

SEEDLING COUNTS FROM
SINGLE, DOUBLE AND TRIPLE LOCULED SEGMENTED SEED UNITS

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Complete mechanization of the sugar beet crop has meant that we must accept greater tolerances of certain conditions than formerly. One of these is the presence of "doubles" or places within the beet row where two beet plants are growing close together, and possibly neither attaining the total size of single plants nearby. Formerly, with hand labor at thinning time, only a trace of these doubles was left in the thinned stand. We now accept stands with many doubles and have considerable experimental evidence to show that the yields and sucrose content of the beets are not affected adversely. (4) In fact, there is some evidence that the occurrence of these multiple hills has actually increased yields, (1) especially on the wider spaced rows.

In the past we have attempted, while preparing segmented seed, to secure as many seed units as possible with single germs, and the operators of our seed processing plants have, by the use of the crack test, regulated the machines to produce as few as possible seed units with two germs. Three germed units have always been kept to a trace and the two germed units, or doubles, held lower in number than the single germed units or singles. This has meant lower recoveries of segmented seed from the processing operation and also many more abnormal germinating seed units than when more doubles were allowed. (2)

How do double loculed or germed seed units perform under field and greenhouse conditions? Do all doubles germinate and produce two seedlings close together in the row? Or is there a large percentage of these so-called visible double seed units which produce only one seedling?

From actual experience we know that field emergence and greenhouse soil emergence of a sample of segmented seed never follow exactly the classification of its component units as determined by eye examination. Some of the single locule seed units do not germinate, and many of the seed units with two locules produce only one seedling. Field germinations are almost always lower than greenhouse germinations.

A field study was conducted in 1946 at Sheridan, Wyoming, in which segmented seed was sorted by hand, under a magnifying glass, into units containing one, two and three seed locules, in which no germs were exposed. Individual units of this classification were planted in hills three inches apart in a replicated test and the resulting stands were recorded. The results are shown in Table I.

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Table I

FIELD SEEDLING STANDS RESULTING FROM PLANTING
SINGLE UNIT, DOUBLE UNIT, TRIPLE UNIT AND UNSELECTED SEED
FROM COMMERCIAL SEGMENTED SEED (1)

Percentage of seed units germinating as:	Segmented Seed Units Showing Only			
	1 Locule	2 Locules	3 Locules	Unselected
Singles	26.75	22.75	17.75	29.00
Doubles	.87	7.62	6.25	3.62
Triples	.08	.58	1.58	.75
Total	27.70	30.95	25.08	33.37
Total Number Plants per 100 Units	28.73	39.73	34.49	38.49
<u>Percentage of germinating units appearing as:</u>				
Singles	96.60	73.50	68.80	86.90
Doubles	3.10	24.60	24.90	10.85
Triples	.30	1.90	6.30	2.25
Total	100.00	100.00	100.00	100.00
Average Number of Plants per Germinating Unit	1.04	1.28	1.38	1.53

(1) Average of 5 replications. Segmented seed sized through 10/64 and over 7/64 round hole screen.

The single germed units in this field test germinated about as well as did the units having two and three locules, but the units having two and three locules produced more seedlings than the single loculed units. Most of the two loculed units produced single seedlings. Very few of the three loculed units produced three seedlings, most of them appearing as single seedlings. The appearance of a few doubles and triples from the single units is attributed to errors creeping in at planting time and not to two germs in one locule. The average number of plants per germinating unit increases with locule number.

The official germination test of this same seed, unsorted, showed 45.6% singles, 31.4% doubles, 1.7% triples, or a total of 78.7% germinating with 1.44 sprouts per germinating unit.

A further study of performance of single, double and triple loculed seed units, as determined by the eye, was conducted in greenhouse soil during the fall of 1946. Seed units were sorted from five commercial varieties of seed being prepared for use in 1947. Plantings were made in greenhouse soil at a depth of 1-1/4 inches. Germination conditions were excellent. A greater percentage of units in each class germinated than under field conditions. Since all five varieties were remarkably similar in germination performance, only the averages of the test are given here. The results appear in Table II.

Table II

GREENHOUSE SOIL SEEDLING STANDS RESULTING FROM PLANTING
SINGLE UNIT, DOUBLE UNIT, TRIPLE UNIT AND UNSELECTED SEEDS
FROM SEGMENTED COMMERCIAL SEED⁽¹⁾

Percentage of seed units germinating as:	Segmented Seed Units Showing Only			
	1 Locule	2 Locule	3 Locule	Unselected
Singles	80.8	29.5	22.7	41.4
Doubles	0	58.0	39.3	33.3
Triples	0	0	24.2	4.2
Total	80.8	87.5	86.2	78.9
Total Number Plants per 100 Units	80.8	145.5	173.9	120.6
Percentage of Total Units germinating as:				
Singles	100.0	33.7	26.3	52.5
Doubles	0	66.3	45.6	42.2
Triples	0	0	28.1	5.3
Total	100.0	100.0	100.0	100.0
Average Number of Plants per Germinating Unit	1.00	1.66	2.02	1.53

(1) Averages of 5 varieties, two replicates each.

The data indicate that the total percentage of single, double and triple loculed units germinating in the greenhouse were approximately the same. This was also true for the field samples in Table I, but the total unit germination was only about one-third as much in the field as in the greenhouse. In the greenhouse germinations the double loculed units and triple loculed units produced a much lower percentage of singles than was the case in the field test. About one-third of the doubles produced single plant hills. The germinating triples produced about one-fourth singles, one-fourth triples, and about half two plant hills.

These results are given as a progress report only. We realize that it is impossible to pick by the eye alone, even under a magnifying glass, seed units that always contain one, two or three germs, even though the morphology of the units indicates that to be the case. A few blanks are sure to occur. Actual crack test checks upon the material used in these tests showed an average of 3.7 per cent blanks or locules without any seed germ or endosperm. A further check with field planting is planned as a matter of interest.

Apparently many of our so-called doubles (two germed units) and triples (3 germed units) reported in crack tests are producing a preponderance of single plants upon germinating in greenhouse soil and an even greater percentage under field conditions which are much more severe. This is probably due to greater injury during preparation to the seed ball from which the multi-germed unit originates. (3)

A greater tolerance of "doubles" at the processing plant may be in order. This can easily be secured by less severe cracking of the whole seed and will reflect in greater recoveries of segmented seed and higher total field germination with less loss from abnormal plants.

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- (1) Cormany, C. E. Unpublished data reported at Holly Sugar Corporation Technical Meetings. January 1946.
 - (2) Maxson, Asa C. Experiences with segmenting machine and gravity table. Proceedings American Society of Sugar beet Technologists, Regional Meeting of Eastern Slope and Intermountain. 1944: 47-52.
 - (3) Tolman, Bion and Stout, Myron. Segmented sugar beet seed with special reference to normal and abnormal germination. Proceedings American Society of Sugar Beet Technologists, Regional Meeting of Eastern Slope and Intermountain. 1944: 25-33.
 - (4) Ryan, George K. and Owen, F. V. Yields from sugar beets with doubles 20 inches apart versus singles 10 inches apart. Proceedings American Society of Sugar Beet Technologists. 1946.