

Variation in the reproductive capacity of *Earias vittella* (F.) (Lepidoptera: Noctuidae) following antennectomy or alactomy in males or wing loss in both sexes

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Abstract. An extremely low egg output, almost approaching zero level, and with no sign of viability, occur in *Earias vittella* (F.) when the females are coupled for mating with antennectomised males or if both sexes paired for coition are wingless. However, sexual union arranged between normal females and males whose both wings or only fore or hindwings are excised facilitates these insects to deposit fertile eggs whose number, however, always remains markedly lower (more so when the males in the breeding pairs are without hindwings) in comparison to that recorded for mated females in pairs where both sexes are normal.

Keywords. *Earias vittella*; oviposition; egg viability; antennectomy; alactomy.

1. Introduction

Mishra and Krishna (1981) reported that normal females of rice moth, *Corcyra cephalonica* (Stainton), a serious pest of stored commodities (Piltz 1977), when paired with antennectomised or alactomised males, do not lay any viable egg. Taking this as a cue, it was considered desirable to ascertain to what extent the egg output and egg viability would become affected in another, though taxonomically unrelated, moth, *Earias vittella* (F.), a major pest of cotton and okra in the tropics (Mehta 1977; Butani and Jotwani 1984), by antennectomy or removal of wings (one of the two pairs or both) in males involved in mating or alactomy *in toto* of individuals belonging to both sexes coupled for copulation. We present our data obtained from such a study in this communication.

2. Material and methods

For this investigation, adults of either sex reared individually in the laboratory on developing seeds separated from okra fruit (Vishwapremi and Krishna 1974) were used. Antennae or fore and/or hindwings of males or both alae of the two sexes were extirpated completely from their bases with a pair of Dewecker's scissors and the cut ends of these appendages in the body of the moths were immediately dressed with Savlon antiseptic cream to check possible subsequent infection and also to block further bleeding.

Following this operation, the insects were housed individually for 24 h in muslin-covered glass containers (70 mm diameter; 90 mm height), provided with a hanging

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glass capillary filled with 15% sucrose solution that formed the food of the adults, to enable them to recover from any postoperational shock that might otherwise interfere during experimentation. At the end of 24 h, such an antennectomised or a partially or wholly wingless male was paired for mating with a normal (in which both antennae and wings were intact), newly eclosed individual of the opposite sex inside another glass container, similar in all respects to the one in which moths were kept soon after surgery, that served as the oviposition chamber. A totally wingless male and a female were also coupled for mating and formed an independent experimental set in this study. The monitoring of egg laying during the first 4 days of oviposition (the period when mated females in their life time deposited most of their eggs) was similar to that described earlier (Vishwapremi and Krishna 1974) and egg hatchability in these tests was also recorded. All trials were adequately replicated and were performed at temperatures ranging between 25°C and 28°C and relative humidity varying from 80–100%. The data obtained were compared with those collected from separately arranged control tests which included normal males and females and, wherever desirable, subjected to appropriate statistical analysis (Paterson 1939) for interpretation.

3. Observations

Very few eggs, all non-viable, were laid by normal females of *E. vittella* coupled with males devoid of antennae or by wingless females closeted with males sans wings (table 1). Partial alactomy (removal of fore or hindwings) or complete loss of wings of males, although did not hamper mating of these individuals with normal females, resulted in such copulations the outcome of which always yielded pronouncedly reduced number of total and viable eggs, more so when the males in the breeding pairs were without hindwings (table 2).

4. Discussion

Loss of both antennae in males of *E. vittella* appears to have fully incapacitated these individuals to perceive the female sex pheromone reported to be present in this

Table 1. Estimates of oviposition and hatchability of eggs in *E. vittella* in tests where both sexes of copulating pairs were normal (control) or without wings or where males in such couples were devoid of antennae (data pooled from 5 females).

Experimental condition	Mean number of total eggs laid	Mean number of viable eggs laid
Normal females paired with normal males (control)	312.2	258.0
Normal females paired with antennectomised males	2.2	0
Alactomised females paired with wingless males	0.6	0

Table 2. Estimates of oviposition and hatchability of eggs in *E. vittella* in tests where both sexes of copulating pairs were normal (control) or where males in such couples were completely wingless or were devoid of fore or hindwings (data pooled from five females)*

Experimental condition	Mean egg output/female	Mean egg viability/female
Normal females paired with normal males (control)	312.2 a	258.0 a
Normal females paired with males devoid of forewings	183.4 b	141.4 b
Normal females paired with wingless males	121.8 b	84.4 b
Normal females paired with males devoid of hindwings	93.8 b	44.4 b
Mean	177.8	132.1
LSD (1%)	141.1	133.8
(5%)	102.4	97.1

*Means in the same vertical column followed by the same alphabet do not differ significantly at the 1% or 5% level by the least significant difference (LSD) test.

noctuid species (Campion 1984) (information based on a private communication received by Campion from B F Nesbitt and R Baker). This, in turn, plausibly, must have miserably handicapped these males in the performance of any of the steps of orientation associated with precopulatory behaviour leading to mating. In this respect, *E. vittella* resembles the rice moth, *C. cephalonica* (Mishra and Krishna 1981). The inability of wingless females housed with wingless males to deposit any fertile egg may presumably be due to failure in achieving proper and successful copula between such pairs. The marked fall in the laying of viable eggs by normal females subsequent to mating with males without wings clearly indicates that physical maiming of the male by excising its wings adversely affects the ability of this sex to properly inseminate the female during copulation. The relatively greater depressions in egg number and egg hatchability in females mated with hindwingless males in comparison to that recorded for counterpart mateds where sexual union took place with totally wingless males wherein also hindwings were severed are, indeed, interesting, if not intriguing. While it is decidedly premature at this stage to give any unequivocal explanation for such decrease in productivity, we feel it will not be entirely unreasonable to assume the occurrence of some sort of imperfect orientation, consequent to removal of only hindwings, by copulating males mounted on females causing the latter to get further poorly inseminated and thus to release fewer total and viable eggs.

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