Two Years of Planter Testing

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The question "Are the Present Day Drills Adequate?" for planting our present day sugar crop has been a point of much debate between men of the sugar companies as well as representatives of the many implement manufacturers. Two lines of thought are encountered: (1) If present day planters were adequate, we would not have today's emergence and thinning problems, and (2) If beet seeds are more germinable, our methods of getting a stand are satisfactory, present day planters would suffice. The Beet Sugar Development Foundation has picked the first as a problem worth investigating with the thought of finding methods to improve present planting practices with the machinery which is already on the farms. By no means has the answer been found but some startling obsrvations have been made.

Before dwelling upon observations and results, a brief summary of the method of attack will be given. For many years the primary method of checking the seed pattern from any drill was to give it a "grease board" test which does not permit the movement of seed as in a furrow. The method most commonly used to obtain cell fill is to jack one wheel of a planter up, drive that wheel from an auxiliary motor and collect seed as it is discharged from the seed tube for weighing and analysis of the cell fill. The British have two rather elaborate photosensitive devices to check planter seed distribution. One charts, as a seismograph, each impulse caused by seed discharged from the tube. The other method registers on photosensitive paper with a movie camera (shutter removed) the actual path of each seed as the paper moves past it.

Deeming these methods not too satisfactory, the Foundation launched on a program to construct a planter tester rack which permits planters to be mounted stationary in a simulated ground furrow condition to move under the drill on an endless belt. Provisions were made to adjust plate speeds at any desired seeding rate and any probable speed of drilling as obtained in each case by the use of two P.I.V. variable speed drives. Drills without provisions for varying seeding rates were mounted so as to be driven from a ground speed sprocket.

A large variety of materials was tested to arrive at a condition which most nearly simulated furrow conditions. Asbestos cemented to V-shaped rubber sheeting sewn to cord rubber belts was the material finally selected to serve as a standard approximating soil conditions.

The method of checking the seed distribution in the furrow was identical with the method used to count stands in the field, using a 100-inch ladder and a stand count sheet. Presently thirty (30) 100-inch counts (250 feet) are deemed adequate for each analysis. Longer runs have been counted to show small differences which are statistically insignificant. During the life of the planter tester some 1,900,00 inches have been counted inch for inch. This is equivalent to approximately 30 miles.

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The method of checking cell fill is somewhat revolutionary since weighing of planted seed is eliminated. Cell fill is figured from the actual seeds which are counted in the simulated furrow, as we know from the setting the number of cells which has passed under the knock-out. The error of weighing grindings or ungerminable seed portions is eliminated. We have had opportunity to check one method against the other by collecting the seeds discharged from the tube in a container before they drop on the endless belt. This was done immediately subsequent to the counting method using the same seed, all conditions identical. The results are shown below in Table 1:

Table 1.—Comparison of Cell Fill Methods.

	Percent Cell Fill	
	Seed Count Method	Weight Method
Seed No. 1	100.17	106.38
Seed No. 2	98.63	104.34

Notice that with this particular seed the cell fill obtained by the planter tester method is in the order of 6% below the other methods. This 6% could be taken as a measure of grinding of the particular seed being tested. These figures were all compiled considering seed ball count, weights and actual distribution counts.

Our tests indicate to the amazement of all concerned that new plates give better cell fill than old plates. We have been able thus far only to theorize reasons causing better cell fill in new plates since the opposite seems most logical. Below[r] are given comparisons of five identical seeds showing difference in cell fill between old plates and new plates.

Table 2.—Old and New Cell Plate Comparisons.

	Percent Cell Fill	
	Old Plate	New Plate
Seed No. 1 8-9/64	77.26	94.79
Seed No. 2 9-10/64	68.82	74.17
Seed No. 3 6.4% 7-8/64; 46.9% 8-9/64; 46.7% 9-10/64	70.07	88.44
Seed No. 4 15% 7-8/64; 45% 8-9/64; 40% 9-10/64	63.58	91.74
Seed No. 5 25% 7-8/64; 70% 8-9/64	86.01	96.91

The effect of segmentation or decortication on cell fill seems to be of no significance since our results have indicated little trend of one over the other.

Table 3.—Effect of Segmentation or Decortication on Cell Fill.

	Percent Cell Fill	
	Segmented	Decorticated
Seed No. 1	87.57	84.41
Seed No. 2	96.56	87.47
Seed No. 3	92.71	92.43
Seed No. 4	89.27	89.17

Note that seed No. 2 shows a difference which cannot be overlooked. We are not prone to suggest that this variety of seed should be segmented rather than decorticated to obtain better cell fill. Tests have indicated that the same seed, from year to year, will not give identical results. Seeds seem to be extremely sensitive to processing methods. Dr. C. W. Doxtator[2] has shown in his tests that the method of driving his screens has materially affected size of seed separation, consequently affecting cell fill. The seed balls per pound within a specified size limit have not offered a means of determining the size of cells to be used. A low seed ball count, of course, means a greater percentage of the seed is large, and a high seed ball count a greater proportion is small. Dr. H. B. Walker[3] and associates, in 1945, completed an intensive study relative to the shape of seed varieties before and after seed processing. It seems logical, from his report, that seed shapes are important in their relation to cell fill and such, perhaps, offers explanation to the information tabulated in Table 4.

Table 4.—Effect of Seed Character on Cell Fill.

Plate	Seed No. 1	Seed No. 2	Seed No. 3	Seed No. 4	Seed No. 5
10/64			103.5	100.3	89.1
108			113.3	110.5	95.0
11/64	103.3	105.1	111.6	104.7	95.4
180			117.4	118.5	101.8
Seed Ball Count	49,700	46,800	44,997	48,997	38,102

Note: All seeds 7.4/64 decorticated (cans one-half full)

A large number of experiments carried out by many individuals has proven that speed of drilling materially affects cell fill and distribution. The Beet Sugar Development Foundation has continued this study as shown:

Table 5.—Speed Relation to Cell Fill.

Speed M.P.H.	1½	2	3	4	5
% Cell Fill	125.87	108.93	102.31	93.40	93.32

We have found that plates which give a cell fill of 95% to 100% based on planter tester results also distribute the seed to a more desirable pattern. Both above and below this specified limit a rather sharp decline from a desirable distribution is noticed. Many thousands of acres of sugar beets were planted in the year 1949 according to specifications given after tests on the planter tester. The results of these plantings have indicated that the planter tester has been valuable on a commercial basis for selection of the proper cell plate for a certain seed variety.

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Yes, we might say our present day drills are adequate for planting **our** present day beet crop, if time is taken to select properly the correct plate which most satisfactorily gives the desired cell fill, keeping **in** mind **the** following:

1. **New plates give better cell fill than used plates which are worn.**
2. **There does not appear to be much difference in the performance of segmented or decorticated seed, provided the proper cell plate is used.**
3. **Performance of seed appears to be dependent upon seed shape or character and is not specifically related to the number of seed units per pound.**
4. **There is a definite limit on speed for each combination of seed and cell size.**
5. **Seed pattern is best within the 95% to 100% cell fill limits.**
6. **We recommend the use of all available facilities to pre-determine for each lot of commercial seed a plate which most successfully gives the most desirable cell fill at given field drilling speeds. The sugar beet grower will then have a good chance of planting the rate of seed which he has selected, if the proper adjustments are made.**