

Year registered in Canada: 1993

Registration No.: 3785

Maturity: early

BOTANICAL FEATURES

Plants: medium, spreading growth; medium thick stems; inconspicuous wings, nodes not prominent.

Leaves: medium green, open, sparse pubescence on upper surface.

Terminal leaflets: ovate, tip acuminate, obtuse to truncate base, usually symmetrical.

Primary leaflets: four pairs, narrowly ovate, tip acute, base somewhat asymmetrical.

Flowers: medium size white corolla, petals are separated at the base (hole); orange anthers.

Tubers: round to oval, slightly blocky; smooth buff coloured skin; moderately shallow eyes; white flesh.

Sprouts: spherical, small, no colouration or pubescence.

AGRICULTURAL FEATURES

Medium to high yielding variety; not susceptible to hollow heart. Medium specific gravity. Medium dormancy.

Utilization: good to excellent quality for boiling and baking.

Chief Market: early fresh market

REACTION TO DISEASES

Resistant: PVY, tuber symptoms of early blight.

Moderately resistant: common scab, PVS, *Verticillium albo-atrum* wilt, phoma tuber rot.

Susceptible: leaf roll, *Verticillium dahliae* wilt, blackleg, rhizoctonia, late blight, foliar symptoms of early blight, fusarium dry rots.

Chieftain



GENERAL

Origin & Breeding: bred by A.E. Kehr from (Ia1027-18 x La1354) and selected by the Department of Horticulture, Iowa State University, Ames, Iowa, in 1957.

Year registered in Canada: 1973

Registration number: 1487

Maturity: mid-season

BOTANICAL FEATURES

Plants: medium sized, upright, spreading at maturity; wings prominent.

Leaves: dark green, semi-open, long, slightly pubescent; midribs reddish purple. Terminal leaflets: broadly ovate.

Primary leaflets: narrowly ovate, generally four pairs.

Flowers: large, light violet.

Tubers: oval to oblong, smooth bright red skin; shallow to medium-deep eyes, darker than the skin; white flesh.

Sprouts: reddish purple.

AGRICULTURAL FEATURES

High yielding variety, attractive appearance, widely adapted. Undersizing can be a problem if soil moisture becomes limiting. Well suited for washing at maturity. Good storability. Medium specific gravity.

Remark: space at 15 cm with low nitrogen for seed export.

Utilization: good to excellent for boiling, good for chipping at harvest, excellent for french frying; not suitable for processing.

Chief Market: seed export, fresh market, pre-peeled product in the institutional trade.

REACTION TO DISEASES

Moderately resistant: late blight, common scab, rhizoctonia, silver scurf, stem-end browning, tuber net necrosis, verticillium wilt.

Susceptible: black leg, fusarium dry rot, leaf roll, phoma rot, PVX and PVY.

Superior



GENERAL

- **Origin & Breeding:** bred by the University of Wisconsin from (B96-56 x M59.44) and selected at the University Potato Research Farm near Rhinelander, Wisconsin, in 1951.
- **Year registered in Canada:** 1970
- **Registration number:** 1273
- **Maturity:** early to mid-season

BOTANICAL FEATURES

- **Plants:** medium, erect to spreading; stems reddish purple at the base and internodes; nodes green; wings straight and prominent.
- **Leaves:** dull yellowish green, open, small.
Terminal leaflets: short-ovate to round, thick, arched; tip acuminate; base decurrent.
Primary leaflets: thick, arched; base symmetrical.
Secondary leaflets: thick, arched; tip acute.
- **Flowers:** pale lilac; tips white, with white extending to the centre.
- **Tubers:** oval to oblong; smooth shaped; uniform size; smooth to lightly flaked buff skin; medium-deep eyes, evenly distributed; white flesh.
- **Sprouts:** dark purple.

AGRICULTURAL FEATURES

Medium yielding variety, self fertile, well adapted to mechanical harvesting. Short dormancy period, stores well, washes excellently. Tubers size early and are not subject to internal defects. Medium specific gravity.

It is recommended to space seed at 20 cm for the production of seed, table and transformation.

- **Utilization:** fair to good for boiling, baking and french frying; excellent for chipping.
- **Chief Markets:** early fresh market and chipping.

REACTION TO DISEASES

Moderately resistant: common scab.

Susceptible: black leg, fusarium dry rot, late blight, leaf roll, seed-piece decay, PVX, PVY.

Highly susceptible: verticillium wilt.

Kennebec



General

- **Origin & Breeding:** bred by USDA from ((Chippewa x Katahdin) x (3895-13 x Earlaine)) and selected by Presque Isle Station, Maine, in 1941.
- **Year registered in Canada:** 1951
- **Registration number:** 563
- **Maturity:** mid-season to late.

Botanical Features

- **Plants:** large, erect, spreading at maturity; stems thick, not pigmented, prominently angled.
- **Leaves:** dark green, long, broad; midribs scantily pubescent.
Terminal leaflets: ovate; tip acute; base lobed.
Primary leaflets: large, ovate, four pairs.
Secondary leaflets: medium in number.
Tertiary leaflets: few to none.
- **Flowers:** very few, large, white; scantily pubescent green buds.
- **Tubers:** elliptical to oblong, medium thick; smooth creamy buff skin; shallow eyes; white flesh.
- **Sprouts:** greyish green, faintly purple at the base.

Agricultural Features

High yielding fast growing variety, widely adapted. Requires close planting (15 to 20 cm between plants) and vine killing to avoid producing oversized and rough tubers. Excellent storage quality. Long dormancy period. High total solids.

NOTE: tubers grow green rapidly when exposed to light.

- **Utilization:** good to excellent for boiling, baking, chipping and French frying.
- **Chief Markets:** seed export, fresh market, chipping.

Reaction to Diseases

Field resistant: PVA, PVY.

Resistant: tuber net necrosis.

Moderately resistant: foliage late blight, black leg , fusarium dry rot (*Fusarium coeruleum*), phoma rot, potato wart, seed-piece decay, PVS and PVX.

Susceptible: common scab, fusarium dry rot (*Fusarium sambucinum*), tuber late blight, leaf roll, pink eye and rhizoctonia.

Highly susceptible: verticillium wilt.

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