

UNITED STATES DEPARTMENT OF AGRICULTURE

AGRICULTURAL RESEARCH SERVICE

Crops Research Division

Potato Introduction Station

Sturgeon Bay, Wisconsin 54235

18 March 1970

2 Copies
Dr. M. S. Swaminathan
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New Delhi 12, India

Dear Swami:

You may have heard or read of the release of a U.S. potato variety named Alaska Frostless, a variety which involves one of your hybrids, S. acaule var. Recoba ($2n=96$) x S. tuberosum var. Katahdin, in the pedigree, (re. enclosed reprint).

When the seed stocks you left with us were submitted for Plant Introduction (PI) number assignments, we simply listed them under consecutive Swaminathan numbers (earlier MSS-, later Swa-) 1-26. These you may recall were earlier prefixed with C-, PI-, SD-, M-, MS-, or MSS- numbers. If you have had an opportunity to glance through the latest inventories of stocks maintained here, you will find for example:

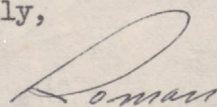
PI 230529	=	Swa 1	=	<u>S. acaule</u> var. Recoba ($2n=48$)
PI 230530	=	Swa 2	=	<u>S. acaule</u> var. Recoba ($2n=96$)
PI 230531	=	Swa 3	=	<u>S. acaule</u> var. Recoba ($2n=96$) x var. Katahdin
etc.				

We are now revising a 1956 publication, "The Use of Foreign Introductions in Breeding American Potato Varieties." But first of all we must revise one table contained in that publication for use in a USDA Plant Introduction 20-year report. To up-date the table, we very much need to know the source of that acaule, at least whether it was collected in Bolivia, Peru, or NW Argentina. Do you recall, or still have any old records of your potato work that might establish this? I notice that Jack Hawkes has annotated a herbarium specimen of your acaule as "originally from U.S.S.R., origin unknown", perhaps because of the use of "var. Recoba". We would be grateful for any information you might be able to provide.

I always hope that we will have an opportunity to meet again sometime, Swami, and still have fond memories of those days 'way back in 1952. I know that you are enjoying much success, deservedly, and hope that you and your family are in the best of health.

With best regards,

Sincerely,



Roman Ross
Project Ass't.

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ALASKA FROSTLESS, AN INHERENTLY
FROST RESISTANT POTATO VARIETY

C. H. DEARBORN¹

ABSTRACT

A potato clone with frost resistant foliage designated Alaska Frostless has been selected from the progeny of crosses involving *Solanum acaule* and commercial varieties. Its chromosome number is ($2N=5X=60$). Nearly mature vines have withstood field frosting at -3 C for 2 hours and have recovered from several frosts of -2 C. Yields in cwt per acre of tubers 2-3.5 inch in diameter have equaled those of Alaska's standard varieties. Dry matter of 21.7% is equivalent to that of the Green Mountain variety. Tubers are flattened, round, smooth and white with a nonuniform faintly purple blush after exposure to light. Culinary quality, flavor, and texture are very good.

RESUMEN

Un clone (especie *Solanum* asexualmente propagada) de patata de resistencia al hielo, la Alaska Frostless (Alaska sin hielo) ha sido escogido de la progenie de cruces envolviendo *Solanum acaule* y variedades comerciales de *Solanum tuberosum*. Las selecciones 8-60-17-61 eran hecho en 1961 de una cruz de 1960. La parra casi madura ha resistido helando a los -3 C por dos horas y ha recubierto de diversos helados del campo de los -2 C. Los reduituares en quintal por acre de tubérculos de 5 a 9 centímetros han igualado esos de las variedades regulares de Alaska. La materia seca de 21.7 por ciento es equivalente a la variedad Green Mountain (Montant Verde). Los tubérculos son allanados alrededor, lisos y blancos con el rubor no-uniforme y ligeramente morado después del exponer al sol.

Alaska Frostless was selected in 1961 at Matanuska, Alaska, from a potato breeding program designed to combine the frost resistance of *Solanum acaule* Bitt. and *Solanum demissum* Lindl. with desirable characters of non-resistant Alaskan varieties. The significance of frost resistance was recognized in a sample of *Solanum acaule* PI 186176 and *Solanum demissum* PI 161731 in 1953. The material remained green at -5 C but did not tuberize in the field because the short day requirement could not be met during the remaining fall days prior to freeze-up.

In the search for tuberizing types with frost-resistant foliage several tubers were obtained from J. R. King, Horticulturist, Louisiana State University in 1956 and planted at Matanuska. King obtained this material through IR-1 Potato Introduction Station, Sturgeon Bay, Wisconsin, as PI 230531 MSS 3 *S. acaule* var. Recoba ($2n=96$) \times Katahdin (1). This clone was crossed with Ontario and an early tuberizing, low tuber-set, frost resistant seedling from the cross was designated 27-11.

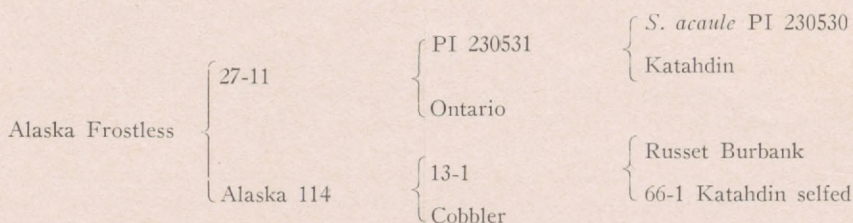
Numerous other presumably frost resistant PI clones lacked the desirable horticultural characteristics of 27-11. Many crosses of 27-11 with varieties and selections were attempted with partial success. A seedling selected from the cross, Alaska 114 \times 27-11 was designated 8-60-17-61.

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It has been tested under this code since 1964 by gardeners in remote frost hazardous potato growing areas of Alaska as well as in replicated trials at Matanuska.

Chromosome number ($2n=5X=60$) was determined by personnel of IR-1 Potato Introduction Station at Sturgeon Bay, Wisconsin, for which service the writer is deeply grateful.

The pedigree of Alaska Frostless is shown below:



DESCRIPTION

PLANTS — Medium, spreading, strong basal branching from central stem. *Stolon plants*: occasional, early. *Stem*: large, internodes short, reddish purple ground color speckled by normal green stem color, red pigment strong in basal portion of plant especially at nodes, red pigment diminishing toward apices, winged heavily and smooth. *Nodes*: slightly larger than stem, densely pigmented, and supporting large lateral basal branches. *Leaves*: dark green, heavily pubescent, elliptic, small, deeply furrowed by veins. *Leaflets*: round to elliptic, symmetrical. *Primary leaflets*: elliptic, four and five pair. *Secondary leaflets*: small, round, many. *Tertiary leaflets*: few. *Midribs*: pigmented with speckled appearance. *Petioles*: pigmented with speckled appearance where exposed to direct light, pubescence coarse.

FLOWER: *Buds*: persistent, reddish purple. *Calyx lobes*: small, short, downy pubescent, tips green. *Flowers*: abundant, small. *Corolla*: orchid 9-F (2). *Pistil*: slender, fragile, two lobed, not protruding through corolla. *Pollen*: scarce, poor. *Fruit*: scarce.

TUBERS — *Shape*: round thin.² Mean length 98 mm; mean width 79 mm; mean thickness 52 mm; indices — width to length 80.6, thickness to length 53.1, thickness to width 65.8. *Skin*: smooth, white, tough. *Eyes*: shallow, numerous, well distributed; eyebrows short, inconspicuous; eye canker inconspicuous. *Flesh*: white. *Sprouts*: pigmented, purple trace in darkness.

MATURITY — Vines remain green until soil is frozen 2 to 3 centimeters. Tubers set about a week later than Green Mountain.

GENERAL DESCRIPTION — The plants are resistant to moderate field frosting; they are dark green and are spreading with many leaves giving a uniform canopy effect. Orchid colored flowers are borne on short peduncles arising at a wide angle to the stem early in the ontogeny of

²Data for tuber length, width, and thickness were taken from measurements of 100 tubers each weighing approximately 8 oz. Indices were calculated by dividing the width by the length, the thickness by the length, and the thickness by the width.

the vine. The white and faint purple blushed, smooth skinned, flattened tubers are uniform in shape and size and average nine tubers per hill.

FROST AND DISEASE RESISTANCE

Alaska Frostless has been grown successfully by gardeners from Southeast Alaska's panhandle to Unalakleet on Norton Sound. It has withstood field frosting to -3 C and regained turgidity of tissues after thawing. At -1 or -2 C the leaves became stiff and brittle but recovered on thawing without apparent injury. Alaska Frostless has remained green and maintained turgidity following field frosting at -1 C for four hours. At -5.5 C its tops were killed. Parental frost resistant clones also were killed by this exposure. Of the 156 named varieties tested none has withstood sustained night temperatures of -1 C at this latitude, $61^{\circ} 34'$ N. The resistance of Alaska Frostless to freezing has not been tested at an early physiological stage of plant growth. Its paternal parent 27-11 has exhibited uniform frost resistance in September from plantings made May 15, 29, June 18, 26 and July 10, 1962.

Scab resistance has not been systematically studied with this variety but in plantings with susceptible and resistant varieties it has been intermediate in resistance. Virus symptoms identified by leaf abnormalities or plant dwarfing have not been observed in this new variety. Potato Virus-X tests on *Gomphrena* have been negative. Late blight, *Phytophthora infestans* (Mont.) D By. is not present in Alaska; cooperators in other states testing Alaska Frostless have not reported it to be susceptible to late blight.

CHARACTERISTICS

Alaska Frostless continues to grow after standard varieties have been killed or severely damaged by frost. In replicated trials where frosting conditions did not destroy the tops of standard varieties until a fair yield of tubers had developed, Alaska Frostless yields compared favorably with yields of standard varieties as shown in Table 1.

TABLE 1.—*U. S. No. 1 yields and dry matter (DM) of Alaska Frostless, Green Mountain and Alaska 114 potato varieties.*

Year	Planting to harvest Days	Variety					
		Alaska Frostless		Green Mountain		Alaska 114	
		Yield cwt/A	DM %	Yield cwt/A	DM %	Yield cwt/A	DM %
1964	125	289	22.9	319	23.5	322	22.2
1965*	99	214	19.9	224	19.6	248	18.7
1965	139	409	22.2	348	22.2	334	20.9
1966	128	508	20.1	446	19.6	469	18.9

*Harvested August 19 to measure the relative stage of tuber development.

The high yield of Alaska Frostless in 1965 and 1966 is attributed to functional green foliage of Alaska Frostless after the vines of the other varieties had been killed by frost. Total yield of Alaska Frostless not shown here was significantly less than that of Green Mountain but the yield of 2-3½ inch tubers was equal to Green Mountain each year. Tubers of Alaska Frostless seldom exceed 3½ inches in diameter whereas 20 to 25% of Green Mountain's yield results from tubers over 3½ inches in diameter. Data for the early harvest of August 19, 1965 showed that none of the Alaska Frostless tubers had reached a 3½ inch diameter on that date although nearly 12% of Green Mountain tubers exceeded 3½ inches. As early as mid-August in 1965 Alaska Frostless tubers had 19.9% dry matter which was equivalent to Green Mountain. At the close of the season both varieties contained 22.2% dry matter.

Culinary characteristics of Alaska Frostless are very good. The eyes and stolon cavity are shallow and the skin is tough. A purple skin pigment that develops irregularly over tubers exposed to light disappears when the tubers are boiled or baked. Preliminary baking tests indicate that tubers of Alaska Frostless require less time to bake than thick or round tubers. The flesh is white and remains white after cooking. The texture is mealy and fluffy but not gritty. It has a pleasant flavor characteristic of but milder than Cobbler. Acceptable, light-colored chips and french fries have been made from freshly harvested tubers. Tubers stored at 38 F then conditioned at 70 F for 3 weeks usually produce a chip significantly darker than chips offered by West Coast processors. Tubers from malic hydrazide-treated vines have stored well at 50 F and produced good chips. Untreated tubers for the fresh market or seed purposes stored at 38 F retain their quality and dormant condition as well as the best varieties now being stored in Alaska. Per cent soluble solids by hand refractometer tests on material stored at 38 F are 6.4, 6.5 and 5.0 respectively for Alaska Frostless, Green Mountain and Alaska 114. Soluble solids, one component of flavor, are not significantly different in these varieties. Under these conditions some clones contain 8 to 11% soluble solids and are objectionably sweet to the taste after cooking.

When a normal heavy tuber-set was grown under dry conditions a high proportion of tubers were small at harvest. It is suggested that the seed pieces be spaced 14 inches apart in rows 36 inches apart or equivalent distances to compensate for low soil moisture conditions. Early vine growth of Alaska Frostless has been slower than in standard varieties which has delayed hilling a few days. At harvest, vine growth may be so rank as to require vine beating before digging. Another feature of Alaska Frostless that might not be anticipated is that its flat tubers do not roll easily in the binning and grading operations.

LITERATURE CITED

1. Hougas, R. W., et al. 1958. Inventory of tuber-bearing *Solanum* species. Univ. of Wisc. Agr. Expt. Sta. Bull. 533. 40 pp. [Revised 1965; Suppl. 1966].
2. Maerz, A. and M. Rea Paul. 1950. A dictionary of color. 2nd edition. McGraw-Hill Book Co., Inc., New York.