

**TWO NEW SPECIES OF THE GENUS ELASMUS WESTWOOD**  
(**Elasmidae:\*** Hymenoptera) parasitic on larvae of *Earias* spp. in Sind

KULSOOM FATIMA KHOKHAR, MANZOOR AHMED and M.A.H. QADRI

*Department of Zoology, University of Karachi, Karachi 32*

(Received September 17, 1970; revised November 19, 1970)

*Elasmus* Westwood is a well-known genus of the parasitic hymenoptera and belongs to the family Elasmidae. Its species usually occur as ectoparasites or hyperparasites. *Elasmus orientalis*, new species, and *E. dorsalis*, new species, being described hitherto are parasitic on larvae of *Earias insulana* and *Earias fabia*, both pests of cotton, okra and the wild plant *Abutilon* spp. The parasite completes a number of generations in a year, and a number of parasites are capable of developing on a single host larva.

*Elasmus* Westwood is the most commonly represented genus of the family Elasmidae. Its species live as primary parasites of lepidopterous larvae. As primary parasites they usually attack larvae hidden in webs, cases or plant material. Ferriere<sup>1,2,3</sup> described some species of *Elasmus* belonging to the two types of life habits and habitats. The species *E. johnstoni* Ferriere was recorded on the pink boll-worm larvae, *platyedra gossypiella* and spotted boll-worm *Earias insulana* in the bolls of *Abutilon* spp. The studies of the genus *Elasmus* from Indo-Pakistan are very restricted. Rao and Cherian<sup>4</sup> gave an extensive account of *Elasmus nephantidis* Roh. parasitic on the coconut caterpillar, *Nephantis serinopa*. Hussain and Mathur<sup>5</sup> reported an unidentified species of *Elasmus* parasitising *Earias* spp. in Lyallpur, Punjab.

The present workers, while investigating the parasites of cotton boll-worm in lower parts of Sindh, collected a number of parasite specimens from the infested larvae, and these are being described here as two new species of the genus *Elasmus* Westwood. The two species were bred in the laboratory of the Department of Zoology, University of Karachi, out of the larvae collected from Mirpur Khas, Hyderabad, Thatta and Karachi. The present account consists of the taxonomy, biology and life history of the two species.

*Elasmus orientalis*, **new species** (Figs. 1-3)

#### *External Features*

**Female.**—Length 3.50–3.80 mm; head slightly narrower than thorax, with frontal punctations rather strong, but not close; antennal scape almost equal in length to the two following segments together; pedicel longer than broad a little shorter than second segment of funicle; first segment of

funicle somewhat longer than broad, second and third segments nearly equal in size; club broader than other segments, consisting of three segments; thorax with mesonotum broader than long, covered with dark hairs; postscutellum triangular, its border projecting over the smooth, shining propodeum; wings hyaline, hairy all over excepting a small portion on the posterior margin; length of wings greater than the abdomen; abdomen elongate, longer than head and thorax together; first segment of the abdomen longer, rest of about equal length.

Body colour entirely black, with brownish shine; abdomen jet black, excepting the first segment, which is brownish at base; antenna and legs dark brown; tarsi and tibiae light brown.

**Male.**—Length 2.50–3.00 mm; appearance very similar to female, but smaller in size; antenna with scape short; pedicel triangular, slightly broader than long; first funicular segment shorter than the other two, each of the three segments bearing a long slender, lateral branch, much longer than scape; fourth segment much elongate; club about  $\frac{2}{3}$  in length of fourth segment; all the funicular segments and their branches covered with hairs.

**Host.**—Spotted boll-worm species *Earias insulana* and *E. fabia*.

**Type and Other Material.**—Holotype female, Mirpur Khas, Sindh, 10 VII 69 (Khokhar), spotted boll-worm, and twenty paratypes from Hyderabad, Thatta on the same host in the Zoological Museum, University of Karachi, Karachi.

#### *Biology and History*

*Elasmus Orientalis* new species is an ectoparasite like other species of the genus. In the progeny of a single female reproducing sexually, the females always outnumber the males. The virgin females are also capable of laying eggs, but the progeny would be all males. Mating takes place soon after emergence, and female starts laying eggs within 2–3 days. The whole life history of

\*The work was partly financed by the Pakistan Central Cotton Committee, and partly from the funds in the Department of Zoology, University of Karachi.

the parasite is completed in about 9–11 days in July and August, and in 15–18 days in November and December

**Oviposition.**—The female selects usually a full fed or fourth instar host larva for the purpose of egg laying. When she comes in contact with an infested boll, she walks around on the boll, and locates the larval entrance. After confirming the presence of a suitable host inside the hole, she inserts her ovipositor, stings the larva to paralysis, and drops 10–20 egg all over the body. A single female continues laying eggs for about a month. The maximum number of eggs that a female could lay in her life time was estimated to be 60.

**Egg** (Fig. 3A).—The egg is elongate in shape; broad anteriorly, pointed posteriorly; measures about 0.48 mm in length and 0.18 mm in width. It is creamy white in colour and hatches in a period of 24–30 hr.

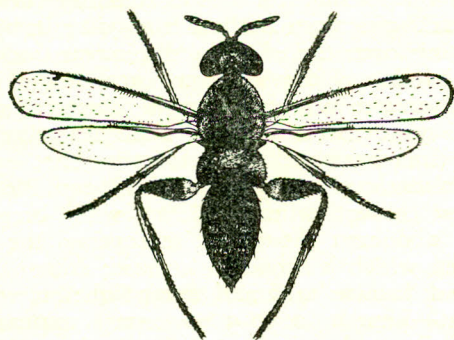


Fig. 1.—*Elasmus orientalis*, new species, adult female  $\times 50$ .

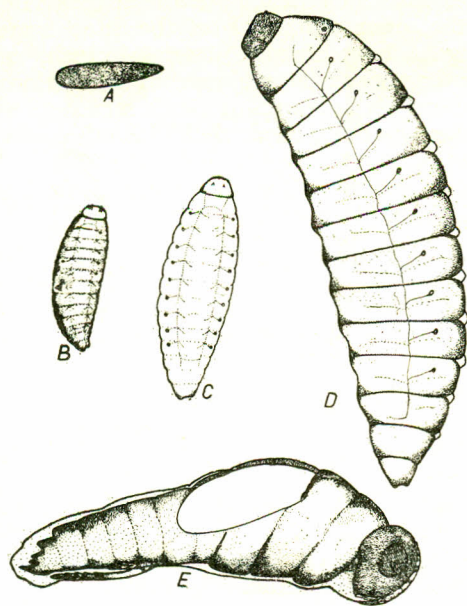


Fig. 3.—*Elasmus orientalis*. (A) egg  $\times 50$ ; (B) larva, first instar  $\times 72$ ; (C) larva, second instar  $\times 72$ ; (D) larva, full-fed  $\times 36$ ; (E) pupa  $\times 36$ .

**First Instar** (Fig. 3B).—The first instar is very active soon after emergence, and starts sucking from the body of the host larva as an actoparasite. It measures about 0.58 mm in length and 0.19 mm in width. It possesses 13 body segments, with its body wider in the anterior abdominal region. Head is quite distinct and sclerotized. Spiracles are present on the second thoracic and first three abdominal segments. Anal segment is small and possesses an invagination on posterior margin.

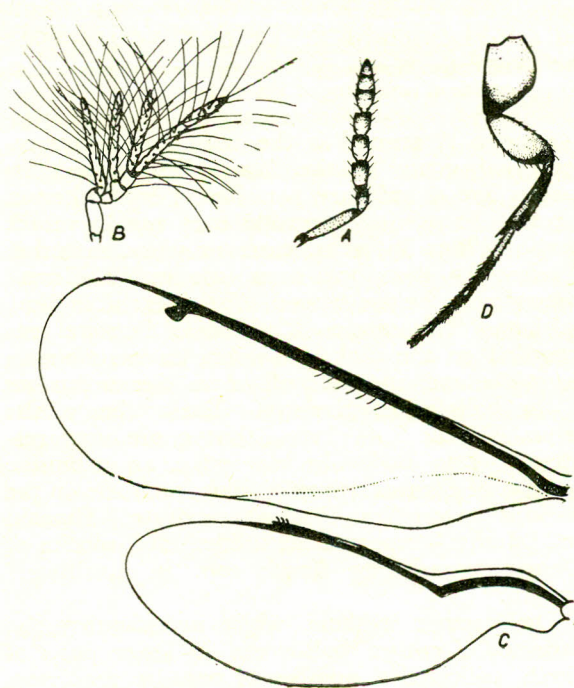


Fig. 2.—*Elasmus orientalis*. (A) antenna, female  $\times 72$ ; (B) antenna, male  $\times 72$ ; (C) wings  $\times 72$ ; (D) hind-legs  $\times 36$ .

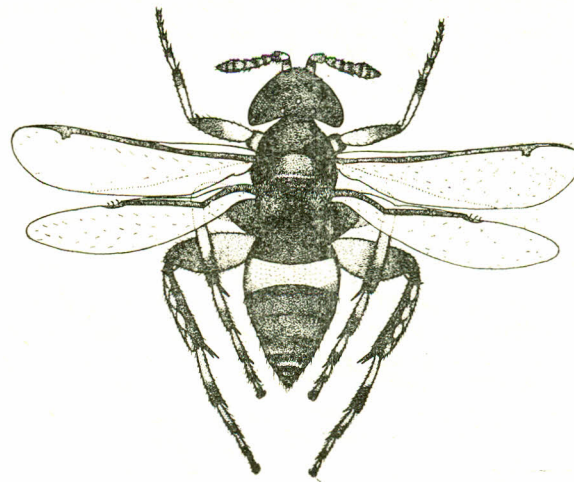


Fig. 4.—*Elasmus dorsalis*, new species, adult female  $\times 18$

Antennae are simple long narrow papillae. It is whitish in colour and passes into the next instar in about 24 hr.

*Second Instar* (Fig. 3C).—The larva in this stage is similar to that of first instar, except that the size is slightly bigger. Spiracles are nine pairs situated on the second and third thoracic segments and first seven abdominal segments. Mouth parts are easily visible.

*Full-fed Larva* (Fig. 3D).—The full-fed larva measures 3.60 mm in length and 1.50 mm in width. It is greyish white in colour. The head and 13 body segments are clearly distinguishable. The mouth parts with the exception of mandibles are poorly differentiated. The face is light brown in colour; clypeal margins are dark. The spiracles are nine pairs, located on the first and 4-11 abdominal segments. The two lateral tracheal trunks are interconnected anteriorly in the first segment and posteriorly in the middle of the eleventh segment. The dorsal tracheal branches leave the lateral trunks behind each spiracle and rebranch. Similar is the origin of ventral tracheal branches. The whole larval history is completed in 5-6 days.

*Pupa* (Fig. 3E).—The full-fed larva starts pupation near the remains of the host. It measures 2.90 mm in length and 1.40 mm in width. Newly formed pupa is at first dirty white but gradually turns yellow and then brownish black. The adult comes out after 3-4 days by rupturing the pupal case.

*Elasmus dorsalis*, **new species** (Fig. 4-6)

#### External Features

*Female* (Fig. 4).—Length 2.20 mm, width 0.45 mm; head slightly broader than thorax; frontal punctations rather strong and very close; antennae with scape longer than the two following segments together; pedicel elongate, a little shorter than the first segment of funicle; first, second and third segments all of almost equal length; club consisting of three segments, as broad as the preceding segments; thorax with mesonotum as long as broad; covered with dark hairs; scutellum and propodeum always rough; postscutellum triangular; wings hyaline, hairy from the base, a part of wing on the posterior margin devoid of hairs; legs with femora and hind tibia covered with long hairs, hairs on the lateral surface of hind tibia arranged as in *Elasmus orientalis* described earlier; abdomen spindle shaped, longer than the head and thorax together; first and second segments of abdomen longer than all other segments; second segment with a yellow band dorsally; ovipositor slightly protruding.

Body blackish brown; abdomen dark brown, antennae brownish with a yellow tinge; legs brownish yellow; tibiae and tarsi of all the legs light yellow.

*Male*.—Similar to female except in size, which is slightly smaller; colour very dark, without a yellow band on abdomen; abdomen shorter than head and thorax together; antenna with scape

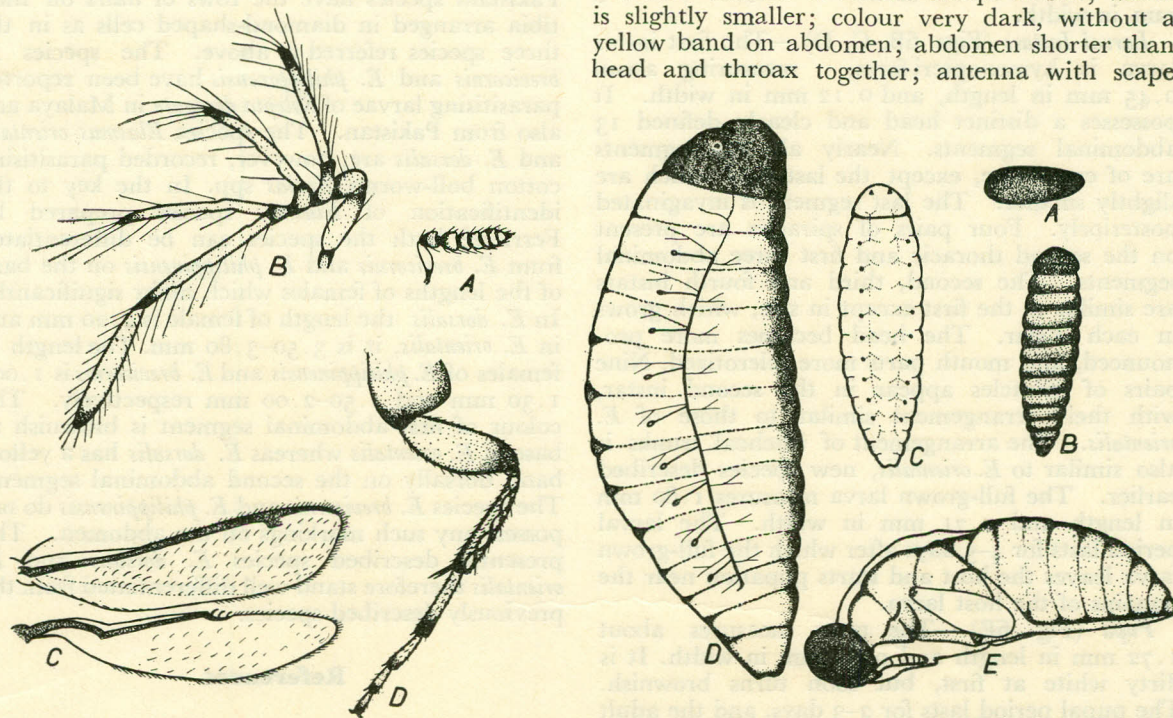


Fig. 5.—*Elasmus dorsalis*. (A) antenna, female —50; (B) antenna, male —100; (C) wings —50; (D) hind-leg ×50.

Fig. 6.—*Elasmus dorsalis*. (A) egg —50; (B) larva, first instar —100; (C) larva, second instar —100; (D) larva, full-fed ×50; (E) pupa ×25.

shorter than that of female; pedicel triangular, as long as broad; first three funicular segments short, each bearing a long and slender branch; fourth segment much elongate; club about 3/4 of fourth segment; all the funicular segments covered with hairs.

*Host*.—Larvae of *Earias insulana* and *Earias fabia*.

*Type and Other Material*.—Holotype female, Karachi, Sindh, 12 IX 69 (Qadri), spotted boll-worm, and thirty paratypes from Thatta, Hyderabad, and Mirpur Khas in the Zoological Museum, University of Karachi, Pakistan.

#### *Biology and Life History*

Biology of the species *Elasmus orientalis* is quite similar to the species *E. dorsalis* described earlier. It also prefers full-fed larvae for the purpose of egg laying. The larva in the burrow is stung to complete paralysis by the parasite, and 10–30 eggs laid scattered on its body. A single female can lay as many as 100–150 eggs in about a month's period. The life history of the parasite is completed in 8–10 days in July and August, and 10–15 days in November and December. In our laboratory as many as 23 parasites were developed on a single host larva. The parasite passes a number of generations in a year and is active almost always.

*Egg*. (Fig. 6A).—It is of simple form, smoothly rounded at both ends. Its colour is creamy white and measures 0.39 mm in length and 0.15 mm in width.

*Larval Instars* (Figs. 6B, C, D).—The first instar larva is hymenopteri form, measuring about 0.45 mm in length, and 0.12 mm in width. It possesses a distinct head and clearly defined 13 abdominal segments. Nearly all the segments are of equal size, except the last two, which are slightly smaller. The last segment is invaginated posteriorly. Four pairs of spiracles are present on the second thoracic and first three abdominal segments. The second, third and fourth instars are similar to the first except in size, which grows in each instar. The head becomes more pronounced, and mouth parts more sclerotized. Nine pairs of spiracles appear in the second instar, with their arrangement similar to those of *E. orientalis*. The arrangement of tracheal trunks is also similar to *E. orientalis*, new species described earlier. The full-grown larva measures 1.80 mm in length and 0.71 mm in width. The larval period lasts for 4–5 days after which the full-grown larva leaves the host and starts pupation near the remains of the host larva.

*Pupa* (Fig. 6E).—The pupa measures about 1.72 mm in length and 0.65 mm in width. It is dirty white at first, but soon turns brownish. The pupal period lasts for 2–3 days, and the adult parasite comes out by rupturing the pupal case. The adult after emergence moves on the pupal

case sluggishly for a few minutes and then flies away. Mating takes place immediately.

#### **Discussion and Comparison**

Due to the fact that the unidentified species with which Hussain and Mathur<sup>5</sup> worked is not properly preserved anywhere in Pakistan for study, it is not possible to comment upon the true identity of the species. Nor there exists any other description of species of *Elasmus* on cotton boll-worms in Pakistan. The species described in the preceding pages therefore appears to form the first proper description of the *Elasmus* spp. in this country. The two species can, however, be easily differentiated from one another on the basis of their size, characters of head, and colour of second abdominal tergite. The two species also differ in their egg laying capacity, and life history duration. In lower Sindh area, the species *E. dorsalis* is more common in Mirpur Khas area and the species *E. orientalis* more prevalent in Karachi and its suburbs. The parasites are capable to locate the host larvae in the cotton boll as well as in the bolls of *Abutilon* spp.

Of the Asiatic and African species of *Elasmus* described by Ferriere<sup>2</sup> the species *E. dorsalis* and *E. orientalis*, described in this work appear close to the species *E. brevicornis* Gahan, *E. philippinensis* Ashmead, and *E. johnstoni* Ferriere. Both the Pakistani species have the rows of hairs on hind tibia arranged in diamond-shaped cells as in the three species referred to above. The species *E. brevicornis* and *E. philippinensis* have been reported parasitising larvae of *Sylepta derogata* in Malaya and also from Pakistan. The species *Elasmus orientalis* and *E. dorsalis* are, however, recorded parasitising cotton boll-worms *Earias* spp. In the key to the identification of *Elasmus* species prepared by Ferriere<sup>2</sup> both the species can be differentiated from *E. brevicornis* and *E. philippinensis* on the basis of the lengths of females which differ significantly. In *E. dorsalis* the length of female is 2.20 mm and in *E. orientalis*, it is 3.50–3.80 mm. The length of females of *E. philippinensis* and *E. brevicornis* is 1.00–1.30 mm and 1.50–2.00 mm respectively. The colour of first abdominal segment is brownish at base in *E. orientalis* whereas *E. dorsalis* has a yellow band dorsally on the second abdominal segment. The species *E. brevicornis* and *E. philippinensis* do not possess any such markings on the abdomen. The presently described species *E. dorsalis* and *E. orientalis* therefore stand well differentiated from the previously described species.

#### **References**

1. C. Ferriere, Bull. Entomol. Res., **20**, 255 (1929).

2. C. Ferriere, Bull. Entomol. Res., **20**, 411 (1929).
3. C. Ferriere, Bull. Entomol. Res., **22**, 127 (1937).
4. R.Y. Rao and M.C. Cherian, *Notes on the Life History and Habits of Elasmus nephandidis* Roh (Madras Agriculture Department Yearbook, 1927), p. 39
5. M.A. Hussain and C.B. Mathur, *Some Parasites of the Cotton Boll-worm (Earias Insulana and E. fabia) in the Punjab Pusa Fifth Entomol Mtd. Rpt. Proc. (1924), p. 34*

Examination of 124 specimens of *Elasmus* from the Punjab and Mysore revealed the presence of two new species (*Elasmus nephandidis* and *Elasmus* sp. n.) but could not be correlated with the season. The material, however, was found only during 1-3-7 weeks but material from the Punjab was collected during 1-3-5-6 weeks but material from Mysore was collected during 1-3-5-6 weeks.

*Elasmus* is locally very common in the Punjab and Mysore near Chandigarh. The local name of this species is 'Pog'. It is fairly large but my largest specimen measured 34.5 mm in length. Examination of this species revealed the presence of a larval cocoon (*Elasmus* sp. n.) in the cocoon. The incidence of the larvae in the cocoon was fairly common throughout the year. Practical workers on cottons from Indian States are Southwell, Southwell and Pashab, Pashab, Rao, Singh, Subramanian, Subramanian, Verma, Woodhead, and others. Although the occurrence of the larvae was reported earlier from the mesocyst of the leaf, their incidence and intensity were not recorded. The present paper is intended to describe the incidence and intensity of the larvae in the cocoon and to determine if a seasonal variation exists in its incidence and intensity.

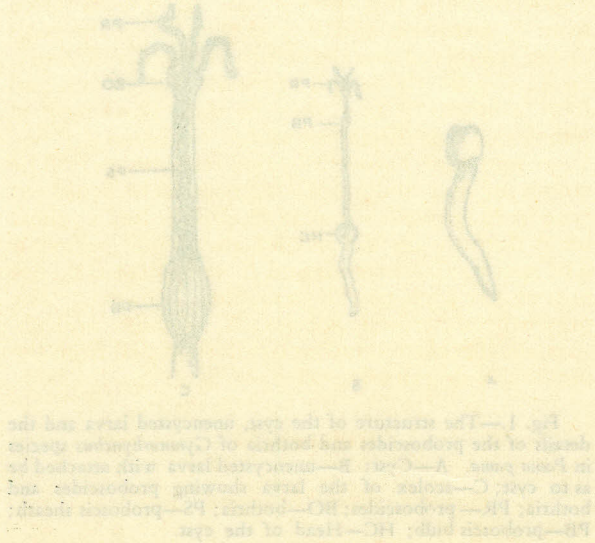


Fig. 1.—The structure of the head of *Elasmus nephandidis* in the pupa. A—Head of the pupa; B—Head of the pupa with mandibles; C—Head of the pupa with mandibles and maxillae; D—Head of the pupa with mandibles, maxillae, and labrum; E—Head of the pupa with mandibles, maxillae, labrum, and labial palps; F—Head of the pupa with mandibles, maxillae, labrum, labial palps, and labial gland; G—Head of the pupa with mandibles, maxillae, labrum, labial palps, labial gland, and labial duct; H—Head of the pupa with mandibles, maxillae, labrum, labial palps, labial gland, labial duct, and labial opening; I—Head of the pupa with mandibles, maxillae, labrum, labial palps, labial gland, labial duct, labial opening, and labial setae; J—Head of the pupa with mandibles, maxillae, labrum, labial palps, labial gland, labial duct, labial opening, labial setae, and labial sclerite; K—Head of the pupa with mandibles, maxillae, labrum, labial palps, labial gland, labial duct, labial opening, labial setae, labial sclerite, and labial muscle; L—Head of the pupa with mandibles, maxillae, labrum, labial palps, labial gland, labial duct, labial opening, labial setae, labial sclerite, labial muscle, and labial sheath; M—Head of the pupa with mandibles, maxillae, labrum, labial palps, labial gland, labial duct, labial opening, labial setae, labial sclerite, labial muscle, labial sheath, and labial sclerite; N—Head of the pupa with mandibles, maxillae, labrum, labial palps, labial gland, labial duct, labial opening, labial setae, labial sclerite, labial muscle, labial sheath, labial sclerite, and labial sclerite; O—Head of the pupa with mandibles, maxillae, labrum, labial palps, labial gland, labial duct, labial opening, labial setae, labial sclerite, labial muscle, labial sheath, labial sclerite, labial sclerite, and labial sclerite; P—Head of the pupa with mandibles, maxillae, labrum, labial palps, labial gland, labial duct, labial opening, labial setae, labial sclerite, labial muscle, labial sheath, labial sclerite, labial sclerite, labial sclerite, and labial sclerite; Q—Head of the pupa with mandibles, maxillae, labrum, labial palps, labial gland, labial duct, labial opening, labial setae, labial sclerite, labial muscle, labial sheath, labial sclerite, labial sclerite, labial sclerite, and labial sclerite; R—Head of the pupa with mandibles, maxillae, labrum, labial palps, labial gland, labial duct, labial opening, labial setae, labial sclerite, labial muscle, labial sheath, labial sclerite, labial sclerite, labial sclerite, and labial sclerite; S—Head of the pupa with mandibles, maxillae, labrum, labial palps, labial gland, labial duct, labial opening, labial setae, labial sclerite, labial muscle, labial sheath, labial sclerite, labial sclerite, labial sclerite, and labial sclerite; T—Head of the pupa with mandibles, maxillae, labrum, labial palps, labial gland, labial duct, labial opening, labial setae, labial sclerite, labial muscle, labial sheath, labial sclerite, labial sclerite, labial sclerite, and labial sclerite; U—Head of the pupa with mandibles, maxillae, labrum, labial palps, labial gland, labial duct, labial opening, labial setae, labial sclerite, labial muscle, labial sheath, labial sclerite, labial sclerite, labial sclerite, and labial sclerite; V—Head of the pupa with mandibles, maxillae, labrum, labial palps, labial gland, labial duct, labial opening, labial setae, labial sclerite, labial muscle, labial sheath, labial sclerite, labial sclerite, labial sclerite, and labial sclerite; W—Head of the pupa with mandibles, maxillae, labrum, labial palps, labial gland, labial duct, labial opening, labial setae, labial sclerite, labial muscle, labial sheath, labial sclerite, labial sclerite, labial sclerite, and labial sclerite; X—Head of the pupa with mandibles, maxillae, labrum, labial palps, labial gland, labial duct, labial opening, labial setae, labial sclerite, labial muscle, labial sheath, labial sclerite, labial sclerite, labial sclerite, and labial sclerite; Y—Head of the pupa with mandibles, maxillae, labrum, labial palps, labial gland, labial duct, labial opening, labial setae, labial sclerite, labial muscle, labial sheath, labial sclerite, labial sclerite, labial sclerite, and labial sclerite; Z—Head of the pupa with mandibles, maxillae, labrum, labial palps, labial gland, labial duct, labial opening, labial setae, labial sclerite, labial muscle, labial sheath, labial sclerite, labial sclerite, labial sclerite, and labial sclerite.

**Materials and Methods**

124 specimens were mostly collected in each month from the January to June and occasionally from the July to August in Chandigarh. A total of 124 specimens were examined during July, 1936 to June, 1937. Samples of the cocoon were dissected and examined. The specimens were dissected and the virus was examined carefully. The larvae were collected and complete counts were made in all the cases. The cocoon was found to be empty the cocoon spontaneously when left in a dish of tap-water in a few hours time. The identification was based on the character of the cocoon. The identification up to generic level was done after Southwell and Yarnall. A number of specimens of the cocoon were stained by the pectinized borax-carbamide method and mounted in Canada balsam. The percentage of incidence and intensity of infestation was recorded month-wise. The data on their month-wise incidence and intensity were analyzed statistically to ascertain the possible seasonal variation.