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THE FLIGHTS OF FARIAS INSULANA BOISDUVAL IN THE ARID SOUTH (NEGEV) OF ISRAEL

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ABSTRACT

Observations in the Negev , over two winter seasons , and the collection and maintenance of malvaceous plants from various Negev sites in the laboratory, showed that Earias insulana does not breed in the Negev during the winter, except in the most northern area (between Gaza and Beer Sheba).

In the spring and summer,Earias insulana moths invade the Negev from neighbouring cotton-growing territories, and may infest cotton grown there.

As indicated by light trapping the moths may reach as far as Eilat, and become most numerous in the autumn.

INTRODUCTION

The aim of this study was to obtain a better understanding of any reciprocal influences between the cotton-growing areas of Israel and the southern arid region (Negev), with regard to infestation by Earias insulana. The study aimed at determining the extent to which malvaceous Negev plants might serve as intermediate hosts to the spiny boll worm, and to what degree the Negev might serve as a barrier against invasions of this pest into Israel from nearby cotton-growing regions.

For those who are unfamiliar with Israel, a short description of the observation sites is given:

1) Nizana: elevation 2.00 m, about 70 km south of Gaza, adjacent to the Egyptian border; wide wadis with rich loess soil surround it. Irrigation agriculture is practiced here. Stretches of sand dunes separate it from the nearest agricultural area, 40 km to the north. Southward are barren, arid hills. The annual precipitation ranges from 50-75 mm.

2) Avdat: elevation approx. 650 m , about 50 km south of Beer Sheba. Agriculture here was last practiced by the Nabateans, and was based on the

cachement of the storm torrents so typical of arid regions, running off the barren hills, in terraced wadis. Annual precipitation ranges from 150-200 mm, while that of the surrounding lower steppe is from 55-100 mm. Thus, Avdat is a semi-arid enclave in a more arid zone.

3) Eilat: this is at sea-level, at the northern tip of the Gulf of Akaba and at the southern tip of the Arava - the continuation of the arid, narrow Jordan Valley. Annual precipitation is less than 25 mm, so that it is extremely arid.

Methods

a) Host-plant inspection

Malvaceous plants, collected during the short growing season, were examined for larvae and pupae. Bundles of these plants were kept in breeding cages for future observations on moths that might emerge.

The plant survey was made at Nizana in March 1961. In March 1962 plants were collected from Avdat, Sde - Boqer and Kfar Yeruham, and from their respective neighbourhoods along the Beer Sheba-Eilat road.

b) Cotton cultivation

At two Negev sites, Nizana and Avdat, small trap plots were planted with cotton, and the insect population studied throughout the growing period. Density of the Earias population was estimated by examining a number of bolls picked at random. In 1961 2 dunams * of cotton were planted at Nizana; in 1962 400 m^2 were planted at Avdat.

c) Ultraviolet traps

Ultraviolet light bulbs were set up for certain periods in some Negev localities. The E. insulana caught were recorded daily. Light traps operated at Nizana from March 2 to May 13 1962, at Avdat from March 23 to September 24 1962, and at Eilat from May 1959 to the present.

* 1 acre = 4.1 dunams.

Results

a) Host-plant survey

The only malvaceous plant found in the Negev was Malva sylvestris. Plants examined and kept in cages in 1962 were free of E. insulana; other insects found were disregarded.

In 1962, counts were made of all insects that emerged from plants collected along the Beer Sheba-Eilat road. No E. insulana was obtained from 237 plants collected at Avdat on March 22 1962 (of these, 20 plants had a total of 163 flowers and 206 fruits). However, Heliothis armigera (3), Platyedra vilella (1), and Vanessa cardui (1), were reared. On the same date 165 plants were collected at Sde-Boqer, 10 km north of Avdat (of these, 20 had 214 flowers and 560 fruits). No E. insulana was obtained from them, but H. armigera, P. vilella (4), and 83 individuals of an unidentified Platyedra sp. were counted. Similar numbers of plants were collected from two sites, 20 and 30 km further north of Avdat, but no insects were obtained.

At a second trip, on April 3 1962, the flora had almost entirely disappeared, the few Malva collected from the sparse vegetation at the same site had no insects, and no moths emerged in the breeding cages.

On April 24 1962, Malva sylvestris growing in the agricultural area at Nirim, 10 km south of Gaza, were found to harbour many E. insulana.

b) Infestation of cotton

The two dunams of irrigated cotton sown at Nizana started flowering in early July; fruiting began two weeks later. No infestation by E. insulana was observed through July, but at the end of the month bolls showed 0.5 per cent infestation. Two weeks later , by mid-August 1961, all bolls were infested with the pink bollworm Platyedra gossypiella; infestation ranged from 5.-7.5 per cent.

The cotton field at Avdat was irrigated on May 15 1961, and seeded two days later. Sprouting occurred 10 days later. Buds appeared on August 11 and no infestation by E. insulana was noticed. Larvae of Laphygma exigua Huebner were found at that, and at subsequent inspections on August 16 and 23, but no spiny boll worms were found.

On August 28 young 5-6-day-old larvae of E. insulana were found in small

numbers. Counts on August 30 showed 28 per cent infestation; this increased to 67 per cent on September 12 and to 100 per cent on September 24.

c) Light trapping

At Nizana, light traps operated from March 2 1961 to May 13 1962. Unfortunately, there were a few interruptions, but worthwhile data were obtained. Two moths were caught during May 1961, but the majority of E. insulana moths were caught in the autumn – 7 in September and 20 in October. A single moth caught in February 1962 probably originated from the local cotton field of the previous year; this had not been turned-over until spring 1962.

At Avdat, trapping was not regular. The lamp hung there from March 23 to September 24 1962. Three E. insulana moths were caught in the latter half of September.

Four years of trapping at Eilat showed that E. insulana frequented the site from September to early November; this is seen in Table 1. Very rarely a moth might lag, and appear as late as December (December 27 1959) or it might appear early in August (August 7 1960). A moth was only once caught in the early summer – on May 19 1962.

TABLE 1. Number of E. insulana and A. ypsilon individuals trapped at Eilat in four years

Year	1959		1960		1961		1962	
Period of trapping	III-V (2.IX-2.XI)*	IX-XI	III-V (13.IX-15-XI)	IX-XI	III-V (1.IX-9-XI)	IX-XI	III-V (9.IX-28.X)	IX-XI
Number caught								
E. insulana	-**	10	0	21	0	22	1	31
A. ypsilon	-	54	349	222	46	28	2477	19

* in parentheses – period in which Earias were caught.
** Trap not functioning.

Discussion

Pearson(1957), in discussing factors controlling the density of E. insulana populations in cotton fields in various parts of Africa, stressed the role intermediate hosts may play. The fact that on various occasions this moth was found to infest cotton earlier in southern Israel than in the north, raised the question of whether wild malvaceous Negev plants might serve as an intermediate host. This investigation showed that the only Negev (central and southern Negev), Malva, M. sylvestris, was free of spiny boll worm infestation.

The fact that this plant was found to be infested with E. insulana in the more northerly agricultural zone near Gaza, shows that host selectivity was not the reason for this phenomenon. This plant's flowering and fruiting period lasts no more than 5-6 weeks, from late February to April. Had there been a resident population, it would have meant a 10-month existence without a host. In the Negev, with prevailing conditions of temperature and lack of intermediate hosts, this would be impossible for a non-diapausing insect. M. sylvestris grows at a season when invasions of E. insulana from remote areas are impossible - because of distance and low prevailing temperatures.

It may, therefore, be stated that the E. insulana moth does not exist as a resident in the major portion of the Negev. However, when small plots of cotton were planted, infestation with this pest occurred by mid-summer at the time the plants were bearing fruit. One may, therefore, suppose that the infestation was caused by invading moths.

The agricultural area nearest to Nizana lies 40 km to the north. In 1961, cotton-field infestation in that area, at Gilat, began in late June and early July. At Nizana, infestation started at the end of July - one month later. The nearest possible source of infestation at Avdat in 1962 were cotton fields in areas east and south of Beer Sheba. At Nevatim, 5 km east of Beer Sheba and 50 km north of Avdat, infestation started early in May, as it did in the fields at Mashava Sade, 20 km south of Beer Sheba and 30 km north of Avdat. This indicates that small numbers of moths are on the wing in the northern Negev as early as April and May, and increase in numbers during summer and autumn.

A comparison of the flights of E. insulana and A. ypsilon - a distinct migrant - shows two outstanding differences: 1) E. insulana was caught only in autumn and not in spring, whereas A. ypsilon was numerous both in autumn and spring; 2) E. insulana was not caught in large numbers on a single night, not in the masses as was the case with A. ypsilon. This shows that the

migration of E. insulana is of a different nature from that of A. ypsilon.

This contradicts a previous hypothesis put forward by the present writer (1962). The flights of E. insulana are actually typical of an irregular disperson from a denser population to a sparser, and from a cooler neighbourhood to a warmer, or they are flights in quest of oviposition sites. In such flights the moth may travel as much as 200 km(trapping at Eilat)and perhaps even more.

Conclusions

When growing among cotton fields, Malva sylvestris plants may serve as intermediate hosts to E. insulana in the cotton-free period. However, since the growing season of these plants in the Negev is very short, they do not harbor E. insulana and do not serve as a source of infestation for cotton in Israel.

The contrary is the case; moths which develop in summer in Israel cotton fields disperse southward, and may be trapped in various places in the Negev in autumn.

One may conclude from trappings at Avdat and Eilat that E. insulana may fly long distances even in the desert, which does not act as a barrier. It is not impossible that moths originating in cotton fields at the western part of the Sinai Peninsula could fly to cotton fields located on its eastern boundaries, the distance being only a little greater than the length of the Negev.

Literature Cited

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