Effects of plant density on pigeonpea (Cajanus cajan (L.) millsp.) in sub-humid environments

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Pigeonpea is attracting widespread interest in Australia as a potential summer crop legume for sub-humid tropical and subtropical environments. Internationally, pigeonpea is an important traditional crop in many farming systems of the semi-arid tropics, but short-season photoperiod-insensitive types suited to mechanized cropping have been developed only recently (1).

Studies in humid environments have indicated that densities of 30-50 plants m^2 are required for maximum yield in short-season pigeonpea (1). Moreover, high density reduces branching and enhances synchrony of flowering and pod production, which shortens the period of potential insect damage and thus simplifies insect control, and improves the synchrony of pod maturity. More information is needed, however, on the effects of density in sub-humid environments and this study was undertaken with that objective.

Methods

Four pigeonpea lines were sown factori$_2$ally in two row spacing's (25, 50 cm) and three densities (22, 33, 50 plants m^{-2}) with and without irrigation, at Dalby Agricultural College on 1.12.1984. The soil was a deep, cracking black earth with high water content at sowing. Rainfall after emergence was well below average, and because of power restrictions irrigation could not be applied for extended periods during flowering and early pod growth.

Results and Discussion

Rainfall, irrigation and evaporation for the three months from 1.1.85 totalled 44, 213 and 672 mm respectively. Yields under dryland conditions were extremely low (Table 1). While there were no significant effects of either density or row spacing, earlier flowering resulted in higher yield (Table 2). With partial irrigation, the highest density was detrimental to yield but there was no significant effect of row spacing. Yields were highest with mid-season lines.

Of the two current commercial cultivars, the phenology of cv Hunt is similar to that of QFL 207 while that of cv Quantum is 4-6 days earlier. Evidence from other studies indicates that cultivars flowering in approximately 65 days are most widely adapted to sub-humid environments. Although high density was detrimental to seed yield in these studies, the effect was not large. Low density is believed to conserve water during seedling growth but this may be of little ultimate advantage if the saving is used for later vegetative growth, rather than seed growth.

Table 1 Effect of irrigation, row spacing and plant density on seed yield (t ha^{-1}) of pigeonpea at Dalby in 1984/85.

Density (m^{-2})	Irrigated			Dryland		
	25 cm rows	50 cm rows	Mean	25 cm rows	50 cm rows	Mean
22	1.77	1.52	1.64c	0.30	0.18	0.24a
33	1.72	1.43	1.57c	0.18	0.16	0.17a
50	1.35	1.35	1.35b	0.17	0.21	0.19a
Mean	1.61	1.43	1.52y	0.22	0.18	0.20z

Within categories, values followed by the same letter are nsd (P<0.05)

Table 2 Days t9 50% flowering, and effects of irrigation on seed yield (t ha^{-1}) of four pigeonpea lines at Dalby in 1984/85

	QPL 95	QPL 207	QPL 250	QPL 136
Days to 50% flowering	59	74	76	80
Yield - Irrigated	1.44cd	1.66e	1.57cde	1.42c
Dryland	0.40b	0.17a	0.17a	0.07a

1. Whiteman, P.C., Byth, D.E. and Wallis, E.S. (1985). In 'Grain Legume Crops' Eds. R.J. Summerfield and E.H. Roberts, pp 658-698.