

"Bulletin (Alaska Agricultural Experiments
Stations (U.S.))"

Performance of 55
POTATO VARIETIES
in Alaska's Matanuska Valley
1948-1951

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ALASKA AGRICULTURAL EXPERIMENT STATION

University of Alaska
Palmer, Alaska

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Performance of 25
POTATO VARIETIES
in Alaska Matanuska Valley
1948-1951

ALASKA AGRICULTURAL EXPERIMENT STATION
BUREAU OF PLANT INDUSTRY
Fairbanks, Alaska

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Table I.—Comparative yields in bushels per acre of potato varieties tested in 1948

PERFORMANCE OF FIFTY-FIVE POTATO VARIETIES

IN ALASKA'S MATANUSKA VALLEY

M. F. Babb and C. H. Dearborn

Variety	No. 1	No. 2	No. 3
Alaska	201	+101	20
White Rose	468	+ 68	12
Russet Rural	446	+ 46	7
Knik	439	+ 39	16
White Gold	456	+ 56	21

This bulletin reports the results of potato variety trials conducted at the Matanuska Experiment Station during 1948, 1949, 1950 and 1951. They were conducted for the purpose of determining the value of the more common commercial varieties of potatoes and the comparative performance of certain seedlings, for culture in Alaska or for use as parental material in potato breeding. The publication of the results of these tests has been unavoidably delayed. They are being published now, however, because the information they contain is as pertinent as it was at the time the tests were conducted and of as great value to growers, potato buyers and other research workers.

Arctic Seedling was at that time — and still is — the most commonly grown variety in Alaska. Several serious defects detract from its popularity with the public, with buyers and with growers. It is late maturing and frequently fails to mature its tubers in certain growing areas. Its large tops interfere with cultural and harvesting operations and the thin skin of the tubers feathers badly in handling. When grown on some soils, at least, the flesh of the tubers tends to darken on cooking.

METHODS

For three years beginning with 1948, 81 commercial potato varieties and numbered selections were on trial each year. These were planted in a 9 x 9 lattice design with four replicates each. In 1951, 49 varieties and selections were compared, in a fully randomized complete block design with four replicates each. In all years, individual plots consisted of 20 plants each, spaced approximately 15 inches apart in rows spaced 42 inches apart.

Fertilizers used and their method of application varied somewhat from year to year. In 1948, 600 pounds of fertilizer having a 1-4-3 ratio supplying approximately 35 pounds of nitrogen per acre was distributed by hand in the seed rills and covered by hand before the potatoes were planted. In 1949, 700 pounds of fertilizer with a 1-5-2 ratio, supplying 35 pounds of nitrogen per acre, was applied as in the previous year. In 1950, 800 pounds of fertilizer with a 1-5-2 ratio, supplying 35 pounds of nitrogen per acre, was applied with a grain drill to the entire field before the potatoes were planted. In 1951, an assist type planter was used which distributed a fertilizer with a 1-4-2 ratio at the rate of 800 pounds per acre as the potatoes were planted; this supplied approximately 45 pounds of nitrogen per acre.

Neither the spacing distances between plants nor the rate and type of fertilization used in these tests are considered ideal now. Moreover, it has long been known that potato varieties often differ markedly in their spacing and fertility requirements and hence that all can not be expected to attain their peak of performance under any one given set of conditions. However, in tests such as are reported here it is impossible to provide differential treatment for particular varieties even when such needs are known. For this reason a uniform, rather conservative treatment for all varieties was employed.

Table 1.-Comparative yields in bushels per acre of potato varieties tested in 1948

Variety	U.S. Compared U.S.			Culls
	No.1	with Arctic	No.2	
Bushels per acre				
Alaska.	501	+101	20	3
White Rose. . . .	468	+ 68	15	1
Russet Rural. . .	446	+ 46	7	1
Knik.	439	+ 39	16	1
White Gold. . . .	426	+ 26	21	3
Arctic Seedling	400	---	12	1
114.42-3-44. . .	393	- 7	25	3
Irish Cobbler . .	372	+ 28	23	4
Chippewa.	368	- 32	12	1
Columbia Russet	366	- 34	15	2
La Salle.	360	- 40	18	3
10.44-2-46. . . .	357	+ 43	10	1
Pawnee.	355	+ 45	8	1
Smooth Burbank.	355	+ 45	57	6
Teton.	339	- 61	13	1
Chisago.	314	- 86	7	1
Russet Burbank.	310	- 90	90	7
Early Ohio. . . .	280	-120	13	2

Significant difference at 5% point for U.S.No.1 is 87 bushels; for U.S.No.2, 11 bushels.

METHODS

During the first three years weeds were controlled by cultivation. In 1951 Premerge was used as a complete cover spray at the rate of 8 quarts in 18 gallons of water per acre when from 1 to 5 per cent of the plants were just breaking ground. This effectively eliminated all chickweed, mustard and lambsquarters, the only troublesome broad-leaved weeds in the field.

Planting dates ranged from May 20 to May 27 and the potatoes were harvested during the last week in September of each year.

Individual plot yields were stored in slatted potato crates in common storage until all yield records and other data had been collected. During the first week of storage a temperature of approximately 70° F was maintained to assist in the suberization of cuts or skin breaks resulting from harvesting operations. Following this initial period of suberization, the temperature was lowered to from 46° to 48° F, at which level it was maintained for the remainder of the storage period. Circulation of air in the storage was accomplished by an electrically driven, thermostatically controlled fan.

Data as to yields, specific gravity and certain other important horticultural characteristics were taken after the potatoes had been in storage for about two months. All evaluations were made by two or more competent judges independently on each plot yield. Therefore, each value represents the mean of at least eight determinations per variety.

Specific gravities were computed from the air vs water weights of 20-pound samples of U.S. No. 1 grade tubers from each plot. Thus, each value reported is the mean of four determinations on a total of 80 pounds of tubers from each variety.

YIELD PERFORMANCE

1948 yields - The test in 1948 included 16 commercial varieties and 65 numbered selections. One of these selections (57.44-3-46) has since been released to growers as the variety "Knik" and two (10.44-2-46 and 114.42-3-44) have been released to the public as numbered varieties. Though full data and records were kept for all varieties and selections under test, this report deals only with the performance and characteristics of the commercial varieties and those seedlings subsequently released to the public as varieties.

Yield data for the varieties tested in 1948 are presented in table 1. In this, and in subsequent tables, comparisons are made with Arctic Seedling, because this is still the most commonly grown variety in Alaska. Column 2 of the table has been prepared to make such comparisons easier.

In this test, a difference of 87 bushels of U.S. No. 1 grade potatoes is required to establish significant differences in yields at the 5 per cent point. From this it is evident that only one variety (Alaska) yielded significantly more than Arctic Seedling; 14 varieties did not differ significantly from it and two yielded significantly less.

Yields of U.S. No. 2 potatoes varied from 7 bushels per acre for Russet Rural and Chisago to 90 bushels for Russet Burbank. A difference in yield of 11 bushels per acre is required to establish significance at the 5 per cent point. Only four varieties produced significantly greater yields of U.S. No. 2 grade potatoes than Arctic Seedling. Of those producing significantly greater yields, the differences are not great except in the case of Smooth Burbank and Russet Burbank which yielded 45 and 78 bushels more, respectively. Such high production of U.S. No. 2 grade tubers, especially in view of their relatively low yields of U.S. No. 1 grade, indicates that these two varieties are not well adapted to Alaskan conditions.

There were no appreciable differences among the varieties in their production of culls.

1949 yields - The variety test in 1949 consisted of 38 commercial varieties and 43 numbered selections. Yield data are presented in table 2 in which comparisons are made with Arctic Seedling as a standard variety for Alaska. A difference of 69 bushels per acre of U.S. No. 1 grade potatoes is required to establish a significant difference in yield among varieties at the 5 per cent point. No variety outyielded Arctic Seedling in production of U.S. No. 1 tubers; 13 varieties yielded significantly less and in two cases (Early Ohio and Cayuga) the difference in yield was twice as great as the actual production of the varieties themselves. Twenty-six varieties were not significantly different from Arctic Seedling in yields.

Yields of U.S. No. 2 grade potatoes varied from 10 to 81 bushels per acre. Since a difference in yield of only 14 bushels per acre is required for significance at the 5 per cent point, it is evident that only two varieties (Russet Burbank and Smooth Burbank) yielded significantly more than Arctic Seedling and 10 yielded significantly less. In only two cases (Smooth Burbank and Russet Burbank) can the production of this grade be considered as abnormal or highly important to the grower.

For this particular test, the production of culls assumes a highly important role in determining the value of certain varieties. Varieties such as Sebago, Teton, Katahdin and Pawnee produced practically no culls, whereas Mohawk, Smooth Burbank, White Rose, Cayuga and Bliss Triumph all produced in excess of 100 bushels of culls per acre with the last two producing 173 and 184 bushels, respectively. With the exception of Smooth Burbank, none of these varieties produced an unusual yield of U.S. No. 2 grade, but on the basis of their production of culls it is evident that they are not well adapted

Table 2.-Comparative yields in bushels per acre of potato varieties tested in 1949

Variety	U.S. No.1	Compared with Arctic	U.S. No.2	Culls
	Bushels per acre			
Knik.	481	+ 56	31	32
Pawnee.	454	+ 29	17	6
Sequoia	442	+ 17	12	49
Kasota.	435	+ 10	36	26
114.42-3-44	431	+ 6	41	7
47.44-3-47.	428	+ 3	23	23
Arctic Seedling	425		31	20
Alaska.	423	- 2	29	19
Ontario.	421	- 4	13	49
Earlaine #2	420	- 5	26	19
White Gold.	419	- 6	22	14
Houma.	411	-14	32	4
Swiss	408	- 17	44	8
Red Eyed Warba.	400	- 25	30	81
Columbia Russet	394	- 31	25	26
Menominee	388	- 37	22	15
Green Mountain.	388	- 37	30	30
Marygold.	387	- 38	22	33
Rural New Yorker.	385	- 40	17	54
Sebago.	376	- 49	25	2
Red Warba	375	- 50	22	34
Pontiac	374	- 51	22	64
Russet Rural.	371	- 54	10	37
Teton	370	- 55	14	4
American Wonder	366	- 59	40	69
Irish Cobbler	364	- 61	38	90
White Rose.	362	- 63	26	111
Katahdin.	355	- 70	13	6
La Salle.	350	- 75	21	29
Chippewa.	348	- 77	19	18
Seneca.	345	- 80	17	24
Spaulding Rose.	345	- 80	30	16
Earlaine.	324	-101	28	11
Chisago.	291	-134	22	18
Mohawk.	286	-139	12	103
Bliss Triumph	285	-140	25	184
Smooth Burbank.	274	-151	71	105
Russet Burbank.	247	-178	81	76
Early Ohio.	205	-220	37	91
Cayuga.	183	-242	15	173

Significant difference for U.S.No.1 at 5% point is 69 bushels; U.S.No.2, 14 bushels; Culls, 41 bushels.

to Alaskan conditions. Other comparisons among varieties may be made by using 41 bushels per acre as a standard to measure significance at the 5 per cent point.

1950 yields - In 1950, the potato variety test consisted of 33 commercial varieties and 48 numbered selections. Yield data are presented in table 3 in which (column 2) comparisons among varieties in production of U.S. No. 1 grade tubers are made with Arctic Seedling. A difference in yield of 70 bushels per acre is needed to establish significance at the 5 per cent point.

Table 3.-Comparative yields in bushels per acre of potato varieties tested in 1950

Variety	U.S. No.1	Compared with Arctic	U.S. No.2	Culls
	Bushels per acre			
Knik.	483	+ 53	54	8
Sequoia	474	+ 44	57	2
Ashworth.	453	+ 23	42	3
Kennebec.	436	+ 6	38	4
Arctic Seedling	430	---	71	10
Ontario	427	- 3	52	12
Russet Rural.	422	- 8	66	3
Snowdrift.	415	- 15	69	13
Columbia Russet	407	- 23	79	8
10.44-2-46.	407	- 23	23	3
Placid.	406	- 24	64	16
Chenango.	401	- 29	56	4
Green Mountain.	395	- 35	69	10
La Salle.	395	- 35	35	6
Cherokee.	389	- 41	71	17
Potomac	376	- 54	75	13
Houma	373	- 57	68	11
Virgil.	372	- 58	40	9
Spaulding Rose.	363	- 67	69	10
Menominee	360	- 70	50	3
47.44-3-47.	357	- 73	48	8
Chippewa.	355	- 75	44	4
Pawnee.	349	- 81	20	4
Teton	348	- 82	46	4
114.42-3-44	348	- 82	63	10
Essex	341	- 89	94	24
Earlaine.	328	- 102	44	7
Chisago	327	- 103	43	9
Mesaba.	318	- 112	45	8
Calrose	308	- 122	71	17
Alaska.	299	- 131	21	7
Empire.	298	- 132	43	4
Sebago.	287	- 143	49	4
Katahdin.	286	- 144	21	4
Norkota	282	- 148	32	12
Fillmore.	249	- 181	35	6

Significant difference for U.S.No.1 at 5% point is 70 bushels; for U.S.No.2, 44 bushels; for culls, 18 bushels.

Using the value of 70 bushels per acre as a standard, it is evident that no variety significantly exceeded Arctic Seedling in yield of U.S. No. 1 grade tubers. Seventeen varieties yielded significantly less than Arctic Seedling and 10 of these by over 100 bushels per acre.

Yields of U.S. No. 2 potatoes varied from 20 to 94 bushels per acre. With a difference of 44 bushels required for significance among yields, it is evident that four varieties yielded less than Arctic Seedling and that none exceeded it.

The production of culls was exceptionally low in this particular test and hence is not an important factor in determining the relative merit of the varieties. Eighteen bushels per acre are required to establish significance at the 5 per cent point.

1951 yields - In 1951, the test included 20 commercial varieties and 32 numbered selections. Yield data for the test are presented in table 4. Column 2 of the table has been constructed to make comparisons with Arctic Seedling easier.

A difference in yield of 75 bushels per acre is required for significance at the 5 per cent point for the U.S. No. 1 grade. Thus it is evident that no variety significantly outyielded Arctic Seedling whereas four varieties yielded significantly less. Green Mountain, usually considered as being synonymous with Arctic Seedling, did not differ significantly from it in the 1949, 1950 or 1951 tests.

Arctic Seedling was relatively high in its production of U.S. No. 2 grade tubers and was not exceeded by any other variety in this particular test, whereas 12 varieties yielded significantly less. One variety (Alaska) produced significantly more culls than Arctic Seedling and none produced significantly less.

These data indicate that the relatively poor showing of Arctic Seedling was due to its high production of the U.S. No. 2 grade tubers.

Yield comparisons - Table 5 compares the performance of eight varieties under test for four consecutive years. It shows the variation from year to year of particular varieties and of all varieties for any one year.

Table 4.-Comparative yields in bushels per acre of potato varieties tested in 1951

Variety	U.S. No.1	Compared with Arctic	U. S. No.2	Culls
Bushels per acre				
Ontario	473	+ 58	47	13
47.44-3-47	468	+ 53	46	11
Knik	425	+ 10	61	7
Marygold	422	+ 7	26	35
Houma	420	+ 5	62	12
Arctic Seedling	415	--	87	9
Green Mountain	414	- 1	60	5
10.44-2-46	414	- 1	18	2
La Salle	405	- 10	54	4
Kennebec	397	- 18	41	26
Swiss	393	- 22	56	7
Pawnee	381	- 34	22	15
Cherokee	372	- 43	60	40
114.42-3-44	372	- 43	49	9
Chippewa	357	- 58	29	11
Teton	356	- 59	25	7
Snowdrift	355	- 60	95	19
Sequoia	354	- 61	43	30
Rural New Yorker	341	- 74	64	4
Placid	338	- 77	64	5
Katahdin	316	- 99	43	8
Sebago	310	- 105	30	16
Alaska	305	- 110	70	74

Significant difference for U.S.No.1 at 5% point is 75 bushels; for U.S.No.2, 38 bushels; for culls, 37 bushels.

Table 5.-Comparative yields of U.S.No.1 grade potatoes for eight varieties grown for four consecutive years

Variety	1948	1949	1950	1951	Average	Maximum variation
Bushels per acre						
Knik.	439	481	483	425	457	58
Arctic Seedling	400	425	430	415	418	30
114.42-3-44	393	431	348	372	386	83
Pawnee.	355	454	349	381	385	105
Alaska.	501	423	299	305	382	202
La Salle.	360	350	395	405	378	55
Chippewa.	368	348	355	357	357	20
Teton	339	370	348	356	353	31
Average	394	410	376	377	394	---
L.S.D. at 5% point 87		69	70	75	---	---

Since the maximum variation among the average yearly yields for the eight varieties is only 34 bushels, it seems evident that there was no pronounced seasonal influence affecting all varieties in any given year but highly significant differences are to be found among the variety means in all years.

The last column of the table shows the maximum variation of each variety for the four years it was under test. It is evident that some varieties, such as Alaska (202) and Pawnee (105) showed wide variations in their yearly yields, whereas other varieties, such as Chippewa, Arctic Seedling and Teton were remarkably stable in yielding ability from year to year.

SPECIFIC GRAVITY OF POTATOES

The specific gravity of potatoes has been, and still remains, the best single criterion of their value for specific culinary purposes. Thus; Leichsenring, Morris, et al. (1) have pointed out that "For baking, potatoes high in starch and low in moisture content are preferred. Conversely, for steaming or boiling, potatoes lower in starch and higher in moisture content are preferred." They do not state the exact dividing point between those that are preferred for baking and those that are preferred for water cookery. However, Thiessen (2), in a study of the factors determining quality in potatoes grown upon dry and irrigated land in Wyoming, states, "Potatoes that floated in salt water with a specific gravity of 1.068 were definitely not mealy. Those that sank in water with a specific gravity of 1.078 were mealy, but if they floated in this solution they were only slightly mealy." Such potatoes have a total solids content of approximately 19.8 per cent. Smith (4) in commenting on this subject states that "After years of experimental work we have chosen 1.080 specific gravity as a point between mealy potatoes (those above 1.080) and non-mealy (those below 1.080)." Since this differs from the point set by Thiessen by only 0.002, it seems safe to accept one or the other of these points as differentiating between mealy and non-mealy potatoes. Total solids content of tubers as reported in this paper are taken from a table prepared by von Scheele, C., Svensson, G., and Rasmusson, J. (5)*

The specific gravity of potatoes is known to be affected by a number of factors such as soil moisture, soil type, quantity and analysis of fertilizer applied, time of planting and harvesting and methods of vine killing. It has also been found to differ from plant to plant in a given variety and even among tubers on an individual plant.

* Italic numbers in parenthesis refer to literature cited, p.

In these tests all varieties were grown each year under identical conditions to eliminate insofar as possible all variability due to environmental factors. And an exceptionally large (20 pound) sample was selected at random from each plot for the specific gravity measurements in order to minimize the effect of individual plant and tuber variations.

Specific gravities 1948 - Table 6 presents the specific gravity data for the varieties under test in 1948. A value of 0.008 is required for significance. From this it is evident that no variety significantly exceeded Arctic Seedling in specific gravity and that only two varieties (Chippewa and White Rose) were significantly lower. The average specific gravity for all varieties was exceptionally low in this particular test and no variety exceeded the value of 1.080.

Table 6.-Specific gravity and total solids of potato varieties tested in 1948

Variety	Specific gravity	Total solids Percent
White Gold.	1.070	18.1
Russet Burbank.	1.069	17.9
Smooth Burbank.	1.069	17.9
Early Ohio.	1.067	17.4
Alaska.	1.066	17.2
Columbia Russet.	1.066	17.2
114.42-3-44	1.065	17.0
Arctic Seedling	1.064	16.8
Russet Rural.	1.063	16.6
La Salle.	1.061	16.2
Irish Cobbler.	1.060	16.0
Teton.	1.060	16.0
Chicago.	1.058	*15.6
Knik.	1.057	15.3
Pawnee.	1.057	15.3
10.44-2-46.	1.057	15.3
Chippewa.	1.054	14.7
White Rose.	1.050	13.9

Significant difference for specific gravities at 5% point is 0.008

*Data below this point were extrapolated from von Scheele's table

Specific gravities 1950 - For this test a value of 0.001 is required to differentiate between the specific gravity of varieties at the 5 per cent level. Using this as a measure, only one variety, Green Mountain, actually exceeded Arctic Seedling in specific gravity. However, because of the extremely low value required for differentiation, it may be assumed for all practical purposes that they were identical.

Applying this same standard to the other varieties Columbia Russet and all subsequent varieties listed were significantly lower in specific gravity. Using the value 1.080 to differentiate between mealy and non-mealy types, it is evident that only eight of the 36 varieties fell into the non-mealy category.

Specific gravities 1949 - A value of 0.009 is required to establish a significant difference in specific gravity between varieties at the 5 per cent level. No variety actually exceeded Arctic Seedling in specific gravity but Russet Burbank failed to do so by a value of only 0.001. Menominee and all varieties subsequently listed were significantly lower in specific gravity than Arctic Seedling.

If 1.080 is used to differentiate between mealy and non-mealy tubers, it is evident that 23 of the 40 varieties fell into the mealy classification. Where it has been possible to make direct comparisons, the values for specific gravity as reported in this bulletin are in close agreement with those given by other workers for the same varieties grown in the States. Thus, there is general agreement that such varieties as Smooth and Russet Burbank, Columbia Russet and Green Mountain rank high in specific gravity, whereas, such varieties as Earline and Earline #2 rank lower. This statement holds true, not only for their relative rank, but also for the absolute magnitude of the determinations.

Table 7.-Specific gravity and total solids of potato varieties tested in 1949

Variety	Specific gravity	Total solids Percent	Continued		
Russet Burbank.	1.100	24.4	Red Eyed Warba.	1.081	20.4
Smooth Burbank.	1.099	24.2	Seneca.	1.081	20.4
Alaska.	1.094	23.1	Mohawk.	1.080	20.2
Columbia Russet	1.094	23.1	La Salle.	1.079	20.0
White Gold.	1.094	23.1	White Rose.	1.079	20.0
Swiss	1.093	22.9	47.44-3-47.	1.079	20.0
Arctic Seedling	1.092	22.7	Red Warba	1.078	19.8
Green Mountain.	1.092	22.7	Ontario	1.077	19.5
Rural New Yorker.	1.090	22.3	Pontiac	1.077	19.5
Russet Rural.	1.089	22.1	Bliss Triumph	1.075	19.1
American Wonder	1.088	21.9	Kasota.	1.075	19.1
Spaulding Rose.	1.088	21.9	Knik.	1.075	19.1
Sebago.	1.087	21.7	Pawnee.	1.075	19.1
Teton	1.087	21.7	Irish Cobbler	1.074	18.9
114.42-3-44	1.087	21.7	Cayuga.	1.073	18.7
Houma	1.085	21.2	Chippewa.	1.073	18.7
Early Ohio.	1.084	21.0	Chisago.	1.072	18.5
Menominee	1.083	20.8	Earlaine.	1.071	18.3
Sequoia	1.083	20.8	Marygold.	1.068	17.7
Katahdin.	1.082	20.6	Earlaine#2.	1.066	17.2

Significant difference for specific gravities at 5% point is 0.009

Table 8.-Specific gravity and total solids of potato varieties tested in 1950

Variety	Specific gravity	Total solids Percent	Continued		
Green Mountain.	1.097	23.8	Ontario.	1.083	20.8
Arctic Seedling	1.095	23.4	Placid.	1.083	20.8
Sebago.	1.095	23.4	Virgil	1.083	20.8
Columbia Russet	1.093	22.9	Alaska	1.082	20.6
Kennebec.	1.093	22.9	Fillmore	1.082	20.6
Spaulding Rose.	1.092	22.7	Ashworth	1.080	20.2
114.42-3-44	1.092	22.7	Norkota.	1.080	20.2
Katahdin.	1.090	22.3	Pawnee	1.080	20.2
Russet Rural.	1.090	22.3	Cherokee*.	1.079	20.0
Menominee	1.088	21.9	10.44-2-46	1.079	20.0
Teton	1.086	21.4	47.44-3-47	1.079	20.0
Houma	1.085	21.2	Chisago.	1.078	19.8
Knik.	1.085	21.2	Essex.	1.078	19.8
Chenango.	1.084	21.0	Mesaba	1.077	19.5
Empire.	1.084	21.0	Chippewa	1.076	19.3
La Salle.	1.084	21.0	Earlaine	1.074	18.9
Potomac	1.084	21.0			
Sequoia	1.084	21.0			
Snowdrift	1.084	21.0			
Calrose	1.083	20.8			

Significant difference for specific gravities at 5% point is 0.001

*Cherokee was grown as B-61-3 in 1950

Specific gravities 1951 - A value of 0.005 serves to differentiate between the specific gravity of varieties at the 5 per cent level of significance. By this standard no variety exceeded Arctic Seedling in specific gravity, whereas, 114.42-3-44 and all subsequently listed varieties were significantly lower.

Eleven of the 23 varieties under test had a specific gravity of 1.080 or better and would, therefore, be generally classified as belonging in the mealy category.

Table 9.-Specific gravity and total solids of potato varieties tested in 1951

Variety	Specific gravity	Total solids	Continued	Specific gravity	Total solids
		Per cent			Per cent
Arctic Seedling.	1.094	23.1	Snowdrift.	1.079	20.0
Green Mountain	1.091	22.5	Katahdin	1.077	19.5
Swiss.	1.091	22.5	10.44-2-46	1.077	19.5
114.42-3-44.	1.086	21.4	Knik	1.076	19.3
Rural New Yorker	1.085	21.2	Placid	1.076	19.3
Sebago	1.085	21.2	Sequoia.	1.076	19.3
Cherokee	1.084	21.0	Alaska	1.075	19.1
Teton.	1.084	21.0	Pawnee	1.075	19.1
La Salle	1.082	20.6	Ontario.	1.074	18.9
Kennebec	1.081	20.4	Marygold	1.073	18.7
47.44-3-47	1.080	20.2	Chippewa	1.072	18.5
Houma.	1.079	20.0			

Significant difference for specific gravities at 5% point is 0.005

Table 10 makes possible direct comparisons among eight varieties that were grown for four consecutive years of these tests.

From these data, it is evident that the specific gravity of all eight varieties averaged lower in 1948 than for any of the remaining three years. The reason for this is not definitely known, but the presence of considerable scab throughout the planting may have been a contributing factor. Otherwise there is remarkable uniformity among the specific gravities for each variety from year to year and in the average of all varieties for each year.

There were significant differences among the eight varieties in specific gravity each year but none of them was significantly better than Arctic Seedling in any given year.

Table 10.-Comparative specific gravities for eight potato varieties grown for four consecutive years

Variety	1948	1949	1950	1951	Average
Arctic Seedling.	1.064	1.092	1.095	1.094	1.086
114.42-3-44.	1.065	1.087	1.092	1.086	1.083
Alaska	1.066	1.094	1.082	1.075	1.079
Teton.	1.060	1.087	1.086	1.084	1.079
La Salle	1.061	1.079	1.084	1.082	1.077
Knik	1.057	1.075	1.085	1.076	1.073
Pawnee	1.057	1.075	1.080	1.075	1.072
Chippewa	1.054	1.073	1.076	1.072	1.069
Average.	1.061	1.083	1.086	1.081	---
L.S.D. at 5% point	0.008	0.009	0.002	0.005	---

EVALUATION OF PHYSICAL CHARACTERISTICS

After a variety has been introduced into a region, its ability to produce high yields is usually its most important single characteristic. However, before a variety can be considered worthy of introduction, various other characteristics must be evaluated and found to be satisfactory.

Table 11 gives a general evaluation of some of the more important physical characteristics of the varieties included in these tests.

In making these evaluations, a judging panel of two or more competent individuals voted independently on the value of each characteristic and assigned an appropriate rating. Thus each value shown in the table is the mean of at least eight independent evaluations made on field-run tubers just prior to the sizing, grading and specific gravity operations.

Average size - The ratings for average size (table 11) show the natural tendency of varieties to produce tubers of a given size when grown under identical conditions of culture. Thus some varieties show a natural tendency to produce over-size tubers under what might be considered standard methods of culture, whereas other varieties have a tendency to produce small tubers. Much can and has been done in the way of correcting such natural tendencies through differential spacing and special fertilizer practices and by other means, so these data also indicate the type of treatment that may be expected to correct a natural fault.

A rating of 3 indicates the most desirable size. Therefore varieties such as Kennebec with a rating of 4.13, Knik with a rating of 4.00, Ontario with 4.08 and Sequoia with a rating of 4.25 show a natural tendency to produce over-size tubers and will benefit from cultural methods tending to reduce tuber size. On the other hand, varieties such as Essex with a rating of 2.00 and Russet Burbank with a rating of 1.88 produce tubers that average too small to be acceptable commercially. It is doubtful if these particular two varieties can be made to produce high yields of tubers of acceptable size under Alaskan conditions. Other varieties, such as Early Ohio, Fillmore, Red Warba and Smooth Burbank all with ratings of about 2.25 can usually be made to produce tubers of acceptable size by proper cultural methods.

Eye depth - With certain varieties of potatoes, at least, eye depth was influenced more by Alaskan environmental factors than any other tuber characteristic. For example, eye depth on such old familiar varieties as Irish Cobbler, Bliss Triumph and Rural New Yorker was so greatly increased as to render them almost unrecognizable and totally unfit for commercial production. Five other varieties, Potomac, Red Warba, Cherokee, Kasota and Red Eyed Warba were even more seriously affected and were given ratings ranging from 4.50 to the maximum of 5.00.

Some other varieties retain their normal shallowness of eye. Thus, Norkota (1.00), Knik (1.56), Mohawk (1.75), Sebago (1.92) and Sel. 10.44-2-46 (1.92) were all given ratings of less than 2.00 and so were classified as being exceptionally smooth.

Growth cracks - Growth cracks did not appear to be a serious factor in these trials. Cherokee with a rating of 2.50 and Placid with a rating of 1.75 were the most seriously affected and with Menominee (1.25) and Seneca (1.25) were the only varieties given a rating of over 1.00 out of a possible rating of 5.00. Twelve varieties showed no evidence of growth cracking and with a majority of them it was not an important factor.

Shatter cracks - Shatter cracking, sometimes referred to as "digger cracking", varies greatly from variety to variety and apparently from year to year. In these tests it was not a serious factor. Among the commercial varieties, Bliss Triumph with a rating of 5.00 was by far the most seriously affected and cracked badly even with the most careful handling. Others that

Table 11.-Evaluation of physical characteristics

Variety	Average size	Eye depth	Growth cracks	Shatter cracks	General appearance
Alaska	3.50	3.56	0.06	0.81	2.62
American Wonder	3.00	4.00	----	----	3.62
Arctic Seedling	3.35	3.63	0.06	0.38	3.00
Ashworth	3.50	2.50	----	0.75	3.62
Bliss Triumph	3.00	4.00	----	5.00	3.87
Calrose	3.50	3.50	0.25	----	3.87
Cayuga	3.75	2.25	----	----	4.62
Chenango	2.75	2.75	----	0.50	3.12
Cherokee	3.13	4.63	2.50	0.88	3.78
Chippewa	3.49	3.00	0.06	0.69	2.45
Chisago	2.92	2.33	0.75	1.92	2.45
Columbia Russet	3.08	2.25	0.08	1.08	2.04
Earlaine	2.50	2.63	0.25	2.25	2.62
Earlaine #2	3.00	3.75	0.75	2.00	3.12
Early Ohio	2.25	3.50	0.50	0.88	3.50
Empire	3.25	3.00	----	----	3.37
Essex	2.00	3.00	0.25	2.75	3.62
Fillmore	2.25	3.75	0.25	0.25	3.62
Green Mountain	3.17	3.93	0.08	0.25	3.23
Houma	2.40	3.58	----	0.25	2.54
Irish Cobbler	3.00	4.25	0.12	2.38	4.00
Kasota	3.00	4.50	----	1.00	3.87
Katahdin	2.67	2.83	0.17	0.75	2.29
Kennebec	4.13	2.25	0.25	0.25	1.88
Knik	4.00	1.56	0.88	0.19	1.70
LaSalle	3.05	3.91	0.13	0.75	3.01
Marygold	3.75	2.50	0.13	0.75	2.28
Menominee	3.00	3.13	1.25	1.75	3.00
Mesaba	3.00	3.25	0.50	3.25	3.12
Mohawk	3.50	1.75	----	0.50	3.37
Norkota	2.75	1.00	----	0.25	2.37
Ontario	4.08	2.58	0.67	0.58	2.21
Pawnee	3.49	2.38	0.25	1.06	1.89
Placid	3.00	2.00	1.75	0.38	3.28
Pontiac	2.75	4.00	0.50	2.00	3.62
Potomac	3.25	5.00	0.25	----	4.62
Red Eyed Warba	2.50	4.50	----	2.00	4.12
Red Warba	2.25	5.00	----	3.00	3.87
Rural New Yorker	3.10	4.38	0.75	----	3.66
Russet Burbank	1.88	2.00	0.25	0.13	3.62
Russet Rural	3.42	3.67	----	0.17	2.79
Sebago	3.15	1.92	0.42	0.33	1.62
Seneca	3.00	3.50	1.25	1.00	2.87
Sequoia	4.25	2.83	0.58	0.50	3.06
Smooth Burbank	2.23	3.25	0.50	0.13	3.62
Snowdrift	2.35	2.63	----	----	2.66
Spaulding Rose	2.75	3.00	0.13	0.25	3.00
Swiss	2.95	3.75	----	0.25	3.16
Teton	3.05	2.81	0.06	1.06	2.14
Virgil	2.75	3.75	----	0.50	3.37

White Gold.	3.13	3.00	0.13	0.38	2.75
White Rose.	3.75	3.88	0.13	----	4.12
10.44-2-46.	3.67	1.92	----	0.42	1.73
47.44-3-47.	3.73	2.17	0.33	1.00	1.88
114.42-3-44	2.61	2.31	0.06	0.38	2.08

All ratings are based on a scale of 5 in which (except for "Average Size") "1" is best and "5" is poorest. For "Average Size", "1" is too small, "3" is best, and "5" is too large.

shattered rather seriously include: Mesaba (3.25), Red Warba (3.00), Essex (2.75), Irish Cobbler (2.38), Earline (2.25), Pontiac (2.00), Earline #2 (2.00) and Red Eyed Warba (2.00). Eight varieties showed no evidence of shatter cracking. A comparison of the shatter-crack ratings with specific gravity measurements indicates that, in general, cracking is inversely related to specific gravity.

General appearance - The ratings in the column titled "General appearance" represent an attempt to use a numerical rating as a measure of the attractiveness of the varieties under test. The ratings were made on field-run or un-graded, un-sized tubers in order that factors such as plot-yield, general size, eye depth, growth cracks and shatter cracking might be evaluated all together as they would appear to a prospective grower, buyer or consumer.

Using Arctic Seedling with a rating of 3 as a standard, it will be noted that varieties such as Sebago, Knik, 10.44-2-46, Kennebec, 47.44-3-47 and Pawnee with ratings of 1.62 to 1.89 were much more attractive in their overall appearance. On the other hand, Cayuga and Potomac were given almost maximum ratings of 4.62 for unattractiveness. Three other varieties, Red Eyed Warba, White Rose and Irish Cobbler were given ratings of 4.00 or over and hence were considered as being very unattractive, at least in the un-graded condition.

In general, the rating for general appearance is closely correlated with eye depth, indicating that the latter characteristic is highly influential in determining the attractiveness of a variety. But there are several noteworthy exceptions. Thus Cayuga had relatively shallow eyes but was too rough and deformed by secondary growth, and Russet Burbank was too small and too rough to be acceptable. Others such as Mesaba, Bliss Triumph, Essex, Irish Cobbler and Red Warba would have been discarded on the basis of shatter cracking regardless of eye depth.

SUMMARY

Screening tests were conducted during the years 1948-1951, inclusive, on 55 commercial varieties and 188 numbered selections. This bulletin reports the results on the commercial varieties and on 4 of the numbered seedlings which have since been introduced as varieties. One of the seedlings, 57.44-3-46, was introduced as the variety "Knik" and the other three were introduced under their original test numbers, 114.42-3-44, 47.44-3-47 and 10.44-2-46.

Results reported include: yields of U.S. No. 1, U.S. No. 2 and Gulls in bushels per acre; specific gravities and total solid matter content, and a numerical evaluation of such horticultural characteristics as average size, eye depth, growth cracking, shatter cracking and general appearance.

Comparisons are made directly with Arctic Seedling, the most commonly grown variety in Alaska, but provision is made for direct comparisons among all varieties grown in any particular year.

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