

Studies Regarding Resistance in Different Genotypes of Cotton Against Bollworm Complex

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ABSTRACT

The comparative resistance of six cotton genotypes of cotton to bollworm complex was studied under field conditions. The results revealed that infestation of spotted bollworm was significantly high on shoots, squares, flowers and green bolls of FH-901. The infestation of American bollworm of cotton was high on FH-901 followed by FH-945, FH-925 and FH-930. The infestation on green bolls of FH-901 caused by pink bollworm was significantly high followed by FH-945. However, overall infestation of bollworm complex was found to be high on FH-901 as compared with other varieties in field conditions. It can be inferred from the results that FH-901 was more susceptible to bollworm complex, however FH-900 emerged as comparatively resistant variety to bollworms.

Key Words: Cotton genotypes; Bollworm complex; Resistance

INTRODUCTION

Cotton (white gold) is a major fiber crop of Pakistan. This crop provides livelihood to millions of people engaged in its trade and textile industry. Moreover, it is a major source of foreign exchange earning, which not only provides raw material for our local industry but also stands at the top of exports. Therefore, there is a dire need to produce maximum and best quality cotton in Pakistan. Cotton bollworms damage the cotton crop very severely. The intensity of their attack is, sometimes so severe that it can cause major destruction of the crop. According to an estimate, they reduce the annual potential of agriculture production by 25% (Anonymous, 1999). One of the safe measures to evade such a situation is to grow resistant cotton cultivars. Finding out of resistance in different genotypes of cotton, which is generally practiced in Punjab and Sindh provinces, respectively is a pre-requisite for the success of such a strategy. Very few information on the comparative resistance of cotton except that of foreign workers i.e., Naqvi (1975), Flint *et al.* (1980), Baloch *et al.* (1982), Yein (1983), Zaman (1986) and Dillon (1993) is available. Therefore, present study is very imperative under the local agro-climatic conditions.

MATERIALS AND METHODS

The studies were conducted at Ayyub Agricultural Research Institute. (AARI) Faisalabad. There were six cotton cultivars, namely (V₁) FH-901, (V₂) FH-900, (V₃) FH-930, (V₄) FH-634, (V₅) FH-925 and (V₆) FH-945. The experiment was laid out in RCBD with six treatments having three repeats each. The data of the bollworm population was taken from flowers, squares and bolls on weekly basis from the different genotypes of cotton from July to October. There were three rows of cotton in each

treatment. In each treatment fifteen plants, were selected, i.e., 5 plants/row at random for recording pest population. These plants were tagged and were not considered again, when next observations were taken. The mean population of different bollworms, i.e. American bollworm, spotted bollworm and pink bollworm was calculated on percentage infestation basis.

RESULTS AND DISCUSSION

The data on infestation (%age) of spotted bollworm, american bollworm and pink bollworm on shoots, squares, flowers, green bolls, and seed damage were recorded (Table I, II, & III).

Spotted Bollworm. The data in Table I revealed that the maximum infestation of 1.93% on shoots was recorded on the variety FH-901 followed by the variety FH-945, FH-925 and FH-930 which infested 1.87, 1.82 and 1.80% respectively. Similarly, maximum infestation (17.32%) of spotted bollworms on squares, was recorded on the variety FH-901 while the minimum infestation of 13.03% was recorded on variety FH-900. However, the varieties FH-900 and FH-634 showed comparatively better resistance against spotted bollworms. Again with the varieties FH-901 and FH-945, the maximum infestation of 9.66 and 8.47% were recorded on flowers while the maximum infestation (15.14%) was observed on green bolls in FH-901. The lowest, 7.11% infestation of spotted bollworm was recorded in the variety FH-900. The significant infestation was observed among the varieties. These findings on per cent infestation of spotted bollworm on shoots, squares, flowers and green bolls conform to those already completed by Yein (1983), Bughio *et al.* (1984), Ullah *et al.* (1985), Ahmad *et al.* (1989), Nadeem (1989) and Wahla *et al.* (1998) differ with that of possibly due to climatic and varietal differences.

American Bollworm. Data in Table II indicated that on

Table I. Per cent mean infestation of spotted bollworms on shoots, squares, flowers and green bolls in different genotypes of cotton

| Variety | Shoots | Squares | Flowers | Green bolls |
|---------|--------|----------|---------|-------------|
| | Mean | Mean | Mean | Mean |
| FH-901 | 1.93 a | 17.32 a | 9.66 a | 15.14 a |
| FH-900 | 1.12 b | 13.03 c | 4.35 d | 7.11 d |
| FH-930 | 1.80 a | 14.27 bc | 6.03 cd | 9.44 c |
| FH-634 | 1.26 b | 13.68 c | 4.63 d | 7.51 d |
| FH-925 | 1.82 a | 15.02 bc | 7.05 bc | 10.20 c |
| FH-945 | 1.87 a | 15.78 ab | 8.47 ab | 12.58 b |
| LSD | 0.2698 | 1.914 | 1.611 | 1.616 |

Means sharing common letters does not differ significantly to each other

Table II. Per cent mean infestation of American bollworm on squares, flowers and green bolls in different genotypes of cotton

| Variety | Squares | Flowers | Green bolls |
|---------|---------|---------|-------------|
| | Mean | Mean | Mean |
| FH-901 | 3.57 a | 1.93 a | 4.61 a |
| FH-900 | 2.22 c | 1.12 b | 2.89 c |
| FH-930 | 2.67 bc | 1.80 a | 3.65 bc |
| FH-634 | 2.64 bc | 1.25 b | 2.92 c |
| FH-925 | 2.64 bc | 1.82 a | 3.67 bc |
| FH-945 | 2.89 b | 1.87 a | 4.03 ab |
| LSD | 0.5146 | 0.2636 | 0.7804 |

Means sharing common letters does not differ significantly to each other

Table III. Per cent mean infestation of pink bollworm on flowers, green bolls and seed in different genotypes of cotton

| Variety | Flowers | Green Bolls | Seed Damage |
|---------|---------|-------------|-------------|
| FH-901 | 3.90 a | 5.45 a | 3.39 a |
| FH-900 | 2.22 c | 3.77 c | 3.17 bc |
| FH-930 | 2.67 b | 4.80 ab | 3.20 abc |
| FH-634 | 2.64 b | 3.97 bc | 3.00 c |
| FH-925 | 2.64 b | 4.87 a | 3.31 ab |
| FH-945 | 2.89 b | 5.43 a | 3.30 ab |
| LSD | 0.3151 | 0.8416 | 0.1908 |

Means sharing common letters does not differ significantly to each other

squares the variety FH-901 showed maximum infestation of 3.57% while the minimum (2.22%) infestation was recorded on the variety FH-900. However, there was no significant difference between the varieties FH-930, FH-634, FH-925 and FH-945. On flowers, the maximum (1.93%) attack of american bollworms was observed in variety FH-901 followed by the genotypes FH-945 (1.87%), FH-925 (1.82%) and FH-930 (1.80%) which showed non significant differences. Similar results were observed on green bolls. Again, the varieties FH-900 and FH-634 showed better resistance against American bollworms which showed the main infestation of 2.89 and 2.92%, respectively. Highest infestation of 4.61% was recorded in the variety FH-901. These findings on per cent infestation of American bollworm on squares and green bolls are in close conformity with those of Flint *et al.* (1980) Vargas and Young (1980), Salgado and Silguero (1981), Baloch (1982), Anrsingkar

(1984), Hormchan *et al.* (1987), Ozgur *et al.* (1988), Dillon (1993) and Rao and Prasad (1996) and results for flowers.

Pink Bollworm. Data on Table III revealed that maximum infestation 5.45% was recorded on green bolls on (FH-901), while minimum 3.77% on (FH-900). However, there was no-significant difference among the varieties in i.e. FH-901, FH-930, FH-925 and FH-945. The damage caused by the pink bollworm on seed indicated that maximum damage 3.39% was recorded in FH-901 and minimum 3.00% in FH-634. However, non-significant differences were observed in the varieties FH-901, FH-930, FH-925 and FH-945. These findings on percent infestation of pink bollworm on green bolls, flowers and seed damage are compatible with those of Flint *et al.* (1980), Bughio *et al.* (1984), Ahmad *et al.* (1989) and Wahla *et al.* (1998) and differ with that of Wilson (1990) possibly due to climatic and varietal difference.

The varieties FH-900 and FH-634 showed better resistance against spotted, American and pink bollworms. The other genotypes of cotton remained under studies. These varieties can be further used in hybridization programme of cotton for enhancement of resistance in other genotypes.

REFERENCES

- Ahmad, M., M.R. Khan and S.M. Hussain, 1989. Some studies on the physio-chemical factors contributing towards resistance in different cultivars of cotton against insect pests complex of cotton. *Pakistan Entomol.*, 11: 23-8
- Anonymous, 1999. *Agricultural Statistics of Pakistan 1989-99*. Govt. of Pakistan. Ministry of Food, Agric. and Livestock Div., Econ. Adv. Wing, Islamabad
- Anrsingkar, A.S., G.R. Vyahalkar and H. Deshpande, 1984. Stability for bollworm resistance in *Gossypium arboreum* L. *Indian J. Agric. Sci.*, 54: 422-5
- Baloch, A.A., B.A. Soomro and G.H. Mallah, 1982. Evaluation of some cotton varieties with known genetic markers for their resistance against sucking and bollworm complex. *Turk. Bit. Kor. Derg.*, 6: 13-4 (Rev. Appl. Entomol. (A), 70(12): 887, 1982)
- Bughio, A.R., A. Rahman, A.Q. Zafar, T. Hussain and Q.H. Siddiqui, 1984. Field evaluation of cotton mutants for pink and spotted bollworms resistance. *Nucleus Pakistan*, 21: 47-9 (Rev. Appl. Entomol.(A), 74(3): 116,1986)
- Dillon, G., 1993. Techniques and conversion Tables for presence and absence sampling of *Heliothis*. *Australian Cotton Grower*, 14: 56-68
- Flint, H.M., S.S. Salter and S. Walters, 1980. Development of cotton and associated beneficial and insect pest populations in a ratoon field at Phoenix, Arizona. *Agric. Reviews and Manuals, Sci. and Edu. Admin. ARM-W-15. 1V+14 PP- USA* [Rev. Appl. Entomol., (A), 69(8): 583, 1981]
- Hormchan, P., Dereksee and V. Rojanavongas, 1987. Preliminary screening of resistant cotton varieties to the American bollworm (*Heliothis armigera* Hubner). *Thailand J. Agric. Sci.*, 20: 91-6
- Nadeem, A., 1989. The comparative resistance to some recent releases of cotton cultivars to bollworms. *M.Sc. Thesis*, Deptt. Agri. Entomol., Univ. Agric., Faisalabad, Pakistan
- Naqvi, K.M., 1975. Crop protection to boost up cotton production. Paper read at cotton seminar, April,13-14, 1975, Lyallpur.
- Ozgur, A.F., Sekeroglu, O. Gencer, D. Yelin and N. Isler, 1988. Study of population development of important cotton pests in relation to various cotton varieties and plant phenology. *Doga-Turk-Turim-Ve-Ormancilik-bergisi*, 12: 48-74 (Rev. Appl. Entomol., (A), 77: 1192, 1989).

- Rao, C.N. and V.D. Prasad, 1996. Comparative population growth rates of *Helicoverpa armigera* (Hub.) on certain cultivars of cotton, *Gossypium hirsutum* L. *Ann. Pl. Prot. Sci., India*, 4: 138–41
- Salgado, S.E. and J.F. Silguero, 1981. Response of the cotton line LA 17081 to attack by bollworm *Heliothis virescens* (Fab.) in south of Tamaulipas. *Agric. Tech. Mexico*, 7: 149–58 (Rev. Appl. Entomol., (A), 71(1): 65, 1983)
- Ullah, K., A. Raqib, M.S. Khan and F. Shah, 1985. Incidence of the spotted bollworm on different cultivars of cotton. *The Pakistan Central Cotton Committee*, 29: 168–71
- Vargas, C.J. and J.J.H. Young, 1980. Behavior of cotton varieties of *Gossypium hirsutum* L. resistance to bollworm complex. *Agric. Tech. Mexico*, 6: 137–43 (Rev. Agric. Entomol., 71(1): 65, 1983).
- Wahla, M.A., M. Tuafil, M. Afzal and M.N. Tariq, 1998. The comparative resistance of some recent releases of cotton cultivars to the insect pest complex. *Pakistan Entomol.*, 20: 92–4
- Wilson, F.D., 1990. Relative resistance of cotton lines to pink bollworm. *Crop Sci.*, 30: 500–04
- Yein, B.R., 1983. Relative susceptibility of some cotton cultivars to insect pests. *J. Res., Assam Agric. Univ.*, 4: 141–7
- Zaman, M., 1986. Relative abundance of the pink bollworm on different cultivars of cotton. *Pakistan Cottons*, 30: 17–20

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