

1955 - 1956 RESULTS in NORTH DAKOTA

POTATO VARIETY Trials

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THE development of an early maturing potato variety with high yielding capacity, attractive appearance, good table quality, disease resistance and well adapted to produce under North Dakota conditions has been an important objective of the potato breeding program at North Dakota Agricultural Experiment Station.

At present, Red Pontiac, a medium late maturing variety, comprises approximately 80 percent of the potato production in the state. Essentially, it is a late crop variety and is usually marketed in the fall or after a period of storage. No suitable varieties are available for early harvesting and marketing as a mid-summer crop in this area.

A variety that would mature and yield well for profitable marketing as a midsummer crop to be used fresh, or for potato chips, would greatly strengthen the competitive position of the potato growers in North Dakota. Such a variety would necessarily have to be sufficiently mature by midsummer, or possess skin characteristics that would adapt it for mechanical harvesting with a minimum of skinning and bruising. The present high costs of produc-

tion, competitive marketing and often rapid price fluctuations could be more readily absorbed if the growers had a suitable early variety with which to extend their marketing season. Early maturity would also reduce frost damage, certain disease hazards, and the cost of vine killing.

During 1955 and 1956, early harvest potato variety trials were grown at Park River and Grand Forks by the horticulture department, North Dakota Agricultural College. Promising new North Dakota potato selections were evaluated as to early marketable yield, specific gravity, chipping quality, tuber size, tuber type and resistance to common scab, silver scurf, skinning and bruising. Comparisons were made with such standard varieties as Red Warba, Triumph, Irish Cobbler and Red Pontiac. The trials were planted as randomized, replicated blocks of 25 plants per variety row, with part of each trial harvested at each of three dates; Aug. 1, 15 and 29.

Marketable Yields

The average marketable yields for all varieties and selections obtained at each date of harvest are shown in table I. Two early maturing North

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TABLE I.—Early Harvest Potato Variety Trials.

Average marketable yield (1955 and 1956) in bushels per acre of varieties and selections grown at Park River¹ and Grand Forks², North Dakota.

Variety	Aug. 1 harvest mark. yield		Aug. 15 harvest mark. yield		Aug. 29 harvest mark. yield		Av. mark. yield during Aug.		Both locations Average mark. yield during August
	Park River	Grand Forks	Park River	Grand Forks	Park River	Grand Forks	Park River	Grand Forks	
N. D. 457-1-16	244	182	280	214	339	246	288	214	251
N. D. 2906-1R	215	186	286	196	324	238	275	207	241
Triumph	222	152	271	193	336	216	276	187	232
Red Pontiac	128	138	240	198	366	274	245	203	224
N. D. 457-1-10	192	152	242	192	323	220	252	188	220
Red Warba	222	158	247	158	300	212	256	176	216
Manota	217	119	264	159	310	198	264	159	212
N. D. 2555-12R	168	101	228	154	251	192	216	142	179
N. D. 2774-3R	141	80	184	117	213	146	179	114	146
Early Gem	136	48	176	117	248	150	187	105	146
Irish Cobbler ³	235	167	331	212	399	263	322	214	268
Waseca ⁴	179	153	251	167	309	201	246	174	210
Kennebec	135	100	190	136	283	184	203	140	172
Average	187	134	245	170	308	209	247	171	...
L.S.D. 5 percent . . .	48	34	48	34	48	34	...	...	...

¹Park River plots planted May 6, 1955 and May 10, 1956.

²Grand Forks plots planted May 5, 1955 and May 22, 1956.

³Varieties grown in trial 1956 only, when marketable yield was generally higher than in 1955.

⁴Variety grown in trial 1955 only.

Dakota selections, ND 457-1-16 and ND 2906-1R produced the highest average marketable yields when harvested at any time during August. Their yields were sufficiently high for growers to market profitably these varieties during early August.

The normally high yielding Red Pontiac did not outyield these early maturing varieties until the last harvest date on Aug. 29. Irish Cobbler, Triumph and Red Warba produced good yields at both locations. However, they were inferior in tuber type, size and percent U. S. No. 1 as compared with the advanced selections ND 457-1-16, ND 2906-1R and ND 457-1-10. Selection ND 2774-3R due to its low set and small size—Early Gem because of small size and growth cracks—and Waseca mainly due to its low set generally produced low yields in these trials. The Manota variety showed good tuber type and uniformity, with yields that compared very closely with those of Irish Cobbler. Selection ND 457-1-16 generally was

superior in early yields as compared with its very similar sister selection ND 457-1-10.

Marketable yields of all varieties and selections were much higher at Park River than at Grand Forks. The average differences at the Aug. 1, 15 and 29 dates of harvest were 53, 75 and 99 bushels per acre, respectively.

All lots of potatoes grown in these trials were sized using a Kerian potato sizer. At the first two harvest dates in 1955, ND 457-1-16, ND 457-1-10 and ND 2906-1R produced the highest percentage of tubers over 3 inches in diameter, which indicates their capacity to produce size early in the season. In 1956, most of the ND 2906-1R tubers were between 1 7/8 and 3 inches in diameter, while ND 457-1-10, ND 457-1-16 and Irish Cobbler produced the greatest percentage of tubers over 3 inches. The late maturing varieties such as Red Pontiac did not produce many tubers over 3 inches until the Aug. 29 harvest date.

Specific Gravity

Specific gravity is a convenient measure of the solid content of potato tubers. A high specific gravity is usually associated with mealiness and good eating quality. A high specific gravity also means a higher yield of a processed product such as potato chips.

A cool growing season in 1956 probably accounted for the higher specific gravity in all varieties and selections as compared with the 1955 growing season when higher temperatures prevailed. Specific gravity readings are shown in table II. Early maturing varieties and selections generally had a higher specific gravity than the late maturing ones at the Aug. 1 harvest date. In the period Aug. 1 to 15 all varieties showed marked increases in specific gravity. After Aug. 15, such early maturing varieties as ND 2906-1R, ND 2774-3R and Red Warba showed little or no further increase but all late maturing varieties produced increasingly higher specific gravity as the season advanced.

At all harvest dates, the specific gravity of ND 2774-3R, Red Warba, Cobbler, Manota, ND 457-1-10 and ND 457-1-16 was generally high. The lowest specific gravity occurred in the variety Early Gem, followed by Red Pontiac and ND 2906-1R. Although the average specific gravity of ND 2906-1R was only slightly higher than that of Red Pontiac, the difference was much greater at the Aug. 1 and 15 harvest dates.

Russet Scab and Silver Scurf

Observations were made on varietal response to russet scab and silver scurf and the development of these conditions over the period covered by the three harvest dates. Samples from each replicate and at each date of harvest were scored on a one to five basis. A score of five

indicated complete or almost complete freedom from scab or silver scurf. Thus the lowest score (out of 100) indicates the greatest susceptibility. The ratings appear in the last two columns of table II. Early Gem, ND 457-1-16, ND 457-1-10 showed the least scab in that order, while Red Pontiac was the most susceptible. Red Warba was the most resistant and ND 2774-3R was the most susceptible to silver scurf which is characterized by a serious loss of red pigment in red varieties. The severity of silver scurf increased as the season advanced.

Abrasion Tests

The abrasion tester attempts to measure the toughness of the potato by measuring the energy required to remove the skin. Pressure and impact tests gave no indication of any measure of maturity. The results of the abrasion tests for 1956 are given in figure. 1 and 2. Previous tests have indicated that a signifi-

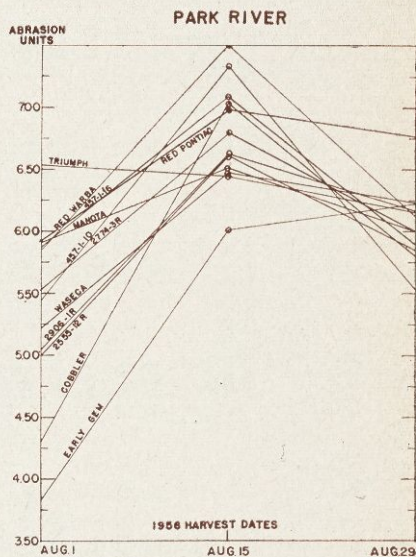


Figure 1.—The abrasion units of 11 varieties dug at three harvest dates at Grand Forks.

TABLE II.—Early Harvest Potato Variety Trials.

Two year average specific gravity, scab and silver scurf ratings of varieties and selections grown at Park River¹ and Grand Forks¹, North Dakota 1955 and 1956.

Variety	Aug. 1 harvest spec. gravity		Aug. 15 harvest spec. gravity		Aug. 29 harvest spec. gravity		Average spec. gravity during August		Both locations Average spec. gravity during Aug.		Scab ² rating	Silver ² Scurf rating
	Pk. Rvr.	G. Fks.	Pk. Rvr.	G. Fks.	Pk. Rvr.	G. Fks.	Pk. Rvr.	G. Fks.	Pk. Rvr.	G. Fks.		
N. D. 457-1-16.....	1.069	1.069	1.086	1.086	1.085	1.085	1.080	1.080	1.080	1.080	86.0	....
N. D. 2906-1R.....	1.066	1.069	1.077	1.078	1.074	1.075	1.072	1.074	1.073	1.073	75.0	80.0
Triumph.....	1.065	1.068	1.080	1.079	1.082	1.081	1.076	1.076	1.076	1.076	64.0	80.0
Red Pontiac.....	1.061	1.064	1.072	1.076	1.075	1.082	1.069	1.074	1.072	1.072	53.0	64.0
N. D. 457-1-10.....	1.072	1.070	1.084	1.085	1.084	1.083	1.080	1.079	1.080	1.080	75.0	....
Red Warba.....	1.072	1.071	1.086	1.086	1.086	1.085	1.081	1.081	1.081	1.081	68.0	86.0
Manota.....	1.071	1.070	1.088	1.089	1.086	1.088	1.082	1.082	1.082	1.082	63.0	....
N. D. 2555-12R....	1.071	1.074	1.079	1.086	1.080	1.083	1.077	1.081	1.079	1.079	64.0	61.0
N. D. 2774-3R....	1.074	1.076	1.084	1.086	1.084	1.084	1.081	1.082	1.082	1.082	68.0	44.0
Early Gem.....	1.063	1.060	1.074	1.074	1.075	1.074	1.071	1.069	1.070	1.070	94.0	....
Irish Cobbler ³	1.071	1.074	1.091	1.095	1.092	1.101	1.085	1.090	1.088	1.088	63.0	....
Waseca ³	1.069	1.068	1.084	1.087	1.086	1.091	1.080	1.083	1.082	1.082	66.0	78.0
Kennebec ⁴	1.066	1.062	1.079	1.072	1.077	1.084	1.076	1.070	1.073	1.073	....	....
Average.....	1.068	1.069	1.082	1.083	1.082	1.084	1.078	1.079	....	....	....	....
L.S.D. 5 percent...	.004	.004	.004	.004	.004	.004	.....	.....	.....	.....	.....	.....

¹Dates of planting at each location shown in table I.

²The highest rating indicates the most resistance (based on 100)

³Varieties grown in 1956 only, when specific gravity was generally higher than in 1955.

⁴Variety grown in 1955 only.

cant interaction takes place between location and variety, so the results of the two locations have not been combined. Referring to the graphs, it was expected that the readings would be higher for the later digging dates. At both locations, the readings on the Aug. 29 harvest are lower than the readings on the Aug. 15 harvest.

Previous tests have indicated that high soil moisture at harvest reduced the readings. The Aug. 29 harvest was accompanied with considerable rain at both locations, indicating that the moisture situation must be taken into account. The two graphs indicate a wide spread on the Aug. 1 harvest, a medium spread on the Aug. 15 harvest and a very close spread on the Aug. 29 harvest date.

If the magnitudes of the abrasion tests for each harvest date are disregarded, and only the differences at each harvest considered, it would appear that the abrasion tester was giving a good indication that the skin of some of the varieties was maturing considerably earlier than that of others. The skin of Triumph, Red Pontiac, Red Warba, 457-1-16 and Manota matured early at Park River and that of 2774-3R, Red Pontiac, 457-1-10, 457-1-16, Red Warba and Triumph matured early at Grand Forks.

The greater slope of the lines between harvest dates for some varieties also indicates that the skin maturity for a given variety probably takes place over a short period of time. At Grand Forks, for example, the skin of Red Pontiac, Red Warba, Waseca, Manota, 2906-1R and Early Gem matured more than that of the other varieties between the Aug. 1 and Aug. 15 dates. The Early Gem, however, continued to indicate skin maturity between the Aug. 15 and Aug. 29 dates.

This problem of using the abrasion tester for measuring maturity appears to be more complex than originally expected. Although the abrasion graphs do not show a general increase in readings as might be expected, they may give a true indication that, due to moisture conditions, the Aug. 15 harvest date is to be preferred for most of the varieties at Park River and for four of the varieties at Grand Forks.

Chipping Quality

Chips were prepared from sample lots of certain of the potato varieties from both locations in 1956. Three named varieties and five promising numbered selections were included in the tests. Only seven varieties from the Park River location were included from the first harvest in a nonreplicated test. All other sample lots consisted of three replications. Chips were prepared within two days after each harvest date. Additional sample lots from the Aug. 29 harvest were stored at approximate-

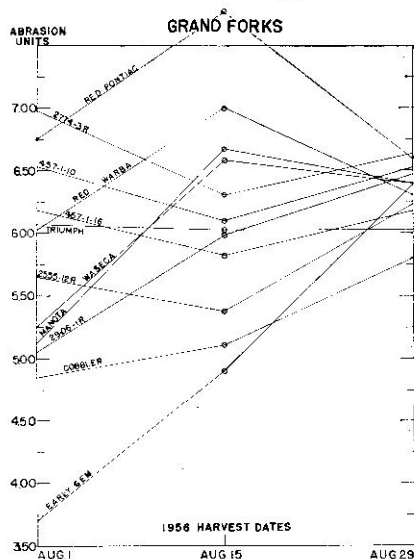


Figure 2.—The abrasion units of 11 varieties dug at three harvest dates at Park River.

TABLE III.—Color Ratings¹ of Chips Made From Eight Varieties of Potatoes Grown at Park River and Grand Forks, North Dakota, in 1956.

Variety	After harvest on						After storage and reconditioning ²		
	Aug. 1		Aug. 15		Aug. 29		March 20		
	Park River	Grand Forks	Park River	Grand Forks	Park River	Grand Forks	Park River	Grand Forks	
Early Gem.....	..	..	77	80	75	80	50	46
Irish Cobbler.....	55	..	73	71	78	75	69	67	
Manota.....	57	..	77	73	75	75	55	53	
N.D. 457-1-10.....	60	..	64	67	75	67	60	58	
N.D. 457-1-16.....	60	..	67	67	76	68	59	55	
N.D. 2555-12R.....	65	..	77	82	70	82	59	60	
N.D. 2774-3R.....	75	..	89	90	84	85	69	72	
N.D. 2906-1R.....	70	..	78	76	80	85	64	63	
L.S.D. at .05 level...	8	6	N.S.D.		8	6	7
L.S.D. at .01 level...	11	8	11	8	10

¹Scale of color ratings: Very dark brown, 50 or less; dark brown, 55 to 65; medium brown (lowest salable grade), 70; light brown, 75 to 85; cream (less attractive to most consumers, although not all), 90.

²Samples from only the Aug. 29 harvest were stored at approximately 40° F. until Feb. 26, then reconditioned for 3 weeks at 80°.

ly 40° F. until Feb. 26, then reconditioned 3 weeks at 80° prior to chipping on Mar. 20.

The chips were scored for color using an arbitrary scale. A score of 50 or less was recorded for chips that were very dark brown; 55 to 65 represented dark brown; 70 medium brown (lowest salable grade); 75 to 85, light brown; and 90, cream (less attractive to most consumers, although not all). Yields of chips were calculated as a percentage of peeled, raw, sliced potato weight and, therefore, are not comparable with commercial yield figures which are based on weight of unpeeled, unwashed potatoes.

The average color ratings of the chips of all sample lots are given in table III. The most striking results were obtained with selection ND 2774-3R, which consistently

yielded chips of the most attractive color. This selection and ND 2906-1R were the only varieties harvested Aug. 1 at Park River that made chips light enough in color to be considered salable. With the exception of two selections, all varieties and selections harvested Aug. 15 and Aug. 29 from both locations made chips of salable color.

Selections ND 457-1-10 and ND 457-1-16 harvested on Aug. 15 at both locations, and Aug. 29 at Grand Forks made undesirably dark colored chips. At the two later harvests, outstandingly attractive chips were made from selection ND 2774-3R followed by ND 2906-1R and Early Gem. Selection ND 2555-12R harvested Aug. 15 yielded attractive chips at both locations but, when harvested Aug. 29, only the sample lot from Grand Forks yielded attractive chips.

After storage and reconditioning of sample lots harvested Aug. 29*, none of the varieties from the Park River location and only ND 2774-3R from the Grand Forks location fried into chips of acceptable color. However, ND 2774-3R from the Park River location and Irish Cobbler from both locations approached the level of acceptability. Early Gem from both locations gave chips of undesirable dark color.

Yields of chips were generally

lower from the Aug. 1 harvest than the Aug. 15 and Aug. 29 harvests (table IV). Location did not appear to have any consistent effect in chip yields. Highest chip yields were usually obtained from Irish Cobbler and ND 2774-3R while the lowest yields were obtained from Early Gem and ND 2906-1R.

Further tests are needed to fully evaluate the new varieties and selections included in these tests.

TABLE IV.—Yields¹ of Chips Made From Eight Varieties of Potatoes Grown at Park River and Grand Forks, North Dakota, in 1956.

Variety	After harvest on						After storage and reconditioning ² March 20	
	Aug. 1		Aug. 15		Aug. 29		Park River	Grand Forks
	Park River	Grand Forks	Park River	Grand Forks	Park River	Grand Forks		
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Early Gem.....	.....	.....	31.6	31.8	30.5	31.7	31.0	30.9
Irish Cobbler.....	32.7	.....	34.7	34.8	32.7	36.5	35.8	36.2
Manota.....	31.3	.....	33.9	34.2	32.7	34.2	34.2	33.0
N.D. 457-1-10.....	33.1	.....	33.6	34.1	33.0	33.5	33.2	33.0
N.D. 457-1-16.....	30.6	.....	33.6	32.8	33.6	33.5	32.5	33.0
N.D. 2555-12R.....	31.9	.....	32.8	33.5	31.3	34.2	33.0	32.1
N.D. 2774-3R.....	31.3	.....	35.2	35.1	33.6	34.6	33.8	33.4
N.D. 2906-1R.....	32.6	.....	31.1	33.6	30.8	32.9	32.9	30.9
L.S.D. at .05 level...	.....	.....	2.5	1.2	1.9	1.5	1.9	2.3
L.S.D. at .01 level...	.....	.....	.....	1.6	.....	2.1	2.6	3.2

¹Calculated on the basis of weight of peeled potatoes and therefore not comparable with commercial yield figures, which are based on weight of unpeeled, unwashed potatoes.

²Samples from only the Aug. 29 harvest were stored at approximately 40° F. until Feb. 26, then reconditioned for 3 weeks at 80°.

*Commercial potatoes intended for potato chips following a period of storage and reconditioning would normally be harvested at least 2 to 3 weeks later and would be considerably more mature.