Pak J Sci Ind Res 1998 ***41*** *(1) 36-38*

Effect of Okra Leaf Shape on Boll Rot, Earliness and Yield of Upland Cotton *Gossypium Hirsutum* L

Abdul Razaque Soomro, Ali Mohammad Memon, Gulab H Nachnani and Ali Hassan Baloch*

Cotton Research Institute, Sakrand-67210, Pakistan

(Received 31 August 1995; accepted 15 September 1997)

Seedcotton yield, earliness and boll rot incidence studies on the okra leaf trait against normal leaf were carried out at Cotton Research Institute, Sakrand during 1993. Boll rot incidence of 28.8% was recorded in normal leaf trait as against 7.7% of okra leaf. Thus okra leaf trait reduced the boll rot incidence considerably and the percentage difference over normal was 70.8%. Okra leaf shape was earlier than normal leaf shape and formed and opened more number of bolls per plant thus out yielded normal leaf cultivar by giving 3002 kg ha^{-1} seedcotton yield as compared with 2870 kg ha^{-1}.

Key words: Okra leaf, Earliness, Boll rot, Yield.

Introduction

It is estimated that the insect pests, on an average cause 5 to 10 percent damage to cotton crop every year in Pakistan. In case of serious attack, however, 30 to 40 percent crop is lost (Huque 1972).

It is generally conceded that resistance to pests affords a preferred means of minimizing crop losses to diseases, insects and other agents. Genetic resistance in plants stabilizes production levels and quality, is relatively permanent and may be additive. But the most important attribute of pest resistance is that it reduces hazards of environmental pollution which otherwise would have been caused by the use of pesticides for the control of pests and diseases.

Presence of known genetic markers for desired characters particularly in cotton cultivars render them resistant to pest attack and therefore these should be introduced in cotton breeding programmes.

Breeding for open canopy okra leaf, a mutant found in certain stocks of American upland cotton (*G. hirsutum* L) has shown greater advantages on pest resistance. Brown and Cotton (1937) were the first to report that okra leaf has less boll rot than normal leaf types. Okra leaf (gene Lo) cultivars reduce boll rot incidence by 40% and super okra (gene Ls) by 53% in several parts of the United States (Jones and Andries 1967; Andries *et al* 1969a; 1970; Jones 1970; 1972; Karami and Weaver 1972; Reddy 1974; Roncadori 1974; Rao and Weaver 1976 and Jones *et al* 1978b; 1980) It seems that this type of canopy causes the microclimate within the boll zone of the plant less favourable for the development of boll rot organisms. But Major (1971) did not find reduced boll rot incidence in okra leaf.

*Author for correspondence

As regards yield of seed cotton, okra leaf plant out-yielded normal leaf cultivars by 5% on an average (Andries *et al* 1969b; Karami and Weaver 1972; Jones *et al* 1978a), however Kohel and Richmond (1971), Major (1971) and Rao and Weaver (1976) did not record yield superiority of okra leaf over normal one. Though super okra compared with normal canopy did not respond to yield (average lint yield per acre ranged from -8% to +2%) but it responded positively in narrow rowed spacing as reported by Johnson and Wallhood (1972), Meiville and Caldwell (1972) and Anderson (1973).

Earliness was another component considered in open canopy types. This was considered as number of days taken from sowing to specific percentage of boll opening. According to Andries *et al* (1969a,1970), Karami and Weaver (1972), Reddy (1974) and Jones (1982), okra leaf gave 80 to 90 percent boll opening level one week earlier and super okra about two weeks earlier than normal leaf varieties.

Materials and Methods

Cotton Research Institute, Sakrand has developed new strain CRIS-151 which has the okra leaf trait. This strain was developed through hybridization between BH-41, an okra leaf variety developed at Bahawalpur, and CRIS-54, an early maturing and high yielding variety developed at CRI, Sakrand.

Okra leaf strain CRIS-151 was sown in the second week of May 1993 alongwith CRIS-9, a commercial variety of Sindh province on non replicated blocks of uniform fertility. Each block consisted of 40 rows per variety, each row being 15.20m long. The row to row distance was maintained at 0.76m and plant to plant at 0.22m. The 1993-94 season received heavy rains of 482.5 mm. 1 bag of DAP acre^{-1} at the time of sowing and 2 bags of urea acre^{-1} were applied at the time of 1st irrigation and flowering. In all 7 irrigations were given to the experiment. All the recommended cultural operations were carried out when needed. As regards the plant protection measures, the experiment was sprayed thrice during the season under report. 1st spray was done against the sucking pests 70 days after sowing, the second spray was applied against sucking as well as boll worm complexes and the third and last spray was applied to control the boll worm complex. Plant protection measures were taken only when the attack reached the economic threshold level.

Total number of bolls per plant and number of rotted bolls per plant were counted on ten plants in each row taken randomly then the average of five rows was taken. Number of bolls formed and opened after 90, 120 and 150 days of sowing was also counted to compare the earliness of both the leaf shapes. Yield in kilograms per hectare was also calculated.

Results and Discussion

The results presented in Table 1 revealed that the incidence of boll rot varied in all rows and reduced by 1.0 to 1.9 i.e. 5.5 to 10% rotted bolls per plant against the normal leaf in which the incidence of boll rot appeared from 4.4 to 5.1 i.e. 25.9 to 31.0% rotted bolls per plant. These observations are in accordance with those of Brown and Cotton (1937), Andries *et al* (1970), Jones (1972), Karami and Weaver (1972), Jones *et al* (1978a) and Jones (1982).
The overall effect showed that out of 17.13 bolls per plant, the incidence of boll rot was 1.4 bolls per plant i.e. 7.7% in okra leaf plants against 16.9 bolls per plant, whereas the incidence of boll rot was 4.8 bolls per plant i.e. 28.8% in normal leaf and the percentage difference over normal was 70.8%. This confirms the results.

As regards the earliness, the results are presented in Table 2. The observation for bolls formed and opened were taken after 90, 120 and 150 days of planting. Accordingly in case of okra-leaf, the bolls formed were 16.3, 28.8 and 40.5 and bolls opened were 2.8, 8.7 and 17.2 respectively against normal leaf whereas 11.5, 24.7 and 33.5 bolls were formed and 1.5, 6.4 and 16.9 bolls were opened per plant. The percentage increase of okra leaf over normal leaf was 41.7%, 16.6% and 20.9% bolls formed and 86.6%, 35.9% and 1.8% of bolls opened at 90, 120 and 150 days of plant-

Table 1
Incidence of boll rot as affected by okra leaf

Sr.	Okra leaf			Normal leaf			
No.	Av. No. of bolls plant^{-1}	Av. No. of rotted bolls plant^{-1}	%age of rotted bolls	Av. No. of bolls plant^{-1}	Av. No.of rotted bolls plant^{-1}	% age of rotted bolls	% age diff. over normal
1.	27.5	2.4	8.0%	17.2	5.1	30.0%	72.5%
2.	18.1	1.0	5.5%	18.0	5.0	28.2%	80.0%
3.	16.9	1.3	7.6%	17.0	4.4	25.9%	70.4%
4.	16.0	1.9	10.0%	15.5	4.8	31.1%	60.4%
Mean	17.13	1.4	7.7%	16.9	4.8	28.8%	70.8%

Table 2
Earliness of boll opening as affected by okra leaf

	Okra leaf		Normal leaf		Percentage over Normal	
Days after planting	Bolls formed	Bolls opened	Bolls formed	Bolls opened	Formed	Opened
90	16.3	2.8	11.5	1.5	41.7%	86.6%
120	28.8	8.7	24.7	6.4	16.6%	35.9%
150	40.5	17.2	33.5	16.9	20.9%	1.8%

ing. These observations are in agreement with the findings of Andries *et al.* (1969b), Jones (1972), Karami and Weaver (1972) and Reddy (1974).

In addition, it has been observed that not only more number of bolls were formed and opened in case of okra leaf cultivars but it also out-yielded the normal leaf cultivars by giving 3002 kg ha^{-1} as compared with 2870 kg ha^{-1} of normal leaf. The results are in accordance with those of Andries *et al* (1969a), Karami and Weaver (1972) and Jones *et al* (1980).

Conclusion

The results of the present study support previous findings that okra leaf cultivars are comparatively better than normal leaf cultivars to reduce rotting of bolls, induce earliness and increase the yield of cotton.

References

Anderson K E 1973 Effect of nitrogen rate, method of application, leaf type, and row width on certain characters of cotton. Ph D Dissertation, Mississippi State Univ. USA.

Andries J A, Jones J E, Sloane L W, Marshall J G 1969a Effect of okra leaf shape on boll rot, yield and other important characters of upland cotton *(Gossypium hirsutum* L). *Crop Sci* **9** 405-410.

Andries J A, Jones J E, Sloane L W, Marshall J G 1969b The effect of okra leaf and plant population on boll rot, yield and other characters of cotton. *Proc Beltwide Cotton Prod Res Confs Natl Cotton Council,* Memphis, Tennessee, USA, pp112-114.

Andries J A, Jones J E, Sloane L W, Marshall J G 1970 Effect of super okra leaf shape on boll rot, yield and other characters of upland cotton *(Gossypium hirsutum* L). *Crop Sci* **10** 403-407.

Brown H B, Cotton J R 1937 Crop and soils information. *Louisiana Agr Exp Sta Bull* **283** 7-9.

Huque H 1972 Cotton Entomology. In: *Cotton in Pakistan.* Pakistan Central Cotton Committee, Karachi, pp 305.

Johnson R E, Walhood V T 1972 Growth and yield response of three cotton genotypes over a range of plant population. *Proc Beltwide Cotton Prod Res Confs Natl Cotton Council,* Memphis, Tennessee, USA, pp 64.

Jones J E, Andries J A 1967 Okra leaf cotton for boll rot control. *Louisiana Agri* **10** (4) 4-5, 11.

Jones J E 1970 The status of okra leaf. *Proc Beltwide Cotton Prod Res Confs Natl Cotton Council,* Memphis, Tennessee, USA, pp 55.

Jones J E 1972 Effect of morphological characters of insects and pathogens. *Proc Beltwide Cotton Prod Res Confs Natl Cotton Council,* Memphis, Tennessee, USA, pp 88-92.

Jones J E, Weaver J B, Schuster F M 1978a Host plant resistance to the boll weevil. Arkansas Agric Exp Stn Univ of Arkansas, Fayetteville, AR. 72701, USA. *Southern Cooperative Series Bull, no.228,* pp 50-73.

Jones J E, Williams B R, Brand J W, Clower D F, Bowman D T 1978b Interacting effects of the okra leaf, frego bract and glabrous traits on pest resistance and agronomic characters. *Proc Beltwide Cotton Prod Res Confs Natl Cotton Council,* Memphis, Tennessee, USA pp 84-85.

Jones J E, Bowman D T, Brand J W, Caldwell C D, Clower D F 1980 Genetic improvement of open-canopy cottons. *Proc Beltwide Cotton Prod Res Confs Natl Cotton Council,* Memphis, Tennessee, USA, pp 72-74.

Jones J E 1982 The present status of the art, science of cotton breeding for leaf morphological types. *Proc Beltwide Cotton Prod Res Confs Natl Cotton Council,* Memphis, Tennessee, USA, pp 93-98.

Karami E, Weaver J B Jr 1972 Growth analysis of American upland cotton *(Gossypium hirsutum* L) with different leaf shapes and color. *Crop Sci* **12** 317-320.

Kohel R J, Richmond T R 1971 Isolines in cotton: Effect of nine dominant genes. *Crop Sci* **11** 287-289.

Major J A Jr 1971 The interacting effects of okra leaf and frego bract on important agronomic characters in upland cotton. M Sc Thesis, Louisiana State Univ. Baton Rouge, LA, USA.

Meiville D R, Caldwell W D 1972 Studies with narrow row cotton. *Louisiana Agri* **16** (1) 12-13.

Rao M J, Weaver J B Jr 1976 Effect of leaf shape on response of cotton to plant population, nitrogen rate and irrigation. *Agron J* **68** 599-601.

Reddy P S C 1974 Effect of three leaf shape genotypes of *Gossypium hirsutum* and row types on plant microclimate. Boll weevil survival, boll rot and important agronomic characters. Ph D Thesis, Louisiana State Univ. Baton Rouge, LA, USA.

Roncadori R W 1974 A new look at the cotton boll rot complex and promising approaches to control. *Proc Beltwide Cotton Prod Res Confs Natl Cotton Council* Memphis, Tennessee, USA, pp 155-158.