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Effect of Fruiting Positions on Yield in American Cotton

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Abstract: Fruiting position effects on seedcotton yield were studied on four advance cotton strains and one commercial cultivar developed by CCRI Sakrand. The results demonstrated that the first three positions on sympodial branches were more important than the remaining fruiting positions. The first fruiting position contributed significantly highest percentage of the total seedcotton yield per plant in all the five cultivars ranging from 55.91 to 63.46 % . The second fruiting position ranked second in order and contributed 26.33 to 31.43 % of the total seedcotton yield per plant in all the cultivars. In case of CRIS-9 and CRIS-19, third, fourth and fifth position contributed 10.65 to 7.04%, 3.57 to 3.61 % and 1.38 to 2.05 % of the total seedcotton yield per plant. While in case of CRIS-52, CRIS-133 and CRIS-134, third and fourth fruiting position contributed 8.18 to 9.19 % and 0.93 to 4.64 % respectively of the total seedcotton yield per plant. Collectively the first three positions contributed about 95 to 97 % of the total seedcotton yield per plant in all the cultivars. Thus from the cotton management point of view the first three positions were most important.

Key words: Fruiting position, cotton, sympodial branch, contribution percent

Introduction

Cotton plant has very prominent main stem, which consists of series of nodes and internodes. Two types of branches are produced; vegetative or monopodial and fruiting or sympodial branches that bear flowers and fruits directly. Whereas, the vegetative branches are structurally like main stem, but they bear flower and fruit only after rebranching (Oosterhuis, 1990). Thus, the main stem and monopodia do not bear flowers directly, but produce fruiting branches (Munro, 1987). Kerby and Buxton (1981), found 76 % of the boll set at position 1. Nodes 9 through 14 had the highest boll set and accounted for the majority of the yield. They further expressed that, if we assume a 3-day vertical flowering interval and a 6-day horizontal interval, the peak boll set occurred 15 to 18 days after first bloom. Peak boll set was of node 11 for position 1, Node 9 for position 2 and node 8 for position 3. Considering position 1, there was an increase in percentage of plants with a boll from node 6 through 12 and a decrease at each node after 12.

Jenkins *et al.* (1990) studied the effect of fruiting sites on the number of harvestable bolls in *G. hirsutum* cultivars sown in a conventional pattern of rows, 1m apart with a plant population of approximately 95000 plants/ha for 2 years in Mississippi. Bolls at position one on sympodial branches produced 66 to 75 % of the total yield; those at position 2 produced 18 to 21 percent; all other positions on sympodial branches produced from 3 to 9 % of the total yield. Sympodial branches from nodes 9 to 14 % produced the bulk of the lint in all cultivars.

Oosterhuis (1990) observed that the distribution of the bolls on the plants varied due to abscission from physiological and environmental causes. A large percentage of the total yield is derived from the central portion of canopy, approximately between main stem nodes 6 and 13 that coincides with the distribution of leaf area with the canopy. The relative importance of the fruiting positions (nodes) along a fruiting branches varies i.e. the first, second and third sympodial positions contributed about 60%, 30% and 10% of the total seedcotton yield respectively.

Materials and Methods

A field experiment was conducted at the experimental area of the Department of Plant Breeding and Genetics, Sindh Agriculture University, Tandojam during 1997 cotton season. The trial comprised of four advanced strains (CRIS-19, CRIS-52, CRIS-133 and CRIS-134) and a standard cultivar CRIS-9 evolved by the Central Cotton Research Institute, Sakrand. The experiment was conducted in randomized complete block design with four replications. The row-to-row distance was maintained at 2.5 feet whereas plants within rows were thinned out to maintain a distance of 8 – 9". Each treatment plot contained three rows 17.5 feet long. All the agronomical, nutritional and plant protection requirements of the experiment were completed when needed. A random number of five plants from the central row of each cultivar per replication were monitored individually. All the randomly selected plants of all the cultivars were picked separately and average seedcotton weight per plant was obtained by dividing the total seedcotton weight by the number of plants per replication. The position wise number of bolls for all randomly selected plants of all the five cultivars was recorded. All open bolls developed on the five randomly selected plants of the cultivar were picked and weighed separately. Thus position-wise seed cotton weight for all randomly selected plants of all cultivars were determined, position-wise seed cotton weight and seedcotton yield contribution percentage was also calculated using following formula:

$$\text{Position-wise seedcotton weight} = \frac{\text{Seedcotton weight of a particular fruiting position}}{\text{Number of bolls of a particular fruiting position}}$$

$$\text{Position-wise seedcotton contribution \%} = \frac{\text{Seedcotton weight contributed by particular fruiting position}}{\text{Total seedcotton weight / plant}} \times 100$$

The data were statistically analyzed by analysis of variance (ANOVA). Least significant difference (LSD) test was also carried out for comparison of means after Snedecor and Cochran (1967).

Results and Discussion

Analysis of variance (Table 1) showed non-significant differences among cultivars for both the characters studied (fruiting position / plant and seedcotton yield / plant). However, the data presented in Table 2 indicate that CRIS-19 numerically the highest number of fruiting sites (49.35), while CRIS-134 has the lowest (42.45) per plant. Numerically, CRIS-19 yielded highest (48.14 g) and CRIS-133 produced lowest seedcotton yield (39.09 g) per plant.

Table 1: ANOVA for seedcotton yield / plant and fruiting positions / plant

Source of variance	Replication	Cultivar	Error
Degree of freedom	3 4	12	
Seedcotton yield / plant	98.46	25.19 NS	40.16
Fruiting positions / plant	126.08	59.01 NS	83.61

NS = Non-significant

Position-wise seed cotton yield (g): Significantly highest seedcotton yield was produced by all cultivars at their first position on sympodial branches (Table 4). Among the cultivars, CRIS-19 produced 26.90 g followed by CRIS-52, CRIS-134, CRIS-9 and CRIS-133 with average seedcotton yield per plant of 26.75, 26.69, 25.37 and 24.64 g respectively. The second position on sympodial branches in case of all cultivars produced significantly less than first position, yet it produced second highest seedcotton yield in case of all the cultivars under study.

The remaining two or three fruiting positions showed a gradual decline in seedcotton production in such a way that the fifth position produced significantly lowest seedcotton yield in case of CRIS-9 and CRIS-19. For example CRIS-19 produced 0.70 g, followed by CRIS-9 with 1.06 g. While CRIS-52, CRIS-133 and CRIS-134 produced significantly lowest yield (2.48, 0.37 and 1.01 g, respectively).

Position-wise seedcotton contribution percentage: The first position contributed significantly highest percentage of the total seedcotton yield per plant in all the five cultivars ranging from 55.91 to 63.46 percent (Table 4). The second fruiting position contributed significantly less than the first position in case of all cultivars.

Yet the second position was second in ranking order in all cultivars and contributed second highest percentage of seedcotton yield ranging from 26.33 to 31.43 % of the total seedcotton yield per plant. A significant and gradual decline was noted in seedcotton contribution percentage in case of remaining fruiting positions. In case of CRIS-9 and CRIS-19, fifth position contributed significantly lowest i.e. 2.05 and 1.38 % respectively of the total seedcotton yield per plant, while in case of CRIS-52, CRIS-133 and CRIS-134, fourth position on sympodial branches contributed only 4.64, 0.93 and 2.48 % respectively of the total seedcotton yield per plant being the minimum.

Fruiting position effects on seed cotton yield per plant: Cultivars used in present study did not show significant differences in seed cotton yield per plant (Table 1). In present case it was observed that on an average, 4 fruiting positions were developed along the sympodial branches of three cultivars, CRIS-52, CRIS-133 and CRIS-134 and five positions on two cultivars CRIS-9 and CRIS-19 used in this study. The analysis of variance conducted for position-wise seedcotton yield (g) and position-wise seedcotton yield (%), indicated that fruiting positions had highly significant effects on seedcotton yield(g) and seedcotton yield contribution percentage(Table 3). The results presented in Table 4 clearly indicate that the first fruiting position on sympodial branches is definitely more important in all the cultivars. In case of CRIS-9 and CRIS-19 third, fourth and fifth positions contributed 10.65 – 7.04, 3.57 – 3.61 and 1.38 – 2.05 % of the total seed cotton yield per plant.

Table 2: Means for seedcotton yield/plant and fruiting positions/plant in five American cotton cultivars

Character studied	CRIS-9	CRIS-19	CRIS-52	CRIS-133	CRIS-134
Seedcotton yield / plant	46.89	48.14	47.76	39.09	43.22
Fruiting positions / plant	44.85	49.35	45.4	46.4	42.45

Table 3: Mean squares (ANOVA) for position-wise seedcotton yield (g) and position-wise seedcotton yield (%) in five American upland cotton cultivars

Source of variation	Replications	Positions	Error
CRIS-9			
Degree of freedom	3.00	4.00	12.00
Position-wise seedcotton yield (g)	16.10	445.70**	8.03
Position-wise seedcotton yield (%)	0.00	2179.77**	77.60
CRIS-19			
Degree of freedom	3.00	4.00	12.00
Position-wise seedcotton yield (g)	23.33	471.40**	16.16
Position-wise seedcotton yield (%)	0.00	2109.64**	17.28
CRIS-52			
Degree of freedom	3.00	4.00	12.00
Position-wise seedcotton yield (g)	47.22	482.65**	2.88
Position-wise seedcotton yield (%)	0.00	2409.86**	50.05
CRIS-133			
Degree of freedom	3.00	4.00	12.00
Position-wise seedcotton yield (g)	11.79	472.35**	3.30
Position-wise seedcotton yield (%)	0.00	3128.29**	12.89
CRIS-134			
Degree of freedom	3.00	4.00	12.00
Position-wise seedcotton yield (g)	6.85	396.21**	17.55
Position-wise seedcotton yield (%)	0.00	2840.43	79.99

** Highly significant

Table 4: Means for position-wise seedcotton yield (g) and position-wise seedcotton yield (%) in five American upland cotton cultivars

Positions	CRIS-9	CRIS-19	CRIS-52	CRIS-133	CRIS-134
Position-wise seedcotton yield (g)					
First	25.37	26.90	26.75	24.64	26.69
Second	14.96	13.41	13.67	10.90	11.61
Third	23.71	5.24	4.86	3.18	3.91
Fourth	1.79	1.89	2.48	0.37	1.01
Fifth	1.06	0.70	-	-	-
Total	46.89	48.1	47.76	39.09	43.22
LSD	4.37	6.19	2.71	2.90	6.69
Position-wise seedcotton yield (%)					
First	55.91	56.72	58.71	63.46	62.02
Second	31.43	27.62	27.46	27.43	26.33
Third	7.04	10.65	9.19	8.18	9.17
Fourth	3.57	3.61	4.64	0.93	2.48
Fifth	2.05	1.38	-	-	-
Total	100.00	100.00	100.00	100.00	100.00
LSD	13.58	6.41	10.90	14.05	13.79

These results are in conformation with the results reported by previous workers, such as Kerby and Buxton (1981) and Jenkins *et al.* (1990), who reported that about 76 percent of the open bolls were borne at first position. Oosterhuis (1990) working on American upland cottons in Arkansas, USA, also mentioned that the relative importance of the fruiting positions along with the fruiting branch varies i.e., the first, second and third sympodial positions contribute about 60, 30 and 10 % of the total seedcotton yield respectively. Collectively, the first three positions contributed about 95 to 97 % of the total seed cotton yield. Thus from cotton management point of view, the first three positions were most important.

References

Jenkins, J. N., J. C. McCarty and W. L. Parrott, 1990. Fruiting efficiency in cotton: Boll size and boll set percentage. Crop Sci., 30: 857-890.

Kerby, T. A. and D. R. Buxton, 1981. Competition between adjacent fruiting forms in Cotton. Agron. J., 73: 867-871.

Munro, J. M., 1987. Cotton. (Tropical Agriculture Series). Longman Group, U. K. Limited.

Oosterhuis, D. M., 1990. Growth and development of a cotton plant. In W. N. Miley and D. M. Oosterhuis, (ed.) Nitrogen nutrition in cotton. Practical issues. Proceedings of the First Annual Workshop for practicing Agronomists. Amer. Soc. Agron., pp:1-24

Snedecor, G. W. and W. G. Cochran, 1971. Statistical Methods. The Iowa State University Press, Ames. IOWA, U S A.