Spud Topics

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NOTE: This article is to be put in the Potato Grower's Handbook in the Seed Section.

Potato Seed Cutting

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The seed cutter operator has the responsibility for turning seed tubers into cut seed with:

1. a maximum number of blocky, ideal-size seedpieces [1.5 to 2 oz. (43 to 57 grams)]
2. minimal waste (chips) and
3. minimal oversize pieces,

all while achieving

4. a "good" level of through-put.

However, for a given lot of seed tubers, the only controls the cutter operator has currently are sizer settings, blade spacing and blade type, and on the rotary-blade cutters, stripper adjustment.

Sizer setting is the most convenient control to adjust. For that reason, it is sometimes used to increase through-put in preference to achieving good seed size. **Remember that sizer adjustment is for getting the best seed size, not for crowding more tubers through the cutter.**

Single-drop Sizer Settings

Since the smallest seedpiece should weigh approximately 1.5 oz., the single-drop sizer should be set to drop through all tubers weighing 3 oz. or less. Figure 1 shows length, width and thickness in inches of Russet Burbank single-drop tubers by tuber weight in ounces. The regression lines (solid) show that tuber length is the better predictor of tuber weight (R^2 = 0.7), while thickness is the poorer (R^2 = 0.4). However, roller sizers, star sizers and similar devices all size on the basis of the minimum dimension of the tuber, i.e., the thickness, rather than the length or width. For that reason, such sizing of potato tubers is imprecise and leads to some of the problems in seed cutting.

The lower dotted horizontal line (Fig. 1) shows that most of the tubers 3 oz. and under have a thickness less than 1-5/8 inch. So 1-5/8 inch should be the approximate setting for single-drop sizers on most seed cutters.

Chain sizers (eliminator chains) size by tuber mid-

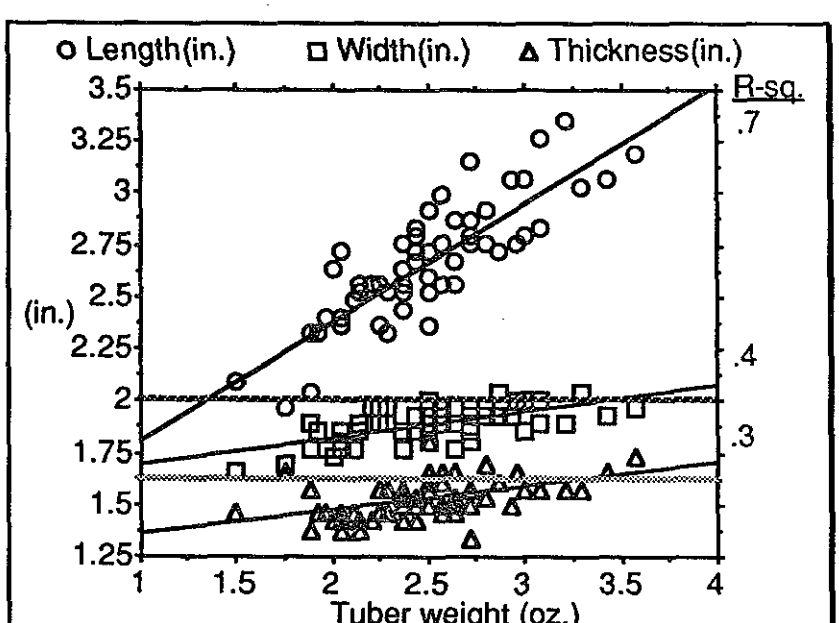

Fig. 1. Regressions of length, width and thickness of single-drop tubers vs. tuber weight.

dimension, width; so if a chain sizer is used to separate out the single-drop tubers, the chain opening should be about 2 inches (the upper horizontal dotted line, Fig. 1). That translates into 1-7/8-inch sizer chain, since they are measured across the flats of the hexagonal openings. Tubers to be cut into two pieces can be sized with a 2-inch sizing chain. One operation is successfully using a chain sizer to eliminate chips. Either 1-1/2 or 1/5/8 chain is used, depending upon the seedlot. Single-drop tubers should probably be routed around the chain sizer.

Larger Sizers --

For the other sizers in the seed cutter, the settings depend upon whether the machine is a rotary-blade or fixed-blade cutter; therefore, the remainder of this article is divided: one part for rotary cutters and a second for fixed-blade cutters.

Two-Stage, Rotary-Blade Seed Cutters:

Sizer settings:

•Set Single-drop sizer at about 42 mm (1-5/8 in.)
•Set intermediate sizer[1] no wider than 50 mm (2 in.)
•Top cutter blade spacing: 45 mm (1.75 in.), which is standard
•Bottom blade spacing: Standard is 50 mm (2 in.); but 45 mm (1.75 in.) is better.

Theoretical Cuts in a Rotary Cutter with Horizontal Knife

Figure 2 shows the theoretical or ideal cuts that could be produced by a rotary-blade cutter. The **bold numbers** give number of good seed pieces, and the *italic numbers* show the chips produced. Note that the rotary-blade cutter can theoretically produce 1, 2, 3, 4, 5, 6, 7, 8 or more seedpieces per tuber, depending upon the tuber size. However, since there is no mechanism to align the tubers precisely with the blades, these ideal cuts don't always occur. Note also that chips off the tuber ends are a fact of life with this machine.

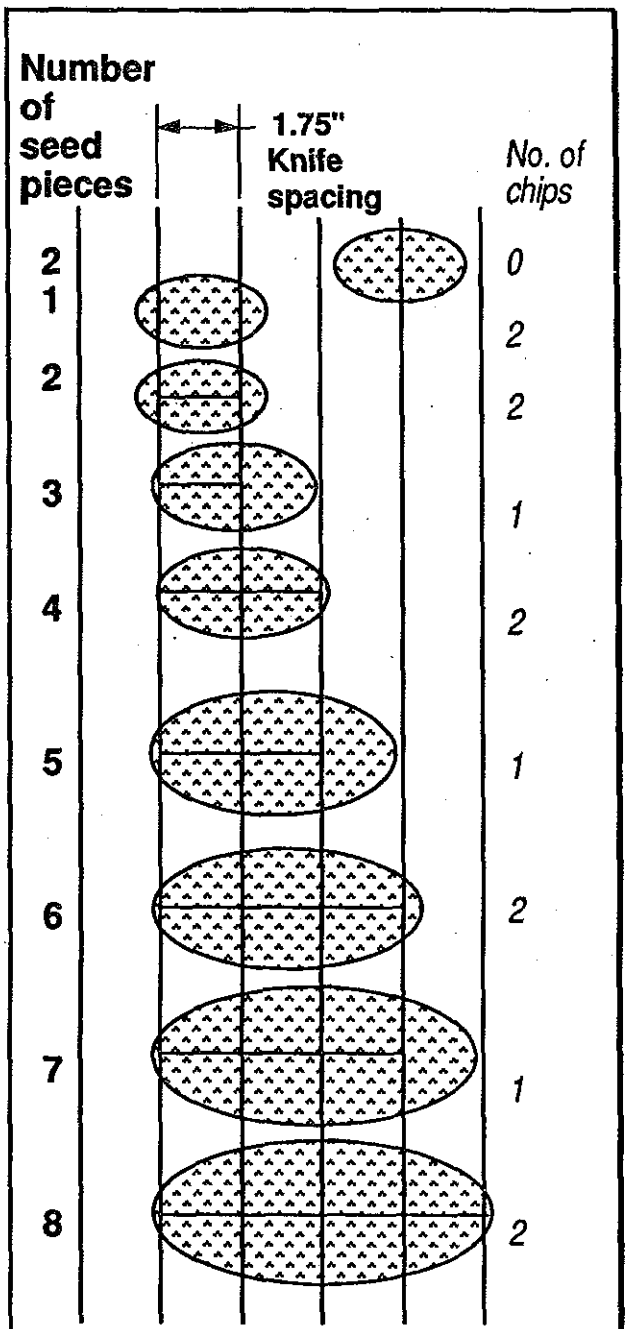

Fig. 2. Cutting possibilities with rotary blade seed cutters.

Two Single-Stage vs. One Two Stage Rotary Cutter

Simulation of two-stage rotary cutters showed that the lower cutter is essentially good only for cutting 3 to 3.5 oz. tubers if blade spacing is 2 inches (standard), and for 3 to 4.25 oz. tubers if blade spacing is 1.75 inches. Tubers larger than these

[1]This is the sizer between the top cutter, which has a stationary horizontal blade, and the lower cutter. A single-stage rotary machine has only a top cutter and a single-drop sizer.

sizes result in oversize seed, and should be cut on the upper cutter. It appears that most of the oversize on these machines comes from the lower cutter. If you have a single-stage rotary cutter, it may not be worthwhile to trade it for a two-stage cutter unless you expect a lot of 3.5-oz. tubers. It may be better to increase the size of your single-drop to 3.5 oz. and run everything larger through the cutter. Also, the strippers between the disk blades (Fig. 3) can be adjusted so that smaller tubers are not cut by the horizontal blade. Thus, the single-stage cutter can do the entire cutting job. The second stage just adds capacity and flexibility in sizing to the machine.

Problems with Roller Shafts & Partial Cuts

Figure 3 shows a side view of the disks blades and orientation rollers on a rotary-blade cutter. Note that the disks should not contact the roller shafts. If partial cutting of tubers occurs, it may be due to a roller shaft that is broken inside a roller. The shaft will still support the rollers and the machine will work, but the shaft will move sideways under the blades and allow the tuber to drop down so that it isn't cut all the way through.

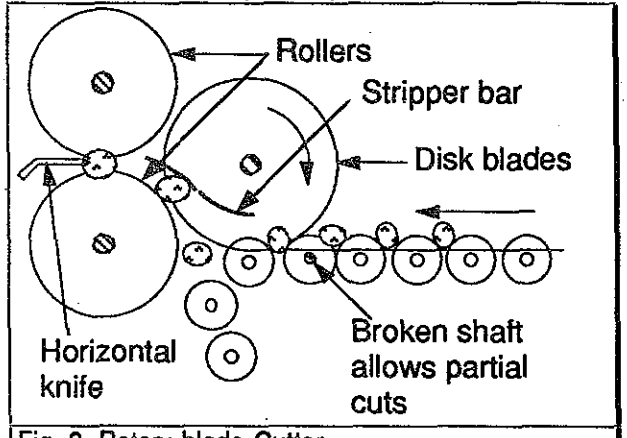

Fig. 3. Rotary-blade Cutter.

Fixed-blade cutters:

Sizer settings:

- **Set Single-drop sizer at about 42 mm (1-5/8 in.)**
- **Set 2-4 sizer at 45 mm (1.75 in.)**
- **Set 4-6 sizer from 55 to 60 mm (2-3/16 to 2-3/8 in.), depending on number of large tubers.**

Theoretical Cuts in a Fixed-blade Cutter

Figure 4 is a schematic of a fixed-blade cutter. It produces 2, 4, or 6 pieces per tuber (on the 2-, 4-, or 6-cutter, respectively). The sizers between these cutter types are referred to as the 4-6 sizer, the 2-4 sizer, and the 1-2 or single-drop sizer. The recommended sizer settings above were determined by an experiment with the machine in which the 2-4 sizer was set successively to pass 45, 50 and 55 mm thick tubers and the 4-6 sizer was set at 50, 55, and 60 mm.

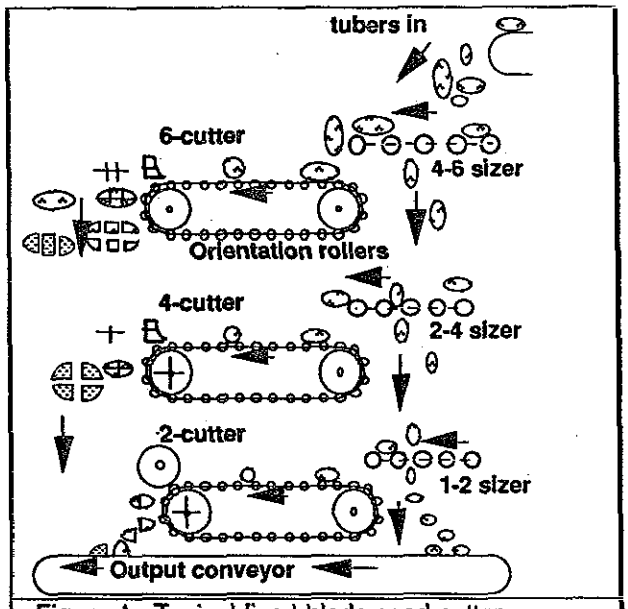

Figure 4. Typical fixed-blade seed cutter schematic diagram.

With the standard blades, the fixed-blade cutter can produce only 2-, 4-, and 6-cuts; however, a modified, notched blade design (Fig. 5) can produce a 3-cut. Similar modifications can be made to produce other cuts; but the blades are somewhat difficult to support. A 3-cut is often desirable because many small seed tubers will produce undersize seedpieces if cut into 4 pieces, but are too large for cutting in half.

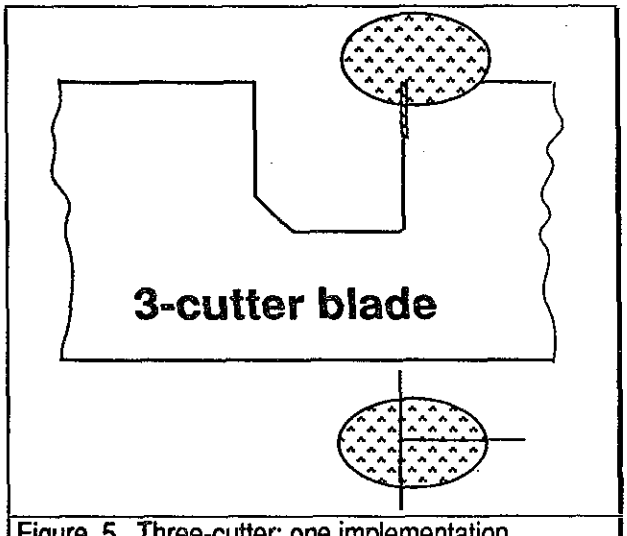

Figure 5. Three-cutter: one implementation.

General Comments

Fixed-blade cutters have difficulty orienting tubers when high through-put is attempted, just as do rotary-blade cutters. They do, however, use bevelled rollers that tend to orient the tubers so that their thickest part is centered on the blade, which is generally advantageous. Fixed-blade cutters also tend to cut parallel to the flat side of flat tubers, so that seedpieces from such tubers tend to be thin rather than blocky.

Rotary-blade cutter orientation rollers roll backwards as the roller chain moves forward, so that long, misoriented tubers tend to move backward until they become properly oriented if the flow through the cutter isn't too great. However, the orientation rollers used are slightly bevelled, so the positioning of the tuber ends with respect to the blades is not random, but tends to center the tuber so that it is cut symmetrically, i.e., with a chip off each end of the tuber if it is the appropriate length.

In summary, both cutting systems have advantages and disadvantages. Overloading of either will result in poor seed cutting. It is important to keep blades sharp and to pay close attention to the seedpieces being produced. Chips that get planted in place of good seed cost dearly in yield and quality. Properly sized and planted seed is worth as much as $100 to $200 per acre to the grower. Above all, don't use sizer setting to increase machine capacity. If seed size is good, **don't open up a sizer just to put more tubers through an underloaded cutter!**

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