

DP 555 BG/RR GROWTH AND YIELD AS RELATED TO SEED SIZE

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Abstract

In 2003, Delta and Pine Land Company released a cotton variety, DP 555 BG/RR, which has the potential to produce a significantly smaller seed when compared to other cotton varieties. With this reduction in seed size, D&PL readdressed the question of seed size as it relates to plant emergence, development and yield. During 2003, D&PL conducted a field trial to determine if the seed size of DP 555 BG/RR had an influence on plant emergence, plant growth and development, and yield. From the seed lots of DP 555 BG/RR sold in 2003, eight lots were selected to have similar warm and cool germs while representing a wide range in seed size. The eight lots of seed were planted in Winterville, MS and data was collected on plant emergence, plant development and yield. Two seed lots had delayed emergence compared to the other six lots. However, this difference did not correlate with seed size and was not significant at 38 DAP. Seed size did not affect the plant growth parameters of height, vegetative nodes, total nodes, and height to node ratio, or the plant development parameter of nodes above white flower. Seed cotton yields from all eight seed lots were statically the same indicating that the yield potential of DP 555 BG/RR was not affected by seed size.

Introduction

The size of cotton planting seed is different within and between varieties. Several studies have been conducted to determine if the size of cottonseed has any effect on emergence and field performance. Tupper et al. (1971) reported cottonseed emergence and subsequent growth depended more on seed density than on weight or size. Porterfield and Smith (1956) reported germination and field emergence were greater for intermediate size seed than for either small or larger size seed. Most recent, Gwathmey et al. (2001) reported results with multiple state cooperators where two varieties were separated into five seed size groups. Their results suggested planting a larger size seed could improve emergence and yield performance in some environments. Gwathmey et al, (2002), reported on the second year of the same study and results suggested that the sizing of cotton seed for planting did not consistently improve the uniformity of plant age and growth within stands, although the largest size seed produced larger plants with more nodes than the smallest size seed. Seed size did not affect lint yield in these studies. The introduction of a potentially significantly smaller cottonseed size variety (DP 555 BG/RR) than what growers are accustomed to planting prompted us to revisit seed size and cotton growth, development, and yield.

Materials and Methods

Delta and Pine Land Company's Quality Assurance department selected eight lots of cottonseed, from the 2003 inventory of DP 555 BG/RR, which represented the range (5576 to 7017 seed per pound of acid delinted seed) of available seed size. The eight selected lots had similar warm and cool germs but varied in seed size. Table 1 shows a list of the selected lots of seed with their respective germination and seed size information.

The eight selected lots were planted in Winterville, MS on May 12, 2003 in a RCB factorial arrangement with eight replications. Individual plots were two rows wide (6.3 ft) by 35 foot in length and planted at a seeding rate of 4 seed per foot. Before seedling emergence, a 10-foot section of each row was flagged for stand counts. During emergence, four stand counts were conducted. The first stand count was conducted when the first treatment could be rowed. The second and third stand counts were conducted 1 week after the prior count and the final count was conduct in conjunction with the early square plant map.

Plant growth and development data was collected at four growth stages, early square, early bloom, peak bloom (early bloom + 3 weeks), late bloom (cut out ~ 5 NAWF), and final map. Plots were then spindle picked to determine seed cotton yields.

Results and Discussion

Plant Emergence

Emergence percentages of the eight seed lots are shown in Table 2. Early emergence percentage from two seed lots, 782B200622S and 782E203321H, were significantly different from the other six seed lots at the P=0.05 level. On the final emergence count, 38 days after planting (DAP), there was no significant difference between the seed lots. This early difference in emergence does not correlate with seed size were seed lot 782B200622S was the smallest seed and seed lot 782E203321H was the fourth largest seed tested (Table 2). Regression between field emergence and seed size was not significant.

Plant Growth and Development

The average plant growth and development measurements from all five-plant mappings are shown in Table 3. The plant growth parameters of height, vegetative nodes, total nodes and height to node ratio (HNR) were collected during all five plant mappings and showed no significant difference between seed lots at the P=0.05 level. The plant development parameter of nodes above white flower (NAWF) was collected during the middle three plant mappings and again showed no significant difference between seed lots at the P=0.05 level. None of development parameters measured was affected by seed size in this field trial.

Yield

Mean seed cotton yield for the eight seed lots of DP 555 BG/RR are shown in Table 4. Seed cotton yield ranged from 3153 to 2784 lbs/ac, which was not significantly different. . Regression analysis for seed size versus yield was also insignificant. Seed cotton yield of DP 555 BG/RR was not affected by seed size.

Summary

In 2003, Delta and Pine Land Company introduced a cotton variety, DP 555 BG/RR, that has the potential to produce significantly smaller seed when compared to other cotton varieties. With this reduction in seed size, D&PL readdressed the question of seed size as it relates to plant emergence, development and yield. D&PL conducted a field trial in 2003 to evaluate the performance of different cottonseed size of DP 555 BG/RR based on plant emergence, plant growth and development, and yield. Seed size was not related to plant emergence, plant growth and development, or seed cotton yield.

References

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- Porterfield, J. and E.M. Smith. 1956. Characteristics and field performance of mechanically graded acid-delinted cottonseed. Oklahoma Exp. Sta. Tech. Bull. T-60, Stillwater OK.
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Table 1. A listing of the eight selected lots of DP 555 BG/RR with corresponding germination and seed size data.

Lot #	4-day warm	Date of 4-day warm	9-day warm	Date of 9-day warm	7-day cool	Date of 7-day cool	Seed Vigor Index	Visual Mech. Damage	Seed Size (seed/lb.)
782B200622S	80	2/9/2003	84	2/14/2003	73	2/12/2003	153	11	7017
782S224621S	76	2/14/2003	93	2/19/2003	72	2/17/2003	148	13	6354
782S224721S	74	2/14/2003	92	2/19/2003	77	2/17/2003	151	15	6243
782E204021E	76	2/14/2003	89	2/19/2003	76	2/17/2003	152	8	5991
782E203321H	75	4/1/2003	92	4/6/2003	73	4/4/2003	148	12	5839
782E299021H	83	2/12/2003	91	2/17/2003	70	2/15/2003	153	9	5740
782S223621S	74	2/13/2003	93	2/18/2003	71	2/16/2003	145	10	5706
782S223921H	76	2/28/2003	91	3/5/2003	71	3/3/2003	147	13	5576

Table 2. Emergence percentages from the four stand counts of the eight seed lots of DP 555 BG/RR and statistical analyses of main effects.

Lot #	Seed Size (seed/lb.)	Day After Planting (DAP)				
		8	15	22	38	Over Dates
		% Emergence	% Emergence	% Emergence	% Emergence	% Emergence
782B200622S	7017	53.91	55.00	58.13	60.47	56.88
782S224621S	6354	63.75	63.75	65.31	66.09	64.73
782S224721S	6243	65.47	64.84	68.59	70.47	67.34
782E204021E	5991	63.13	66.72	66.25	64.53	65.16
782E203321H	5839	55.16	57.50	56.88	59.69	57.30
782E299021H	5740	64.06	67.50	68.13	68.91	67.15
782S223621S	5706	64.38	65.00	65.63	68.75	65.94
782S223921H	5576	60.78	64.53	64.38	66.09	63.95
Average		61.33	63.11	64.16	65.63	63.55
R ²		0.38	0.38	0.43	0.31	0.37
Root Mean Square Error		7.9424	8.0743	7.6205	9.2939	7.9538
Mean Square Error		63.08	65.20	58.07	86.38	63.26
%C.V.		13%	13%	12%	14%	13%
Lot #						
P		0.0296	0.0322	0.0225	0.2181	<0.0001
LSD 0.05		7.99	8.12	7.67	NA	4.00
Lot # * DAP						
P						1.00
LSD 0.05						NA

Table 3. Average plant growth and development measurements from the five plant mappings of the eight seed lots of DP 555 BG/RR and statistical analyses of main effects.

Lot #	Seed Size (seed/lb.)	Height (in.)	Veg.-Nodes	Total Nodes	HNR	NAWF
782S224621S	6354	38.59	5.28	17.62	2.06	6.30
782S224721S	6243	37.97	5.31	17.72	2.01	6.10
782E204021E	5991	38.60	5.40	17.89	2.03	6.46
782E203321H	5839	38.12	5.30	17.71	2.02	6.31
782E299021H	5740	38.41	5.41	17.62	2.05	6.12
782S223621S	5706	39.21	5.41	18.03	2.05	6.22
782S223921H	5576	38.60	5.33	17.63	2.06	6.22
Average		38.45	5.34	17.76	2.03	6.26
R ²		0.98	0.53	0.96	0.96	0.94
Root Mean Square Error		2.6375	0.5839	1.2240	0.1190	0.8468
Mean Square Error		6.96	0.34	1.50	0.01	0.72
%C.V.		7%	11%	7%	6%	14%
Lot #						
P		0.5058	0.9477	0.7601	0.1114	0.8201
LSD 0.05		NA	NA	NA	NA	NA
Lot # * DAP						
P		0.8478	0.6793	0.8470	0.5456	0.9998
LSD 0.05		NA	NA	NA	NA	NA
N (# of Plant Maps)		5	5	5	5	3

Table 4. Average seed cotton yields of the eight seed lots of DP 555 BG/RR and statistical analyses of main effects.

Lot #	Seed cotton	
	Seed Size (seed/lb.)	Yield (lb./ac)
782B200622S	7017	2828
782S224621S	6354	2784
782S224721S	6243	2953
782E204021E	5991	3013
782E203321H	5839	2820
782E299021H	5740	2939
782S223621S	5706	3153
782S223921H	5576	2863
Average		2919
R ²		0.25
Root Mean Square Error		331.6805
Mean Square Error		110012.00
%C.V.		11%
Lot #		
P		0.3999
LSD 0.05		NA