Antixenosis and Antibiosis Determination to Bollworm (*Heliothis virescens*) in Seven Advanced Lines and Three Cultivars of Cotton (*Gossypium hirsutum* L.) in Argentina

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ABSTRACT

Antixenosis to Heliothis virescens was evaluation in trials to test genetic resistance in three cultivars and seven advanced lines of cotton. Genotypes tested were: 1-Pora INTA, 2-Guazuncho2 INTA, 3- "okra leaf", 4-"glandless", 5-"without trichomes", 6-"nectariless", 7-"without trichomes - okra leaf", 8-"frego bract", 9-Deltapine 90 and a pool of 10 T-94 lines. Thirty six m2 cages, protected, with anti-aphid screens, were used. Ten pots were used per cage in a Latin square design and fifty mated females were released in each cage. Oviposition was recorded by counting eggs on leaves, shoots and bracts the morning after moths were released. Genotype differences in underleaf oviposition were significant (a=0.05), the least preferred being those without trichomes, with okra leaf or the combination of the two. Neonate larvae in individual test tubes were fed squares of each genotype to evaluate antibiosis. After seven days, larval weight, pupal weight, time to pupation and time to adult emergence were significantly different between genotypes. Larvae fed with genotypes 2 and 10 showed less larval and less pupal weight and those fed with genotype 1 showed longer time to pupal formation and adult emergence. This result showed that "Guazuncho2 INTA" and the "Pool of T-94 lines" to be the most antibiotic to H. virescens.

Introduction

Numerous factors influence the yield and quality of cotton. Numerous pests attack the plant and this translates into a high input demand to keep them below action thresholds. (Barral and Zago, 1983). Several lepidopteran species attack cotton, *Heliothis virescens* (Fabricius) being among the most serious, causing damage by a) feeding from the apical meristem during the seedling stage, causing branched plants and b) feeding from reproductive structures, causing a decrease in yield. Farmers usually use chemical controls, often causing serious imbalances because of destruction of beneficial organisms, the development of resistance and the risk of environmental contamination. In the circumstances, the use of non-pollutant strategies is desirable. One of these, considered a major component of IPM programmes, is pest tolerant cultivars that lead to decreased damage with very low cost to the farmer.

The objective of this work was to evaluate degrees and/or types of resistance of cotton genotypes to *Heliothis virescens* (Fabricius).

Material and Methods

Genotypes

Ten genotypes were evaluated in pot experiments.

A) Cultivars:
Porá INTA (1)
Guazuncho 2 INTA (2)
Deltapine Acala 90 (9)

B) Advanced Lines:
Okra Leaf (3)
Glandless (4)
Without trichomes (5)
Nectariless (6)
Without trichomes - okra leaf (7),
Frego Bract (pool of lines) (8)
Pool of Lines T-94 (10)

Rearing

The *H. virescens* were reared following the methodology described by Contreras *et al.* (in litt.), with the objective of obtaining adults for the evaluation of antixenosis and neonate larvae to subject the different genotypes to artificial infestation in order to determine antibiosis.

Determination of Types of Resistance

Antixenosis

Pots were placed in a 36 m2 cage for later release of mated females. The morning following the release, the number of eggs per experimental unit was counted. The design used was a 10 x 10 Latin square. The trial was repeated on five successive dates.

Antibiosis

Neonate larvae of *H. virescens* were fed with squares in test tubes with one larva per tube. The experimental design was completely randomized, with five repetitions on three successive dates.

Data Analysis

Data were subjected to analysis of variance and means were separated by the of Tukey test of significance (p = 0.05).

Results and Conclusions

Antixenosis

The results obtained manifest significant effects of the genotypes for all the variables (p = 0.05). There were significant effects of dates and significant interaction, except for "number of eggs on the leaves´ lower side". Varietal differences in oviposition on the upper surface of the leaf were significant on all dates, genotypes 5 (without trichomes), 3 (okra leaf) and 7 (okra leaf - without trichomes) being the least favoured for oviposition of *H. virescens* (Figure 1).

The differences in "total number of eggs" were highly significant (p = 0.001) on four out of five dates, the differences on the other date being significant at p = 0.05. Genotypes 7, 5, 3 and 6 (without nectaries) were the least preferred. Genotypes 5 and 7 lack trichomes (they have low density hairiness), a morphological character that has great influence on insect behavior. *Heliothis virescens* manifests a high "non preference" for materials with absence or low hairiness density.

The "okra leaf" character it relates to a greater light penetration that influences changes in insect behaviour. The absence of nectaries produces a negative effect on the behaviour of adults, leading to lack of stimuli for oviposition.

Antibiosis

There are significant differences for all variables, "larval 7-days weight", "pupal weight" (Figure 2), "time to pupa formation" and "time to adult emergence" (Figure 3), among the evaluated genotypes. There were no effects of date or genotype-date interaction. On all dates, larvae fed on genotypes 2 and 10 showed the least larval and pupal weight. Larvae fed with genotype 1 (Pora INTA) showed a longer time to pupa formation and adult emergence.

References

Barral, J.M. and L.B. Zago. (1983): Programa para el Manejo Integrado de Insectos y Acaros del Algodón. Boletín Nº 71. EEA - Sáenz Peña, Chaco.

Contreras, G.B. et al. Metodología de cría en laboratorio de lepidopteros plagas del algodón para el estudio de sus posibles agentes de biocontrol. (in Press).

Figure 1. The expression of antixenosis in Heliothis virescens (F).

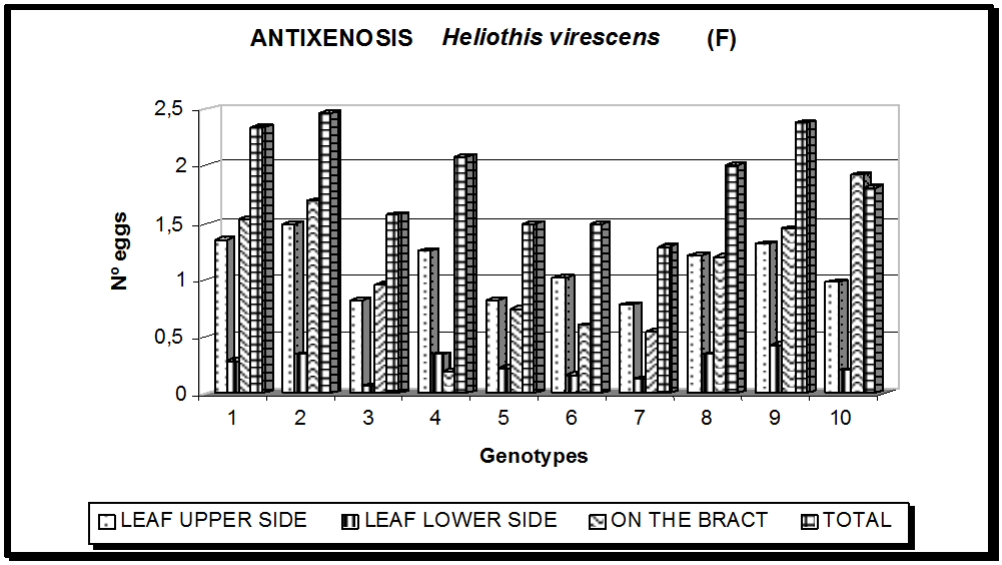

Figure 2. The influence of genotype on larval and pupal weights.

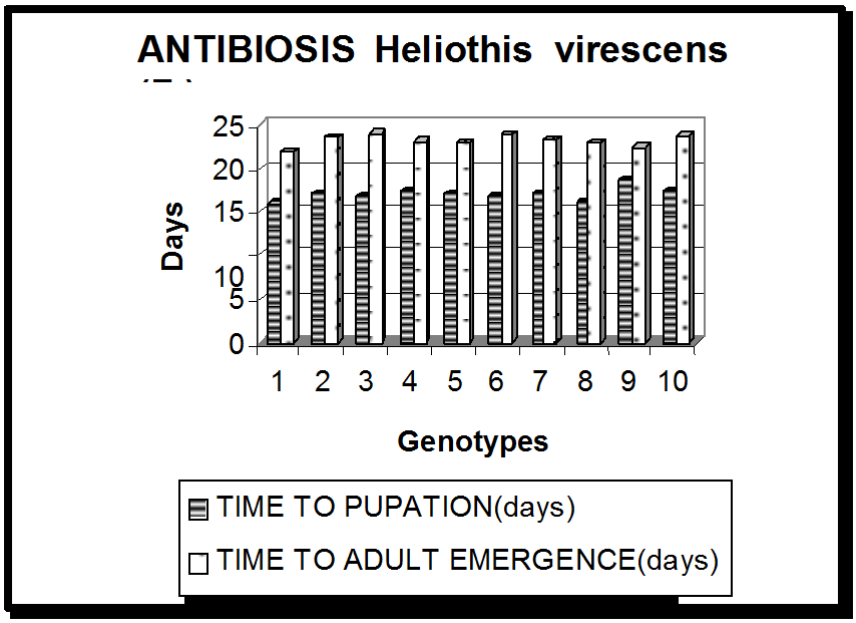

Figure 3. The influence of genotype on time to pupation and time to adult emergence