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PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences 3 (5): 854-855, 2000

Evaluation of Resistance of Cotton Strains to *Anthonomus Grandis Grandis* (Boheman) (Coleoptera: Curculionidae) under Different Levels of Pest Management

Muhammad Aslam[1], R. B. Chalfant[2] and G. A. Herzog[2]
[1]Associate Professor of Entomology, Department of Entomology,
University of Arid Agriculture, Rawalpindi, Pakistan
[2]Department of Entomology, University of Georgia, Coastal Plain Experiment Station,
Tifton, GA. 31794, USA

Abstract: *Anthonomus grandis grandis* (Boheman), the boll weevil (BWVL), in a field experiment with 20 cotton strains planted in 3 levels [A (intense pesticide use), B (intermediate use of pesticides) and C (low pesticide use)] of pest management at the University of Georgia, Department of Entomology, Coastal Plain Experiment Station, Tifton, USA, showed low to equal oviposition and feeding preferences on GATIR 84-664 and PD-0786 (a frego bract strain), while on the other lines either intermediate or equal oviposition and feeding preferences were found compared with Stoneville 213 (a susceptible check). It showed equal oviposition and feeding preferences in the averages of level B and C and less in level A.

Key words: *Anthonomus grandis grandis* (Boheman), Stoneville 213, Frego bract, Oviposition and Feeding, Preferences Levels of Pest Management, Susceptibility

Introduction

Based on Renolds *et al.* (1994), *Anthonomus grandis grandis* (Boheman), the boll weevil (BWVL) is a key pest in the cotton belt of the United States. It inflicts 51 percent yield loss to cotton (Schwartz, 1983). Various techniques have been used to evaluate the resistance of different cotton lines to this pest. Dahms (1972) identified sixteen possible criteria for evaluation of insect resistance in crop plants including difference in yield between infested and non-infested plots, number of eggs laid, number of larvae attracted to a cultivar when given a free choice and damage done by insects to the plants. The resistance of an experimental strain is usually measured by comparing the strain with a cultivar known to be 'susceptible' (Painter, 1951; Dahms, 1972; Namken *et al.,* 1983).

Field evaluations have been used very successfully to assess plant resistance to BWVL by studying feeding and oviposition punctures on cotton squares (Niles, 1980). Aslam *et al.* (1999), showed variations in BWVL oviposition and feeding on 5 cotton lines in a separate field study. Maxwell *et al.* (1969) indicated that frego bract character of cotton contributed a significant degree of non-preference by BWVL. Clower *et al.* (1970) showed higher tendency of BWVL population in plots having normal cotton than in plots having either frego bract or the medium red foliage characteristic (AK Djura). He further showed more suppression of BWVL population when these two characters were combined. Jones *et al*. (1987), in field tests, studied BWVL preference and non-preference to selected cotton lines comparing with the standard cultivars 'Stoneville 213' and/or 'Deltapine 41' and showed certain genotypes several times more attractive to BWVL than Deltapine 41.

The objective of these studies is to evaluate the resistance of cotton strains to BWVL in the field using Stoneville 213, a commercial, susceptible check.

Matarials and Methods

A field experiment was conducted at the University of Georgia, Coastal Plain Experiment Station Tifton, Georgia using twenty strains of cotton (including Stoneville 213 as a susceptible check). The strains were planted on May 13 at the Ponder experimental farm in plots maintained under 3 levels of pest management. In level A, cypermethrin (Cymbush^{R} 3e), a pyrethroid and broad spectrum insecticide was applied at the rate of 0.056 kg (ai)/ha twice weekly for fourteen times from July 15 through September 2. In level B, the insecticide was applied at the same rate at two week intervals for four times from July 18 through August 29, while in Level C no insecticide was applied. The cotton strains were replicated 3 times in each level using randomized block designs. The plots consisted of two rows, 10.67 m in length and 1.83 m in width. Fertilizer was applied at a rate of 42.01, 84.028, 126.04 kgs of N, P, K per ha, respectively. Also 33.61 kgs of nitrogen/ha was side dressed four weeks after planting.

A John Deere Hi-cycle sprayer with 3 TX-6 nozzles/row, ground speed 4.83 kms/hr, delivering 77.6 litres of total spray volume/ha, was used to apply the insecticides. The infestations of BWVL were recorded on 25 squares per plot, recording weekly the number punctured by BWVL oviposition and feeding from July 10 through September 18 for 11 times. The observations recorded are shown as percent squares punctured by BWVL oviposition and feeding in all the lines separately to relate the oviposition and feeding preferences by this insect. The statistical analysis was done as 3 randomized block designs nested with the main plots, using SAS (SAS, 1986).

T tests (LSD) as recommended by Benedict (1983) were applied to the means. Based on the groupings of the T tests, the resistance of the strains to BWVL was classified as high oviposition and feeding preferences, when boll weevil showed significantly higher oviposition and feeding preferences on cotton lines than on Stoneville 213; equal, when oviposition and feeding preferences on the cotton lines were not significantly different (NSD) from that on Stoneville 213; low, when BWVL showed the minimum oviposition and feeding preferences and intermediate when nature of preferences was in between low and equal.

Results and Discussion

Although there was difference in different lines with respect to squares punctured by BWVL oviposition, however, the lines did not differ significantly from the standard (Table 1). Table 1 shows that MISCOT TB 27-86 and GATIR 84-635 received more feeding punctures to their squares than Stoneville 213. GATIR 84-664 and PD 0786 (a frego bract cotton) showed numerically the lowest percentage of squares punctured by BWVL feeding, but it was NSD from that on Stoneville 213 (Table 1). Based on Maxwell *et al.* (1969) frego bract character of cotton contributed a significant degree of

Table 1: Percent squares damaged by boll weevil oviposition and feeding in cotton strains, Tifton, Ga

Cotton Strains	Percent Squares Damaged by Boll Weevil	
	Oviposition	Feeding
86MRH-6	11.7a-e	27.4a-d
86MRH-7	12.6a-d	29.3 a-d
MISCOT TB27-86	13.6abc	31.9a
MISCOT 7913-S	13.5abc	28.4 a-d
MISCOT 7913-H	11.7a-e	29.3 a-d
JBW 503	12.2a-d	29.0 a-d
JBW 504	14.2ab	29.0 a-d
TXCDP 37HH	12.0a-e	27.1 a-d
PD-0786	12.7a-d	25.2d
LAHG 810065	10.8cde	27.3 a-d
LAHG 810063	8.9e	27.0 a-d
UARK 2402	13.3a-d	26.7bcd
Stnoneville 213	11.6a-e	26.2cd
GATIR 84-634	10.8cde	28.7 a-d
GATIR 84-655	10.3de	26.3bcd
GATIR 84-664	10.6cde	25.9d
GATIR 84-663	11.7a-e	28.5 a-d
GATIR 84-662	11.5b-e	28.4 a-d
GATIR 84-635	14.4a	31.2ab
TAMCOT CAB-CS	12.5a-d	31.0abc

Means followed by same letters are not significantly different at p = 0.05

Table 2: Correlations between different criteria used to evaluate resistance of cotton strains to boll weevil, Tifton, GA

Criteria	Correlation (r)	
Per cent Squares Punctured by Boll Weevil:	1	2
Oviposition 1	x	0.51*
Feeding 2		x

Correlation Coefficient with* is significant at significant level $p<0.05$, $N=20$

Table 3: Percent cotton squares punctured by boll weevil oviposition and feeding in 3 levels of pest management, Tifton, GA

Levels	Squares Punctured by Boll Weevil	
	Oviposition	Feeding
A	8.8484 b	22.6242 b
B	13.8969 a	30.7030 a
C	13.2909 a	31.1878 a

Means followed by the same letters are not significantly different from one another at $p=0.05$

non-preference for oviposition by BWVL. Clower *et al*. (1970) also showed higher tendency of BWVL population in plots having normal cotton than in plots having frego bract cottons. In another experiment the BWVL, had shown significantly low preference to PD 0786 when compared with Stoneville 213 (Aslam *et al*., 1998). In this experiment as well, the boll weevil to some extent was able to discriminate between the squares of frego bract and those of normal cottons. Jones *et al.* (1987) in the field tests reported certain genotypes of cotton several times more attractive to BWVL than the standard ones. The squares punctured by BWVL oviposition and feeding were significantly correlated (Table 2).

There were no significant differences between levels B and C in the percentage of squares punctured by BWVL oviposition and feeding; however, the percentage was numerically lower in level A than in the other two levels (Table 3).

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