Row Spacing Affects Yield of Machine-harvested, Green-mature Southernpeas

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Abstract. An investigation was conducted in 1993 and 1994 to examine the effect of row spacing on yield and pod maturity distribution of machine-harvested, green-mature southernpeas [*Vigna unguiculata* (L.) Walp]. ‘Texas Pinkeye Purple Hull’ was planted at row spacings of 53, 89, and 107 cm single drilled and 107 cm double drilled. Marketable yield increased linearly as row spacing decreased. A double drill on a standard 107-cm row spacing did not result in higher yield than a single drill. Marketable yield from the double-drilled, 107-cm row spacing was less than yield from the 53-cm spacing. The seeding rate per hectare for the two treatments was the same. In 1993, the mature pod percentage at harvest increased linearly as row spacing decreased. Row spacings as narrow as 53 cm can be used to increase yield of machine-harvested, green-mature southernpeas.

Southernpeas grown for fresh market are harvested at the green-mature pea stage. The use of mechanical harvesters has increased as availability of hand laborers has decreased. Machine harvest at the green-mature pea stage requires a cultivar with an erect, determinate plant habit and synchronous pod maturation. Since machine harvest is a once-over process, the percentage of pods that mature at harvest directly affects marketable yield. Pod maturation for currently available cultivars is only moderately synchronous. Yield from machine harvest is, therefore, generally less than from hand harvest. Yield per hectare from machine harvest might be increased by manipulating row spacing. Standard row spacings for southernpeas range from 91 to 107 cm. Hand-harvested yield of determinate green-mature southernpeas (Stewart, 1965, 1969) and dry southernpeas (Nangju, 1979; Nangju et al., 1975) increased with decreasing spacing between rows. Optimum row spacing for determinate southernpeas harvested mechanically at the dry pea stage was 23 cm (Eaton and Morelock, 1990). However, even among determinate cultivars, optimum spacing is cultivar dependent.

To our knowledge, row spacing effects on yield of determinate southernpeas that are mechanically harvested for fresh market have not been previously reported. Our objective was to determine the effect of row spacing on yield and pod maturity distribution of machine-harvested, green-mature southernpeas.

Materials and Methods

This investigation was conducted at the Calhoun Research Station, Calhoun, La., in 1993 and 1994. The determinate cultivar Texas Pinkeye Purple Hull (Miller and Scheuring, 1994) was planted by machine in a Ruston fine sandy loam soil (fine-loamy, siliceous, thermic Typic Paleudults) at four row spacings. The treatments consisted of single drills (SD) planted on 53-, 89-, and 107-cm row centers, and double drills (DD) planted 18 cm apart on 107-cm row centers. Seeds were spaced 8 cm apart within a drill. A plot consisted of three rows of a treatment. Plot length was 9.15 m. The design was a randomized complete block with four replications. Before planting, 8N–10.6P–19.9K fertilizer at 336 kg·ha⁻¹ was incorporated in the soil. The 1993 test was planted 7 July and harvested 17 Sept.; in 1994 the dates were 1 June and 23 July. In-row plant

stands were reasonably consistent within and among treatments in each year. Water was applied as needed with an overhead irrigation system. Time of harvest was determined by hand-harvesting all pods from a 3-m section of an outer row of each plot and recording the percentage of mature, green, and dry pods. All plots were harvested when the percentage of mature pods from the majority of plots was greater than the combined percentage of green and dry pods. The middle row of each plot was harvested with a Pixall One-Row Pull-Pix harvester (Pixall Corp., Clear Lake, Wis.).

A 100-pod sample was taken from the harvest of each plot, and the percentage of mature, green, and dry pods was recorded. Mature pods were partially to entirely purple and contained fully developed peas. Green pods contained partially developed peas. Pods classified as dry were leathery to entirely dry. All mature pods were separated from each plot's harvest, weighed, and recorded as marketable yield. Data from the three SD row spacing treatments were tested by analysis of variance and regression analysis. A separate analysis was performed on data from each of the four treatments. Nonorthogonal contrasts compared the DD 107-cm row spacing to the SD 107- and 53-cm row spacings.

Results and Discussion

Marketable yield in both years increased linearly as row spacing decreased (Table 1). Similarly, Stewart (1965) reported that yields of hand-harvested, determinate, green-mature southernpeas increased as row spacing decreased from 107 to 46 cm. Analogously, yield of green-mature southernpeas averaged over 3 years was 74% higher from a 15-cm row spacing than from a 91-cm spacing (Stewart, 1969).

The double drilling was proposed as a method to increase plant population without changing row spacing. Marketable yield from the DD 107-cm row spacing was similar to that

Table 1. Marketable yield and pod maturity distribution of machine-harvested ‘Texas Pinkeye Purple Hull’ southernpeas as affected by row spacing and single (SD) vs. double drill (DD).

Row-spacing and drill ^z (cm)	Marketable yield ^y (kg·ha ⁻¹)	Pod type (%)		
		Mature	Green	Dry
1993				
53 SD	2394	65	19	16
89 SD	1454	60	22	18
107 SD	1175	49	27	24
107 DD	1175	59	22	19
Significance ^x	L ^{***} , Q [*]	L [*]	L [*]	NS
53 vs. 107 DD	***	NS	NS	NS
107 SD vs. 107 DD	NS	NS	NS	NS
1994				
53 SD	2835	62	26	12
89 SD	1390	57	36	7
107 SD	1208	58	35	7
107 DD	1736	68	26	6
Significance ^x	L ^{**}	NS	NS	NS
53 vs. 107 DD	*	NS	NS	NS
107 SD vs. 107 DD	NS	NS	NS	NS

²Seeds were spaced 8 cm apart within a drill. DD were 18 cm apart.

³Marketable yield consisted of mature pods.

⁴Within the three SD treatments: L = linear, Q = quadratic.

NS, *, **, ***Nonsignificant or significant at $P \leq 0.05$, 0.01, or 0.001, respectively.

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from the SD 107-cm spacing in both years. Marketable yield from the DD 107-cm row spacing was 51% lower than the SD 53-cm spacing in 1993 and $\approx 39\%$ lower in 1994. Our results parallel those of Nangju (1979) that higher yield was best attained by manipulating row spacing rather than plant density within the row. Yield per plant was not recorded, but it is likely that there was more competition between plants with DD 107-cm spacing than with the 53-cm spacing. In addition, the harvester did not operate as efficiently in the DD rows as in the SD rows. Twice as much plant material entered the harvester at a time with the DD, and some plants were missed by the harvester.

In 1993, the percentage of mature pods at harvest increased linearly as row spacing de-

creased. In 1994, pod maturity distribution was not affected by row spacing. Narrow row spacing did not have a negative effect on synchronous pod maturation.

Results of this investigation indicate that growers might increase marketable yield of machine-harvested, green-mature, determinate southernpeas by decreasing row spacing to as narrow as 53 cm. Until a cultivar with a very high degree of synchronous pod maturation is available, narrow row spacings offer a good cultural method to increase yield of machine-harvested, green-mature southernpeas.

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