

Studies on biology and behavior of *Earias vittella* (Lepidoptera: Noctuidae) for mechanisms of resistance in different cotton genotypes

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Received 30 May 2003; received in revised form 7 July 2003; accepted 29 August 2003

Abstract

Spotted bollworm, *Earias vittella* (Fab.), is one of the most important insect pests of cotton, and host plant resistance is an important component for the management of this pest. The antixenosis and antibiosis components of resistance to this pest in five *Gossypium hirsutum* (HS 6, HHH 81, PCHH 31, Somnath, SS 9) and one *Gossypium arboreum* (HD 107) genotypes were undertaken at $28 \pm 2^\circ\text{C}$ and $70 \pm 5\%$ relative humidity under laboratory conditions. The larval period ranged from 8.2 to 9.2 days on buds and 9.2–12.2 days on bolls of different cotton genotypes. The mean larval period irrespective of food was significantly shorter in *G. arboreum* as compared to *G. hirsutum* cultivars. Pre-oviposition period (2.42 days) was longer on *G. arboreum* genotype than on *G. hirsutum* genotypes (1.44–2.00 days), while the reverse was true for oviposition and post-oviposition periods. Larval survival, pupation, adult emergence, fecundity, incubation period, and egg hatchability were significantly lower on *G. arboreum* than on *G. hirsutum*. The first- and third-instar larvae of spotted bollworm preferred buds than bolls in both, *G. arboreum* and *G. hirsutum* genotypes. Multi-choice assays on larval preference for buds and bolls among different genotypes revealed that the preference for buds of *G. arboreum* was significantly higher by the first-instar and lower by the third-instar larvae than the *G. hirsutum* variety and hybrids. *G. hirsutum* cultivars were more preferred than the *G. arboreum* variety, and among the plant parts the lower leaf surface, buds and bolls were preferred over the other plant parts for egg laying by the female. The interactions between *E. vittella* larvae and cotton genotypes are quite diverse, and there is a distinct possibility for increasing the levels and diversifying the basis of resistance to this pest by intensive breeding program.

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Keywords: Spotted bollworm; *Earias vittella*; Antixenosis; Antibiosis; Resistance mechanisms; Cotton; *Gossypium*

1. Introduction

Cotton (*Gossypium* spp.) is an important cash crop in India, and plays an important role in socio-economic well being of the people, but productivity is very low in comparison to other countries. Several biotic and abiotic factors contribute to low cotton yield, of which insect-pests are the major component. Of the 1326 species of insects on cotton listed by Hargreaves (1948), only a few are of economic importance. Bollworms, including the spotted bollworm, *Earias vittella* (Fab.) (Lepidoptera: Noctuidae) cause serious losses with a 50–60% reduction in cotton yield (Nagpal, 1948; Khan and Rao, 1960; Sohi, 1964). Spotted bollworm has been reported to attack 14.4% seedlings, 34–51% buds, 3.2%

flowers, and 3.2–69.0% bolls resulting in nearly 20% loss in seedcotton yield (Patel, 1949; Kaushik et al., 1969). In one case 79–97% of the loculi of cotton were damaged by this pest (Sidhu and Sandhu, 1977). Application of insecticides is costly and led to development of resistance and adverse effects on the non-target organisms. One approach to combat this problem and reduce insecticide use could be through host plant resistance, to develop lines resistant to spotted bollworm, a thorough knowledge of the resistance mechanisms on different cotton genotypes is needed.

2. Materials and methods

Six cotton genotypes (*Gossypium arboreum*: HD 107; *Gossypium hirsutum*: HS 6 (variety), and HHH 81,

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