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EFFECT OF GRAVITY SEPARATION ON COTTONSEED

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Getting a stand is an acute problem facing cotton farmers. Many farmers replant at least a part of their acreage each year and thus increase their cost of production. Not only is the cost of replanting involved, but the success of the entire season's cotton producing operation depends on uniform stands.

Although fungicide seed treatment and chemical weed control are steps toward achieving better stands and lower production costs, little has been done to improve stands by planting high quality seeds.

A cotton crop reflects directly the quality of seeds planted. Even with the best quality seeds poor stands sometimes result, but good seeds increase the probability of good stands.

Studies have been in progress at the Delta Branch of the Mississippi Agricultural Experiment Station to determine whether or not seed size and density affect stands. Unpublished data from studies conducted in 1963 indicate marked differences in stands grown from different density classes of acid delinted cottonseed obtained by gravity table separation. The gravity table separates seed on the basis of weight and size. It does a more effective job of weight separation if seeds are first sized. Gravity tables are commonly used in areas with short growing seasons to remove immature cottonseeds; they have also been used to remove cockleburs from cottonseeds.

Seeds produced in 1962 and in 1963 of M8, Stoneville 213, and Deltapine Smooth Leaf were acid delinted and separated into three size-classes with sieves. Each size class was then subdivided into five density classes with a laboratory model gravity table.

The density classes were arbitrarily called, A, B, C, D and E, with A being the most dense and E the least dense class. A composite from each size-class was grown as a check. This made 36 classes of seed of each variety. These graded seeds were then evaluated in the laboratory and field.

Three tests were planted in the field in 1964 each containing 1962-produced seeds and 1963-produced seeds from one variety. Sixteen-hundred seeds from each of the 36 classes were planted, 200 seed per 60-foot plot row. The 1963 seeds were chosen because they were produced in a "good seed year", and the 1962 seeds because they were produced in a "poor seed year".

The seeds were planted the first week of May and emerged under favorable growing conditions. The emerged seedlings were counted two weeks after planting. Records were taken on the percentages of emergence, the percentage of the total seed lot in each of the three size-classes, the percentage of the total seed lot in each of the density classes, data on percentage of germination, vigor rating, and pounds per bushel (density).

The data on percentage of germination were obtained from a standard germination test of 90° F. The vigor ratings were obtained from tetrazolium embryo staining.

Results indicate that the same density class from all three size-classes behaved similarly. The A or B class produced the highest percentage of emergence; and the stands decreased directly as the density (pounds per bushel) decreased. There was a significant difference in percentage of emergence between seeds produced in 1962 and seeds produced in 1963 from all three varieties. (Technically, M8 is not a variety.)

Statistical analysis of the emergence data from the variety and year seed lots indicated that between size classes: The A density classes did not differ, the E density classes differed in four of the six seed lots, and the remaining density classes differed in some size classes but not in others. This indicates that in addition to making seed density separations more effective, seed sizing directly influences emergence.

The practical application of seed density separation would require fewer than the 15 density classes used in these experiments. Data obtained by averaging the density and composite classes from each of the three size-classes of each variety are presented in Table 1.

Emergence data from the six seed lots obtained by combining the three size-classes followed the same patterns. The A, B, and C lots did not differ significantly, except that the C class differed from A in the 1963 analysis, and in the 1962 and 1963 combined analysis of Stoneville 213. The D class and the composite check did not differ; and the E class produced significantly fewer seedlings.

These comparisons indicate that a superior grade of seeds for planting was obtained from these six seed lots by combining classes A, B, and C. Classes D and E should not be used for planting purposes.

These data indicate that high-vigor seed can be separated from low-vigor seed when both are present in a seed lot. They further indicate that it is possible to increase the percentage of germination of a low-vigor seed lot by eliminating the low-density seed by separation. However, there is not a corresponding increase in vigor or field emergence.

Within a seed lot, density apparently is more highly correlated with percentage of field emergence than with percentage of germination or vigor rating. Density provided reliable estimates for the three

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(Over)

varieties within each year. However, between years, it was not a reliable estimate as some 1962 seeds had the same density as 1963 seeds, but produced a poorer stand. More studies are needed before it will be known how generally seed density can be used to estimate field emergence.

Data from the three tests indicated that a better stand is obtained from low-vigor seeds or high-vigor seeds if only the heaviest seeds are planted. Low-vigor seeds do not produce vigorous stands and should not be used for planting purposes. Gravity tables have sometimes been used in salvage operations to remove dead seeds from low-vigor seed lots to meet certification standards. This practice has resulted in seed lots with low vigor being placed on the market, and has been a factor in making growers suspicious of acid delinted seed.

Seedmen generally agree that seed separation on a small laboratory gravity table is less effective than on a large commercial gravity table. Therefore, the results presented here would tend to be conservative.

Table 1. The percentage of total seed lot and average percentage emergence of six density classes of cottonseed produced in 1962 and 1963 and processed and planted at Stoneville, Miss., in 1964.

		1962 Produced seed		1963 Produced seed		1962 & 1963
Pedigree	Density Class	% Total seed lot	% Field emergence	% Total seed lot	% Field emergence	% Field Emergence
M8	A	11.8**	48.7a*	22.6**	63.6a*	56.2a*
	B	13.2	46.6a	13.4	63.7a	55.2a
	C	21.7	45.7a	19.3	58.0a	51.9a
	D	38.6	36.4b	31.8	44.9b	40.7b
	E	14.6	20.1c	12.8	18.3c	19.2c
	Check[1]	(100)	35.9b	(100)	51.3ab	43.6b
Stoneville 213	A	21.6	49.9a	26.2	66.7a	58.3a
	B	12.5	46.4ab	15.7	63.1ab	54.8ab
	C	22.9	41.1abc	24.3	59.6b	50.3bc
	D	32.1	34.0c	27.0	53.2c	43.6c
	E	11.0	18.2d	6.7	23.6d	20.9d
	Check[1]	(100)	37.3bc	(100)	51.9c	44.6c
Deltapine Smooth Leaf	A	31.8	53.1a	27.3	71.8ab	62.4a
	B	14.1	51.0a	41.1	76.1a	63.6a
	C	20.5	49.ab	21.5	67.4ab	58.5ab
	D	23.9	37.5b	26.7	59.3b	48.5b
	E	9.7	23.1c	10.4	30.1c	26.6c
	Check[1]	(100)	42.4ab	(100)	62.6ab	52.5ab

*Means followed by the same letter in the same column and variety are not significantly different at the .05 level as measured by Duncan's New Multiple Range Test.
**Sum is not always 100 due to rounding off.
[1]Sized, but not separated for density.

Table 2. The percentage of total seed lot and average percentage emergence of three width classes of cottonseed produced in 1962 and 1963 and processed and planted at Stoneville, Miss., in 1965.

		1962 Produced seed		1963 Produced seed		1962 & 1963
Pedigree	Width class	% Total seed lot	% field emergence	% Total seed lot	% Field emergence	% Field emergence
M8	Greater than 14/64"	31.43	38.9a*	27.82	50.8a*	44.8a*
	Less than 14/64" greater than 13/64"	47.73	38.9a	45.19	53.4a	46.1a
	less than 13/64"	20.84	39.0a	26.97	45.9a	42.4a
Stoneville 213	Greater than 14/64"	17.45	35.2b	30.13	54.6a	44.9a
	less than 14/64" greater than 13/64"	42.87	40.1a	49.10	55.5a	47.8a
	less than 13/64"	39.68	38.1ab	20.77	49.0a	43.5a
Deltapine Smooth Leaf	Greater than 14/64"	12.84	47.1a	11.37	59.7a	53.4ab
	less than 14/64"	44.98	46.3a	38.09	66.2a	56.3a
	greater than 13/64" less than 13/64"	42.18	34.9b	50.53	57.8a	46.4b

*Means followed by the same letter in the same column and variety are not significantly different at the .05 level as measured by Duncan's New Multiple Range Test.