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Influence of Row Spacing, Seeding Rates and Herbicide Systems on the Competitiveness and Yield of Peanuts[1]

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ABSTRACT

Peanuts (*Arachis hypogaea* L. 'Florunner'), infested with sicklepod (*Cassia obtusifolia* L.) were grown during 1977 and 1978 in 20.3-, 40.6- and 81.2-cm row widths (on Dothan sandy loam and on Greenville sandy clay loam). The crop was maintained weed-free for 0, 2, or 5 weeks or for the entire growing season. Three herbicidal systems with various intensities were utilized. In 1978, reduced and regular rates of in-row crop seeding were compared. Weed-free maintenance for 5 weeks generally produced yields of peanuts equivalent to those obtained with continuous weeding. Sicklepod green weights were reduced by 28 and 53% in peanuts with row spacings of 40.6 and 20.3 cm, respectively, as compared to standard 81.2 cm spaced rows. Peanuts in close-row patterns yielded about 14% higher than the conventional 81.2 cm row spacing when averaged for all studies. Adjustments of the in-row seeding rate to produce a more normal seed-drop per hectare reduced the yield of peanuts only 1 to 3% and, therefore, did not negate the increased yields produced with close-row spacings.

Key Words: Peanuts, row spacing, seeding rates, herbicide systems, weed-crop competition, weed-free maintenance, close-rows, *Arachis hypogaea* L., Florunner.

Studies of the effects of row spacing on growth and yield of peanuts began on a limited basis in the 1890's and have continued intermittently (3). Early investigators emphasized the difficulty of cultivating narrow-row plantings. With the precision cultivating equipment and herbicides that are available today, difficulty in cultivation is no longer a compelling reason for use of conventional row spacings.

Beattie *et al.* (1) pointed out in 1927 that "in commercial practice the intervals between rows vary from a width sufficient for the passage of a mule to as much as 4 ft" (1.2 m). Texas growers were advised to plant peanuts in 76- to 91-cm rows (9). Later, Parham (11) found that yields of Spanish peanuts were higher in 46- than in 61-, 76-, 91-, or 107-cm rows. Alluding to the difficulty of cultivating narrow rows and to the large quantities of seed needed for planting, he suggested a 67- to 76-cm row spacing as most practical.

In 1964, Duke and Alexander (5) found that yields of large-seeded Virginia bunch-type peanuts were often higher in close rows than in standard-width rows. Among the close-row patterns, yields were similar with rows spaced 30 and 46 cm apart. Row spacing did not significantly affect yields of runner-type peanuts. Duke and Alexander (5) further observed that Virginia bunch-type peanuts planted in conventionally spaced rows produced more extra-large kernels than did those planted in close rows. Norden and Lipscomb (10) reported 16% higher yields with "bunch" lines of peanuts planted in 46 cm rows rather than 91-cm rows; the 5% yield increase of runner lines was not statistically significant. They used an in-row seeding rate that resulted in equal plant populations per hectare for each of the row spacings employed.

From North Carolina, Cox and Reid (4) reported that increasing populations of peanut plants either by increasing the seeding rate in the row, or by decreasing the row widths, led to higher yields of peanuts; decreasing row widths was generally the more effective and consistent means of increasing yields. They further reported that the responses to the use of close rows were often negligible at high yield levels (4300 kg/ha or higher).

Mixon (8), in recent Alabama research, failed to show a yield advantage when runner-type peanuts were planted in 30- or 46-cm rows rather than in 91-cm rows. He did, however, suggest other possible advantages of close-row plantings such as better opportunities for control of weeds and diseases.

In Australia, a yield increase of 14% resulted from decreasing the row width from 76 to 61 cm when peanuts were planted early, but not when they were planted late (12). From Texas, Harrison (6) reported that twin rows of Spanish peanuts planted 25 cm apart outyielded single rows. Seeding rates were compensated for in each row width, i.e., one-half the number of seed in each twin row as in each single. Three-row patterns significantly outyielded one-row patterns but not two-row patterns.

Significant increases in yields from "close rows" of runner-type peanuts have not been reported. Furthermore, we found no publications which described the effects of row spacing on Florunner (the most widely grown peanut cultivar in the United States). Previously, we studied the competition of broadleaf weeds with peanuts (7), but no prior work with this crop combined the variables of row spacing and weed competition. Our initial row spacing studies of Florunner peanuts with equal in-row seeding rates indicated a general increase in yield with a decrease in row width irrespective of weed population (2). The experiments described herein were designed to evaluate crop seeding rates and to further study the effects of crop row spacing and herbicide systems on competition between weeds and Florunner peanuts.

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Materials and Methods

Experiments were conducted in 1977 and 1978 at Headland, Alabama, on Dothan sandy loam and at Plains, Georgia, on Greenville sandy clay loam. Sicklepod, one of the most troublesome broadleaf weeds in the Southeastern peanut belt, was the test weed used in all experiments. Florunner peanuts were planted in all studies. The experimental design was a split-split-plot in 1977 and a split-split-split-plot in 1978 with four replications each. Treatments for whole plots were periods of Weed-free maintenance: (a) 0 weeks of weed-free maintenance, i.e., weeds emerge with peanuts; (b) 2 weeks of weed-free maintenance, i.e., weeds emerge about two weeks after the peanuts; (c) 5 weeks of weed-free maintenance, i.e., weeds emerge about 5 weeks after the peanuts; and (d) seasonlong weed-free maintenance, i.e., peanuts maintained free of weeds for the entire season.

The treatments for the split plots consisted of three herbicide systems with increasing intensity of herbicidal inputs. The entire experimental area was treated with benefin (*N*-butyl-*N*-ethyl-α-α-α-trifluoro-2,6-dinitro-*p*-toluidine) applied at 1.68 kg/ha as a preplant-incorporated (PPI) treatment to control grasses and small-seeded broadleaf weeds. Escaped weeds other than sicklepod were removed by hand-pulling. The simplest herbicidal system thus consisted of benefin alone. The second system consisted of benefin followed by a "groundcracking" application (GC) of a mixture of alachlor [2-chloro-2',6'-diethyl-*N*-(methoxymethyl)acetanilide], at 3.36 kg/ha + Dyanap [a mixture of naptalam (*N*-1-naphthylphthalamic acid) and dinoseb (2-*sec*-butyl-4,6-dinitrophenol)] at 3.36 kg/ha. The third and most intensive herbicide system included benefin, alachlor + Dyanap, and a postemergence application (PO) of dinoseb at 0.84 kg/ha.

Split, split plots were row spacings of 81.2 cm, 40.6 cm, and 20.3 cm. The rows spaced 20.3 and 40.6 cm apart are referred to as "closerow" spacings. At Plains, the peanuts were planted on beds that measured 157 cm between the tractor wheel centers and about 127 cm from shoulder-to-shoulder of the bed. Two rows, 81.2 cm apart; three rows, 40.6 cm apart, or five rows, 20.3 cm apart were centered on each bed. At Headland, two, four, and seven rows of peanuts were planted to give 81.2-, 40.6-, and 20.3-cm row spacings, respectively.

The treatments for the split-split, split plots (in the 1978 studies only) were (a) a constant in-row seeding rate (12-15 seed/m), regardless of row spacing, and (b) reduced seeding rates. The constant in-row rate provided 134, 202, and 336 kg/ha of seed for the 81.2-, 40.6- and 20.3-cm row spacings, respectively, at both locations. With the reduced seeding rates, the standard two-row pattern received 10% less seed per hectare, and the 40.6- and 20.3-cm close row patterns received 25% and 50% less seed per hectare, respectively than would have been planted with the constant in-row rate.

Sicklepod was planted with either hand-pushed or tractor-mounted planters to give about 30 plants/m or row. Seeds that had been appropriately scarified to ensure high germination were planted as follows to give equivalent weed populations with each row spacing: four rows of weeds per row of peanuts in 81.2-cm-spaced peanuts; two rows of weeds per row of peanuts in 40.6-cm-spaced peanuts; and one row of weeds per row of peanuts in 20.3-cm-spaced peanuts. To provide comparable effects, a row of weeds was always planted 10 cm from a crop row. If rain did not occur within 5 days after initiating a weed treatment, the entire experimental area was irrigated with a sprinkler system. Dates of emergence treatment (weeks of weed-free maintenance) were established by hand-weeding of plots for the specified times and then planting the weed seed.

Two to three weeks before harvesting peanuts, weeds from one m^2 on each plot were counted, harvested and weighed. Peanuts were dug with a conventional digger-shaker-inverter, allowed to dry in the field, and usually on the third day after digging were combined with standard equipment.

Statistical analyses were done by the Computer Center, Coastal Plain Experiment Station and Duncan's Multiple Range Test was used for separation of means.

Results

1977 Studies

Green weight of sicklepod. The green weight of sicklepod generally decreased as the weed-free period increased at both locations (Table 1). The only weeds present in the plots weeded for the season were those that escaped earlier weedings. It is impossible to detect all of these weeds while they are intermingled with the peanut foliage and before they overtop the canopy of peanut leaves. The averages show that the greatest reduction in green weight among the early season weed-free intervals occurred between the 0- to 5-week periods at Headland and between the 0- and 2-week weed-free periods at Plains.

Table 1. Summary of weed competition and row spacing data, Headland, Alabama and Plains, Georgia. 1977[a/].

Weed-free periods	Headland, Alabama		Plains, Georgia	
	Green wt. of sicklepod	Yield of peanuts	Green wt. of sicklepod	Yield of peanuts
	kg/ha	kg/ha	kg/ha	kg/ha
0 wk	2516 a	3116 a	4104 a	2422 b
2 wk	1450 ab	3533 a	390 b	3165 a
5 wk	721 bc	4001 a	175 b	3116 a
Season	75 c	4386 a	38 b	3143 a
Row spacing				
81.2 cm	1551 a	3355 a	1689 a	2896 a
40.6 cm	1198 a	3847 b	1141 b	3012 a
20.3 cm	822 a	4077 b	700 c	2987 a
Herbicide systems				
PPI	2446 a	3008 b	2906 a	2750 b
PPI+GC	794 b	4061 a	455 b	3060 a
PPI+GC+PO	331 b	4211 a	170 b	3097 a

a/ Any two averages not followed by the same letter are significantly different at the 5% level.

As expected, increasing the intensity of the herbicide treatments by adding a mixture at "ground-cracking" decreased the green weight of sicklepod; however, the addition of dinoseb as a postemergence treatment did not produce further significant reductions.

The row-spacing averages show that in spite of numerical differences in green weight at Headland, variability in the data prevented expression of statistically significant row-spacing effects. At Plains, green weight of sicklepod was reduced 32% and 59% in rows spaced 40.6 and 20.3 apart, respectively, compared to that in standard 81.2-cm rows.

Yield of peanuts. At Headland, consistent but statistically nonsignificant increases in peanut yield occurred within each row spacing as the weed-free period increased (Table 1). At Plains, average yields from the various weed-free periods were significantly higher than yields from the 0-week interval (weedy all seaosn).

Applying a "cracking" mixture after benefin consistently and significantly increased the yield of peanuts (Table 1). In five of six comparisons, the subsequent treatment with dinoseb promoted insignificant increases in yield, presumably because of moderate reductions in weed weights.

The averages for row spacing show that at Headland yields were significantly higher with both close-row patterns than with standard rows; however, peanut yields did not respond significantly to row patterns at Plains.

The green weight of sicklepod and the yield of peanuts were inversely related at Headland. Although peanut yield increased with increases in the weed-free period the differences were not significant at the 5% level. At Plains, the peanuts yielded significantly higher whenever an increase in the weed-free maintenance period significantly reduced the green weight of sicklepod.

The effects of row spacing were less consistent than in previous years (2). Although row width at Headland reduced green weight of sicklepod in a non-significant manner, peanut yields from close-rows were higher than from the 81.2-cm rows. In contrast, at Plains, green weight of sicklepod was decreased significantly with each decrement in row width but significant differences in yield of peanuts did not develop. If the effects from row spacing on green weight are averaged over locations, the 40.6-cm and 20.3-cm spacings reduced weed weights 28 and 53%, respectively, as compared with the 81.2-cm spacing.

1978 Studies

Number of sicklepod plants, Headland. Almost without exception, more sicklepod plants survived with reduced seeding rates of peanuts than with the regular seeding rate (Table 2). This was true regardless of the other variables involved.

Closer row spacing, the season long weed-free periods, and intensified herbicidal treatment reduced the number of sicklepod plants (Table 2). However, the trends were more definitive for row spacings and herbicides than for weed-free periods. Compared with the standard 81.2-cm rows, the reductions in weed number for the 40.6-, and 20.3-cm rows were 46% and 64%, respectively. More sicklepod plants were present where only benefin was used than where the ppi + cracking or the ppi + cracking + postemergence sequences of herbicides were used.

Weight of sicklepod plants, Headland. In contrast to weed numbers (Table 2), substantial differences in weed weights occurred among the 0-2-, and 5-week weed-free maintenance intervals (Table 3). The weed weights appear to be more meaningful than number of weeds since size of the plants influences the weight but not the number.

Lengthening the weed-free period from 0 to 2 or from 2 to 5 weeks caused about a 50% reduction in weight (Table 3). Like weed number, weed weight was greater with the reduced seeding rate for peanuts than with regular seeding. As the row spacings decreased from 81.2 to 40.6 to 20.3 cm, weed weight decreased by 47% and 65% respectively.

Number of sicklepod plants, Plains. In contrast to results at Headland, no overall differences in weed number occurred between the crop seeding rates at Plains (Table 4). The low average number of weeds in the 0-week weed-

Table 2. Influence of row spacing, periods of weed-free maintenance, herbicide systems, and peanut seeding rate on number of sicklepod plants, Headland, Alabama, 1978[a/].

Row spacing (cm)	Seeding rate	Number of sicklepod plants per plot: Periods of weed-free maintenance 0 wk	2 wk	5 wk	Season	Averaged over weed-free periods: Row spacing	Seeding rate x row spacing: Regular	Reduced
81.2	Regular	110	112	97	4	89 a	81	
81.2	Reduced	153	135	91	8			97
40.6	Regular	70	60	33	6	47 b	42	
40.6	Reduced	80	71	55	5			53
20.3	Regular	43	16	28	1	32 c	22	
20.3	Reduced	70	46	49	4			42
Herbicide systems						**Herbicides**	**Seeding rate x herbicide: Regular**	**Reduced**
PPI	Regular	134	139	102	8	113 a	96	
PPI	Reduced	204	189	119	9			131
PPI+GC	Regular	43	23	21	2	25 b	22	
PPI+GC	Reduced	43	31	30	3			27
PPI+GC+PO	Regular	46	26	35	2	31 b	27	
PPI+GC+PO	Reduced	56	32	45	5			34
Overall averages for weed-free periods		88 a	73 a	59 a	5 b	Overall averages for seeding rate	48 b	64 a

a/ Any two averages not followed by the same letter are significantly different at the 5% level.

Table 3. Influence of row spacing, periods of weed-free maintenance, herbicide systems, and peanut seeding rate on weights of sicklepod plants, Headland, Alabama, 1978[a/].

Row spacing (cm)	Seeding rate	Green weights in kilograms per hectare: Periods of weed-free maintenance 0 wk	2 wk	5 wk	Season	Averaged over weed-free periods: Row spacing	Seeding rate x row spacing: Regular	Reduced
81.2	Regular	2914	1292	936	0	1541 a	1286	
81.2	Reduced	3665	2624	872	24			1796
40.6	Regular	1937	1106	396	0	821 b	860	
40.6	Reduced	1816	751	565	0			783
20.3	Regular	1001	291	274	0	533 b	392	
20.3	Reduced	1792	371	501	24			672
Herbicide systems						**Herbicides**	**Seeding rate x herbicide: Regular**	**Reduced**
PPI	Regular	3665	2293	961	0	2040 a	1730	
PPI	Reduced	5126	3213	1025	40			2351
PPI+GC	Regular	1187	145	420	0	431 b	438	
PPI+GC	Reduced	1066	355	274	0			424
PPI+GC+PO	Regular	1001	250	226	0	424 b	369	
PPI+GC+PO	Reduced	1082	186	646	0			478
Overall averages for weed-free periods		2188 a	1073 b	591 bc	8 c	Overall averages for seeding rate	846 b	1084 a

a/ Any two averages not followed by the same letter are significantly different at the 5% level.

Table 4. Influence of row spacing, periods of weed-free maintenance, herbicide systems, and peanut seeding rate on number of sicklepod plants, Plains, Georgia, 1978[a/].

Row spacing (cm)	Seeding rate	Number of sicklepod plants per plot: Periods of weed-free maintenance 0 wk	2 wk	5 wk	Season	Averaged over weed-free periods: Row spacing	Seeding rate x row spacing: Regular	Reduced
81.2	Regular	104	137	103	0	86 a	86	
81.2	Reduced	94	152	97	0			86
40.6	Regular	91	123	49	0	62 b	66	
40.6	Reduced	77	124	36	0			59
20.3	Regular	74	79	6	0	42 c	40	
20.3	Reduced	65	94	20	0			45
Herbicide systems						**Herbicides**	**Seeding rate x herbicide: Regular**	**Reduced**
PPI	Regular	276	312	154	0	179 a	186	
PPI	Reduced	197	339	151	0			172
PPI+GC	Regular	32	23	2	0	14 b	14	
PPI+GC	Reduced	29	27	2	0			14
PPI+GC+PO	Regular	12	4	1	0	4 b	4	
PPI+GC+PO	Reduced	10	4	1	0			4
Overall averages for weed-free periods		84 b	118 a	52 c	0 d	Overall averages for seeding rate	68 a	63 a

a/ Any two averages not followed by the same letter are significantly different at the 5% level.

free period was caused by high winds accompanied by a sandstorm, which severely damaged or killed many weeds soon after emergence at 0 weeks.

As at Headland, significant differences in weed number occurred among the row spacings and herbicide treatments. For example, as compared to standard 81.2-cm rows, the reductions in weed number were 28 and 51%, respectively, for the 40.6- and 20.3-cm rows. Effects of herbicide systems on weed number were quite similar at Headland and Plains.

Weight of sicklepod plants, Plains. The most definitive trends in weed weights at Plains were those with row spacing and herbicides (Table 5). As compared to 81.2-cm rows, the reductions in weed weight were 33 and 46%, respectively, with spacings of 40.6 and 20.3 cm. Increasing the intensity of herbicidal treatment significantly reduced the average weed weight. Also, except with the most intensive herbicidal treatment, weed weight was somewhat higher with reduced cropseeding rates. Average weed weights for weed-free periods were directly related to weed numbers (Table 4). The effect on weed weight of crop seeding rate within weed-free periods was somewhat inconsistent.

Yield of peanuts. The 1978 peanut yields from Headland and Plains are reported in Table 6 and 7, respectively. As in 1977, the close-rows were not significantly different from each other in yield of peanuts. However, yields from both close-row spacings were significantly higher than those from the standard 81.2-cm spacing. Increases in yield from close-rows averaged 22 and 14%, respectively, at Headland and Plains for an average increased yield of 18%. While yield reductions from reduced crop-seeding rates within the weed-free periods were fairly consistent at Headland, they were inconsistent at Plains.

Summary of 1978 Studies. The averages from the 1978 studies (Table 8) show that the number and weight of sicklepod plants decreased with increases in the weed-free periods at Headland; however, yield of peanuts increased significantly only with the increase in weed-free period from 2 to 5 weeks at Plains. Weeding for 5 weeks was not as effective as continuous weeding in this study.

Row spacing effects were both more pronounced and more consistent in 1978 (Table 8) than in 1977 (Table 1). Both weed number and weed weight decreased as widths between peanut rows were decreased. These decreases in weed measurements were accompanied by peanut yield increases in the close rows as compared with the standard width but no significant differences occurred between the two close-row patterns.

Changing the crop-seeding rate produced significant differences at Headland but not at Plains (Table 8). The decrease in peanut yields at Headland attributable to rate of seeding, although statistically significant, was only 3%.

Herbicidal systems affected weeds and peanuts similarly at both locations, with one notable exception. At Plains, a single postemergence treatment with dinoseb significantly reduced the weight of sicklepod.

Table 5. Influence of row spacing, periods of weed-free maintenance, herbicide systems, and peanut seeding rate on weights of sicklepod plants, Plains, Georgia, 1978[a/].

Row spacing (cm)	Seeding rate	Weights of sicklepod in kilograms per hectare: Periods of weed-free maintenance 0 wk	2 wk	5 wk	Season	Averaged over weed-free periods: Row spacing	Seeding rate x row spacing: Regular	Reduced
81.2	Regular	3544	4472	2083	16	2545 a	2529	
81.2	Reduced	3609	4408	2228	0			2561
40.6	Regular	2583	3092	783	16	1695 b	1618	
40.6	Reduced	2559	3560	969	0			1772
20.3	Regular	2155	2164	226	8	1382 c	1138	
20.3	Reduced	2277	3600	614	8			1625
Herbicide systems						**Herbicides**	**Seeding rate x herbicide: Regular**	**Reduced**
PPI	Regular	6281	7701	2825	8	4491 a	4204	
PPI	Reduced	6466	9058	3584	8			4779
PPI+GC	Regular	1380	1841	194	16	920 b	858	
PPI+GC	Reduced	1558	2260	121	0			985
PPI+GC+PO	Regular	622	186	73	16	209 c	224	
PPI+GC+PO	Reduced	428	250	97	0			194
Overall averages for weed-free periods		2788 b	3549 a	1150 c	8 d	Overall averages for seeding rate	1762 b	1986 a

a/ Any two averages not followed by the same letter are significantly different at the 5% level.

Table 6. Influence of row spacing, periods of weed-free maintenance, herbicide systems, and seeding rate on yield of Florunner peanuts, Headland, Alabama, 1978[a/].

Row spacing (cm)	Seeding rate	Yield in kilograms per hectare: Periods of weed-free maintenance 0 wk	2 wk	5 wk	Season	Averaged over weed-free periods: Row spacing	Seeding rate x row spacing: Regular	Reduced
81.2	Regular	3269	3835	4044	4117	3801 b	3816	
81.2	Reduced	3221	3697	3972	4254			3786
40.6	Regular	4359	4836	5142	4811	4693 a	4787	
40.6	Reduced	4335	4521	4811	4731			4601
20.3	Regular	4545	4779	4828	4771	4636 a	4731	
20.3	Reduced	4254	4480	4690	4739			4541
Herbicide systems						**Herbicides**	**Seeding rate x herbicide: Regular**	**Reduced**
PPI	Regular	3173	3835	4230	4464	3858 b	3926	
PPI	Reduced	3084	3512	4141	4424			3790
PPI+GC	Regular	4545	4844	4949	4618	4669 a	4739	
PPI+GC	Reduced	4375	4747	4698	4577			4599
PPI+GC+PO	Regular	4448	4674	4828	4658	4598 a	4652	
PPI+GC+PO	Reduced	4351	4448	4658	4723			4545
Overall averages for weed-free periods		3997 a	4351 a	4593 a	4577	Overall averages for seeding rate	4440 a	4310 b

a/ Any two averages not followed by the same letter are significantly different at the 5% level.

Table 7. Influence of row spacing, periods of weed-free maintenance, herbicide systems, and peanut seeding rate on yield of Florunner peanuts, Plains, Georgia, 1978[a/].

Row spacing (cm)	Seeding rate	Yield in kilograms per hectare: Periods of weed-free maintenance 0 wk	2 wk	5 wk	Season	Averaged over weed-free periods: Row spacing	Seeding rate x row spacing: Regular	Reduced
81.2	Regular	3746	4093	4553	4577	4275 b	4242	
81.2	Reduced	4077	3980	4513	4658			4307
40.6	Regular	4601	4513	5199	5393	4830 a	4926	
40.6	Reduced	4529	4303	4973	5126			4733
20.3	Regular	4844	4521	5086	5215	4918 a	4916	
20.3	Reduced	4634	4585	5183	5280			4920
Herbicide systems						**Herbicides**	**Seeding rate x herbicide: Regular**	**Reduced**
PPI	Regular	3132	3076	4658	5118	3900 b	3996	
PPI	Reduced	3108	2850	4440	4819			3804
PPI+GC	Regular	4965	4779	4997	5013	5025 a	4938	
PPI+GC	Reduced	4989	4965	5247	5247			5112
PPI+GC+PO	Regular	5094	5263	5142	5054	5092 a	5138	
PPI+GC+PO	Reduced	5134	5046	4997	5005			5046
Overall averages for weed-free periods		4404 a	4331 a	4916 b	5042 b	Overall averages for seeding rate	4690 a	4654 a

a/ Any two averages not followed by the same letter are significantly different at the 5% level.

Table 8. Summary of weed competition and row spacing data, Headland, Alabama and Plains, Georgia, 1978[a/].

Weed-free periods	Headland, Alabama			Plains, Georgia		
	No. of sicklepod per plot	Wt. of sicklepod kg/ha	Yield of peanuts kg/ha	No. of sicklepod per plot	Wt. of sicklepod kg/ha	Yield of peanuts kg/ha
0 wks.	88 a	2188 a	3997 a	84 b	2788 b	4404 b
2 wks.	73 a	1073 b	4351 a	118 a	3549 a	4331 b
5 wks.	59 a	591 bc	4593 a	52 c	1150 c	4916 a
Season	5 b	8 c	4577 a	0 d	8 d	5042 a
Row spacing						
81.2 cm	89 a	1541 a	3801 b	86 a	2545 a	4275 b
40.6 cm	47 b	821 b	4693 a	62 b	1695 b	4830 a
20.3 cm	32 c	533 b	4636 a	42 c	1382 c	4918 a
Seeding rate						
Regular	48 b	846 b	4440 a	68 NS	1762 b	4690 a
Reduced	64 a	1084 a	4310 b	63	1986 a	4654 a
Herbicide systems						
PPI	113 a	2040 a	3858 b	179 a	4491 a	3900 b
PPI+GC	25 b	431 b	4669 a	14 b	920 b	5025 a
PPI+GC+PO	31 b	428 b	4598 a	4 b	209 c	5092 a

a/ Any two averages not followed by the same letter are significantly different at the 5% level.

Discussion

In the first phase of our row spacing research, yield of peanuts was 7 to 30% higher with 40.6-cm rows and 11 to 40% higher with 20.3-cm rows, respectively, than with 81.2-cm rows (2). In contrast, the data presented herein showed little difference in yield between the two close-row spacings; however, as compared to conventional spacing, the close rows increased peanut yields by an average of about 15%. Considering both our past and present results, we believe that a reasonable interpolative projection of the potential yield increase on farms which use close-row spacings with 'Florunner' peanuts is 12 to 15%. This projection is based on 14 studies conducted on two soils over a four-year period. Close-row patterns failed to produce a yield increase in only one of the 14 experiments (Plains, 1977). The results of this experiment were affected by periodic severe droughts, punctuated by supplemental irrigations to save the experiment and not necessarily implemented for maximum crop yield. Peanut plants growing in close rows probably have a shorter fruiting period than plants in normal rows and, therefore, would be more affected by periodic droughts. Timely irrigation, designed to provide optimal moisture during the fruiting period, should maximize the opportunity for yield increases induced by peanuts grown in narrow-row patterns. Our previous research (2) also showed that the yield increases induced by close rows are sometimes accompanied by better market quality.

In evaluating our results, one must critically consider the weight of weeds produced within the different row spacing regimes. Assuming that no yield increases resulted from row spacings per se, a switch to closer rows might well be justified from the standpoint of increased suppression of weeds, with resultant easier harvesting. The increased weed control is obtained by biological means, i.e., production early in the season of a canopy of crop leaves with heavy shade, which decreases weed growth. No additional herbicidal treatments are necessary to achieve this suppression of weeds -- in fact, it seems feasible to reduce the intensity of herbicide treatment because of the effective biocontrol from the shading crop canopy. The only additional cost to the peanut producer is the cost of the extra seed required to plant additional rows. If reduced in-row seeding rates are used, the additional cost seems very reasonable for the benefits derived.

An obvious disadvantage to use of close-rows is that many such patterns are not adapted to current harvesting implements. However, four-row patterns with two sets of twins do not have this disadvantage. And, undoubtedly, if various close-row patterns are widely adopted in the future, manufacturers will devise appropriate modifications in harvesting equipment.

Our research data indicate that peanuts grown in close rows are more effective in suppressing weeds than those grown in wide rows. Although yield increases were reported previously for Spanish and Virginia cultivars (4, 5, 6, 10, 11) other research, such as that of Mixon (8), uncovered no significant yield advantage for runner-type peanuts. However, Mixon's research was conducted before the introduction of the widely grown 'Florunner' cultivar. Our data and that of previous studies by Cox and Reid (4), Harrison (6), and Phillips and Norman (12) support the theory that close-row patterns are effective in suppressing weeds and increasing yield of peanuts irregardless of the cultivar or the geographical location.

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