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EFFECT OF WHOLE AND CUT SEED ON STAND AND YIELD OF IRISH POTATOES

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Effect of Whole and Cut Seed on Stand and Yield of Irish Potatoes[1]

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It is generally recognized that seed-piece decay is frequently serious in the early-planted potato crop in Louisiana. Experiments made in other States indicate that small, whole tubers are usually less subject to decay than freshly-cut seed pieces. Because of this fact some growers in the early-producing areas of Louisiana are now using small, whole tubers for their earliest plantings.

No data are available as to whether better stands and higher yields would be obtained by the use of small, whole tubers as seed for later plantings in Louisiana. Therefore, experiments were made to study the relation of freshly-cut seed pieces, suberized seed pieces, and small, whole tubers to the stand and the yield of 4 varieties of Irish potatoes planted about the middle of February, or somewhat later.

METHODS AND MATERIALS

The experiments included four varieties, Katahdin, Chippewa, Sebago, and Triumph and were made in the spring of the years 1940 to 1943, inclusive, at Baton Rouge, Louisiana. The dates of planting each year were as follows: February 29, 1940, February 17, 1941, March 16, 1942, and February 13, 1943. The tubers of each variety were grown at the Federal Potato Station at Presque Isle, Maine each year and were kept in cold storage at Baton Rouge, Louisiana, until planting time. The tubers for planting whole were carefully selected for a weight of about 1½ ounces each, and tubers of about 6 ounces were selected for cutting into 1½-ounce seed pieces.

About a week prior to planting, half of the 6-ounce tubers of each variety were cut into quarters, so as to make pieces of about 1½ ounces. These cut pieces were carefully spread out for 7 to 10 days to allow suberization (healing) of the cut surfaces. At the time of planting, the remaining large tubers were quartered and planted immediately. Thus there were three different types of planting material, whole, suberized, and freshly cut.

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[1] Cooperative investigations by the Division of Fruit and Vegetable Crops and Diseases, Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, United States Department of Agriculture, and the Department of Horticulture of the Louisiana Agricultural Experiment Station.

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For the information of the technically-trained reader, the plots in each test were arranged as a split-plot design with the types of seed pieces allocated to the sub-effects. Five replications were used in 1940, 1941, and 1943, and only 4 replications in 1942. The plots were 40 hills in length and planted with 12-inch spacing. The data were analyzed by the analysis of variance.

It should not be concluded that one type of seed piece (hereafter designated as "treatment") results in a higher yield than another when only small differences exist between the yields. There is no way to determine relative yielding ability of any treatment with absolute accuracy. Difference in yield from adjacent plots may occur even when planted from the same seed lot and is due in most cases to differences in soil. This effect of soil differences on the estimation of yielding ability is overcome to a considerable extent by having a number of plots (replications) of each treatment in the test. Even with such replication, some of the differences may result from causes other than the treatments, and this part is said to be due to chance.

Methods of analysis of yield data are available to determine how large the difference must be between the yield from any two treatments for it to be considered a real difference. At the bottom of Table 3 is given the "differences required for significance" between the mean yields of any two treatments (types of seed pieces). For the yield of two treatments to be significantly different from each other the difference between the mean yields should be as great as or greater than the figures given at the bottom of Table 3. For example, compare yields from freshly-cut pieces and whole tubers where the difference is 33.1 bushels (184.2—151.1=33.1). This difference is more than the 11.7 bushels needed for statistical significance, which indicates that the yield is greater from the whole tubers because of the type of seed material used, and not merely because of chance variations.

EXPERIMENTAL DATA

Stands

The percentages for stands about 4 to 5 weeks after planting (early) are given in Table 1. From these data it appears that emergence was most rapid from freshly cut seed in 1940, but was more rapid from whole seed in 1941 to 1943, inclusive. In 1940, the reduction in percentage stand of whole tubers as compared with freshly-cut seed pieces of the Chippewa variety was not so great as it was with the other three varieties. As an average of the 4 years, however, stands of each variety about 4 weeks after planting were better from small, whole tubers than from freshly-cut seed pieces (Table 2). Thus plants from whole seed usually emerged sooner than from freshly-cut seed pieces.

TABLE 1. Stands in Percentages, About Four to Five Weeks After Planting (Early) and Prior to Harvest (at Harvest), Resulting from the Use of Three Types of Seed Pieces and for Four Varieties of Potatoes at Baton Rouge, Louisiana, in 1940-1943, Inclusive

Variety	Kind of seed piece	Dates and percentage stands							Average Stands (%)	
		Early				At Harvest				
		1940	1941	1942	1943	1940	1941	1943	Early	At Harvest
Sebago	Freshly cut	88	62	70	48	100	98	98	67	99
	Suberized	50	58	60	25	98	95	82	48	92
	Whole	58	80	85	55	98	100	98	70	99
Chippewa	Freshly cut	98	40	70	52	100	88	65	65	95
	Suberized	85	35	65	40	98	72	78	56	83
	Whole	88	82	75	68	100	100	100	78	100
Katahdin	Freshly cut	72	35	48	28	100	92	98	46	97
	Suberized	40	32	45	12	100	90	88	32	93
	Whole	40	75	80	32	100	98	100	57	99
Triumph	Freshly cut	95	50	82	40	100	98	98	67	99
	Suberized	68	65	80	30	98	100	95	61	98
	Whole	68	90	88	48	100	100	98	74	99

TABLE 2. Average Percentage Stands for Four Seasons, About Four Weeks After Planting and at Harvest, of Four Potato Varieties from Three Types of Seed Pieces, at Baton Rouge, Louisiana, 1940-1943, Inclusive

Variety	Type of seed piece and percentage stand		
	Freshly cut	Suberized	Whole
About 4 weeks after planting			
Sebago	67.0	48.2	69.5
Chippewa	65.0	56.2	78.2
Katahdin	45.8	32.2	56.8
Triumph	66.8	60.8	73.5
Average	61.1	49.4	69.5
At Harvest			
Sebago	98.6	91.6	98.6
Chippewa	95.3	82.6	100.0
Katahdin	96.6	92.6	99.3
Triumph	98.6	97.6	99.3
Average	97.3	91.2	99.3

From the data on percentage stands prior to harvest (at harvest) in Table 1 it appears that the number of plants produced from suberized seed is slightly below that from freshly-cut or whole seed (Tables 1 and 2). It would appear, that on the average, the freshly-cut seed was somewhat slower in germinating than were the whole tubers. The stands at harvest, as an average of the 4 seasons for each variety tested, obtained from freshly-cut seed and whole tubers are nearly the same. Of course, the important consideration in this respect is whether or not these stand differences are reflected in increased yields.

Yield of Primes

The yield of primes (No. 1 tubers) obtained for each variety from the 3 types of seed pieces for the years 1940-1943, inclusive, are presented in Table 3. In 1940, the suberized seed emerged more slowly than did the freshly cut seed (Table 1), but it resulted in higher yields of primes (Table 3). This was true with Sebago, Chippewa, and Triumph varie-

TABLE 3. Yields of Primes from Three Types of Seed Pieces and Four Varieties of Potatoes Grown at Baton Rouge, Louisiana, in 1940-1943, Inclusive

Kind of seed piece	Variety and average yield (bushels)				Average Yield†
	Sebago	Chippewa	Katahdin	Triumph	
			*1940**		
Freshly cut	181.6	184.8	181.1	144.3	172.9
Suberized	220.5	219.2	201.9	200.9	210.6
Whole	181.4	167.1	178.8	158.8	171.5
			*1941**		
Freshly cut	194.4	171.7	125.4	158.9	192.0
Suberized	192.3	184.4	233.4	150.5	197.2
Whole	230.6	220.2	268.6	180.1	233.2
			*1942**		
Freshly cut	170.6	203.8	153.4	129.3	164.3
Suberized	184.1	199.2	124.1	127.8	158.8
Whole	233.2	236.3	222.0	169.2	215.2
			*1943**		
Freshly cut	145.0	90.9	120.0	62.1	104.5
Suberized	173.5	117.5	126.6	97.5	128.8
Whole	169.9	108.2	133.4	89.9	125.3

	1940	1941	1942	1943
*Diff. req. for sig. between seed pieces within a variety.	24.1	30.8	21.6	16.9
†Diff. req. for sig. between seed pieces as an average of 4 varieties.	12.0	15.4	10.8	8.4

ties, but with Katahdin the difference in yield between these 2 types of seed pieces was not statistically significant. Generally speaking, the yield from suberized seed as compared with freshly-cut seed is significantly higher when considered as an average of all varieties and seasons (Table 4).

A comparison of whole tubers with freshly-cut seed for all varieties and years (Table 3) shows that whole seed significantly outyielded freshly-cut seed 10 times out of 16, whereas in the other 6 experiments the difference in yield did not reach the level of significance. Table 4 shows that, as an average of all the tests, the yield from whole tubers is significantly greater than that from either freshly-cut or suberized seed potatoes. The increase in yield from whole tubers as compared with that from freshly-cut or suberized seed pieces is probably due to faster sprouting of the whole tubers and the protection afforded from the attack of seed-piece-decaying organisms.

TABLE 4. AVERAGE YIELDS OF POTATOES FROM THE USE OF THREE TYPES OF SEED PIECES AS AN AVERAGE OF FOUR SEASONS AT BATON ROUGE, LOUISIANA

VARIETY	KIND OF SEED PIECES AND YIELD (BUSHELS)		
	Freshly cut	Suberized	Whole
Sebago	172.9	192.6	203.8
Chippewa	162.8	180.1	183.0
Katahdin	145.0	171.5	200.7
Triumph	123.6	144.2	149.5
AVERAGE*	151.1	172.1	184.2

*Diff. req. for significance = 11.7 bu.

In the case of Triumph, which is the red-skinned variety raised in the early-crop sections of Louisiana, the yield was 149.5 bushels from whole tubers and only 123.6 bushels from freshly-cut seed, as an average of the 4 years (Table 4). Likewise, the yield from whole seed of Katahdin, which is the principal white-skinned variety in Louisiana, was 200.7 bushels, as compared with 145.0 bushels from freshly-cut seed.

SUBERIZATION OF SEED PIECES

Suberization (healing) is favored by slow rather than rapid drying of the cut surfaces of seed pieces. This is best accomplished by the storage of cut seed pieces in an environment of relatively high humidity and moderated temperature for about a week. It has been found that the most favorable humidity is between 85 and 90 per cent of saturation. The humidity can be maintained by keeping wet sacks over the crates of seed pieces. A temperature of 60° to 65° F. is best for proper healing. Care should be taken to insure that the temperature does not greatly exceed 65° F. as rotting of the seed pieces may occur.

The freshly-cut seed pieces should be put into slatted crates. After the seed pieces have stood for about 24 hours from cutting, they should be poured from one crate to another to break apart the pieces sticking together.

Suberization is not recommended unless it can be properly carried out, since partial suberization is not beneficial. Few growers will have ideal conditions for application of this procedure. Therefore, with no experience in healing seed, it is recommended that a small lot of seed be tried at first.

GENERAL CONSIDERATIONS

The fact that the yield from whole seed is equal to or higher than that from freshly-cut seed pieces represents a profit to the owner. In addition, the labor required to cut seed pieces is eliminated by the use of such tubers. With continued scarcity of experienced labor the elimination of the cutting operation can become an important factor in potato production.

U. S. No. 1 B tubers (size $1\frac{1}{2}$ to 2 inches) would be very satisfactory for planting without cutting. Quotations for U. S. No. 1 B range from 10 to 20 cents less than U. S. No. 1 (size $1\frac{7}{8}$ inches and larger). The County Agricultural Agent can assist in securing certified seed of this type.

Because the Katahdin variety has so few eyes, a loss of 20 to 30 per cent may result in cutting. It is apparent, therefore, that a sack of U. S. No. 1 B tubers probably would plant a greater amount of land than would a sack of U. S. No. 1 tubers. Thus a saving could be effected by the use of small, whole tubers instead of using cut seed pieces made from U. S. No. 1 tubers. This in addition to the elimination of cost of cutting would represent a considerable saving.

A different situation may exist with the use of small tubers of the Triumph variety. This potato has many eyes and usually no loss results in cutting. Hence a sack of U. S. No. 1 tubers may plant a somewhat larger area than a sack of U. S. 1 B. However, in this case, as with Katahdin, the cost of cutting would be eliminated and would represent a small saving in cost of production.

SUMMARY

Yield tests were made with 4 varieties of Irish potatoes using freshly-cut seed pieces, suberized seed pieces, and small, whole tubers at Baton Rouge, Louisiana, from 1940 to 1943, inclusive.

As an average of the 4 years and 4 varieties, stands 4 to 5 weeks after planting were better from small, whole tubers than from freshly-cut seed pieces or from suberized seed pieces. Likewise, the yield of prime potatoes, on the average, was greater from whole tubers than from either freshly-cut seed pieces or suberized seed pieces. The yield from suberized seed pieces was generally greater than that from freshly-cut pieces.