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Nodes above White Flower (NAWF): an Indicator of Earliness in Cotton

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Abstract: The study was conducted on four advance cotton strains and one commercial cultivar developed by CCRI Sakrand to establish the early maturing variety during 1997 cotton season. The results demonstrated that 58 days after planting (DAP) all the cultivars developed more than 8 NAWF with non-significant difference in their growth and development. However at 65 and 74 DAP significant difference was observed. Commercial cultivar CRIS-9 developed highest number (7.9) of NAWF at 65 DAP and (5.45) at 74 DAP, while CRIS-133 developed lowest number (6.5 and 4.15) of NAWF during the same period. Similarly CRIS-52, CRIS-133 and CRIS-134 developed less than 5-NAWF at 74 DAP suggesting that these cultivars ceased to grow further and moved towards maturity. CRIS-133 was observed as early where as CRIS-9 as late maturing variety in the test.

Key words: NAWF technique, cotton, earliness, crop maturity, frost damage

Introduction

The attainment of earliness in crop maturity and high lint yield has been a primary research objective of cotton breeders and agronomists. Earliness of the crop maturity is important in the avoidance of frost damage, insect and disease buildups, soil moisture depletion and weathering of the open cotton.

The nodes above the upper most white flower (NAWF) technique, is a measure of developmental growth and earliness. It is a technique of monitoring number of main stem nodes above the sympodial branch bearing a white flower in the first position from the main axis (Bourland *et al.*, 1991). The NAWF measurement is an indicator of fruit load relative to vegetative growth and can be used to monitor maturation of plants after flowering. Variation of cultivars in maturity can be distinguished early in the flowering stage, using the NAWF technique. Late maturing cultivars have relatively more NAWF at first flower and throughout the season than early-maturity cultivars (Bourland *et al.*, 1991),

Bourland *et al.* (1991) and Oosterhuis *et al.* (1992) have suggested a method of monitoring number of main stem nodes above the sympodial branch bearing a white flower in the first position from the main axis. The number of NAWF is usually 8 to 10 during early flowering and then decreases as the flowering period progresses. A critical value of 'five' for NAWF is an agreement with the plant mapping, that the top five nodes contribute less than 5% of the total number of first position bolls (Kerby, 1987). Bourland, *et al.* (1991) observed that the plant is the best indicator of actual growth and developmental conditions within any production field. An established "cutout" benchmark (NAWF of 5) will provide a focal point for all management decisions from cultivar selection to fertility and pest control programms. The "cutout" of the plants is eminent at 5-NAWF stage and the contribution of additional flowers to yield, will likely be small.

Oosterhuis, *et al.* (1992) observed that a decline in the number of main stem nodes to five, above the upper most white flower in the sympodial position (NAWF=5), indicates that the demand of developing bolls for plant sugars and nutrients is impeding main-stem growth and development of additional bolls, NAWF=5, is thus considered a "cutout" benchmark. Boll retention and boll size decrease occure to unacceptable levels when NAWF is decreased to less than 5.0. According to Oosterhuis, *et al.* (1992) a favorable NAWF value of 7 or more should exist for 3-4 weeks. Any production practice that extends the effective flower period past the fourth week of flowering should increase cotton yields if external factors such as insects and diseases have been controlled and suitable weather is experienced. The aim of the present study was to assess the earliness of advance strains developed by CCRI Sakrand by using NAWF parameter.

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. A randomized complete block design with four replications was applied. The row-to-row distance was maintained at 2.5 feet where as plants within rows were thinned out to maintain a distance of 8-9" in between. Each treatment plot contained three rows with 17.5 feet length each. All the agronomic, nutritional and plant protection requirements of the experiment were completed when needed. Five plants from the central row of each cultivar per replication were monitored randomly for recording observation on NAWF, to establish the earliest variety in the test. Number of nodes above the upper-most white flower (NAWF) in the first position of the sympodial branches were counted weekly to the last node with unfolded main stem leaf, throughout growing season. Average number of days taken to the stage of 5-NAWF was also recorded. The data were statistically analyzed by analysis of variance (ANOVA). The Duncan's Multiple Range Test (DMR) and Least Significant Difference (LSD) tests were carried out for comparison of means (Snedecor and Cochran, 1967).

Results and Discussions

Statistically significant difference among cultivars for the number of days taken to attain the stage of 5-NAWF was observed (Table 1). It is indicated in Table 2 indicated that strain CRIS-133 had reached the stage of 5-NAWF after only 71 days from the date of sowing and was recorded as an earliest variety in the test whereas cultivars CRIS-134, CRIS-19, CRIS-52 were next in line and reached the stage of 5-NAWF at 73.00, 74.75 and 74.75 days after planting respectively and were observed also significantly earlier than commercial variety CRIS-9 which reached 5-NAWF stage at 77.25 days after sowing.

The data of mean squares obtained from the analysis of

Table 1: ANOVA for Days taken to attain 5 –NAWF stage

Character studied	Replication	Cultivar	Error
Days taken to attain 5-NAWF stage	3.78	21.57*	5.07

*Significant at 0.05% level of probability

Table 2: Means for days taken to attain 5-NAWF stage in five upland cotton cultivars

Character studied	CRIS-9	CRIS-19	CRIS-52	CRIS-133	CRIS-134
Days taken to attain 5-NAWF stage	77.25 a	74.75 ab	74.75 ab	71.00 c	73.00 bc

Means followed by similar letters do not differ significantly from each other according to DMR Test.

Table 3: Mean squares obtained from the analysis of variance for weekly record of NAWF

Source of variance	Degree of freedom	1st week (58 DAP)	2nd week (65 DAP)	3rd week (74 DAP)	4th week (82 DAP)	5th week (90 DAP)	6th week (97 DAP)
Replications	3	1.79	1.04	0.26	0.63	0.81	0.43
Cultivars	4	0.21 NS	1.22*	1.31*	0.68 NS	0.71 NS	0.14 NS
Error	12	0.28	0.36	0.36	0.48	0.27	0.21

*Significant at 0.05% level of probability NS = Non-significant DAP = days after planting

Table 4: Weekly mean number of nodes above white flower in five upland cotton cultivars

Strains	1st week (58 DAP)	2nd week (65 DAP)	3rd week (74 DAP)	4th week (82 DAP)	5th week (90 DAP)	6th week (67 DAP)
CRIS-9	8.65	7.90	5.45	3.75	3.35	2.35
CRIS-19	8.65	6.65	5.30	3.15	2.60	2.10
CRIS-52	8.90	6.80	4.95	3.00	2.45	1.85
CRIS-133	8.30	6.50	4.15	2.70	2.25	2.20
CRIS-134	8.45	6.95	4.35	2.80	2.50	2.00
0.5% level of probability	NS	0.86	0.92	NS	NS	NS

NS = Non-significant

variance for weekly record of (NAWF) are presented in Table 3 and weekly mean number of nodes above white flower in five American upland cotton cultivars in Table 4. The data indicate that during first week of flowering all cultivars had developed more than 8 nodes above the white flowers (NAWF) and there was no significant difference among the cultivars in their growth and development.

However, significant difference among cultivars for their number of NAWF was observed during the second and third week of flowering Table 4. The commercial variety CRIS-9 had developed significantly higher number (7.9) of NAWF in second week at 65 DAP and 5.45 NAWF during the third week at 74 DAP, whereas advance strain CRIS-133 had developed significantly less number (6.5) in second week and 4.15 NAWF during third week. During the third week cultivars CRIS-52, CRIS-133 and CRIS-134 developed less than 5-NAWF (4.95, 4.15 and 4.35, respectively) which suggests that these cultivars ceased to grow further by the end of the third week of flowering (74 DAP) and moved towards maturity one week earlier than CRIS-9. These results further confirm the advantage of early maturity of advanced strains, over the standard variety CRIS-9.

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