A BIOLOGICAL REVIEW OF THE GENUS EUPLECTRUS
[HYM. : EULOPHIDAE] WITH SPECIAL EMPHASIS
ON E. LAPHYGMAE AS A PARASITE OF SPODOPTERA LITTORALIS
[LEP. : NOCTUIDAE]

D. GERLING & S. LIMON
Department of Zoology, The George S. Wise Centre for Life Sciences,
Tel Aviv University, Israel.

The life history and behavior of Euplectrus laphygmae Ferrière were studied. The parasites paralyse the host larvae temporarily before ovipositing 1-2 eggs on their dorsum. Egg and larval development takes place externally in the location of egg deposition and pupation is in a silken cocoon under the dead host. Development lasts 11.7 days for both sexes. The eggs are attached to the host with a pedicel that is inserted under the cuticle but above the hypodermis, and which may have physiological and mechanical functions. The adult parasites host-feed, but do not lay on the same host. All hosts stung by parasites die, regardless whether oviposition has occurred, or whether host larvae develop upon them. Multiparasitism with internal parasites of Spodoptera littoralis (Boisd.) was observed.

A comparison with other Euplectrus species was made. They have a wide range of lepidopterous hosts but very similar biological characteristics. Only very few utilizations for biological control have been reported with this genus.

Among parasites that were introduced into Israel from East Africa during 1969-1970 in an attempt to control Spodoptera littoralis (Boisd.) was also Euplectrus laphygmae Ferrière. The biology and autecology of this species as a parasite of S. littoralis were studied in order to determine its potential, and to develop suitable rearing techniques. In general, our results resemble those of Neser (1973), who studied an undetermined species that is close to E. lamphygmae. However, there are differences in the host-parasite association, in the emphasis given to different parts of the research, and in some of the results. Therefore, we chose to present a short account of the parasite's life history and dwell on some of the biological phenomena that were observed.

MATERIALS AND METHODS

The parasites were reared originally from Spodoptera exempta Wlk, larvae which were collected between June 23 and July 10, 1970 in the vicinity of Nairobi, Kenya. They were reared as parasites of S. littoralis larvae, in screen-topped plastic Petri dishes through the cooperation and courtesy of Mr. E. Brown of the East African Agriculture and Forestry Research Organization.
at a temperature of 26 ± 1.5°C. The hosts used were of the 2nd and 3rd instar and were supplied with leaves of castor bean plants, on which they fed until their death. Parasite females were kept singly in Petri dishes throughout their lives. They were fed honey that was streaked upon the walls of the dish. Hosts were replaced every 24 hours, until the parasite female died. The parasitized hosts were kept in Petri dishes until the new parasite adults emerged.

RESULTS

OVIPOSITION

The parasite female examines the host with her antennae, and then jumps on its back. The host tries unsuccessfully to dislodge her while she inserts her ovipositor into the integument. The host larva becomes motionless within a short time, and the parasite lays her eggs and leaves. About one minute later, the host resumes its activity which appears to be normal. Only the first 4 of the 6 larval stages of the host are attacked. On the 4th instar larva, the eggs are laid in small groups on the anterio-dorsum, whereas on instars 1-3, they are laid singly and may be deposited anywhere from the head to the anal segment, on the dorsal aspect of the abdominal segments.

The parasitized host larvae usually do not molt again. In exceptional cases, partial moulting took place, and the old larval skin remained attached to the host at the oviposition sites.

DEVELOPMENT

The eggs become black 24 hours after oviposition, and hatch 24 hours later. The parasite eggs hatch in situ and the whole larval development takes place at the same location. We observed 4 larval instars, each of which split the exuvium of his predecessor in the mid-dorsal line before commencing to feed. The 4th instar has its posterior 3 segments extended into a tail-like portion through which it exudes the silken material which is used for cocoon spinning. The material itself originates in modified malpighian tubules (Thomsen, 1927). Developmental duration was: egg 2 days, larva 3.4 ± 0.02 days, pupa 6.3 ± 0.04 days, averaging a total of 11.7 days (n = 580).

The eggs are attached to the host with a pedicel. According to Neser (1973), the pedicel of the egg in E. nr. laphygmae is inserted into the integument of the host. Our studies confirmed this observation for E. laphygmae. Moreover, our sections show clearly that the egg is held in place by a plug that is inserted between the cuticle and the epidermal layer (fig. 1). We tried to determine whether the pedicel is a mere anchoring device, or if it has additional functions. For this purpose the pedicels of eggs were cut at different stages of their development. Thereafter, the eggs were replaced on top of the same host from which they have been removed. Care was taken that the eggs would not be dislodged in the absence of the anchoring device. Invariably, the eggs failed to hatch and their development was arrested, (as judged by the lack of color changes of the chorion). This may have been caused by mechanical damage and/or infection; additionally, the pedicel may have served in the transport of materials from the host to the parasite egg.

CAUSE OF HOST MORTALITY

As mentioned, the hosts resume apparently normal activity about 1 minute after the parasites complete oviposition. However, their activity diminishes during the next days and they stop feeding within 2-8 days after oviposition. In order to deter-