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## Varietal Resistance of Cotton Against *Earias* spp.

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**Abstract:** Studies were carried out on varietal resistance of cotton against *Earias* spp. during cropping season 1999. The seeds of 12 cotton varieties viz., Green Red Okra, Qalandri, Red Okra-VI, Red Okra (Insect Resistant), AENS-1/82 VIII, Red Okra, TH-228/87, AENS-10/87, TH-3/83, Reshmi, AEC-78 13/89 and TH-41/83 were sown on April 22, 1999 in a completely randomized design with strip cropping, each strip measuring 20 x 35 feet with nine rows of each variety. Observations on infestation of *Earias* spp. were started 67 days after sowing and continued till complete disappearance of pest from the crop. Observations were taken at random at weekly interval from 20 plants. The results revealed that there was no significant difference of infestation amongst cotton varieties under present investigation. The minimum and the maximum infestation of 1.79 and 2.38% was recorded on Red Okra-VI and Green Red Okra varieties of cotton, respectively. The results also indicated that there was no significant effect of minimum and maximum temperature on percent infestation of *Earias* spp., whereas relative humidity had a significant ( $P < 0.05$ ) effect on infestation.

**Key words:** Varietal resistance, cotton, *Earias* spp.

### INTRODUCTION

Cotton is one of the most sensitive to pest attack and chemically intensive among all field crops. Cotton is cultivated on an estimated 3% of the total cultivated area in the world, but uses about 25% of all insecticides consumed in agriculture. About 50% of the present cotton yields in world are attributable to the use of agrochemicals (ICAC, 1998). Pests are such a serious threat to cotton production that economic yields are almost impossible to achieve without chemical control and plant protection operations have become the crucial aspect of production practices.

Pesticides use on cotton has increased in recent years in Asia and more pesticides are applied to cotton than any other crop (IIBC, 1977). The majority of farmers in Pakistan are small holders and their dependence on pesticides have had serious consequences for their health and well being (Poswel and Williamson, 1998). Dependence on pesticides has increased in recent years and almost 50% of cotton farmers spray their crops up to 7 times per growing season yet do not realize higher yields. This dependence of farmers on pesticides increases the cost of production of cotton crop and it is estimated that about 20% or more of the total cost of production is spent on pesticides (Jones, 1984).

The yield of cotton in Pakistan is low as compared with other cotton producing countries of world and production potential of crop is reduced by insect pest infestation (Ali, 1983). Ghouri (1980) reported a loss of about 20% in yield incurred from bollworm pests. Ahmed (1980) stated that cotton crop is most susceptible to bollworms which inflict heavy damage that may vary from year to year but generally cause 30-40% yield reduction.

Chang *et al.* (2002) screened different strains and varieties of cotton against bollworms and reported that damage to different genotypes ranged between 3.8 to 12.6%.

Spotted bollworm, *Earias insulana* (Boisd.) and *Earias vittella* (Fab.) (Lepidoptera: Noctuidae) are very serious polyphagous pest insects on many economic crops distributed in North Africa, India, Pakistan and many other countries of the world (Arain, 1974). *Earias* spp., were first recognized as pest of cotton in 1905 (Lefroy, 1909). *Earias* spp., remain active through out the year on cotton and other alternate host plants (Abdul Nasr *et al.*, 1973; Faseli, 1977; Siddiqui *et al.*, 1986). Alternate host plants play important role in the carryover of *Earias* spp. (Arif and Attique, 1990). Among bollworms species, *Earias* spp. are more abundant on cotton in Sindh as compared with other bollworm species (Leghari and Kalroo, 2002).

Host plant resistance is one of the eco-friendly and hazardless methods of pest control. A number of genetic characters are now available to cotton breeders for insect resistance such as nectariless, high gossypol, fregobract, hairiness and okra leaf etc. (El-Zik and Thaxton, 1989; Jenkins, 1986; Wilson and George, 1982). Ilango and Uthamasamy (1989) observed that gossypol content of cotton is known to be deleterious to bollworms, declined with boll age but was consistently higher in resistant variety. This, together with the higher total phenolics and crude fibre content in resistant variety was thought to contribute to greater resistance. Similarly, Ratan (1994) reported that genotypes which had highest gossypol gland density also had the lowest incidence of bollworms. Apart from this, host plant resistance is also compatible with other control measures such as chemical and biological control methods and can be utilized in the

integrated pest management (IPM) of cotton for realizing the yield potential of cotton crop. In the present study different cotton varieties were evaluated for their resistance against spotted bollworm, *Earias* spp., under field conditions.

**MATERIALS AND METHODS**

The present studies on the varietal resistance of cotton against *Earias* spp. under field conditions were carried out at Integrated Pest Management Section, ARI, Tando Jam during the cropping season 1999. The seeds of 12 cotton varieties viz., Green Red Okra, Qalandri, Red Okra- VI, Red Okra (Insect Resistant), AENS-1/82 VIII, Red Okra, TH-228/87, AENS-10/87, TH-3/83, Reshmi, AEC-78 13/89 and TH-41/83 were sown on April 22, 1999 in a completely randomized design with strip cropping. Each strip measuring 20 X 35 feet with 9 rows of each variety.

Observations on infestation of cotton by *Earias* spp. were started 67 days after sowing of crop. For recording observations, 20 plants were selected at random from each variety and healthy and infested bolls by *Earias* spp. were recorded and the percent infestation was calculated for each variety. Observations were taken at weekly intervals till the harvesting of the crop. The data recorded were statistically analysed for significant differences in infestation on different varieties of cotton by LSD range test (LeClerg *et al.*, 1962).

**RESULTS AND DISCUSSION**

The results reveal that the pest started its appearance in the field in the fourth week of June and continued its activity till harvest of the crop in the end of September. *Earias* spp. activity remained generally low during the experimental period and the infestation ranged in between 1.0 and 5.38% on different varieties during different dates (Table 1).

The minimum and maximum infestation of *Earias* spp. on different varieties of cotton recorded are: 1.43 and 3.84% on Green red okra on July 6 and August 10; 1.40 and 2.70% on Qalandri on July 20 and August, 30; 1.0 and 3.15% on Red okra-VI on June 29, July 6 and August 10; 1.0 and 3.76 on Red okra (Insect resistant) on July 6 and July 20; 1.00 and 3.00% on cotton variety AENS-1/82 VII on June 29, August 30 and July 20. Similarly the infestation of *Earias* spp., on the remaining varieties of cotton remained in the same range. On overall mean infestation basis cotton variety Red okra-VI and Green Red Okra were found the most and the least resistant varieties with 1.79 and 2.38% infestation, respectively under present study.

The statistical analysis of data showed that there was no significant difference in between infestation means of different varieties. However, the analysis of variance of infestation data on different dates indicated a significant difference in infestation on different dates during present studies (Table 1).

Further studies carried out to ascertain the effect of minimum and maximum temperature and relative humidity on the infestation of *Earias* spp. on different cotton varieties indicated that there was no significant effect of minimum and maximum ( $y=0.303+0.053x$ ;  $r=0.227$ ;  $P>0.05$ ) and ( $y=0.568+0.042x$ ,  $3=0.241$ ;  $P>0.05$ ) temperature on infestation, while relative humidity had a significant ( $y=0.362+0.036x$ ,  $r=0.51$ ,  $P<0.05$ ) effect on infestation of *Earias* spp. on different cotton varieties.

*Earias* spp. is an important pest of cotton causing damage to fruiting bodies and shading of squares, flowers and bolls. Bughio *et al.* (1987) reported that *Earias* spp. caused more abscission of squares and bolls than *P. gossypiella*. Dhawan *et al.* (1990) reported that *Earias* spp., were the cause of the loss of 12.5 to 16.6% of shed buds, 0.9 to 2.5% of flowers and 7.9 to 9.5% of bolls. The impact of pest population depends on planting date and crop development, *Earias* spp. first population (infestation) peak appeared in August first fortnight

Table 1: Percent infestation of *Earias* spp. on different varieties of cotton in field

Name of variety	Dates of observation												Mean
	June			July			August			September			
	29	6	13	20	27	4	10	23	30	3	14	30	
Green Red Okra	2.45	1.43	3.27	2.30	2.42	2.67	3.84	1.56	3.05	1.94	2.09	1.59	2.38
Qaslandri	2.09	1.93	1.46	1.40	1.45	1.84	2.38	2.14	2.70	2.47	1.55	2.32	1.98
Red Okra-VI	1.00	1.00	2.29	1.91	1.00	2.32	3.15	2.10	1.50	1.98	1.70	1.60	1.79
Red Okra (insect resistant)	1.65	1.00	2.45	3.76	2.29	1.48	2.72	1.46	3.08	2.04	2.09	1.61	2.13
AENS-1/82 VIII	1.00	2.12	1.96	3.00	1.90	1.91	2.69	2.80	1.00	2.72	2.08	2.19	2.11
Red Okra	1.00	1.91	2.76	1.94	1.00	1.92	3.72	1.95	1.00	1.98	2.02	1.00	1.85
TH-228/87	1.54	1.67	1.40	1.69	1.42	2.31	2.92	1.47	2.40	2.41	2.29	2.92	2.04
AENS-10/87	1.00	1.00	1.45	2.20	1.86	1.86	2.78	2.11	2.33	1.97	2.94	1.64	1.93
TH-3/83	1.00	1.00	1.00	1.54	1.00	2.30	1.64	1.95	2.96	2.81	2.40	2.33	1.82
Reshmi	1.00	1.00	1.00	1.94	1.59	3.39	3.54	2.96	2.14	3.94	1.00	1.00	2.04
AEC-78 13/89	1.00	1.00	1.78	1.46	1.58	1.67	2.19	2.03	1.00	3.77	3.53	3.94	2.08
TH-41/83	1.00	1.00	1.00	1.48	1.00	3.10	1.59	3.15	4.29	5.38	2.49	2.42	2.32
Mean	1.31a	1.33a	1.81ab	2.05b	1.54a	2.23bcd	2.76d	2.14bc	2.28bc	2.78d	2.17bc	2.04b	

(August 10) and the second one on the September 3, almost 20 days after first peak. Similar observations are recorded by Baloch *et al.* (1990) and Qureshi and Ahmed (1991). As has been observed in the present study, the higher relative humidity caused higher incidence of *Earias* spp. Similar observations were recorded by Khurana and Verma (1990) who reported that a maximum temperature of 36.3°C coupled with a mean RH of 64.8% resulted in a comparatively high incidence (20.0%) of *Earias* spp. in cotton. Further, it has been recorded that the relative abundance of *E. vittella* on cotton and okra showed its preference for more humid microclimate as these crops are irrigated (Arif and Attique, 1990).

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