Research Note

RESPONSE OF COTTON VARIETIES TO THE STAGE OF TOPPING UNDER RAINFED CONDITION OF BARDIYA, NEPAL

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ABSTRACT

A field experiment was conducted to study the impact of topping at different growth stages (3-4, 6-7, 9-10 and 12-13 sympodial branches) on productivity of two (Tamcot SP-37 and H-777) cotton varieties under rainfed condition at the Kumbher Farm (Bardiya district) of Cotton Development Board in 1995. The experiment was laid out in a Randomized Complete Block Design with four replications. The interaction effect between variety and stages of topping showed that significantly higher yield (1.23 t/ha) was produced by topping plants at the stage of 12-13 sympodial banches of the variety Tamcot SP-37 as compared to all other treatments. At all stages of topping the yield produced by Tamcot SP-37 was significantly higher than H-777. The average seed cotton yield (1.03 t/ha) of Tamcot SP-37 was significantly higher than that of H-777 (0.71 t/ha) and the difference in yield was 45.0%. The seed-cotton yield increased from 0.75 to 1.00 t/ha with the postponed of topping from 3-4 to 12-13 sympodial branches, but significant difference was recorded between late (12-13 sympodial branches) and early (3-4 and 6-7 sympodial branches) stages of topping. Thus, for rainfed condition of Bardiya Tamcot SP-37 was a suitable variety with 12-13 sympodial branches as an appropriate stage of topping for sustainable production of cotton.

Key words: Variety, topping, sympodial branches.

INTRODUCTION

Cotton, the 'White gold', is one of the important commercial crops playing a key role in the economic, political and social affairs of the world (Bhatt, 1992; Singh, 1997; Kairon *et al.*, 2004). In spite of severe competition with synthetic fibres, cotton continues to enjoy a place of prime importance in the textile industry (Kairon *et al.*, 2004; Martin *et al.*, 1976; Joshi, 1997). Cotton is grown chiefly for its fibre, used in the manufacture of cloth for the mankind (Singh, 1997). In other words, cotton lint is the most important seed fibre in the world today and is woven into fabrics either alone or combined with other fibres (Purseglove, 1979). Production of cotton was primarily for home use until Eli Whitney inventented the cotton gin in 1793 (Hoveland, 1980). The invention of saw gin and the development of the factory system, together with the ease of production and adaptability to machine manufacture, caused a rapid expansion in the use of cotton. Even in 1924-1928 it provided 84.2% of the world textiles (Purseglove, 1979). At present cotton constitutes 85% of the raw materials of Indian textile industry and in Nepal they fully depend on cotton fibre. India ranks 3rd in cotton production, after China and USA (FAO, 1998). Moreover, in cotton production benefits are obtained when production are combined with processing. Therefore, India which was exporting almost all raw material has developed its own textile industry and become competitor in the world textile market (Arnon, 1972). In this context, cotton cultivation was also started in Nepal to fulfill the demands of its textile industries since 1976. In a crop of cotton shedding of squares, flowers and bolls is a normal phenomenon and all the squares produced by the plant do not grow into bolls and contribute to yield (Sudararaj and Thulsidas, 1993; Purseglove, 1979; Arnon, 1972). As a result of this only 35-45% of the buds produce mature bolls under usual condition (Martin *et al.*, 1976; Metcalf and Elkins, 1980; Ustimenko-Bakumovsky, 1983; Arnon, 1972). Conditions that can influence shedding are excess or lack of moisture, cloudiness, high temperatures, nutrient deficiencies or imbalance and insect and disease damages (Arnon, 1972; Purseglove, 1979; Metcalf and Elkins, 1980). The shedding of these fruiting bodies increases from the center of the main stem to its periphery and from base to top (Ustimenko-Bakumovsky, 1983). One of the effective ways of reducing shedding of these fruiting bodies (squares, flowers and young bolls) is the topping or the removal of the tip of the main stem, alone or together with the tips of the main branches a few weeks before the bolls begin to open (Arnon, 1972, Ustimenko-Bakumovsky, 1983). The purpose of the topping is to ensure a redistribution of the nutritive substances in the plant which helps to check shedding of fruiting bodies and increase seed cotton yield (Arnon, 1972; Bavilova, 1979; Kerephov, 1982). In the experiments of All Union Scientific Cotton Research Institute, topping of cotton plants gave an increment in seed cotton yield from 0.8 to 1.1 t/ha (Bavilova, 1979). In Central Asia topping of the plants is an important procedure in growing cotton and the stage of topping ranges from 12-13 to 17-18 sympodial branches depending upon the growth of the cotton plants (Bavilova, 1979). In Nepal, particularly in Bardiya district, stages of topping of cotton plants used to vary from one farmer to another. So, this research work was designed to identify the appropriate stage for topping of cultivated cotton varieties under rainfed condition of Bardiya.

MATERIALS AND METHODS

The experiment was conducted at the Kumbher Farm of Cotton Development Board, Bardiya in the crop season of 1995. It was laid out in Randomized Complete Block Design with four replications. The treatments included two cotton varieties: Tamcot SP-37 and H-777 and 4 stages of topping i.e. 3-4, 6-7, 9-10 and 12-13 sympodial branches. The plot size was 4.5 m x 6.0 m. The spacing used for sowing cotton was 90 cm x 30 cm. Each plot consisted of 5 rows of 6 m length. The crop was sown on 28th June of 1995 applying 60:40:20 kg NPK per ha and grown under rainfed condition. Yield attributing character like boll weight was determined as the average weight of seed cotton from 20 bolls of 10 plants/plot. Similarly, the number of fresh bolls was counted as the average of 10 plants per plot and plant population per ha was computed from the plants of inner three rows of each plot. All the collected data were subjected to analysis of variance and DMRT mean separation as per Gomez and Gomez (1983).

RESULTS AND DISCUSSION

Number of bolls per plant

The average number of bolls per plant in the experiment was 7.01 and it ranged from 5.15 to 9.27 depending upon the cotton varieties and stages of topping (Table 1). The figure given in the Table 1 represents the actual number of matured bolls/plant. It was comparatively low in Tamcot SP-37 as compared to H-777 and the difference was significant. Thus, the number of bolls (8.30) per plant of the variety H-777 was significantly higher than Tamcot SP-37 (5.72) and increment was 45.10%. Incase of Tamcot SP-37 the variation in number of bolls/plant with the delay in the stage of topping from 3-4 to 12-13 sympodial branches was non-significant where as in H-777 it was significant between the stage of 3-4 and 9-10 sympodial branches. Further, the number of bolls (9.15) retained per plant at the stage of 9-10 sympodial branches of H-777 was significantly higher than that of Tamcot SP-37 at all stages of topping. Moreover, the stage of topping did not significantly affect the number of bolls/plant. The number of bolls per plant showed negative correlation with boll weight and seed cotton yield. The correlation with yield was found non-significant (Table 4). Thus, it can be mentioned that significant variation in number of bolls per plant was mainly due to variety. On the other hand boll weight was decreased with the increment in number of bolls per plant (Table 2).

Table 1. Effect of different stages of topping on number of bolls per plant of cotton

Variety	Stage of topping				Mean
	3-4	6-7	9-10	12-13	
Tamcot SP-37	5.550^{c}	6.750^{bc}	5.450^{c}	5.150^{c}	5.725^{b}
H-777	6.650b^{c}	8.150^{ab}	9.150^{a}	9.275^{a}	8.306^{a}
Mean	6.100^{a}	7.450^{a}	7.300^{a}	7.213^{a}	
	For interaction		For variety		For stage of topping
CV%	19.61		-		-
CD (P=0.05)	2.023		1.012		1.431
Sem±	0.6879		0.3440		0.4864

Mean separated by DMRT and columns represented with same letter are not significant at 5% level of significance. 3-4, 6-7, 9-10 and 12-13 are the number of sympodial branches

Boll weight

The average boll weight in the experiment was 4.4 g and it ranged from 3.78 to 5.08 g depending upon the variety and stage of topping. The boll weight did not differ significantly with stages of topping in both varieties. However, significantly higher boll weights were recorded in Tamcot SP-37 than H-777 at all stages of topping (Table 2). Thus, the boll weight (4.90 g) recorded in Tamcot SP-37 was significantly higher than H-777 (3.89 g) and the difference was 20.6% (Table 2). Boll weight was not affected by the stage of topping. It was correlated significantly with yield (r=0.844) (Table 4).

Table 2. Effect of different stages of topping on boll weight (g) of cotton

Variety	Stage of topping				Mean
	3-4	6-7	9-10	12-13	
Tamcot SP-37	5.00^{a}	4.563^{ab}	4.988^{a}	5.088^{a}	4.909^{a}
H-777	3.912b^{b}	3.787^{c}	3.900b^{c}	3.987b^{c}	3.897^{b}
Mean	4.456^{a}	4.175^{a}	4.444^{a}	4.537^{a}	
	For interaction		For variety	For stage of topping	
CV%	10.56		-	-	
CD (P=0.05)	0.6834		0.3417	0.4833	
Sem±	0.2324		0.1162	0.1643	

Mean separated by DMRT and columns represented with same letter are not significant at 5% level of significance. 3-4, 6-7, 9-10 and 12-13 are the number of sympodial branches

Yield

The average yield depending upon the variety and stages of topping was 0.87 t/ha and it ranged from 0.576 to 1.23 t/ha. According to the data illustrated in the Table 3, the seed cotton yields of Tamcot SP-37 were statistically at par from the stage of 3-4 to 9-10 sympodial branches, but significantly higher yield (1.23 t/ha) was obtained in the treatment where topping was done at the stage of 12-13 sympodial branches. It was also significantly higher than the yield of H-777 obtained at all stages of topping. At the early stages of topping i.e. 3-4 and 6-7 sympodial branches Tamcot SP-37 produced significantly higher yields than H-777. On the other hand, in case of H-777, significantly higher yield (0.854 t/ha) was obtained when topping was done at the stage of 9-10 instead of at 3-4 sympodial branches (0.576 t/ha) (Table 3).

The yield of H-777 declined when topping was delayed from the stage of 9-10 to 12-13 sympodial branches. This may be due to the fact that the upper bolls of the plant did not grow and develop into fully matured stage and contribute to the yield (Table 1). On the average, the seed cotton yield (1.031 t/ha) of Tamcot SP-37 was significantly higher than that of H-777 (0.71 t/ha) and the difference was 45.2% (Table 2). Such differences in yield due to varieties were also obtained by Poonia *et al.* (2002); Sharma *et al.* (1997) and Basnet (1984). On the other hand, the seed cotton yield did not significantly vary with the change in the stage of topping from 3-4 to 9-10 sympodial branches, but the higher yield (1.009 t/ha) obtained with topping at the stage of 12-13 sympodial branches was significant to early stages of topping i.e. 3-4 and 6-7 sympodial branches. Difference in yield with topping at 9-10 and 12-13 sympodial branches was non-significant. Thus, on the basis of above analysis it can be mentioned that a suitable stage of topping should be identified for each variety and about 9-10 sympodial branches should be developed for better effectiveness of topping.

Table 3. Effect of different stages of topping on seed-cotton yield (t/ha)

Variety	Stage of topping				Mean
	3-4	6-7	9-10	12-13	
Tamcot SP-37	0.9353^{b}	0.9807^{b}	09805^{b}	1.230^{a}	1.031^{a}
H-777	0.5767^{d}	0.6233^{cd}	0.8540^{bc}	0.7880b^{cd}	0.7105^{b}
Mean	0.7560^{b}	0.8020^{b}	0.9172^{ab}	1.009^{a}	
	For interaction		For variety	For stage of topping	
CV%	17.47		-	-	
CD (P=0.05)	0.2230		0.1115	0.1577	
Sem±	0.0758		0.0379	0.0536	

Mean separated by DMRT and columns represented with same letter are not significant at 5% level of significance. 3-4, 6-7, 9-10 and 12-13 are the number of sympodial branches

Table 4. Correlation between yield and yield components of cotton.

Parameters	Boll weight	Seed cotton yield
Bolls per plant	-.860(**)	-.556
Boll weight		.844(**)

* Significant at 0.05 level of probability

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