

SEX RATIO AND MATING STATUS OF *EARIAS INSULANA* FEMALES
(LEPIDOPTERA: NOCTUIDAE) COLLECTED FROM LIGHT TRAPS IN ISRAEL*

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ABSTRACT

Earias insulana moths were collected from mercury vapour light traps in Israel, sexed, and the females dissected to establish the number of times each had mated. The sex ratio was in favour of males. Most *E. insulana* females mated once.

INTRODUCTION

Earias insulana Boisduval (Lepidoptera: Noctuidae) is a specific pest of malvaceous plants. It causes serious damage in cotton and has a wide range of distribution (Pearson, 1958). In Israel damage may be very heavy and preventive insecticide sprays are applied (Avidov and Harpaz, 1969; Rivnay, 1962b).

The bionomics and phenology of the pest were studied in Israel when heavy damage was encountered following the re-introduction of the cotton crop (Yathom, 1956; Rivnay, 1962b; Rivnay, 1966). The mating ability of both the males and the females, and fecundity, were studied in the laboratory, with the aim of interfering with their mating behaviour by disruption of pheromonal communication (Kehat and Gordon, 1977).

A study of the situation in the field will add to the information regarding these aspects and will help in our assessments of the possibilities and probabilities of affecting the mating behaviour of *E. insulana* moths.

The present study was carried out with wild *E. insulana* populations. Adult moths were trapped to obtain information concerning the sex ratio and mating status throughout the flight season during the years 1974-1976 and 1978-1980.

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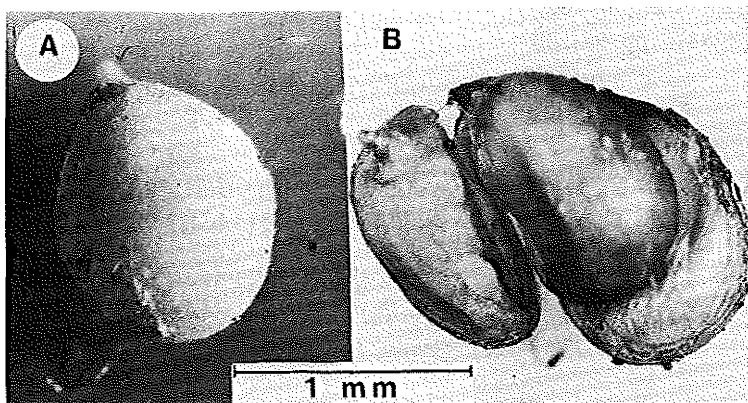


Fig. 1. *Earias insulana*. Spermatophores found in the female body. A. a single spermatophore. B. three adhering spermatophores, slightly separated.

MATERIALS AND METHODS

Earias insulana moths were collected from two mercury vapour light traps operating regularly at two locations in Israel, representing different ecological types. One trap was at 'En Harod in the north, in an area of extensive irrigated cotton fields; the other trap was situated on the Gilat Experiment Farm in the semi-arid (but cultivated) area of the Negev Desert.

Moths were also collected from traps operated occasionally, at non-agricultural locations: at Yatir, at the foothills of the Judean Mountains in a reforested area; at Santa Katarina in the Sinai Peninsula; and at Paza'el in the Jordan Valley, none of them near cotton fields.

Moths collected from traps were immersed in denaturated methanol to soften their abdomens. Then after sexing, over 2500 female moths were dissected under magnification and spermatophores found in the bursa copulatrix were counted (Fig. 1).

RESULTS

The total catches of *E. insulana* moths differed at the various locations. More moths were caught in the traps located at agricultural sites. At each location the catches fluctuated throughout the years. Annual catches during 1974-1980 at En Harod fluctuated between 144 and 670, while at the semi-arid site (Gilat) the corresponding figures were 165 and 1404. At the non-agricultural locations the figures were 42 and 23.

The sex ratio was generally in favour of males; at 'En Harod, 1:1.6; at Gilat, 1:2; and at non-agricultural locations, it deviated only slightly from the 1:1 ratio.

The mating status was related to the number of females in the trap. The percentage of mated females caught at the two agricultural locations was 65%, as compared with 34% in the traps at non-agricultural locations (Table 1). The mating status of females reaching mercury vapour light traps varied with the type of location.

TABLE 1. MATING STATUS OF *EARIAS INSULANA* FEMALES CAUGHT
IN MERCURY VAPOUR LIGHT-TRAPS AT AGRICULTURAL AND
NON-AGRICULTURAL LOCATIONS IN ISRAEL (1974-1980)

Site of traps	Total number of moths	% males	% mated females	Mean number of spermatophores	
				per mated female	per female
Agricultural locations	6649	65	65	1.26	0.82
Non-agricultural locations	443	54	34	1.06	0.36

TABLE 2. DISTRIBUTION OF MATING FREQUENCY OF *EARIAS INSULANA*
FEMALES AT AGRICULTURAL AND NON AGRICULTURAL LOCATIONS
IN ISRAEL (1974-1980)

Number of spermatophores per female	Mating frequency of females at			
	agricultural sites		non-agricultural sites	
	Number of females	%	Number of females	%
0	813	34.9	136	66.3
1	1241	53.3	66	32.2
2	182	7.8	2	1.0
3	72	3.1	1	0.5
4	15	0.6	—	—
5	4	0.2	—	—
Total	2327	99.9	205	100

The general mating range, as manifested by the number of spermatophores found in the female body, is shown in Table 2. Individual females sometimes had 2-5 spermatophores in their bursa copulatrix. The single spermatophore usually filled the abdomen, but when there was more than one, each of them was smaller and they were packed together, forming a ball, usually the size of a single, large spermatophore (Fig. 1).

The average number of matings per mated female decreased as the percentage of males decreased (Table 1).

DISCUSSION

A higher percentage of mated females when male moths predominated in the population was also reported for *Heliothis zea* Boddie (Stadelbacher and Pfrimmer, 1973; Lopez *et al.*, 1978) and for *Spodoptera littoralis* Boisduval (Yathom *et al.*, 1980).

A reduction in the number of matings per mated female was also the case with *Heliothis virescens* F., where small changes in sex ratio influenced the incidence of matings (Stadelbacher and Pfrimmer, 1973).

These findings and the fact that the mating ability of *E. insulana* male and female moths is affected by the number of opposite sex partners present (Kehat and Gordon, 1977) point up the importance of the sex ratio in mating incidence. Mass trapping of *E. insulana* males, in order to affect the sex ratio in favour of females, would probably result in reduced mating incidence.

REFERENCES

- Avidov, Z. and Harpaz, J. 1969. Plant Pests of Israel. Israel Universities Press, Jerusalem.
- Kehat, M. and Gordon, D. 1977. Mating ability, longevity and fecundity of the spiny bollworm *Earias insulana* (Lepidoptera; Noctuidae) *Entomologia experimentalis et applicata* 22:267-273.
- Lopez, J.D., Jr., Witz, J.A., Harstack, A.W., Jr. and Hollingsworth, J.P. 1978. Reproductive condition of bollworm moths caught in black light traps in corn, sorghum and cotton. *Journal of Economic Entomology* 71:961-966.
- Pearson, E.W. 1958. The insect pests of cotton in tropical Africa. Empire Cotton Growing Corporation and Commonwealth Institute of Entomology, London.
- Rivnay, E. 1962a. An hypothesis on the migration of the spiny bollworm, *E. insulana* in Israel. *XI Internationaler Kongress für Entomologie* Bd. III, p. 40.
- Rivnay, E. 1962b. Field Crop Pests in the Near East. W. Junk, The Hague, 450 pp.
- Rivnay, E. 1966. The flight of *Earias insulana* Boisduval in the arid south (Negev) of Israel. *Israel Journal of Entomology* 1:49-54.
- Stadelbacher, E.A. and Pfrimmer, T.R. 1973. Bollworms and tobacco budworms; mating of adults at three locations in the Mississippi Delta. *Journal of Economic Entomology* 66:356-358.
- Yathom, S. 1956. Biology of the spiny bollworm (*Earias insulana* Boisd.). *Ktavim* 7:43-57.
- Yathom, S., Navon, A. and Rosillo, D. 1980. Sex ratio and mating status of *Spodoptera littoralis* females collected from light traps in Israel. *Phytoparasitica* 8:99-103.