

# SEED PROCESSING PREPARATORY TO PLANTING

## Experiments on Beet Seed Sizing and Segmenting

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In the segmenting of beet seed using carborundum stone machines there is a great loss of germinating material. Recently there has been some experimentation with fluted steel wheels in an effort to obtain a greater recovery of both weight and germination from the segmenting process. Likewise, sizing of whole seed before shearing has been attempted for the same purpose.

In order to determine what advantages might be obtained, both in the recovery of seed and in improvement of germination percentage, an experiment was conducted at Rocky Ford, Colo., during December 1944 and January 1945 on sizing of seed before segmenting. Both sized and unsized seed were segmented over a fluted steel wheel and the standard carborundum stone to determine the relative value of seed sizing on these two types of wheels.

### Experimental Procedure

**Cleaning and Sizing.**—The cleaner used was a standard Eureka receiving separator No. 7, with fan shaft speed of 390 r.p.m.

The seed used was American No. 1, Lot 214, which before cleaning germinated 84.6 percent. A 5,587-pound lot of this seed was cleaned over a 7/64 inch round-hole retaining screen with very light air suction. Of the 5,286 pounds recovered, a 3,850-pound lot was sized into three sizes as follows: (1) Between 7/64 and 9/64 inch; (2) between 9/64 and 12/64 inch; and (3) above 12/64 inch. In the sizing operation only a very light air suction, designed to take off dust, was used on the clean seed end of the separator, and all air suction was taken off the receiving end. The remaining cleaned seed, which totaled 1,436 pounds, was held as unsized seed for check purposes.

**Segmenting.**—Six hundred sixty pounds of the unsized seed was segmented over the carborundum stone and 770 pounds over the fluted steel wheel with the shear bars set at .080 inches. In the sized seed portions, the 7-9/64 inch fraction was not segmented. The 9-12/64 inch fraction was segmented at .080 inch shear bar set, 660 pounds going over the carborundum stone and a like amount going over the fluted steel wheel. In the above 12/64 inch fraction, shear bars were set at .085 inches, with 550 pounds being segmented over the carborundum stone, and a like amount over the fluted steel wheel.

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The recovered oversize was resheared at the .080 inch set. Weights of 7-10/64 inch segmented seed recovered, Eureka cleaner discard, (air set at 2.0) and of germs, were recorded for all types seed and both segmenting units. Dust loss was obtained by difference. Germination samples were taken from all recovered seed fractions. All elevation of seed in the experiment was by air suction.

### Experimental Results

Cleaning and Sizing.—Percent recovery and germination on the clean seed, sized and unsized, are given in table X.

Table I.—Cleaning and sizing; percent recovery and germination data.

Treatment	Seed fraction	Percentage recovery	Percentage germ.	Sprout count per 100 seeds			Abnormal
				Singles	Multiples	Total	
Original	Normal Whole	100.00	84.6	81.0	58.0	100.5	0.0
Recleaned	Normal Whole	84.61	84.8	23.6	47.0	173.0	0.0
Recleaned seed sizes	7-8/64"	8.75	64.3	33.3	31.0	99.0	0.2
	9-12/64"	57.85	85.0	46.0	39.0	139.5	0.0
	12/64" and above	31.17	91.3	20.5	70.8	211.3	0.0
	Dust	2.23					
	Total	100.00					

Segmenting, Unsized Seed.—Recovery and germination percentages of segmented seed obtained from shearing over the carborundum stone and the fluted steel wheel from unsized beet seed are compared in table 2.

Table 2.—Carborundum stone and steel wheel compared on unsized seed.

Sheared fraction	Percentage recovery	Percentage germ.	Sprout count per 100 seed balls			Abnormal
			Singles	Multiples	Total	
<b>Carborundum stone</b>						
7-10/64" sheared	34.0	79.5	52.8	26.5	109.0	0.8
Cleaner discard	4.8	5.8	6.6	.5	6.0	.8
Germs	27.7					
Dust	32.6					
<b>Steel wheel</b>						
7-10/64" sheared	48.5	68.0	52.3	15.8	81.5	3.0
Cleaner discard	7.4	7.0	6.8	.2	7.8	.5
Germs	24.4					
Dust	19.7					

A much lower percentage recovery and a much higher percentage germination on recovered seed were obtained from the carborundum stone as compared to the fluted steel wheel. The seed obtained from the steel wheel was not recleaned to improve germination; hence it is impossible to say what recovery would have been obtained had quality been raised to the level of that obtained from carborundum

segmented seed. Had this recleaning been done, however, it would be expected, on the basis of previous experience, that a recovery of not more than 45 percent would have been obtained.

The seed obtained from the two segmenting units was carefully inspected in the laboratory both before and during germination. Seed produced by the steel wheel was much more angular in appearance than that from the carborundum stone. Since seed of variable shape is less "drillable" when used in precision planters, the production of seed of this physical quality is not desirable.

Abnormal sprouts appear to be slightly less for the steel wheel than the carborundum stone. This was due to the fact that most of the damaged germs were so badly broken that they failed to show enough sprouting tendency to be culled abnormal. Such seed balls were considered as dead in the germination counts.

**Segmenting, Sized Seed.**—The results obtained from the two wheels used on sized seed are given in table 3. In this part of the experiment only the 9-12/64 inch size and the above 12/64 inch size were sheared, but the unshaped 7-9/64 inch size has been included in recovery percentage. Data are given on a "sack run" basis.

Table 3.—Carborundum stone and steel wheel compared on sized seed.

Sheared fraction	Percentage recovery	Percentage germs.	Sprout count per 100 seed balls			
			Singles	Multiples	Total	Abnormal
<b>Carborundum stone</b>						
7-10/64" sheared	48.8	75.5	53.2	22.4	100.8	4.9
Cleaner discard	2.5	4.3	3.9	1	4.0	.1
Germ fraction	22.2					
Dust (by difference)	26.0					
<b>Total</b>	<b>100.0</b>					
<b>Steel wheel</b>						
7-10/64" sheared	54.8	70.5	49.5	21.1	90.5	4.6
Cleaner discard	5.0	5.0	4.0	.7	4.1	1.4
Germ fraction	21.2					
Dust (by difference)	18.9					
<b>Total</b>	<b>100.0</b>					

Recovery of seed in this test is in favor of the steel wheel, but percentage germination is higher for the carborundum stone segmented seed. As previously noted, seed segmented over the steel wheel was more angular than carborundum stone seed. In this test, steel wheel segmented seed was slightly lower for single sprouts, multiples, and total sprouts than seed from the carborundum stone.

In order to show the effect of each segmenting wheel on each of the sizes of seed sheared, the recovery and germination data obtained

for each of the seed sizes 7-9/64 inch, 9-12/64 inch, and above 12/64 inch, are set up in table 4.

From these data it will be noted that greater recoveries of seed were obtained from the 9-12/64 inch size than from the above 12/64 inch size for both segmenting wheels; and that germination percentage, multiple sprout count, and total sprout count were higher for segmented seed obtained from the smaller sized seed. The large whole seed gave a segmented product higher in single sprout count and in number of abnormal sprouts per 100 seed balls tested, indicating that even at .085 inch shear bar setting for this size, and a setting of .080 inch for the oversize, appreciably greater damage was done to the larger seed than to the 9-12/64 inch at the .080 inch shear bar setting. It appears that shear bar spacing should be wider than .085 inch for seed above 12/64 inch size, allowing for a greater oversize volume to be obtained and this in turn reduced to the 7-10/64 inch size by successively closer spacings. The 7-9/64 inch size was not segmented, but it is likely that a small amount of damage would have been obtained if this seed had been segmented.

In the comparison of the segmenting wheels, it is evident that the steel wheel was more damaging to the larger size whole seed than the carborundum stone. For this large whole seed size, the recovery is only 2.9 percent higher for the steel wheel, but this seed germinated 61.0 percent as compared to 74.3 percent germination for the carborundum stone.

**Seed Sizing Effects.**—From the information on presizing of seed for the two segmenting wheels given in tables 2 and 3, pertinent data have been extracted and placed in table 5 for direct comparison of presizing results.

For both segmenting wheels, an appreciable improvement in recovery was obtained from presizing of seed. The percentage improvement was, however, much greater for the carborundum stone than for the steel wheel, being 13.9 percent and 6.3 percent, respectively. It is noted that germination percentages did favor the sack run segmented seed from the carborundum stone over the presized seed. It appears that, for unknown causes, air suction on the separator was somewhat more efficient on this test run than on the presized seed run. Consequently, it must be assumed that the recovery of 34.9 percent for sack run seed is slightly lower than should have been obtained, but despite this, the improvement in recovery due to presizing will still favor the carborundum stone over the steel wheel.

**Capacities.**—In all milling operations, capacity of equipment is important. Checks were made on the capacity of both segmenting wheels for the two sizes 9-12/64 inch and 12/64 inch and above. Results are given in table 6.

Table 4.—Recovery and germination data obtained from all sizes of seed using two types of segmenting wheels.

	Sprout count per 100 seed balls						Sprout count per 100 seed balls					
	Percentage recovery	Percentage germ.	Single	Multiple	Total	Abnormal	Percentage recovery	Percentage germ.	Single	Multiple	Total	Abnormal
	Carborundum stone						Steel wheel					
	7-9 seed size											
Sheared fraction	100.0	64.3	35.3	31.0	99.6	0.2	100.0	64.3	32.3	31.0	99.0	0.2
	8-12/64" seed size											
7-9/64" original*	46.8	79.8	55.8	24.0	100.8	5.5	55.5	76.0	62.8	23.3	105.8	5.0
7-10/64" sheared	2.0	6.5	5.6	0.0	5.5	0.0	5.4	4.3	4.3	0.0	4.3	2.0
Cleaner discard	23.2						20.0					
Germ	23.0						19.1					
Dust												
Total	100.0						100.0					
	12/64" and above, seed size											
7-10/64" sheared	38.0	74.3	61.8	12.5	88.3	7.8	40.0	61.0	62.3	8.7	71.3	6.8
Cleaner discard	4.2	3.3	3.0	.3	3.5	.3	3.5	0.3	6.0	.3	6.5	1.0
Germ	23.2						20.5					
Dust	29.6						23.8					
Total	100.0						100.0					

\*Not segmented.

Table 5.—Comparison of sack run and pralized seed in the production of segmented seed from two segmenting wheels.

Seed size	Seed treatment	Percentage recovery	Percentage germ.	Sprout count per 100 seed balls			
				Single	Multi- ples	Total	Abnor- mal
		Carborundum stone					
7-10/64 recovered	Sack run	24.0	70.5	32.8	26.8	109.0	6.8
	Pralized	48.8	75.5	53.2	22.4	100.8	5.0
		Steel wheel					
7-10/64 recovered	Sack run	48.5	68.0	52.3	15.8	85.3	4.9
	Pralized	54.8	70.5	49.5	21.1	90.5	4.6

Table 6.—Capacity of two segmenting wheels on two sizes of seed.

Seed Size	Carborundum wheels			Steel wheel		
	Pounds seed segmented	Time in minutes and seconds	Pounds capacity per hour	Time in minutes and seconds	Pounds capacity per hour	
9-12/64"	690	23.05	1,718	16.48	2,354	
12/64" and above*	550	21.01	1,434	15.49	2,086	

\*Shear bars set at .086 inch until all seed segmented, otherwise seed segmented at .080 inch.

### Summary and Conclusions

In this experiment the carborundum stone segmenting unit when used on sack run seed gave a recovery of 31.9 percent of 7-10/64 inch segmented seed as compared to 48.5 percent for the fluted steel wheel. Germination percentage was 79.5 for the stone and 68.0 for the steel wheel.

On sized whole seed the carborundum stone unit gave a recovery of 48.8 percent of seed germinating 75.5 percent; and the steel wheel gave 54.8 percent recovery of seed germinating 70.5 percent.

Better recoveries and germination percentage of segmented seed were obtained from the 9-12/64 inch size over the 12/64 inch and above size. For the carborundum stone this amounted to 8.8 percent in recovery and 5.5 percent in germination. For the steel wheel this amounted to 14.6 percent and 15.0 percent, respectively.

Much more uniform seed segments were obtained from the carborundum stone in all tests.

Hourly capacity for the steel wheel was much greater than for the carborundum stone.

From this investigation it is concluded that sizing of whole seed before segmenting offers a chance of immediate improvement in seed recovery; and that further experiments on various types of fluted steel wheels are necessary before final evaluation of this segmenting equipment is made.