

Effect of Different Plant Population on Yield and Yield Components of Compact Cotton Genotypes

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Abstract A field experiment was conducted to study the productivity potential of compact cotton genotypes at different spacings under rainfed and irrigated conditions. The experiment consisted of four compact cotton genotypes (RACH-116, RACH-16, RACH-11-8 and RACH-119) under three different spacings in irrigated (60×20 , 60×25 and 60×30 cm) and rainfed (60×10 , 60×15 and 60×20 cm) conditions. The results revealed that the genotype RACH-116 recorded maximum seed cotton yield of 1865.4 kg/ha under irrigated condition at spacing 60×25 cm and 880.1 kg/ha under rainfed condition

at spacing 60×15 cm. The yield components viz., boll weight and number of bolls/plant was also higher in genotype RACH-116 under both the situations to higher seed cotton yield.

Keywords Compact cotton, Irrigated, Rainfed, Yield, Boll weight.

Introduction

Cotton (*Gossypium hirsutum* L.), The king of fiber and the leading fiber crop of the world is grown over an area of 32.9 m ha with a production of 117 m bales and productivity of 774.0 kg per ha. In India, it is grown on an area of 111.61 lakh ha with a production of 312 lakh bales and the productivity is 475.0 kg per ha [1]. These dry lands are categorized by scanty and erratic rainfall leading to the periods of severe stress. this contributes to lower yield levels of rainfed cotton as well as the average productivity of cotton in India.

Cotton hybrids and varieties currently grown are generally very robust, tall and bushy. In addition, the intensive cultivation difference between spacing and genotypes practices by the farmers increase the growth and stature of hybrids, which results into a bushy canopy of the crop. Because of this, plant pro-

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tection can be taken up only from sides and not from top. As a result of this, the pesticide molecules fail to reach the inner regions of the bushy canopy due to which the microclimate of the canopy will have high humidity thereby enabling fast multiplication of the pest [2]. Under these circumstances, compact cotton genotypes are ideally suited for spraying plant protection chemicals in an efficient manner additionally; the shorter growth period also reduces the total pesticide requirement and the risk of prolonged moisture stress. That is why these compact early maturing cottons are described as Eco-friendly cottons [3]. Thus, the compact cottons acquire special significance on account of early maturity and accessibility for efficient plant protection. Because of this the present investigation, attempted to know the effect of different plant population on yield and yield components in compact cotton genotypes.

Materials and Methods

A field experiment was carried out during *kharif* season of 2010-11 at Agricultural Research Station, University of Agricultural Sciences, Dharwad. The experiment was laid out following split plot design with three replications. Crop was grown in 3.6 m × 5.4 m plots at a spacing of 60 × 20, 60 × 25 and 60 × 20 cm in rainfed condition and irrigated condition. Recommended dose of 20 : 20 : 20 kg N, P₂O₅ and K₂O per hectare was applied at the time of sowing. Recommended package of practices were followed to improve crop growth and plant protection measures were taken up. The yield and yield components were recorded at harvest and the data was analyzed statistically.

Results and Discussion

In the present study, a large variation is observed with respect to yield and yield components (Table 1). In rainfed condition, among the genotypes, RACH-116 recorded the maximum boll weight (3.77 g boll⁻¹). While the lowest weight was recorded by RACH-11-8 (3.31 g boll⁻¹). The interaction effects were significant between spacings and genotypes practices of the farmers increase the growth and stature of hybrids, which results into a bushy canopy of the

crop. Because of this, plant protection can be taken up only from sides and not from top. As a result of this, the pesticide molecules fail to reach the inner regions of the bushy canopy due to which the microclimate of the canopy will have high humidity thereby enabling fast multiplication of the pest [4, 5]. Under these circumstances, compact cotton genotypes are ideally suited for spraying plant protection chemicals in an efficient manner additionally, the shorter growth period also reduces the total pesticide requirement and the risk of prolonged moisture stress. That is why these compact early maturing cottons are described as Eco-friendly cottons. Thus, the compact cottons acquire special significance on account of early maturity and accessibility for efficient plant protection. In the present investigation, attempts have been made to find out the productivity potential of ultra compact cotton genotypes under different situations [6].

Whereas, in irrigated condition higher boll weight (g boll⁻¹) was obtained at spacing 60 × 25 cm (3.84 g boll⁻¹). RACH-116 recorded the maximum boll weight (4.17 g boll⁻¹). While, the lowest weight was recorded in RACH-11-8 (3.33 g boll⁻¹). The interaction effects were significant between spacings and genotypes. Similar results were noticed earlier [7]. The total number of bolls that a cotton plant bears at maturity is an important yield component having greatest influence both by physiological and environmental factors. The total number of bolls per plant differed significantly among the genotypes. Among the genotypes, RACH-116 recorded maximum number of bolls per plant (17.73) under rainfed condition at spacing 60 × 15 cm and irrigated condition (25.75) at 60 × 25 cm spacing. While in both conditions the lowest number of bolls per plant were obtained earlier [8, 9].

A large variation in seed cotton yield ranging from 612.1 kg ha⁻¹ to 880.1 kg ha⁻¹ was recorded under rainfed condition. Whereas, in irrigated condition the seed cotton yield ranging from 1338.8 kg ha⁻¹ to 1865.4 kg ha⁻¹ was recorded. Among the different spacings, 60 × 15 cm and 60 × 25 cm in rainfed and irrigated condition, respectively recorded the maximum yield. In the present study, although the four genotypes were compact, the degree

Table 1. Genotypic variation in yield and yield components of compact cotton genotypes.

Spacing (cm)	Genotypes	Yield (g/plant)	Yield (kg/ha)	Boll wt (g)	No. of bolls/pl	Harvest index	Spacing (cm)	Genotypes	Yield (g/plant)	Yield (kg/ha)	Boll wt (g)	No. of bolls/pl	Harvest index
60 × 10	RACH-116	8.73	825.6	3.55	16.98	14.80	60 × 20	RACH-116	29.90	1786.7	3.97	24.63	33.80
	RACH-11-8	3.70	570.9	3.29	14.23	7.20		RACH-11-8	11.22	1248.7	3.23	21.60	16.49
	RACH-16	7.08	694.4	3.38	15.05	12.60		RACH-16	22.60	1613.9	3.67	22.70	27.97
	RACH-119	4.43	679.0	3.38	14.9	8.40		RACH-119	16.06	1436.7	3.43	21.80	21.87
	Mean	5.98	692.5	3.4	15.29	10.70		Mean	19.94	1521.5	3.57	22.68	25.03
60 × 15	RACH-116	9.84	981.6	3.92	17.73	15.37	60 × 25	RACH-116	34.40	1948.7	4.51	25.75	35.83
	RACH-11-8	4.35	671.3	3.37	14.73	8.30		RACH-11-8	14.36	1395.7	3.40	21.79	25.07
	RACH-16	7.97	779.3	3.49	15.68	13.80		RACH-16	26.36	1752.2	3.83	22.81	31.08
	RACH-119	7.02	694.4	3.38	15.05	12.48		RACH-119	19.05	1581.4	3.63	21.89	24.86
	Mean	7.29	784.6	3.54	15.79	12.46		Mean	23.54	1669.4	3.84	23.06	27.96
60 × 20	RACH-116	8.91	833.3	3.68	17.25	14.68	60 × 30	RACH-116	31.00	1859.4	4.63	24.65	34.22
	RACH-11-8	4.36	594.1	3.29	14.59	8.30		RACH-11-8	12.50	1371.9	3.37	21.75	17.98
	RACH-16	7.70	725.1	3.38	15.32	13.50		RACH-16	25.70	1741.3	3.67	22.75	30.57
	RACH-119	6.69	686.1	3.38	14.91	12.10		RACH-119	17.50	1501.5	3.60	21.85	23.34
	Mean	6.30	709.8	3.43	15.53	12.10		Mean	21.60	1619.5	3.66	22.75	26.53
Mean	RACH-116	9.16	880.1	3.71	17.32	14.94	Mean	RACH-116	31.76	1865.4	4.17	25.01	34.68
	RACH-11-8	9.11	612.1	3.31	14.51	7.89		RACH-11-8	12.69	1338.8	3.33	21.71	18.18
	RACH-16	7.58	713.0	3.31	15.34	13.22		RACH-16	24.88	1702.5	3.72	22.75	29.87
	RACH-119	6.05	686.7	3.38	14.98	10.97		RACH-119	17.53	1506.5	3.45	21.84	23.36
	Grand Mean	6.72	728.0	3.45	15.54	11.67		Grand Mean	21.72	1603.2	3.69	22.83	26.51
For comparing :							For comparing :						
Spacing (S)							Spacing (S)						
SEm ±		0.048	3.04	0.613	0.063	0.069	SEm ±		0.149	16.81	0.017	0.092	0.130
CD at 5%		0.187	11.91	0.056	0.247	0.272	CD at 5%		0.585	66.02	0.066	0.362	0.150
Genotypes (G)							Genotypes (G)						
SEm ±		0.407	38.66	0.148	0.897	0.665	SEm ±		1.286	34.29	0.158	0.975	1.139
CD at 5%		0.209	113.65	0.539	2.665	1.974	CD at 5%		3.810	101.65	0.469	2.897	3.382
S × G at same S							S × G at the same S						
SEm ±		0.705	69.93	0.256	1.554	1.151	SEm ±		2.220	59.28	0.274	1.690	1.972
CD at 5%		0.095	195.81	0.761	4.610	3.419	CD at 5%		6.599	176.07	0.813	5.018	5.858
S × G at same/diff. S							S × G at same/diff. S						
SEm ±		0.613	57.18	0.222	1.340	0.990	SEm ±		1.930	54.02	0.238	1.466	1.713
CD at 5%		1.820	169.18	0.660	4.000	2.970	CD at 5%		5.332	116.45	0.766	4.354	5.088

of compactness varied. Thus, necessitating to search for optimal spacing for each genotypes [10].

Thus the present study indicates the superiority of RACH-116 over others. The spacings 60 × 15 cm under rainfed and 60 × 25 cm under irrigated condition proved best for realizing the maximum yield.

In rainfed condition, significantly higher harvest index was obtained at spacings 60 × 15 cm (12.4%). Among the genotypes RACH-116 recorded the maximum harvest index (14.94%). While RACH-11-8 recorded the least (7.89%). The interaction effects

were significant between spacing and genotypes. Where as in irrigated condition, significantly higher harvest index was obtained at spacing 60 × 25 cm (27.96%). Among the genotypes RACH-116 recorded the maximum HI (34.68%). While, the lowest harvest index was found in RACH-11-8 (18.18%). The interaction effects were significant between spacing and genotypes.

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