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# Influence of Row Spacing Cotton Varieties and Strains on New DES



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# **Influence of Row Spacing on New DES Cotton Varieties and Strains**

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All with the MAFES Delta Branch



# Influence of Row Spacing on New DES Cotton Varieties and Strains

Cotton traditionally has been planted on 38- and 40-inch rows in the Delta of Mississippi because row-width standardization has been essential to mechanization of all cotton production practices. However, narrow-row cotton has been grown in tests on the Texas High Plains since 1954 (11). Development of finger-type strippers (3,11,16,20) stimulated interest in research to develop narrow-row production systems (8,15,17,19), and introduction of an experimental "cotton combine" in 1969 (9) increased the technical feasibility of harvesting cotton grown in narrow rows (5,12,14,18). Research at the MAFES Delta Branch in the late 1950s and early

1960s evaluated cotton yields on 20-, 40-, 60- and 80-inch rows (10). Bridge et al (5) reported that lint production of three commercial cotton varieties tested for three years averaged 9% more on 30-inch rows and 6% more on 15-inch rows than on 40-inch rows. However, the normal growing season for current cotton varieties and days suitable for harvesting in most years pose a severe restriction on producing cotton on narrow rows in the Mississippi River Delta (4) because of the requirement for once-over harvesting.

Ray (15) and Niles (13) emphasized that the potential of narrow-row production could not be realized until suitable varieties were

developed. Bridge and Chism (6,7) released two early maturing, high-yielding varieties in 1978. Anderson et al (1) evaluated these varieties on farms in the Delta of Mississippi before they were released and reported that they matured 14 days earlier and yielded 8% more than conventional varieties. Also, a larger acreage could be handled with the same equipment complex, with net income from the total acreage increased about \$20/acre.

The study reported here was designed to determine the earliness and yield of early maturing strains grown in conventional and narrow rows.

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## Materials and Methods

The effect of row spacing on five early maturing strains<sup>1</sup> and one commercial variety was studied at the MAFES Delta Branch for three years (1974-76). We used a split plot design with five replications. Main plots were "varieties" and subplots were row spacings. Each plot was 75 ft long with six rows at 40-inch spacing or 15 rows at 15-inch spacing.

The early maturing "varieties" in the trial were DES-21326-04 (designated DES 04), DES-2134-018 (DES 18), DES 2134-056 ('DES 56'), DES B8-32 (DES 32), DES 88-11-10 (DES 10) and DES 06-020-24 ('DES 24'). The standard commercial variety, 'Stoneville 213', was used as the control.

Seedbeds were prepared either in fall or spring by subsoiling, disking, applying Treflan® and disk-

ing. The plots planted to 40-inch rows were hipped twice, and the plots planted to 15-inch rows were left flat. All seedbeds were conditioned with a "do-all" ahead of the planters, and a 32% urea-ammonium nitrate solution was applied at planting to supply nitrogen at the rate of 80 lbs/acre.

The 40-inch rows were planted with a six-row Burch planter equipped with 5/8-inch-wide experimental sword openers. The 15-inch rows were planted with 15 John Deere 71-B flexi-planter units spaced 15 inches apart on the toolbar, with 20-inch spacing directly behind the tractor tires. Acid-delinted seed were planted at the rate of 25 lbs/acre on May 3, 14 and 10 in 1974, 1975 and 1976, respectively.

Fluometuron was applied

premerge at labeled rates (20-inch band on the 40-inch rows and broadcast on the plots planted to 15-inch rows). Weed control was accomplished on the 40-inch rows by cultivation plus post-directed spray of diuron and MSMA (five cultivations and two spray applications in 1974, five cultivations and three spray applications in 1975, four cultivations and two spray applications in 1976). The 15-inch rows were not cultivated but received two post-directed spray applications of diuron and MSMA in 1974, one in 1975 and in 1976.

Insecticides were applied by air as needed throughout the growing season. Defoliant was applied when the cotton matured in late September each year.

We marked off a 10-ft section of

<sup>1</sup>All strains and varieties are referred to as "varieties" throughout the remainder of this bulletin. All DES entries were MAFES strains when the study was conducted. DES 2134-056 was released as 'DES 56' in 1978 (7) and DES 06-020-24 was released as 'DES 24' in 1978 (6). DES 89-11-10 was tested in 1974 only. DES 06-020-24 was not tested in 1974 but was tested in 1975 and 1976.



one row in each plot and hand harvested the open bolls at intervals of about one week. All green bolls on each 10-ft row section were removed just before harvesting the center four rows of each 40-inch-row plot and a 13-ft-wide swath from each 15-inch-row plot with a cotton combine.

All green bolls on each 10-ft row section were removed just before harvesting, and the amount of seed cotton in the green bolls was estimated.<sup>2</sup> Total seed cotton yield

of each 10-ft row section was determined by summing the hand-harvested yield and the amount of cotton in the green bolls. Yields at each harvest (cumulative) were expressed as the percentage of total yield of each 10-ft row section, and time to 80% open was determined by plotting percentages of open cotton against time.

Samples of the seed cotton harvested from each plot with the cotton combine were collected, and the samples of each replicate were

blended into a composite sample for each treatment. Large sticks were removed by hand to facilitate handling in the small tower drier of the micro-gin, and all samples were ginned on a 20-saw gin with a standard equipment sequence.<sup>3</sup>

Lint samples were graded by personnel of the Cotton Division of the Agricultural Marketing Service, USDA, Greenwood, Mississippi.

## Results and Discussion

The first of seven harvests in 1974 was on September 9, and the percentages of total seed cotton yields that were open on each harvest date (averages of both row spacings) were significantly lower ( $P < .05$ ) for DES 10 and Stoneville 213 than for the other "varieties" tested (Table 1). Maturity averaged

**Table 1. Influence of row spacing on earliness of six cotton "varieties", MAFES Delta Branch, 1974.**

Variety	Row spacing (inches)	Dates of Hand Harvest <sup>1</sup>						
		9/9	9/16	9/23	10/1	10/8	10/17	10/21
		-----% of Seed Cotton Open-----						
DES 04	40	37.3	60.5	74.3	81.9	89.8	94.2	95.9
	15	46.9	61.5	78.8	86.8	92.2	94.7	95.7
	Average	42.1a <sup>2</sup>	61.0a	76.6a	84.4a	91.0a	94.5a	95.8a
DES 18	40	39.4	56.5	72.6	80.0	88.0	92.3	93.8
	15	46.6	60.4	70.4	77.6	87.9	95.4	96.8
	Average	43.0a	58.4a	71.5a	78.8a	88.0a	93.9a	95.3a
DES 56	40	39.5	60.2	74.5	80.2	88.1	92.4	94.3
	15	42.7	58.4	78.3	83.1	89.3	93.6	95.9
	Average	41.1a	59.3a	76.4a	81.6a	88.7a	93.0a	95.1a
DES 32	40	34.8	59.2	72.9	79.9	88.0	93.7	95.6
	15	43.6	67.1	78.4	84.3	90.4	92.8	94.5
	Average	39.2a	63.2a	75.7a	82.1a	89.2a	93.3a	95.1a
DES 10	40	13.1	29.4	40.0	46.7	62.0	76.3	81.3
	15	24.8	39.5	50.2	56.4	71.3	85.8	90.5
	Average	19.0b	34.5b	45.1b	51.5b	66.6b	81.0b	85.9b
Stoneville 213	40	18.5	36.2	49.7	56.7	69.6	80.0	83.6
	15	24.2	44.8	60.5	68.1	79.6	87.7	91.7
	Average	21.4b	40.5b	55.1b	62.4b	74.6b	83.8b	87.6b
<b>Row Spacing (inches)</b>								
40 (Average all varieties)		30.4b	50.3	64.0b	70.9b	80.9b	88.2b	90.8b
15 (Average all varieties)		38.1a	55.3	69.4a	76.1a	85.1a	91.7a	94.2a

<sup>1</sup>A 10-foot section of row was harvested by hand on the dates listed.

<sup>2</sup>Means in the same column followed by the same letter do not differ significantly ( $P < .05$ ) as determined by Duncan's new multiple range test.

<sup>2</sup>Fifty bolls that opened after harvest were used to estimate the amount of seed cotton in all green bolls from each 10-ft row section.

<sup>3</sup>The samples were ginned at the USDA Cotton Ginning Research Laboratory at Stoneville, Mississippi.

over all "varieties" was significantly earlier with the narrower row spacing on six of seven harvest dates. Differences in the relative earliness of maturity at first harvest were more pronounced for DES 04, DES 18, DES 32 and DES 56 than for DES 10 and Stoneville 213.

Percentages of total seed cotton yields that were open at the first harvest on September 8, 1975 (averages of both row spacings) were significantly higher for DES 04, DES 18 and DES 56 than for Stoneville 213, and DES 04 was earlier than Stoneville 213 until the October 16 harvest date (Table 2).

DES 32 was later than all other "varieties" after October 1 but was more storm resistant. DES 04 was earlier than DES 32 and DES 24 on all seven harvest dates.

Maturity (average of all "varieties") at each harvest date in 1975 was earlier for the wider row spacing<sup>4</sup>, and the differences were significant on the September 8 and October 8 harvest dates. However, maturity of DES 04 and DES 24 grown on 15-inch rows was earlier at each harvest date.

Percentages of total seed cotton yields that were open at the first harvest on September 15 in 1976 (averages of both row spacings)

were higher for all DES entries, and the differences were significant ( $P < .05$ ) for DES 04, DES 18, and DES 32 (Table 3). These three and DES 24 were significantly earlier than Stoneville 213 at the second harvest on September 22. Maturity averaged over all "varieties" was earlier for the 15-inch row spacing at each harvest date.

Time to 80% open (1974-76 averages) was longer for Stoneville 213 on 40-inch rows than for any of the other treatments (Table 4). Except for DES 10 in 1974 and DES 32 in 1975, all DES "varieties" grown at each row spacing in 1974

**Table 2. Influence of row spacing on earliness of six cotton "varieties", MAFES Delta Branch, 1975.**

Variety	Row spacing (inches)	Dates of Hand Harvest <sup>1</sup>						
		9/8	9/17	9/23	10/1	10/9	10/16	10/28
		-----% of Seed Cotton Open-----						
DES 04	40	30.8	47.7	59.2	69.0	78.1	86.7	91.3
	15	38.2	58.6	68.9	79.2	87.7	92.0	96.3
	Average	34.5a <sup>2</sup>	53.1a	64.1a	74.1a	82.9a	89.4a	93.8a
DES 18	40	42.8	58.2	68.1	75.7	82.7	88.0	91.4
	15	17.9	41.6	51.4	59.5	71.3	81.2	88.6
	Average	30.3ab	49.9ab	59.8ab	67.6ab	77.0ab	84.6ab	90.0ab
DES 56	40	35.6	51.2	60.5	71.7	80.2	86.9	91.0
	15	22.3	43.4	54.4	62.2	73.5	82.7	88.6
	Average	29.0ab	47.3ab	57.5abc	66.9ab	76.8ab	84.8ab	89.8ab
DES 32	40	32.4	47.8	58.2	66.4	72.6	80.0	83.6
	15	17.1	32.9	43.0	49.1	56.7	65.4	72.9
	Average	24.8bc	40.4b	50.6c	57.8c	64.6c	72.7c	78.3c
DES 24	40	22.7	38.7	49.6	59.6	70.7	78.5	85.1
	15	24.4	46.4	57.3	65.3	76.5	84.7	90.4
	Average	23.5bc	42.5b	53.4bc	62.4bc	73.6b	81.6b	87.7b
Stoneville 213	40	25.9	46.6	57.6	67.8	76.5	85.8	91.4
	15	14.7	36.9	50.1	60.3	70.0	79.3	87.9
	Average	20.3c	41.8b	53.9bc	64.1bc	73.2b	86.6ab	89.6ab
<b>Row Spacing (inches)</b>								
40 (Average all varieties)		31.7a	48.4	58.9	68.4a	76.8	84.3	89.0
15 (Average all varieties)		22.4b	43.3	54.2	62.6b	72.6	80.9	87.4

<sup>1</sup>A 10-foot section of row was harvested by hand on the dates listed.

<sup>2</sup>Means in the same column followed by the same letter do not differ significantly ( $P < .05$ ) as determined by Duncan's new multiple range test.

<sup>4</sup>Cotton is less drought tolerant when grown in 15-inch rows, and it was dry in July and August of 1975.



and 1975 were 80% open earlier than Stoneville 213 at the same row spacing. DES 04 grown on 15-inch rows was 80% open earlier than each other treatment each year.

Lint and cottonseed yields averaged over both row spacings for the three years were highest for DES 56, with lint yields significantly higher ( $P < .05$ ) than for DES 04 and DES 32 and cottonseed yields significantly higher than for DES 32 and Stoneville 213 (Table 4).

Lint yields averaged over both row spacings were higher ( $P < .05$ ) in 1974 for DES 56 than for Stoneville 213 and the other DES "varieties" except for DES 18. Differences in lint yields of the six "varieties" tested in 1975 were not significant. Lint production of all DES 24 plots averaged only 364 lbs/acre in 1976, significantly less than the average for all entries except DES 32.

Lint and cottonseed yields (averages of the five varieties

tested each year) were higher on the 40-inch rows in 1974 and 1976 higher on the 15-inch rows in 1975. The 1974 lint yields of DES 04 and DES 32 were lower ( $P < .05$ ) on the 15-inch rows than on the 40-inch rows.

Fiber property data were not analyzed statistically because seed cotton from all replications of each treatment was combined before ginning. However, measures of fiber quality differed only slightly by row spacing (Table 5).

**Table 3. Influence of row spacing on earliness of six cotton "varieties", MAFES Delta Branch, 1976.**

Variety	Row spacing (inches)	Dates of Hand Harvest <sup>1</sup>			
		9/15	9/22	9/30	10/7
		-----% of Seed Cotton Open-----			
DES 04	40	38.3	57.9	80.5	92.3
	15	78.6	89.6	95.9	99.9
	Average	58.5a <sup>2</sup>	73.7a	88.2	96.1
DES 18	40	47.9	68.7	88.4	96.7
	15	61.8	80.8	93.6	98.5
	Average	54.9ab	74.7a	91.0	97.6
DES 56	40	32.6	53.7	77.9	94.0
	15	60.0	77.3	93.9	97.6
	Average	46.3bc	65.5ab	85.9	95.8
DES 32	40	41.6	59.6	84.4	95.9
	15	67.0	79.9	90.9	98.4
	Average	54.3ab	69.8a	87.7	97.1
DES 24	40	39.4	63.3	84.6	94.3
	15	60.5	80.6	92.9	98.5
	Average	50.0abc	71.9a	88.7	96.4
Stoneville 213	40	29.9	46.9	72.1	85.9
	15	51.5	68.0	86.6	96.7
	Average	40.7c	57.4b	79.3	91.3
Row Spacing (inches)					
40 (Average all varieties)		38.3b	58.3b	81.3b	93.2b
15 (Average all varieties)		63.2a	79.4a	92.3a	98.2a

<sup>1</sup>A 10-foot section of row was harvested by hand on the dates listed.

<sup>2</sup>Means in the same column followed by the same letter do not differ significantly ( $P < .05$ ) as determined by Duncan's new multiple range test.

**Table 4. Influence of row spacing on earliness and yield of seven cotton "varieties", MAFES Delta Branch, 1974-76.**

Variety	Row spacing (inches)	Reached 80%				Lint				Cottonseed			
		1974	1975	1976	1974-76 Average	1974	1975	1976	1974-76 Average	1974	1975	1976	1974-76 Average
		-----No. Days <sup>1</sup> -----				-----Pounds per Acre-----							
DES 04	40	18.0	1.0	3.3	7.4	674cd <sup>2</sup>	774	474	640abc	1419	1731	885	1345a
	15	22.7	9.8	17.7	16.7	589f	825	378	597c	1261	1844	709	1271abc
	Average	20.4	5.4	10.5	12.1	632c	799	426ab	619b	1340ab	1788a	797	1308a
DES 18	40	16.0	5.5	7.5	9.7	734ab	852	448	678a	1430	1722	813	1322ab
	15	14.4	-3.7	11.7	7.5	706bc	815	407	643abc	1344	1707	761	1271abc
	Average	15.2	0.9	9.6	8.6	720ab	833	428ab	660a	1387a	1715ab	787	1296ab
DES 56	40	16.2	2.7	2.5	7.1	752a	798	466	672ab	1429	1695	852	1325a
	15	21.1	-2.4	10.3	9.7	761a	840	407	669ab	1386	1724	773	1294abc
	Average	18.7	0.2	6.4	8.4	756a	819	437ab	671a	1407a	1710ab	813	1310a
DES 32	40	15.9	-4.4	4.7	5.4	700bc	768	388	619bc	1402	1535	730	1222bc
	15	21.7	-27.5	11.1	1.8	632de	804	380	607c	1264	1651	707	1207c
	Average	18.8	-16.0	7.9	3.6	669bc	786	384bc	613b	1333ab	1593b	719	1214b
DES 10	40	-2.9				623ef				1208			
	15	3.6				624ef				1207			
	Average	0.4				623c				1208c			
DES 24	40		-7.2	5.1			806	376			1467	833	
	15		-0.4	11.0			817	353			1642	671	
	Average		-3.8	8.1			811	364c			1554b	696	
Stoneville 213	40	0.0	0.0	0.0	0.0	674cd	795	493	654abc	1275	1502	833	1204c
	15	8.5	-5.1	6.1	3.2	660cde	813	446	640abc	1236	1642	808	1229bc
	Average	4.3	-2.6	3.1	1.6	667bc	804	470a	647ab	1256bc	1572b	821	1216b
Average <sup>3</sup>	40	13.2	1.0	3.6	5.9	707c	797b	454e	653	1391c	1637b	823e	1284
	15	17.7	-5.8	11.4	7.8	671d	819a	404f	631	1298d	1714a	752f	1255
	Average (year) <sup>3</sup>	15.5	-2.4	7.5	6.8	689b	808a	429c	642	1344b	1675a	787c	1269

<sup>1</sup>Number of days a particular variety and/or row spacing reached 80% open compared to Stoneville 213 in 40-inch rows. Positive sign denotes earlier, negative sign denotes later. Number of days not analyzed because replications were combined.

<sup>2</sup>Means in the same column or group followed by the same letter do not differ significantly (P < .05) as determined by Duncan's new multiple range test.

<sup>3</sup>Average of the five varieties included in each year of the three year test.

**Table 5. Influence of row spacing on the fiber properties of seven cotton "varieties", MAFES Delta Branch, 1974-76.**

Variety	Row Spacing (inches)	Composite Grade <sup>1</sup>				Staple Length				Strength <sup>2</sup>				Micronaire			
		1974	1975	1976	1974-76 Average	1974	1975	1976	1974-76 Average	1974	1975	1976	1974-76 Average	1974	1975	1976	1974-76 Average
		-----index-----				-----32nd inch-----				-----g/tex-----							
DES 04	40	80	80	85	81.7	35	36	35	35.3	20.72	19.79	19.93	20.15	4.12	4.16	3.89	4.06
	15	80	80	76	78.7	35	34	34	34.3	20.72	20.28	17.97	19.66	4.20	4.22	3.44	3.95
DES 18	40	80	89	94	87.7	35	35	34	34.7	19.68	19.19	17.52	18.80	4.61	4.73	4.21	4.52
	15	85	89	85	86.3	35	35	34	34.7	19.98	19.19	16.91	18.69	4.58	4.71	3.78	4.36
DES 56	40	80	89	94	87.7	35	35	34	34.7	20.28	19.81	18.57	19.55	4.46	4.71	4.03	4.40
	15	94	89	85	89.3	35	34	34	34.3	19.83	19.66	19.03	19.51	4.42	4.65	3.70	4.26
DES 32	40	85	89	90	88.0	35	35	34	34.7	19.54	19.19	18.12	18.95	4.01	4.43	3.75	4.06
	15	89	89	85	87.7	35	35	34	34.7	18.65	18.56	17.82	18.34	4.09	4.41	3.31	3.94
DES 10	40	85				35				21.02				4.28			
	15	85				35				20.42				4.45			
DES 24	40		85	85			35	34			20.59	20.84			4.49	3.92	
	15		85	85			35	34			20.44	19.63			4.68	3.58	
DES 213	40	85	85	94	88.0	35	35	34	34.7	19.68	18.41	18.57	18.89	4.78	4.82	4.51	4.70
	15	80	85	85	83.3	35	35	34	34.7	19.39	19.19	18.27	18.95	4.78	4.89	4.40	4.69
Average <sup>3</sup>	40	82.0	86.4	91.4	86.6	35.0	35.2	34.2	34.8	19.98	19.28	18.54	19.27	4.40	4.57	4.08	4.35
	15	85.6	86.4	83.2	85.1	35.0	34.6	34.0	34.5	19.71	19.38	18.00	19.03	4.41	4.58	3.73	4.24
Average (year) <sup>3</sup>		83.8	86.4	87.3	85.8	35.0	34.9	34.1	34.7	19.85	19.33	18.27	19.15	4.41	4.57	3.90	4.29

<sup>1</sup>Composite grade index for white cotton: Strict low middling = 94; Low middling = 85; and strict good ordinary = 76. Cotton classed by USDA Classing Office, Greenwood, MS.

<sup>2</sup>Data given are the fiber strength of a bundle of fibers measured on the stielometer with the bundle holding the fiber bundle separated by a 1/8-inch spacer, expressed in grams-force per tex. Tex is the linear density of fibers, filaments, and yarns expressed as the weight, in grams, of 9000 meters of fiber or yarn.

<sup>3</sup>Average of the five varieties included in each year of the three year test.

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