

Field Compared with Blotter Germinations for Processed, Graded, Single- and Double-Germ Seed

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MECHANIZATION of the sugar beet crop has given prominence to any method whereby a lower number of germs per seed unit might be obtained. This is necessary for accurate planting of small amounts of seed per acre. Segmenting or cracking the seedball, which may contain three or four germs, into portions containing mostly one or two germs results in a product which has generally been acceptable in accomplishing this end for the past several years. The process of pelleting these segments has also been tried. More recently the process of "burring" and "decorticating," which consists of rubbing the corky matter from the smaller seedballs, has been developed. Some processors are simply using the smaller grades of whole seed. The plant breeders are now developing varieties which will produce seedballs containing a lower number of germs.

Materials and Methods

A test was designed in 1946² followed by a similar test in 1947 whereby various varieties consisting of different grades of segmented, decorticated, pelleted and whole seed were planted in the field so that the results could be directly compared with those obtained in the laboratory. The seed used was carefully graded with a slotted hand screen, except where otherwise noted, after which seedballs were counted out according to the scheme employed in the regular laboratory analysis. Two samples of 100-seed units each were germinated in the laboratory with the other samples being taken to the field.

The 1946 field test was planted with 100-seed units being distributed in each plot by hand at an accurate 6-inch spacing. There were three dates of planting. The first and second dates consisted of 2 replicates, with 8 replicates for the third date. The planting dates were April 22, May 10, and May 20, respectively. The first planting in 1947, consisting of 5 replicates of 100-seed units for each plot, was made with a John Deere No. 66 Planter geared to deposit one seed unit every 6 inches, the seed units being placed individually in the holes in the plates. Since there were some difficulties encountered by this method, the 2 successive plantings were made in the same manner as in 1946 with 4 replicates of 130-seed units for each plot being planted on each date. Plantings were made May 3, July 9, and August 22.

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²Brewbaker, H. E. and H. L. Bush. Graded whole vs. segmented, pelleted, and single- and double-germ seed in field germination tests. Proc. A. S. S. B. T. Regional Meeting of Eastern Slope and Intermountain, 1947, pp. 188-193.

In addition to this, in 1947, special tests of commercial decorticated, segmented, and whole seed were made by planting amounts of seed designed to give the same number of germinating units per foot of row. These tests were planted May 22, July 9, and August 22, the test for the first date involving only one variety, while seed from three varieties was used on the other two dates. The first planting consisted of 12 replicates, while for each of the two later dates 7 replicates were planted. This test was planted with a Planet Junior Hand Planter.

Discussion of Results

Stands obtained covered a rather wide range in field germination since in 1946 the resulting stands were approximately 90, 70, and 30 percent of the potential for the three respective dates, while in 1947 corresponding values of approximately 70, 50, and 50 percent of the potential were obtained. Thus, these data can be considered as being obtained under such conditions as might be expected to prevail under a wide range of grower conditions.

The 1946 results are presented in table 1 and the 1947 results in table 2. The varieties included were all commercial lots except the double-germ strains, B333 and B401, and the single-germ strain, B402.

An increase in percentage of singles in the field over that indicated by the laboratory results amounted to about 12 percent as an average for all lots studied. This, along with a decrease in doubles or multiples, is a very important point to consider when processing seed.

Several commercial lots of whole seed, selected on the basis of varying number of apparent germs per seed, were included in the 1946 test, where the seed was used as it came from the commercial cleaning plant, screened over a 7/64-inch screen. While important differences exist between these lots of seed with regard to their range in production of singles and multiples, it is very interesting to note the rather high percentage of singles obtained in the field in all cases.

The double-germ varieties B333 and B401, while not appearing to give a higher percentage of potential than the other varieties, indicate the advantages that may be derived from using seed with few or no multiple germs. The very small grade (through 6/64-inch slotted, over 6/64-inch round) of B333 tested in 1946 resulted in a very poor germination, but B402, which resulted from screening B401 to this same grade, gave very satisfactory results indicating nearly all plants to be singles.

Segmented and whole seed performed quite similarly when comparable grades were considered. Direct comparisons between segmented and whole seed graded to either 7/64 to 9/64-inch or 7/64 to 10/64-inch for the variety GW85-46R in 1947 indicated that there were no essential differences between the field results for these two products. This conclusion is substantiated by studying the general performance of all grades of

Table 1.—Summarized Results. Germination Study, Longmont, 1946. Blotter germinations, averages for 2 samples of 100-seed units each. Field germinations, averages for 12 replicates of 100-seed units each.

Variety	Treatment	Size ^a	Where germ.	Number of Seedlings per 100-Seed Units							
				1	2	3	4 or more	Total Seedlings	% singles	% germ.	% ^b potential
GW83	Seg.	7/9	Blotter	45.0	31.0	6.5	0.5	128.5	54.2	83.0	---
GW83	Seg.	7/10	Blotter	35.5	41.0	7.5	0.0	140.0	43.0	82.5	---
GW83	Whole	Over 7	Blotter	28.0	38.5	14.5	4.0	164.5	32.9	85.0	---
GW83	Seg.	7/9	Field	19.7	11.4	1.4	0.1	47.1	60.4	32.6	36.7
GW83	Seg.	7/10	Field	24.1	12.8	1.2	0.1	53.4	63.3	38.1	38.1
GW83	Whole	Over 7	Field	23.3	18.3	4.8	0.4	76.2	49.8	46.8	46.3
GW49	Whole	7/8	Blotter	44.0	13.5	0.5	0.0	72.5	75.9	58.0	---
GW49	Whole	7/9	Blotter	46.5	21.0	1.0	0.0	91.5	67.9	68.5	---
GW49	Whole	8/9	Blotter	42.5	22.0	1.5	0.0	91.0	64.4	66.0	---
GW49	Whole	7/10	Blotter	46.0	26.5	1.0	0.0	102.0	62.6	73.5	---
GW49	Whole	9/10	Blotter	41.0	33.0	2.5	0.0	114.5	53.6	76.5	---
GW49	Whole	9/11	Blotter	35.5	39.5	4.5	0.0	128.0	44.7	79.5	---
GW49	Whole	10/11	Blotter	35.0	40.5	6.5	0.5	137.5	42.4	82.5	---
GW49	Whole	Over 11	Blotter	30.0	42.5	11.0	1.0	152.0	35.5	84.5	---
GW49	Whole	Over 7	Blotter	32.5	38.5	8.0	0.0	133.5	41.1	79.0	---
GW49	Whole	7/8	Field	18.4	5.0	0.3	0.0	29.2	77.6	23.7	40.3
GW49	Whole	7/9	Field	22.3	6.7	0.7	0.8	38.6	74.8	29.8	41.5
GW49	Whole	8/9	Field	22.6	8.4	0.5	0.0	40.9	71.7	31.5	44.9
GW49	Whole	7/10	Field	20.8	12.8	0.6	0.8	45.4	63.4	32.8	44.5
GW49	Whole	9/10	Field	25.3	12.0	0.3	0.0	49.5	68.8	36.8	43.2
GW49	Whole	9/11	Field	23.0	13.1	1.1	0.0	52.4	61.8	37.2	40.9
GW49	Whole	10/11	Field	23.0	14.2	1.5	1.6	56.0	59.3	38.8	40.7
GW49	Whole	Over 11	Field	22.9	20.7	5.4	0.5	82.8	46.3	49.5	54.5
GW49	Whole	Over 7	Field	22.3	13.2	2.1	0.1	55.2	59.3	37.6	41.3
GW267	Whole	Over 7	Blotter	39.0	31.0	4.5	0.0	114.5	52.3	74.5	---
GW267	Burred	8/11	Blotter	30.0	42.5	7.0	1.0	140.0	37.3	80.5	---
GW267	Decort.	6/7	Blotter	71.5	17.5	0.0	0.0	106.5	80.3	89.0	---
GW267	Decort.	7/10	Blotter	47.0	29.0	1.0	0.0	108.0	61.0	77.0	---
GW267	Decort.	Over 10	Blotter	27.5	22.5	3.5	0.0	86.0	51.4	53.5	---
GW267	Whole	Over 7	Field	17.0	9.2	2.9	0.1	44.3	58.2	29.2	38.7
GW267	Burred	8/11	Field	21.5	9.1	1.4	0.1	44.3	67.0	32.1	31.6
GW267	Decort.	6/7	Field	21.4	4.3	0.1	0.0	30.2	82.9	25.8	28.4
GW267	Decort.	7/10	Field	17.3	7.3	1.1	0.1	35.3	67.3	25.7	32.7
GW267	Decort.	Over 10	Field	7.8	3.0	0.3	0.0	14.6	70.3	11.1	17.0
GW59-43A1	Whole	Over 7	Blotter	39.0	23.5	5.5	1.0	106.5	56.5	69.0	---
GW49-42A	Whole	Over 7	Blotter	27.5	27.0	7.0	1.0	106.5	44.0	62.5	---
GW49-41A	Whole	Over 7	Blotter	35.0	19.5	7.5	1.0	101.0	55.1	63.5	---
GW59-45R	Whole	Over 7	Blotter	41.0	32.0	5.0	0.0	120.0	52.6	78.0	---
GW59-44NM	Whole	Over 7	Blotter	28.5	31.5	15.2	4.0	146.5	35.8	79.5	---

TABLE 1—Continued

GW59-43A1	Whole	Over 7	Field	16.3	10.8	3.0	0.3	48.1	53.8	30.3	45.2
GW49-42A	Whole	Over 7	Field	18.3	11.3	2.4	0.3	49.4	56.7	32.3	46.4
GW49-41A	Whole	Over 7	Field	20.3	9.1	1.8	0.2	44.6	64.6	31.4	44.2
GW59-45R	Whole	Over 7	Field	26.1	17.8	2.7	0.1	68.6	56.9	45.9	57.2
GW59-44NM	Whole	Over 7	Field	18.1	12.9	4.3	0.8	59.7	50.3	36.0	40.8
B333	Whole	Over 7	Blotter	35.5	26.0	1.0	0.0	90.5	57.3	62.0	---
B333	Whole	Thru 7	Blotter ^c	35.5	6.5	0.5	0.0	50.0	83.5	42.5	---
B333	Whole	Thru 6	Blotter	8.0	0.0	0.0	0.0	8.0	100.0	8.0	---
		Slotted over 6 Round									
B333	Whole	Over 7	Field	26.8	12.2	0.7	0.0	53.2	67.3	39.8	58.8
B333	Whole	Thru 7	Field	23.3	3.3	0.0	0.0	30.0	87.3	26.7	60.0
B333	Whole	Thru 6 Sl. Over 6 Rd.	Field	9.1	0.4	0.1	0.0	10.2	94.8	9.6	127.5
GW34+GW201	Dow ^a Pellets	7/9	Blotter	40.0	6.5	0.0	0.0	53.0	86.0	46.5	---
GW34+GW201	Pellets ^d	7/9	Blotter	47.0	14.0	0.0	0.0	75.0	77.0	61.0	---
GW34+GW201	Pellets ^e	7/9	Blotter	39.5	25.5	1.5	0.0	95.0	59.4	66.5	---
GW34-GW201	Check Seg.	7/9	Blotter	53.0	24.5	0.0	0.0	102.0	68.4	77.5	---
GW34-GW201	Dow ^a Pellets	7/9	Field	22.3	2.2	0.0	0.0	26.6	91.4	24.4	50.2
GW34-GW201	Pellets ^d	7/9	Field	21.9	5.5	1.6	0.0	33.4	78.8	27.8	44.5
GW34+GW201	Pellets ^e	7/9	Field	24.1	8.7	0.1	0.0	41.7	88.1	32.8	43.9
GW34+GW201	Check Seg.	7/9	Field	21.1	4.7	0.5	0.0	31.9	80.2	26.3	31.3
GW92	Filtrol ^f Pellets	7/9	Blotter	58.5	20.5	0.5	0.5	103.0	73.1	80.0	---
GW92	Check Seg.	7/9	Blotter	58.5	22.0	0.0	0.0	102.5	72.2	81.0	---
GW92	Filtrol ^f Pellets	7/9	Field	20.6	7.0	0.8	0.0	36.8	72.8	28.3	35.7
GW92	Check Seg.	7/9	Field	17.9	6.0	0.7	0.0	31.9	72.8	24.6	31.1

^aSizes are all in 64ths inch, e.g., 7/9 indicates range of 7/64 inch to 9/64 inch.

^bBased on total seedlings.

^cPellet No. 803-2-GW, treated with 10 percent Arasan + 10 percent superphosphate + graphite.

^dPellet No. 801½-1-GW, treated with 7½ percent yellow Cuprocid + 10 percent superphosphate.

^ePellet No. 803-1-GW, treated with 10 percent Arasan + 10 percent superphosphate.

^fCoated with 38 percent P₂O₅ equal to 5 percent of uncoated seed.

Table 2.—Summarized Results. Germination Study, Longmont, 1947. Blotter germination, averages for 2 samples of 100-seed units each. Field germinations, average for 13 replicates, all converted to 100-seed units each.

Variety	Treatment	Size ^a	Where germ.	Number of Seedlings per 100-Seed Units							
				1	2	3	4 or more	Total seedlings	% singles	% germ.	% ^b potential
GW85-46R	Seg.	7/9	Blotter	48.5	30.0	3.0	0.0	117.5	59.6	81.5	---
GW85-46R	Decort.	7/9	Blotter	50.5	28.0	2.5	.5	116.0	62.0	81.5	---
GW85-46R	Whole	7/9	Blotter	40.0	39.5	4.0	.5	133.0	47.7	84.0	---
GW85-46R	Seg.	7/9	Field	35.4	17.0	.5	0.0	71.1	66.9	53.0	60.5
GW85-46R	Decort.	7/9	Field	31.5	11.5	.2	0.0	55.2	73.6	43.2	47.6
GW85-46R	Whole	7/9	Field	33.5	20.4	.8	0.0	76.8	60.9	54.7	63.1
GW85-46R	Seg.	7/10	Blotter	44.0	32.5	3.5	.5	121.5	55.2	80.0	---
GW85-46R	Decort.	7/10	Blotter	37.0	32.0	6.5	.5	122.5	48.1	76.0	---
GW85-46R	Whole	7/10	Blotter	42.5	27.5	3.0	0.0	106.5	58.3	73.0	---
GW85-46R	Seg.	7/10	Field	34.6	18.0	.7	0.0	72.6	65.7	53.0	59.8
GW85-46R	Decort.	7/10	Field	31.1	15.4	.9	0.0	64.5	66.4	47.4	52.7
GW85-46R	Whole	7/10	Field	35.8	15.2	.2	0.0	66.8	70.1	51.1	62.7
GW85-46R	Whole	9/11	Blotter	22.5	53.5	12.5	.5	169.0	25.3	89.0	---
GW85-46R	Whole	Over 11	Blotter	9.5	40.0	26.0	3.5	181.5	11.4	84.0	---
GW85-46R	Whole	Over 7	Blotter	26.0	41.5	15.5	.5	157.5	31.0	83.5	---
GW85-46R	Whole	9/11	Field	26.2	35.1	4.0	.3	108.2	40.1	65.6	64.0
GW85-46R	Whole	Over 11	Field	19.6	30.6	13.5	1.7	127.8	30.4	65.2	70.4
GW85-46R	Whole	Over 7	Field	26.2	27.4	4.8	0.0	95.3	45.1	58.4	60.5
GW64-46A	Whole	Over 7	Blotter	17.0	42.5	25.0	5.5	199.0	19.0	90.0	---
GW201-46A	Whole	Over 7	Blotter	19.0	43.0	24.5	0.0	178.5	22.3	86.5	---
GW64-46A	Seg.	7/10	Blotter	50.5	23.5	6.0	0.0	115.5	62.8	80.0	---
GW201-46A	Seg.	7/10	Blotter	50.5	22.5	3.5	0.0	106.0	65.9	76.5	---
GW64-46A	Whole	Over 7	Field	20.8	20.1	8.3	1.3	91.1	41.4	50.4	45.8
GW201-46A	Whole	Over 7	Field	19.9	24.2	9.0	2.4	105.2	36.3	55.6	58.9
GW64-46A	Seg.	7/10	Field	26.6	12.5	.4	0.0	52.7	68.3	39.4	45.6
GW201-46A	Seg.	7/10	Field	33.8	15.7	.5	0.0	66.7	68.7	50.0	62.9
B333	Whole	7/9	Blotter	52.5	13.0	0.0	0.0	78.5	81.2	64.5	---
B401	Whole	7/9	Blotter	40.5	10.5	0.0	0.0	61.5	79.6	51.0	---
B333	Whole	7/9	Field	32.5	5.5	0.0	0.0	43.5	85.7	38.0	55.4
H401	Whole	7/9	Field	32.2	7.6	0.0	0.0	47.4	80.8	39.8	77.1

TABLE 2—Continued

B333	Whole	7/10	Blotter	45.5	26.5	1.0	0.0	101.5	62.3	73.0	---
B401	Whole	7/10	Blotter	49.5	26.5	.5	0.0	104.0	64.8	76.5	---
B333	Whole	7/10	Field	35.9	11.3	.1	0.0	58.7	82.8	47.3	57.9
B401	Whole	7/10	Field	34.3	12.3	.1	0.0	59.3	80.8	48.3	57.1
B333	Whole	9/11	Blotter	45.5	44.0	0.0	0.0	133.5	50.8	89.5	---
B401	Whole	9/11	Blotter	46.5	30.0	.5	0.0	108.0	60.3	77.0	---
B333	Whole	9/11	Field	34.1	17.8	.1	0.0	70.1	66.5	52.0	52.5
B401	Whole	9/11	Field	35.6	13.7	0.0	0.0	62.9	73.3	49.3	58.3
B333	Whole	Over 11	Blotter	26.5	66.5	5.0	0.0	174.5	27.1	98.0	---
B401	Whole	Over 11	Blotter	31.0	60.0	.5	0.0	152.5	33.8	91.5	---
B333	Whole	Over 11	Field	27.5	29.8	1.4	0.0	91.5	47.8	58.8	52.4
B401	Whole	Over 11	Field	30.6	26.8	1.1	0.0	87.6	52.5	58.5	57.4
B333	Whole	Over 6	Blotter	43.0	35.5	1.5	0.0	118.5	54.0	80.0	---
B401	Whole	Over 6	Blotter	37.0	43.0	0.0	0.0	123.0	46.3	80.0	---
B333	Whole	Over 6	Field	31.6	17.0	.4	0.0	66.8	64.3	49.0	56.4
B401	Whole	Over 6	Field	29.3	17.6	.3	0.0	65.2	63.4	47.1	53.0
B402	Whole	Thru 6	Blotter	43.0	.5	0.0	0.0	44.0	99.0	43.5	---
B402	Whole	Slotted	Field	25.9	.5	.1	0.0	27.2	97.9	26.5	61.7
		Over 6									
		Round									
B401	Decort.	6/11	Blotter	41.0	36.0	.5	0.0	114.5	52.9	77.5	---
B401	Decort.	6/8	Blotter	31.0	4.0	0.0	0.0	39.0	88.6	35.0	---
B401	Decort.	8/11	Blotter	40.0	43.0	0.0	0.0	126.0	48.2	83.0	---
B401	Decort.	Over 11	Blotter	37.0	47.0	3.0	0.0	140.0	42.6	87.0	---
B401	Decort.	6/11	Field	31.7	17.6	.4	0.0	68.2	64.6	49.7	59.6
B401	Decort.	6/8	Field	24.1	2.7	.1	0.0	29.7	89.5	26.9	76.1
B401	Decort.	8/11	Field	33.8	20.6	.4	0.0	76.2	61.8	54.8	60.5
B401	Decort.	Over 11	Field	33.6	19.6	.7	.1	75.0	62.3	54.5	53.6

*Sizes are all in 64ths inch, e.g., 7/9 indicates range of 7/64 inch to 9/64 inch.

¹Based on total seedlings.

segmented and whole seed in both years' tests, although no other direct comparisons can be made.

Decorticating the seed appears to have caused some injury to the germs, especially for the larger grades as evidenced by a 17 percent of potential for seed graded over a 10/64-inch screen in 1946 (table 1). The 1947 test was designed so that comparisons could be made directly upon seed of the same variety for the 7/64- to 9/64-inch and 7/64- to 10/64-inch grades, of segmented, decorticated, and whole seed where the respective percentages of potential were found to be 60.2, 50.2, and 62.9 as an average for the two grades of seed; thus there appears to be a loss of 10 percent of potential for the decorticated seed which had been processed for commercial use. However, the double-germ variety B401, which was decorticated only very lightly, produced 62.5 percent of potential as compared with 60.6 percent for the whole seed as an average of all grades for each category. The results of the special tests for segmented, decorticated and whole seed are presented in table 3.

Table 3.--Summarized Results. Special Test for Segmented, Decorticated and Whole Seed, Longmont, 1947. Averages for three dates of planting for GW85-46R and two planting dates for GW59 and GW268.

Variety	Kind of seed	Seed size	No. of potential sprouts	No. seedlings emerged	% of potential
GW85-46R	Whole	Over 7	287.15	150.8	52.5
GW59	Whole	Over 7	202.20	79.3	38.1
GW268	Whole	Over 7	302.63	52.4	17.3
Mean					36.0
GW85-46R	Seg.	7/10	215.45	83.4	38.7
GW59	Seg.	7/10	234.82	31.0	13.2
GW268	Seg.	7/10	202.43	28.9	14.3
Mean					22.1
GW85-46R	Decort.	7/10	215.65	72.8	33.8
GW59	Decort.	7/10	239.34	30.2	12.6
GW268	Decort.	7/10	223.66	24.0	10.7
Mean					19.0

The whole seed as used was all from commercial ungraded lots, including the larger seed sizes, which may account for the higher percentage of potential obtained for whole seed in this test. The difference between segmented and decorticated seed is not so large as that obtained in the regular germination study, although the segmented seed appears to be slightly better. The first planting of GW85-46R was made under favorable conditions with an average of 73.1 percent of potential being obtained while the average results for the two later dates gave only 25.9 percent of potential for this variety, which is indicative of the adverse conditions encountered for these plantings.

The pelleted seed tested in 1946 appears to be slightly better than the unpelleted checks with which it was compared for the conditions existing under this test.

Summary and Conclusions

1. Field germinations produced a considerably higher percentage of singles, for all types of seed, than was obtained in the laboratory. This increase amounted to about 12 percent for this study.

2. Segmented and whole seed of the same grades appear to give about the same results under comparable field conditions.

3. The seed now produced commercially by decorticating resulted in a 10-percent lower potential than segmented or whole seed of the same grades. A special lot of double-germ seed which was polished only lightly in the decorticating process gave as good results as whole seed from this same lot, indicating that there may have been some injury to the commercial seed in connection with the decorticating process.

4. Results from single- or double-germ varieties indicate that the development of such varieties for use on a commercial basis will simplify the problem of supplying the farmer with a high-grade product adaptable to precision planting.