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Selection and Preparation of Seed Potatoes in the Season of 1912

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AGRICULTURAL EXPERIMENT
STATION

South Dakota
State College of Agriculture
and Mechanic Arts

SELECTION AND PREPARATION OF
SEED POTATOES IN THE
SEASON OF 1912

By A. N. HUME, Agronomist and SuperIntendent of Substations, and
MANLEY CHAMPLIN, Assistant Agronomist and Collaborator,

BROOKINGS, SOUTH DAKOTA

SUMMARY OF BULLETIN 140

1. The potato crop is capable of furnishing enormous amounts of food and energy, and is especially adapted to growing under South Dakota conditions. Page 20.

2. In eastern South Dakota the yield from "large" seed tubers cut into four seed pieces each in one instance was 28 per cent greater than the yield from "small" tubers also cut into four seed pieces each. In another instance it was 20 per cent greater. Page 25.

3. The reasons for these differences will be discussed in another bulletin. Page 26.

4. Such seed will not only yield more in bushels per acre but also larger potatoes. Page 31.

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SELECTION OF SEED POTATOES IN SOUTH DAKOTA

By A. N. Hume, Agronomist and Manley Champlin,
Assistant Agronomist

At the time of writing the present bulletin, the market price of potatoes is so low, throughout the country, that the money received by farmers from potatoes in South Dakota does not pay their expense of production. It is assumed that this condition is an unusual one and that higher prices for the tubers will prevail.

Moreover, the importance of the potato may be argued from broad economic and crop production standpoints. The facts that potatoes make satisfactory yields, even in seasons of not very abundant rain, that they help to conserve moisture for following crops, that they leave the seed bed in good condition for grain crops in rotations, and that the potato crop is capable of making available to the human race enormous numbers of foot-pounds of energy, must make it ever a crop worth thinking about.

This bulletin gives some results of potato seed-selection for the single season of 1912 at Brookings. The experiment here discussed practically resolves itself into a comparison of yields from two kinds of potato seed pieces, (1) Large pieces from large tubers and (2) Small pieces from small tubers.

It is believed that a large number of potato growers use "culls" for seed potatoes. The experiment here reported, was an attempt to secure some data upon the question whether it would pay better to use large seed tubers, cut into the same number of seed pieces. The comparison is between two general practical methods of potato planting, and obviously leaves many problems for settlement later.

The bulletin is, therefore, a report of progress rather than a final report. Very briefly the experiment outlined in this bulletin was conducted on a plot of ground 66 feet by 194 feet in size. The number of rows included in the experiment was eighteen. The seed potatoes used in plant-

ing the entire patch were of the Early Ohio variety. The first row of the patch, beginning with the west was planted with "small" seed and the alternate, or odd numbered rows therefrom throughout the entire patch were planted with this same "small" seed. The even numbered rows were all planted with "large" seed.

The lots of "large" and "small" seed were selected as follows: All small and very irregular tubers were selected out of the total bulk of seed potatoes used in planting the patch. Thus there were left the larger, better formed tubers in the lot called "large." All tubers in the original amount of seed were used for planting, either as "large" or "small" seed, so there were no intermediate, discarded tubers.

After making this simple assortment of all seed tubers used, into two lots, it was ascertained that in case of the large tubers, 39 of them weighed 14 pounds. Therefore, the average size of the large seed tubers used was 5.7 ounces. Of the small seed tubers 89 of them weighed 17.5 pounds, the average weight of the tubers being thus 3.1 ounces.

The average weight of the large tubers was to the average weight of the small tubers as 5.7 ounces is to 3.1 ounces.

Before cutting these two lots of tubers into seed pieces they were all treated with a solution of concentrated formaldehyde. This solution was made by putting one pound of "formalin" into 40 gallons of water for rendering them free from scab. After treating, the tubers were cut into seed pieces, either immediately or the following day when they were planted. In nearly all cases the seed tubers were cut each into four seed-pieces, the exception to this rule being in the case of very small tubers which were cut only into halves. Thus it is fair to estimate the size of *large seed pieces as 1.4 ounces and of small seed pieces as 0.8 ounces.*

In the following plates is given a comparison of large and small seed tubers, the tubers selected for photographing having been, as nearly as might be, typical.

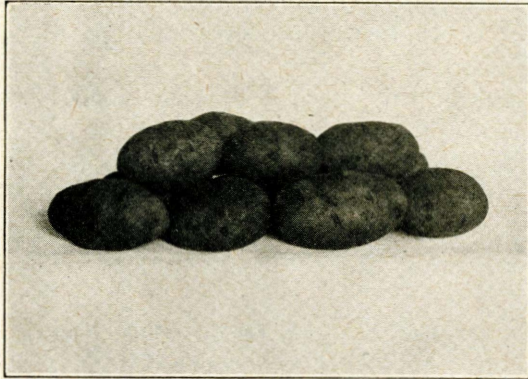


PLATE I.

“Large” seed tubers used in planting even numbered rows, averaging 5.7 ounces.

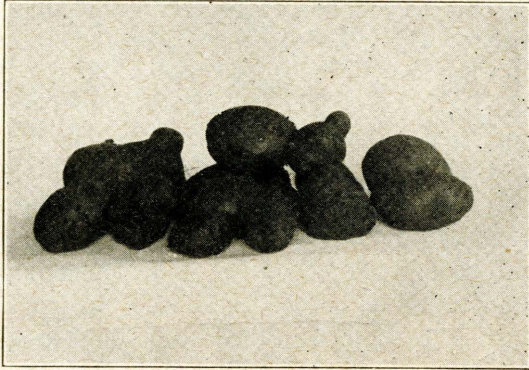


PLATE II.

Small seed tubers used in planting odd numbered rows, averaging 3.1 ounces.

The amount of seed per acre used in the patch, as an average was 13.9 bushels per acre. The seed pieces were put in, one foot apart in the row. Obviously the total weight of seed used per unit area was greater, where "large" seed was planted; this being true because the same number of seed pieces was employed in each case.

The following is a schematic diagram of the rows included in the present experiment. In the diagram of rows is also noted the kind of seed pieces employed and the yield. The yield in each case is reduced to bushels of tubers per acre.

Row 1, small seed. Yield, 127 lbs.—132.3 bushels per acre.
 Row 2, large seed. Yield, 160 lbs.—166.7 bushels per acre.
 Row 3, small seed. Yield, 131 lbs.—136.5 bushels per acre.
 Row 4, large seed. Yield, 173 lbs.—180.2 bushels per acre.
 Row 5, small seed. Yield, 131 lbs.—136.5 bushels per acre.
 Row 6, large seed. Yield, 171 lbs.—178.1 bushels per acre.
 Row 7, small seed. Yield, 129 lbs.—134.4 bushels per acre.
 Row 8, large seed. Yield, 181 lbs.—188.6 bushels per acre.
 Row 9, small seed. Yield, 138 lbs.—143.7 bushels per acre.
 Row 10, large seed. Yield, 187 lbs.—194.8 bushels per acre.
 Row 11, small seed. Yield, 138 lbs.—143.7 bushels per acre.
 Row 12, large seed. Yield, 168 lbs.—175.0 bushels per acre.
 Row 13, small seed. Yield, 150 lbs.—156.3 bushels per acre.
 Row 14, large seed. Yield, 175 lbs.—182.3 bushels per acre.
 Row 15, small seed—Not weighed.
 Row 16, large seed. Yield, 158 lbs.—164.6 bushels per acre.
 Row 17, small seed. Yield, 139 lbs.—144.8 bushels per acre.
 Row 18, large seed. Yield, 187 lbs.—194.7 bushels per acre

E

Average yield of rows from large seed—173 lbs.—180.2 bushels per acre.

Average yield of rows from small seed—135 lbs.—140.6 bushels per acre.

Average difference in favor of large seed, 38 lbs.—39.6 bushels. per acre.

Gain in favor of large seed, using yield of small seed as a base, 28 per cent.

From the figures above, it may be seen that in the case of all rows weighed, the ones planted with "large" seed without exception outyielded the rows next to them, which were planted with small seed. *The average yield of rows planted with large seed was 180 bushels per acre.*

and of rows from small seed 141 bushels per acre. This was an average increase of 28.0 per cent in yield from large seed cut into four seed pieces over small seed cut into the same number of seed-pieces, using the yield from small seed as a base.

This result is the one which would have been anticipated by anyone who made observations upon the potato rows during the growing season. *Planted May 11, 1912, as early as June 26th, it was observed that the rows from large seed were making a more uniform and more rapid growth.* This apparent difference in favor of the rows from large seed continued throughout the entire season, until the vines matured. The maturity of the vines was complete before the date of the first killing frost. In this particular matter of seed-tuber-selection, results of further experiment are to be cited.

The following experiment was carried out on plots No. 766 and No. 769 of West Farm, Brookings, likewise, in the season of 1912. On each of these several plots, three different varieties of potatoes were planted. Only the Early Ohio variety was planted in part with selected and in part with unselected seed. The comparative results of these divisions of the plots that were planted with selected and unselected seed are here of interest. They are arranged in the following table:

**Comparative Yields from "Large" and "Small" Seed Tubers
(West Farm, Brookings, 1912)**

Plot No.	Yield in bu. per acre		Difference in favor of "large" seed
	Large Seed	Small Seed	
766	166.7	118.3	48.4
767	158.3	145.0	13.3
768	170.0	148.3	21.7
769	173.3	143.3	30.0
Average	167.1	138.7	Bushels Per Acre 28.3

From the results here tabulated it is readily seen that well selected seed tubers, yielded as an average of four trials, 28.3 bushels per acre, more than small inferior seed, under otherwise identical conditions. Considering the yield from small tubers as a base, this is an increase in favor of well selected seed of 20.4 per cent. This result

corresponds with the results reported on page 24. Both experiments emphasize the advantage of good sized seed tubers, cut into good sized seed-pieces as compared with tubers cut into small seed-pieces.

Moreover this result of a single season's work under eastern South Dakota conditions is in accord with similar conclusions arrived at elsewhere in other states. The

Array of Weights of Individual Potato Tubers of the Product of "Small Seed". These were From Rows #11 and #13. Tubers Weighing Four Ounces Were of the Greatest Frequency in This Array.

Weight of tubers in ounces	Tally marks indicate frequency of occurrence																				Frequency to Half ounces	Frequency to even ounces
1.0																					92	122
1.5																					30	
2.0																					96	146
2.5																					50	
3.0																					89	151
3.5																					62	
4.0																					84	164
4.5																					80	
5.0																					75	122
5.5																					47	
6.0																					66	94
6.5																					28	
7.0																					36	59
7.5																					23	
8.0																					32	58
8.5																					26	
9.0																					16	20
9.5																					4	
10.0																					7	12
10.5																					5	
11.0																					6	14
11.5																					8	
12.0																					1	3
12.5																					2	

number of experiments comparing results with large and small seed potatoes has been great and in nearly all the yields from "large" seed have been greater than yields from "small" seed. The reason for this uniform dif-

ference in favor of large seed may be the subject of a later South Dakota bulletin. Evidently in the present experiment the higher yield from large seed tubers may have been due in part to the size and in part to the heredity of the seed tubers.

Suffice it to say here, that for the practical potato-grower, under the conditions of this experiment, the selection and use of only good sized seed tubers would prove more profitable than the use of "culls", cut into the same number of pieces.

One or two other questions aside from comparative yield are of interest. One such question is: *Will the average size of potato tubers grown from these large seed tubers, be larger than the size of tubers grown from the small seed tubers?* Another: *Will there be a greater proportion of large potatoes in the product raised from these large seed-pieces than in that from the small ones?*

The only means by which one may arrive at the separate weight of potato tubers or of other objects, is to weigh a great number of the individual objects separately, and record the weights in a systematic way. Having taken separate weights of a sufficient number of individuals, one may not only compute their total weight, and thence their average weight, but may also compute the per cent of the entire number that possess any given weight.

In the case of the potato crop in question, the writers first selected 1107 tubers from the crop grown in rows No. 11 and No. 13. It will be noted that these two were odd-numbered rows, the product of "small" seed. Each separate one of the 1107 tubers from these two rows was weighed. Ordinary poultry scales were used for weighing the individual tubers. It is further recognized after tabulating the present weights that "smoother" results would be secured by employing more sensitive balances. The numbers of tubers weighed in each case, however, make it probable that the ultimate results are accurate. Immediately upon weighing the several tubers, their weights were "arrayed" together systematically as may be seen in

the following diagram. In the diagram the weights of 154 extremely small tubers each weighing 0.5 ounces or less are not tabulated. Also four extremely large ones,

Array of Weights of Individual Potato Tubers, the Product of "Large" Seed. These Were From Rows "12 and #14. Tubers Weighing Four Ounces Were of the "Greatest Frequency".

Weights of tubers in ounces	Tally marks indicating frequency of occurrence of tubers of weight indicated.																Frequency to half ounces	Frequency to even ounces
1.0																	50	71
1.5																	21	
2.0																	90	141
2.5																	51	
3.0																	84	162
3.5																	78	
4.0																	110	169
4.5																	59	
5.0																	68	91
5.5																	23	
6.0																	66	84
6.5																	18	
7.0																	30	60
7.5																	30	
8.0																	27	42
8.5																	15	
9.0																	8	9
9.5																	1	
10.0																	12	16
10.5																	4	
11.0																	7	10
11.5																	3	
12.0																	8	9
12.5																	1	

each weighing more than 14 ounces are not tabulated. These tubers were, however, accounted in making computations.

After completing the weighing of the 1107 tubers produced from "small" seed, 968 tubers that had been produced from "large" seed were weighed and tabulated in a similar manner. The latter tabulation is as follows, omitting from the "array" 97 tubers weighing 0.5 ounces or less and also 7 tubers each weighing more than 12.5 ounces. All tubers weighed however were included in making computations.

Using the figures arrived at in these two arrays, one may secure comparisons which will answer questions proposed.

From the array of weights from rows No. 11 and No. 13, grown from "small seed", one may compute the total and therefrom the average weight of tubers.

Total and Average Weight of Tubers Produced from "Small" Seed

Weight of tubers ounces	Number of tubers of weight given	Total weight of tubers of weight given (ozs.)
0.5	134	67.0
1.0	92	92.0
1.5	30	45.0
2.0	96	192.0
2.5	50	125.0
3.0	89	267.0
3.5	62	217.0
4.0	84	336.0
4.5	80	360.0
5.0	75	375.0
5.5	47	258.5
6.0	66	396.0
6.5	28	182.0
7.0	36	252.0
7.5	23	172.5
8.0	32	256.0
8.5	26	221.0
9.0	16	144.0
9.5	4	38.0
10.0	7	70.0
10.5	5	52.5
11.0	6	66.0
11.5	8	92.0
12.0	1	12.0
12.5	2	25.0
13.0	1	13.0
13.5	1	13.5
14.0	2	28.0
16.0	1	16.0
17.5	1	17.5
20.0	1	20.0
23.0	1	23.0
Total	1107	4444.5
Average weight of 1107 tubers		4.01

In the following table also are arrayed the results of weighing 968 tubers from rows No. 12 and No. 14. These even numbered rows grew from "large" seed.

**Total and Average Weights of Tubers Produced from
"Large" Seed**

Weight of tubers ounces	Number of tubers of weight given	Total weight of tubers of weight given
0.5	97	48.5 ozs.
1.0	50	50.0
1.5	21	31.5
2.0	90	180.0
2.5	51	65.5
3.0	84	252.0
3.5	78	273.0
4.0	110	440.0
4.5	59	265.5
5.0	68	340.0
5.5	23	126.5
6.0	66	396.0
6.5	18	117.0
7.0	30	210.0
7.5	30	225.0
8.0	27	216.0
8.5	15	127.5
9.0	8	72.0
9.5	1	9.5
10.0	12	120.0
10.5	4	42.0
11.0	7	77.0
11.5	3	34.5
12.0	8	96.0
12.5	1	12.5
13.0	3	39.0
13.5	1	13.5
15.0	2	30.0
16.0	1	16.0
Total	968	926.0

Average weight of 968 tubers4.06 oz.

Making comparison of these average weights of tubers from "large" seed and from "small" seed we have:
 Average weight of 968 tubers from large seed, 4.06 ounces
 Average weight of 1107 tubers from small seed, 4.01 ounces
 Average difference in favor of large seed, - 0.05 ounces

It would be expected that whatever difference might appear in the size of tubers resulting from difference in

size of seed tubers, would appear very slight, when reduced to the average per tuber. The difference here is, however, appreciable, even when thus reduced. As an average in tubers, the product of "large" seed and consequent large seed pieces are 0.05 ounces heavier than tubers produced from "small" seed and consequent small seed pieces. *This is a difference of one per cent in favor of "large" seed.*

It is not only interesting to know whether the average size of tubers composing a crop, is to be increased by proper seed selection but also whether the proportion of good sized marketable potatoes in the resulting crop will be increased by such selection.

A very desirable size of potato tuber for use or for market is one weighing four ounces. It is less desirable that tubers be smaller than this size than that they be larger.

By examining the array of weights of tubers from rows No. 11 and No. 13 (p. 29) it may be found that out of the total of 1107 tubers weighed, 554 of them weigh four ounces or more. This amounts to 50.0 per cent.

A similar computation for tubers weighed from rows No. 12 and No. 14 (see p. 30), gives 51.3 per cent. This is a difference of 1.3 per cent as compared with the previous rows. One may say this practically. *The yield of potatoes from large selected seed cut into large seed-pieces was not only greater in bushels per acre, but contained 1.3 per cent more of sizeable tubers than the yield from unselected seed and smaller seed-pieces.*

THE TYPE

One may note by consulting the array of weights of tubers, and referring to the last column in each array that in even ounces the greatest number of both kinds of tubers possess a weight of four ounces. A four ounce tuber is therefore the "natural type" of the crop, a type in fact which is very suitable for use and desirable for sale. In any markets uniform four-ounce tubers will be more readily accepted than either smaller or larger sizes.

In the weights from rows No. 11 and No. 13 which grew from small seed, one may observe that out of a total of 1107 tubers, 164, or 14.8 *per cent.* *adhere to the "natural type."* In rows No. 12 and No. 14, grown from large seed, a total of 968 tubers showed 169, or 17.5 *per cent* *belonging to the natural type.* This may mean simply that the percentage number of tubers from good seed cut into large seed-pieces attaining a weight of as much as four ounces is 2.7 units greater than the percentage of tubers grown from small seed cut into small seed-pieces attaining that weight.

