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SEEDPIECE SIZE *Key to Maximum Potato Yield and Profit*

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Performance of seed as affected by seedpiece size is a basic factor governing potato yields and profits.

A survey conducted in 1970 revealed that most potato growers in Idaho are suffering potential yield losses averaging 50 to 60 cwt. per acre directly as a result of planting undersized seedpieces.

Seed Size Affects Yield

Both research and field observations have demonstrated clearly that the yield potential of a seedpiece is greatly influenced by its size (Fig. 1). Larger seedpieces tend to produce more stems per hill than small seedpieces. In addition, large seedpieces contain more food material, enabling them to support more vigorous stems. Thus, larger seedpieces have a greater potential for producing high yields of quality potatoes. However, since larger seedpieces produce more stems, there may be a greater tendency for smaller tubers to be produced. This tendency, if undesirable, can be largely avoided by employing such practices as earlier planting, wider drop spacing, higher rates of fertilization, and improved irrigation.

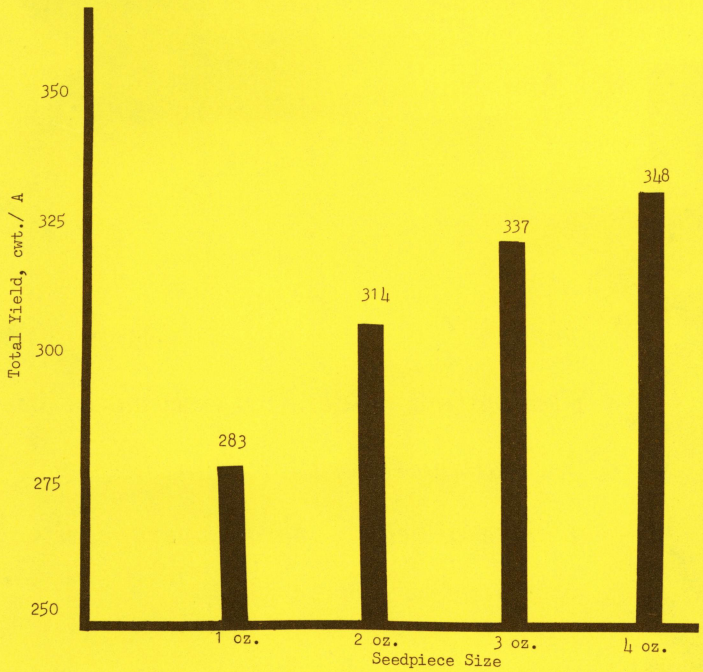

Fig. 1. Effect of seedpiece size on yield in Idaho.

Row and drop spacing (plant population) also influence both total yield and size of tubers produced. The trick is to get the right combination of seedpiece size, plant population, planting date, soil fertility, etc., to produce maximum yields of the desired tuber size.

Poor stands have been identified as one of the factors most limiting to potato yields in Idaho. Stand is influenced by seedpiece size. Undersized seedpieces are more likely to decay or to produce only a weak plant that eventually dies or fails to produce marketable tubers. Seedpieces either too small or too large can result in frequent planter errors.

Research at the Aberdeen Branch Experiment Station illustrates the effect that soil fertility (Table 1) and planting date (Table 2) have on the performance of various seedpiece sizes. Assuming other factors are not limiting yield, early planting date and high (but not excessive) soil fertility levels are required to realize the maximum yield potential of larger seedpieces.

Table 1. Effect of soil fertility level on performance of seedpieces

Fertility level	Yield in cwt./acre of seedpieces weighing			
	1 oz.	2 oz.	3 oz.	4 oz.
Low	290	313	340	341
High	348	384	394	407

Table 2. Effect of planting date on performance of seedpieces

Planting date	Yield in cwt./acre of seedpieces weighing			
	1 oz.	2 oz.	3 oz.	4 oz.
Early I—May 15	310	326	351	---
Late I—May 21	278	310	314	---
Early II—May 22	348	384	394	407
Late II—June 3	327	367	380	395

For years, the University of Idaho has recommended planting seed weighing 1½ to 2 oz. Field trials conducted in Washington have led to a similar recommendation for that area. In the Columbia Basin, the yield level of seedpieces weighing less than 1½ oz. averaged only 66% of that obtained with seedpieces weighing over 1½ oz.*

Seedpiece Size Survey Results

In the Idaho survey, 32 seed-cutting operations were evaluated for their efficiency in producing the recommended seedpiece sizes (1½ to 2 oz.). A 12 lb. sample of cut seed was collected from each seed cutter and analyzed to determine average seedpiece size, proportion of seedpieces in various size categories, and percentage of uncut (single drop) seed. The size of seed tubers going into the cutter was noted as well as other pertinent aspects of the cutting operation (speed and volume of seed flow, number and skill of those working on the cutter, etc.). This survey made it possible to pinpoint where improvements could be made in the cutting operation.

The average **unsorted** seedpiece size for all 32 samples was 1.55 oz. However, slightly over 50% of the **sorted** seedpieces weighed less than 1½ oz. Even more alarming, some 22% of the seedpieces weighed less than 1 oz. The average seedpiece size produced by the best cutting operation was 2.04 oz. with 26% of the seedpieces weighing less than 1½ oz. and only 8 to 10% weighing less than 1 oz. On the other hand, in the poorest cutting job, 77.7% of the seedpieces weighed less than 1½ oz. with over 40% weighing less than 1 oz. Average seedpiece size was only 1.17 oz.

How about hand-cutting operations? Hand-cutting did not appear to offer any definite advantage as far as seedpiece size alone was concerned. Certainly hand-cutting produced far less wastage, but the average seedpiece size was 1.51 oz. and slightly over 50% of the seedpieces weighed less than 1½ oz. Samples from hand-cutting operations were also characterized by fewer chips and slivers, a lower percentage of seedpieces weighing less than 1 oz., and a smaller percentage of single drops.

Increase Average Size

We would prefer that no more than 20 to 25% of seedpieces weigh less than 1½ oz. In 24 of the 32 cutting jobs surveyed, the average seedpiece size was less than 1¾ oz. In 20 of the 24, almost 60% of the seedpieces weighed less than 1½ oz. However, in cutting jobs producing an average seedpiece size of 1¾ oz. or larger, an average of only 34.4% of the seedpieces weighed less than 1½ oz. Increasing the average seedpiece size, then, will help to minimize the proportion of seedpieces weighing less than 1½ oz.

Therefore, growers should strive for an average seedpiece size of at least 1¾ oz., with no more than 20 to 25% of the seedpieces weighing less than 1½ oz.

Eliminating undersized seedpieces produced in the cutting operation is the most effective way to increase seedpiece size. In addition, most modern mechanical seed cutters possess several adjusting points that influence seedpiece size. However, even the best cutters presently available may have difficulty in satisfactorily cutting seed that has a wide range of tuber sizes and shapes.

*8th Annual Washington State Potato Conference Proceedings

Eliminating undersized seedpieces in the cutting operation will help you achieve a better overall overage size.

While undersized seedpieces have inferior yield potential, oversized seedpieces may create problems in the planting operation. Such seedpieces should be recut on the hand knives.

In the jobs surveyed, too many single drop tubers were being cut and too many slab-shaped seedpieces recut. This accounted for a large proportion of the seedpieces weighing less than 1½ oz. If a 3 oz. seed tuber or seedpiece is cut, about half of the resulting seedpieces will weigh less than 1½ oz. since the tuber will seldom be cut exactly in half. Many crews on the hand knives misjudged the actual size of slab-shaped seedpieces. While these seedpieces look large, they are often too thin to weigh up and do not contain adequate food reserves to support optimum growth. Large cut surfaces on such seedpieces are slower to heal and more likely to be attacked by rot organisms in the soil.

The length and adjustment of the single drop eliminator on the cutter are important for reducing the number of single drop tubers that go through the cutting knives. Dirt buildup on the rollers can prevent proper elimination. If eliminator-size seed tubers having a 6 to 8 oz. top are being cut, more than 15% of the seed coming through the cutter should be uncut. Here again, observations indicated that many crews on the hand knives had difficulty judging seed tuber size. Often, single drop tubers sorted out by the eliminator were then cut on the hand knives.

Eliminate Chips and Slivers

Chips and slivers are always a matter of concern. Such seedpieces have a very low yield potential. They can be primarily responsible for poor stands. Some growers are losing $20 per acre or more in potential returns because of chips and slivers. In certain operations, 10 to 15% of the seedpieces were chips and slivers weighing less than ½ oz. Most machine cutters of recent vintage are equipped with chip eliminator rollers that, if properly adjusted, can greatly reduce the number of chips reaching the planter. Older cutters generally do not have enough single drop or chip eliminator rollers to do these jobs efficiently.

Growers frequently reported that chips and slivers coming off the cutter would be eliminated in subsequent handling operations and that few, if any, would reach the planter. However, one sample collected off the end of the loading boom as the seed hoppers on the planter were being filled revealed that 5.7% of the seedpieces were chips and slivers weighing less than ½ oz.

Many growers feel that seedpieces with only one cut surface will produce a better stand because of less seedpiece decay and will have a higher yield potential than seedpieces with more than one cut surface. Any such effect on yield may be related to seedpiece size as well as to number of cut surfaces. Seedpieces having more than one cut surface are more likely to weigh less than 1½ oz. and thus have a lower yield potential.

Uniformity of seedpiece size has assumed new importance with the advent of cup-type planters. Undersized seedpieces result in doubles and triples; oversized seedpieces fall off the cups, producing skips.

For the average seed-cutter surveyed, about 40% of the seedpieces produced were in the extreme size categories. In 80% of the cases where small-top (6 to 8 oz.) seed was being cut, a significantly smaller percentage of the seedpieces was in the extreme size categories.

Try to achieve uniform sizes. Seedpieces at left weigh less than ½ oz.; those in the center, more than 1½ oz., and those at right range in size from ½ to 1½ oz.

Manage for maximum uniformity of seedpiece size. Manage your seed cutting operation to minimize the percentage of seedpieces weighing less than 1½ oz. or over 3 oz.

Seed Treating

Most cutting operators treated seedpieces with a fungicide to reduce potential losses from seedpiece decay. Generally, they applied the material with a lawn spreader-type applicator, with or without an auger mixer underneath. In these operations, less than half of the seedpieces were adequately covered with the material and application rate was usually only half the amount recommended. In general, a high rate of application was required to obtain adequate coverage with a lawn spreader-type applicator. Rolling drum treaters gave excellent seedpiece coverage at lower application rate but the rolling action tended to batter cut edges of the seedpieces.

Conclusion

- Proper adjustment and top-notch management of the mechanical seed cutter are the keys to success in a seed-cutting operation.
- To improve the quality of the operation, first analyze a sample of cut seed.
- Maximize the number of seedpieces weighing 1½ oz. or more.
- Be familiar with every point of adjustment on the mechanical seed cutter and learn how to put together the best set of adjustments for the particular lot of seed being cut.
- Use sized seed or seed with a relatively small top to do a good cutting job most easily. Recognize that even a single major adjustment can affect cutting quality.

Seed Cutting Tips

1. Keep the cutting discs sharp.
2. **Don't push the cutter**—maintain a uniform flow of seed tubers no more than one tuber deep as the flow of tubers reaches the cutting assembly. Overloading the cutter also overloads the crew. The result is invariably an inferior cutting job.
3. Learn how to get the most out of the chip and single drop eliminators.
4. Watch the crew, especially those positioning tubers on the rollers and those on the hand knives. Be sure the crew knows what a 3 oz. seedpiece or seed tuber looks like. Remember, a 3 oz. size seedpiece or tuber must be cut precisely in half to get two 1½ oz. seedpieces. It would be well to let those go through without cutting.
5. When readjusting the cutter to handle a different lot of seed, make sure the new adjustments do not adversely affect seedpiece size.
6. Be sure all seed tubers going through the cutting assembly are cut clear through.
7. Above all, analyze the cutting operation. Take a 2½-gallon bucket rounded full with seed (12 lb. sample). This should have no more than 109 seedpieces, indicating an average seedpiece size of at least 1¾ oz.

Number of seedpieces in 12 lb. sample	Average Seedpiece size
96	2.00 oz.
109	1.75 oz.
128	1.50 oz.
154	1.25 oz.
192	1.00 oz.

Then sort the seedpieces into size categories and separate out the single drops. The results will indicate what adjustments to make in machine and/or crew.

8. Make sure the seedpiece treatment applicator is providing thorough coverage of the cut surfaces.

Summary

1. Seedpiece size is a prime determinant of yield potential (stand, stems per acre, vigor), particularly if the seed comes under stress.
2. Growers should strive for an **average** seedpiece size of at least 1¾ oz.
3. Uniformity of seedpiece size is important. Minimize the number of cut seedpieces in extreme size categories (less than 1½ oz. and over 3 oz.)
4. About 50% of seedpieces planted in 1970 weighed less than 1½ oz. even though the average seedpiece size over all 32 cutting jobs surveyed was 1.55 oz.
5. No cutting operation can eliminate production of seedpieces weighing less than 1½ oz. but the proportion of such seed can be reduced to 25% or less through proper adjustment of equipment and adequate training and supervision of the crew.
6. Slab-type seedpieces having more than one cut surface are misleading. They generally do not weigh as much as they appear to.
7. Size of seed tubers, particularly the uniformity in size, is important in reducing planter errors.
8. Regardless of the spacing you use for planting, increasing seedpiece size from 1½ oz. average to 1¾ oz. average will require about 3 more sacks of seed per acre.
9. Be concerned about seedpiece treatment coverage. Complete coverage of the cut surfaces is vital to obtaining good results. A rolling drum-type treater appears to give excellent coverage with recommended rates of application. A good average rate of application for fungicidal seedpiece treatment is 1 lb. per 100 lb. seed. If the bulk truck holds 350 cwt. of seed and the seed-treating material comes in 50 lb. bags, then 7 bags of seedpiece treatment should be used per truckload of seed.

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