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Performance of Different Cotton Varieties Under Two Row Spacings

F. C. Oad, M. A. Samo, S. M. Qayyum and N. L. Oad
Department of Plant Physiology and Biochemistry, Faculty of Crop Production,
Sindh Agriculture University Tandojam, Hyderabad, Sindh, Pakistan

Abstract: The research was conducted to evaluate the performance of Rehmani, TH-278/87 and TH-4/90 cotton varieties under 30 and 45cm plant spacings. It was observed that plant height, number of bolls, ginning out-turn, and seed cotton yield were significantly higher in TH-278/87 cotton variety when it was drilled at wider plant spacing of 45cm. The narrow plant spacing could not record satisfactory plant character including ginning out-turn and seed cotton yield. Thus, it is recommended that TH-278/87 cotton variety may be enable to produce higher yields, if, the distance between plant to plant would be 45cm.

Key words: Cotton, varieties, plant spacings, yield, GOT

Introduction

The cotton is an important cash crop of Pakistan and plays pivotal role in the economy of the country, on an area of about 2983 thousand hectares with an annual production of 11240 thousand bales. Among the provinces of Pakistan, Punjab is the main cotton producing province covering an area of 2329 thousands hectares and produces 8804 bales. The area under cotton in Sindh province is about 633 thousand hectares with a total production of 2377 thousand bales (Anonymous, 2000). The seed cotton yield obtained at present in the country is low, this might be due to improper agronomic practices, in which proper space between plants and introduction of new high yielding, early maturing, and biotic and abiotic stress resistant varieties play vital role in the stability of yield.

There is a basic difference in the morphology of the cotton plant when sown at high plant density (plant/m^2) as compared with plants which are not submitted to severe plant competition (less than 4 plants/m^2) (Arnon, 1972). In a densely sown population, the plants are subjected to severe competition from an early stage. As a result vegetative growth is co-related and very few or no vegetative branches are formed, the plant produces a single central stem which carries fruiting branches only (or almost exclusively). The first bolls appear higher up on the stem than in the widely spaced cotton, the number of bolls per plant are reduced, but the number of seed/boll, the total weight of individual seeds and the amount of fibre per plant seed are almost unaffected. Therefore, plant density effects yield mainly by determining the number of bolls per unit area (Peebles, 1956 and Tharp, 1960). By contrast, widely spaced plants do not compete severely with each other in the early stages of growth, vegetative growth is not hindered and the individual plant branches freely takes up all space that is available to it and relatively large number of vegetative branches are formed.

The effect of plant density on earliness may be greater and of more economic importance than that yield. In the dense stand plants most of the bolls are concentrated near the main stem. It is in this location that the first flowers appear so that these are the earliest bolls to mature. However, excessive plant density may delay maturity, probably because conditions for boll maturation became less favorable. For example, at a density of 6 plants/m^2, the differences was reduced to 5 plants, whilst at 20 plants/m^2 the plants actually matured later (Peebles, 1956). Most of the factors mentioned above has considerable advantages, for mechanical picking. Thus, the density planted crop produces less vegetative growth, has the bolls produced higher above the ground and exhibits earlier and more uniform maturity.

Keeping the above facts in view and economic importance of the cotton crop an attempt has been made to determine the performance of different cotton varieties under two plant spacings in the agro-ecological conditions of Tandojam.

Materials and Methods

The experiments were conducted at Sindh Agriculture University Tandojam, Pakistan. The treatments were two row spacings (30 and 40cm) applied to three cotton varieties (Rehmani, TH-278/87, and TH-4/90) and laid-down in Randomized Complete Block Design. The collected data were analyzed through the procedures of Gomez and Gomez (1984). The land was prepared by giving two dry plowing, each followed by clod crushing and leveling to eradicate the weeds and uniform distribution of irrigation water. The homogenous delinted seeds of cotton varieties were drilled in well prepared seedbed by single coulter hand driven drill at a rate of 20kg ha^{-1}. The Fertilizer was applied at the rate of 125-75 kg NP ha^{-1} in the form of urea and DAP. The full dose of phosphorus with a half dose of nitrogen was incorporated at the time of seed sowing, while the rest of N was split applied at the time of flowering and boll setting periods, respectively. The thinning was performed just before first irrigation to maintain required plant distance. All the recommended cultural practices were adopted to keep the area free from weeds, insects, and pests.

Results and Discussion

Plant height: Plant height of the different cotton varieties and their interaction significantly affected by plant spacing. Variety Rehmani produced taller plants (141.13cm) followed by TH-278/87 and Th-4/90 giving 129.77 and 123.13 cm plant height respectively (Table 1). It was observed that cotton adjusted in narrow plant to plant distance (30cm) resulted in progressive increase in the plant height (136.34cm). However, the wider distance within plants (45cm) produced shorter plants (126.33 cm). The greater plant height in narrow plant spacing was due to survival for poor space within plants results uniform plant growth. These results are in accordance with the findings of Khokhar (1995) who tested 22, 30, and 38cm plant distances on various cotton varieties and reported that plant spaced at 22 cm distance produced maximum plant height. The best interaction for tallest plants appeared when variety Rehmani was drilled at 30cm plant to plant distance.

Number of bolls per plant: The number of bolls of various cotton varieties as affected by different plant spacing showed significantly different results through analysis of variance and mean comparison tests. The greater production of bolls (19.58 per plant) was found in case of variety TH-278/87, followed by TH-4/90 and Rehmani giving 17.15 and 14.58 bolls per plant respectively (Table 1). This might be genetical makeup of the material. Further wider distance within plants (45cm) produced maximum number of bolls (18.95/plant) while narrow distance within plants (30cm) produced minimum number of bolls (15.25/plant). The interaction for boll production was found efficient where cotton variety (TH-278/87) was sown at wider space (45cm). However, narrow plant spacing applied to Rehmani variety exhibited in-satisfactory interaction for boll number. The greater bearing bolls under wider plant spacing were due to sufficient space between plants which enabled them to prepare food syntheses through photosynthesis process. These results supports the findings of Chhabra and Bishnoi (1993) who concluded that narrow plant spacing reduced the accumulation of dry matter, leaves and productive parts at all growth stages, which in turn decreased the boll number in the cotton crop.

Table 1: Growth and yield characters of three cotton varieties as affected by plant spacings

Plant spacing	Varieties			
	Rehmani	TH-278/87	Th-4/90	Mean
Plant height				
30cm	144.00	138.28	126.75	136.34a
45cm	148.25	121.25	119.50	126.33b
Mean	141.13a	129.77b	123.13c	
	Varieties(V)	Plant spacings (S)	Interaction	
SE	0.658	0.537	0.931	
LSD(5%)	1.402	1.144	1.983	
LSD(1%)	1.941	1.584	2.746	
Number of bolls per plant				
30cm	11.65	18.15	15.95	15.25b
45cm	17.50	21.00	18.35	18.95a
Mean	14.50c	19.58a	17.15b	
	Varieties(V)	Plant spacings (S)	Interaction	
SE	-	-	-	
LSD(5%)	0.669	0.545	0.946	
LSD(1%)	0.926	0.755	1.310	
Ginning out-turn (%)				
30cm	31.52	32.59	32.14	32.08b
45cm	32.74	34.49	32.76	33.33a
Mean	32.13c	33.54a	32.45b	
	Varieties(V)	Plant spacings (S)	Interaction	
SE	0.105	0.086	0.148	
LSD(5%)	0.224	0.183	0.315	
LSD(1%)	0.310	0.254	0.437	
Seed cotton yield (kg ha^{-1})				
30cm	2524.00	3240.00	2755.00	2846.67a
45cm	2277.50	2795.00	2483.75	2518.75b
Mean	2411.50c	3017.00	2619.75b	
	Varieties(V)	Plant spacings (S)	Interaction	
SE	21.447	17.512	30.331	
LSD(5%)	45.682	37.301	64.605	
LSD(1%)	63.269	51.660	89.476	

Values followed by similar letters do not differ significantly at 5% probability level

Ginning out-turn (GOT) percentage and seed cotton yield: The results of the experiment revealed that the differences in ginning out-turn due to varieties, plant spacings, and their interactions were significantly different at 1% probability level. Among the varieties, TH-278/87 produced greater GOT (33.54%), followed by TH-4/90 (32.45%), and Rehmani (32.13%), respectively (Table 1). It was observed that wider plant spacing (45cm) recorded highest GOT (33.33%), while closer distance between plants recorded lowest GOT (32.08%). The treatment interaction between cotton variety Th-278/87 and wider plant spacing (45cm) was found superior for recording greater GOT percentage. The seed cotton yield also followed the similar pattern as in GOT for recording maximum yield in TH-278/87 and wider plant spacing (45cm).

These results agree with the Tupper *et al.* (1995) who reported that narrow row spacing delayed earliness (% first pick) and the returns above production costs were lower due to fibre quality.

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