

The Biology of the Egyptian Alfalfa Weevil, *Hypera brunneipennis* Boh. (Coleoptera: Curculionidae)

By S. I. El-Sherif, M. F. S. Tanfik and A. H. El-Heneidy, Cairo/AR Egypt

1. Introduction

Egyptian clover (*Trifolium alexandrinum* L.) is the principal forage crop for farm animals in Egypt. Due to the fact that this crop usually receives no insecticidal treatments, it is inhabited by numerous insect species, some of which are economically important pests. Among these pests is the Egyptian – or Ethiopian alfalfa weevil, *Hypera brunneipennis* Boh. Since its earliest record in 1834, the alfalfa weevil has been regarded as a minor insect. However, the population of that insect on Egyptian clover as well as on alfalfa (*Medicago sativa* L.), fenugreek (*Trigonella foenum-graecum* L.) and, sometimes, flax (*Linum usitatissimum* L.) plantations tended to increase gradually during the last few years until it became a well-known pest. In badly infested fields, the larvae and adult weevils may devour the greater portion of the whole green foliage of the host plant.

In spite of the increasing importance of the alfalfa weevil, the literature on its status in Egypt is still meager. Van den Bosch (1964a) stated that the limit of its occurrence to the west of the Nile Delta is not known, and it is not found in the countries east of Egypt. Some preliminary observations on the biology of *H. brunneipennis* were also given by Hammad and El-Sherif (1968; 1969). The present study endeavours to contribute to the knowledge on the biology of *H. brunneipennis*. The work was designed to investigate a) the annual generations and life history, b) the seasonal abundance of larvae and adult weevils in Egyptian clover fields, and c) certain observations on the biology of the solitary internal larval parasite, *Blathyplectes curculionis* Thoms. (Hymenoptera: Ichneumonidae).

2. Material and methods

To study the annual generations and life history of *H. brunneipennis*, adult weevils were collected from Egyptian clover fields by net sweeping in January, 1974. In the laboratory, collected weevils were sexed according to the description of Pienkowski and Feng-kuo Hsieh (1969), then pairs of them (a female and a male) were confined separately into Petri dishes lined with cotton wool and covered with muslin. Every dish was provided with some fresh leaves of Egyptian clover plants to serve as adult food, and three stem cuttings as oviposition site. Dishes were examined daily to moisten the cotton wool and renew the plant parts used for feeding and oviposition. Stem cuttings, with the eggs laid inside them, were transferred to new dishes lined with moistened cotton wool and kept under laboratory conditions until hatching. Recently hatched larvae were separately transferred into 1 × 3 inches specimen tubes; each containing few fresh tip leaves of Egyptian clover and covered with muslin. Tubes were examined daily to record larval moults, and to change the feeding leaves. Pupae were left in the rearing tubes until the adult weevils emerged from them. Weevils were then transferred into new tubes covered with muslin and containing fresh leaves of Egyptian clover changed daily until aestivation started. When the weevils retained their activity after aestivation, each pair of them was confined into a Petri dish for oviposition. Laboratory rearing continued until one generation was completed by late April, 1975.

The study of the seasonal abundance of the larvae and adult weevils of *H. brunneipennis* in Egyptian clover fields was carried out in the Agricultural Research Station of the College of Agriculture, University of Cairo,

at Giza region, during the three successive seasons 1971/72 to 1973/74. For each season, a field of about 2 ha was seeded with Egyptian clover by early November. This field received the usual agricultural treatments, and no chemical control applications were practised. Between early December (when the plants became high enough to permit successful sweeping) and late May (when plants began to dry), 100 full-length double-stroke net-sweeps were taken at nearly quarter-monthly intervals by crossing the two diagonals of the field. The catch was killed in an ordinary cyanide jar, then spread on a sheet of white paper to count the swept larvae and adults of the alfalfa weevil.

The survey of the natural enemies of the Egyptian alfalfa weevil in Egypt revealed the occurrence of the Ichneumonid solitary internal larval parasite *Bathyplectes curculionis* Thoms. from early March to mid-April in several localities. However, the maximum abundance of that parasite during the 1974 and 1975 seasons was recorded at Nubariah locality, Tahrir province, which was, therefore, chosen for the assessment of the changes in *B. curculionis* population. In both seasons, larvae of *H. brunneipennis* were collected from Egyptian clover and alfalfa fields at nearly quarter-monthly intervals between the end of February and the end of April by net-sweeping. Collected larvae were kept in paper bags provided with fresh Egyptian clover leaves until pupation. Then the dry leaves accumulated inside the bags were gently crushed by hand, shaken in a wide-meshed wire-gauze screen, and the parasite cocoons were placed on a sheet of white paper. Certain observations on the biology of *B. curculionis* were made under the prevailing laboratory conditions. Cocoons of the parasite were individually kept in 1 × 3 in. specimen tubes covered with muslin until the adult wasps emerged. Each pair of newly-emerged wasps was confined into a similar tube provided with 3 to 4 small drops of honey as food and 5 to 10 second or recently-moulted third instar larvae of *H. brunneipennis* changed daily. After 24 hours exposure to the parasite adult wasps, the larvae of the host were retransferred to new tubes provided with fresh Egyptian clover leaves and allowed to continue their development until they changed into prepupae with the parasite cocoons spun outside their bodies. The duration of the different immature stages of the parasite was approximated by dissecting daily a group of the parasitized larvae.

3. Results

3.1. Host Plants

Field observations of *H. brunneipennis* in the different governorates in Egypt during three successive seasons (1971/72 to 1973/74) indicated that it attacks Egyptian clover (*Trifolium alexandrinum* L.), alfalfa (*Medicago sativa* L.), fenugreek (*Trigonella foenum-graecum* L.) and flax (*Linum usitatissimum* L.). Damage due to infestation was considerably high on both alfalfa and fenugreek, relatively lighter on Egyptian clover, and very limited on flax.

Van den Bosch (1964a) mentioned that, in Egypt, *H. brunneipennis* commonly infests *Trifolium alexandrinum*, *Medicago ciliaris*, *Melilotus* sp.ec, *Trigonella foenum-graecum* and *Trifolium* sp. Wehrle (1939) and McDuffie (1941) stated that fenugreek, lucerne (*Medicago sativa*) hubam (*Melilotus alboannua*), bur-clover (*Medicago bispida*) and sour clover (*Melilotus indica*) are the host plants of *H. brunneipennis* in the U.S.A.

3.2. Symptoms of infestation

Both larvae and adult weevils of *H. brunneipennis* are capable of feeding on its different host plants. However, larval damage is almost more serious than that done by the weevils. Immediately after hatching, the young larvae bore their way outside the stem of the plant into which oviposition occurred, crawl towards its growing tip, then burrow deeply into it. Second instar larvae usually occur on the terminal buds but they may attack the leaves. Larvae of the third and fourth instars are very greedy and may devour the greater portion of the whole green foliage, leaving only the leaf veins and lower epidermis intact. The occurrence of longitudinal slits on the leaflets is a characteristic symptom of larval feeding. When fully grown, the larva hides between two leaflets and spins a silken cocoon inside which it pupates.

Damage resulting from the feeding of the adult weevils on the leaves of the different host plants is quite similar to that caused by the mature larvae. Weevils make two types of holes or punctures in the stems: the feeding and egg-laying punctures. Feeding punctures are elongate holes, 3 to 10 mm long by 1 to 3 mm wide, with irregular edges, while egg-laying punctures are comparatively smaller more or less rounded holes 2 to 3 mm long by 1 to 2 mm wide, with smooth circular edges. Feeding punctures occur on any part of the stem but egg-laying punctures almost only occur on the upper part of it.

3.3. Annual generations

Under the prevailing laboratory conditions, only one complete generation of *H. brunneipennis* could be completed between early January, 1974 and late April, 1975. The first and last dates of occurrence of the different stages during that generation are shown in table 1.

Table 1. First and last dates of occurrence of the different stages of a complete generation of *H. brunneipennis* under laboratory conditions

Stage.	First date of occurrence	Last date of occurrence
Egg	1st week of January, 1974	2nd week of March, 1974
Larva	4th week of January, 1974	1st week of April, 1974
Pupa	3rd week of February, 1974	3rd week of April, 1974
Adult	4th week of February, 1974	4th week of April, 1975

Table 1 indicates that the insect undergoes but a single generation annually. Such result agrees with the observations of Mackie and Carter (1939), Reynolds et al. (1955) in the U.S.A., and Hammad and El-Sherif (1969) in Egypt.

3.4. Life history

A. The egg stage:

The eggs of *H. brunneipennis* are usually laid in batches on the inner surface of the stem cavities of the different host plants. Oviposition may occasionally occur on the leaf petioles and leaf auricles. Each batch consists of 8 to 48 eggs arranged in one or two rows of one layer thickness, or collapsed to each other forming a sphere.

The egg is nearly oval in shape. It measures 0.56–0.75 mm with a mean of 0.64 mm in length, and 0.35–0.48 mm with a mean of 0.40 mm in width. The chorion is ornamented with few rough sculpturings. When recently laid, the egg is shiny yellow or orange yellow in colour, but within 36 to 48 hours after deposition its colour renders grey or yellowish grey. Shortly before hatching, the egg attains a dusky or dark brown colour, and the shiny black head capsule of the developing larva inside is easily seen through the chorion.

By the end of the incubation period, the embryo presses its head capsule strongly against the egg shell. After about 2 to 5 minutes of such a pressing action, the embryo starts active chewing in the egg shell. Then, the pressing action and chewing alternate successively several times until the egg shell ruptures at its anterior pole and the hatching larva gnaws its way outside it.

Under average laboratory conditions of 22 °C and 100% R.H. the incubation of the egg stage ranged 9 to 13 days, with an average of 11.2 ± 0.24 days. Under the same conditions, the hatchability percentage of the fertilized eggs was 100%.

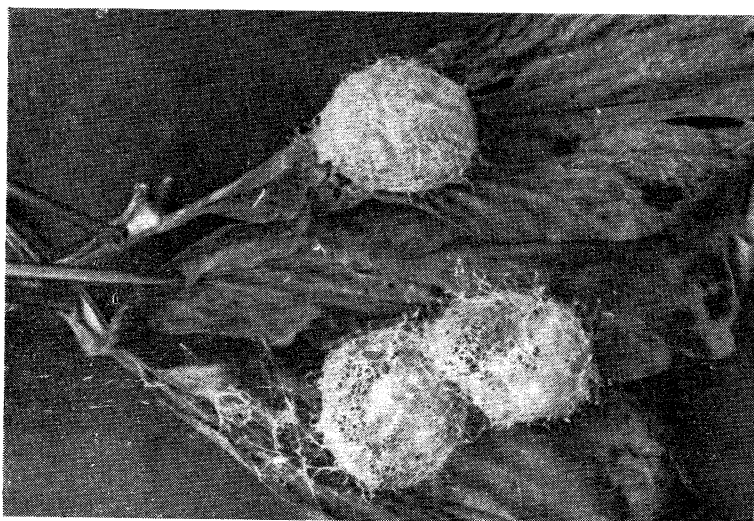


Fig. 1. Pupal cocoons of *Hypera brunneipennis* between two leaflets of an Egyptian clover plant

B. The larval stage:

The larva of *H. brunneipennis* has four instars. The measurements and durations of these instars under 22 °C and 100% R.H. are shown in table 2.

Table 2. Body length, body width, width of the head capsule, and duration of the different larval instars of *H. brunneipennis* under 22 °C and 100% R.H.

Instar	Body length (mm)	Body width (mm)	Width of head capsule (mm)	Duration (days)
First	1.30 (1.10-1.50)	0.28 (0.22-0.33)	0.21 (0.20-0.23)	6.80 (6-8)
Second	2.25 (2.10-2.50)	0.51 (0.46-0.55)	0.25 (0.24-0.26)	3.70 (3-5)
Third	4.31 (3.80-5.00)	0.98 (0.80-1.10)	0.41 (0.37-0.49)	3.80 (3-5)
Fourth	7.36 (6.00-8.50)	1.83 (1.50-2.00)	0.62 (0.56-0.68)	5.05 (5-8)

The first instar larva is elongate in shape and light yellow green in colour. Its head capsule and prothoracic shield are dark brown, and a broad mid-dorsal white stripe extends behind them along the body. Immediately after hatching, larvae start feeding on the interior tissues of the stem at the site of the egg-laying puncture, and remain inside it for about 2 to 24 hours before working their way outside. As soon as they get outside the egg-laying puncture, the larvae conceal themselves in the leaf buds and burrow deeply into them. During the second instar, the body colour changes to light green and the larvae feed on the terminal leaf buds. The third instar larvae are nearly similar in colour to those of the second instar. They feed greedily on the exposed portions of the host plant, especially the upper opened leaves. During the fourth instar, the mid-dorsal white stripe becomes broader and more conspicuous. Another pair of faint white relatively thinner strips appears on each lateral side of the larval body. Mature larvae consume the whole exposed foligae, from which they entirely

devour the green tissues, leaving only the leaf veins and lower epidermis intact. By the end of the larval stage, the mature larva stops feeding, becomes sluggish, attains a pale yellow colour and seeks for a protected place where it starts spinning an oval delicate white cocoon (fig. 1). Cocoon construction is usually completed within 24 hours, and cocoons are almost always attached to the leaves or stems of the host plant. After a prepupal period of 1 to 3 days the larva changes into pupa and the last larval old skin is easily seen inside the cocoon. Some larvae may fail to construct cocoons, but they succeed in changing into pupae. At 22 °C and 100% R.H., the larval stage lasted for 19 to 23 days, with an average of 21.55 ± 1.18 days.

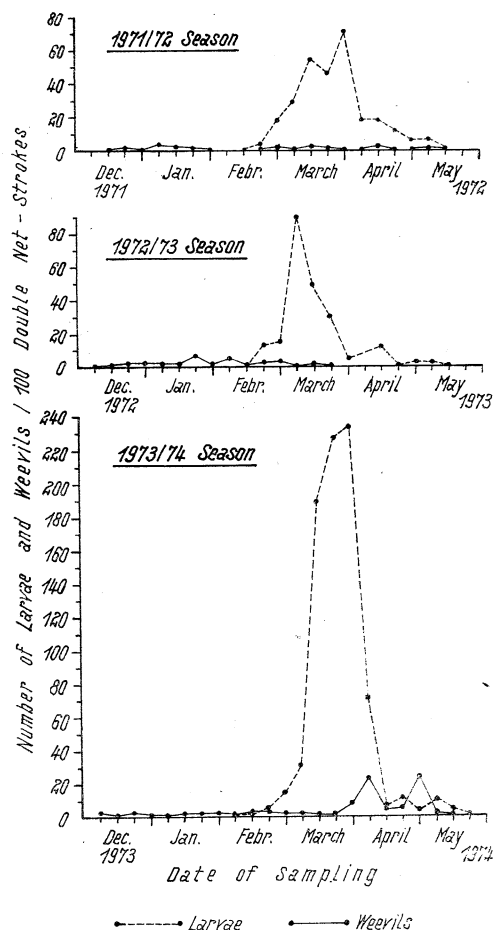


Fig. 2. Quarter-monthly numbers of larvae and adult weevils of *Hypera brunneipennis* in Egyptian clover fields during the 1971/72 to 1973/74 seasons in the giza region

C. The pupal stage:

Newly-formed pupae are yellowish green in colour. With the progress of pupal development, their colour darkens gradually until it becomes light brown shortly before adult emergence. The pupa measures 4.75 to 6.75 mm with a mean of 5.64 mm in length, and 2.25 to 3.00 mm with a mean of 2.55 mm in width. The head is rather rounded and completely concealed from above by the pronotum, while the rostrum is elongated and slender.

Thoracic segments are distinct dorsally, but the meso- and metathorax are obscured ventrally by the thoracic legs. The fore- and hind-wings extend in a posterior direction till the sixth abdominal sternite. The abdomen has nine distinct tergites. At 22 °C and 100% R.H., the pupal stage elapsed 10 to 12 days, with an average of 10.9 ± 0.25 days, for females, and 10 to 11 days, with an average of 10.6 ± 0.30 days, for males.

D. The adult stage:

Recently emerged adult weevils remain inside their pupal cocoons for a period of about 1 to 3 days before they cut their way outside them. In both sexes, the whole body of the adult weevil is generally brown in colour. Three stripes of dense brown or grey scales extend along the dorsal aspect of each elytron. When these scales are rubbed off, the body colour renders dark brown. The distinct short snout measures about 1.7 mm. Female weevils are relatively larger in size than males. In females, the body is 4.5 to 5.5 mm long with a mean of 5.1 mm, and 2.0 to 2.8 mm wide with a mean of 2.5 mm. In males, the corresponding measurements are 4.3 to 5.0 mm with a mean of 4.6 mm, and 2.0 to 2.5 mm with a mean of 2.1 mm, respectively. Beside size differences, the two sexes are differentiated depending on the shape of the caudal abdominal segment as well as the elytral stripes. In male weevils, the tergite of the caudal abdominal segment extends down over the tip of the abdomen and thus becomes easily seen from the ventral side, while the last abdominal sternite terminates posteriorly in a broadly rounded projection. In female weevils, the last abdominal tergite is not easily seen ventrally due to the extension of the last abdominal sternite, which is smoothly and broadly rounded without a projection, to the end of the abdomen. Elytral stripes are relatively darker and broader in males than in females.

a) Copulation:

Adult weevils are capable of successful copulation during both daytime and night. Repeated coitus is of frequent occurrence. Each coitus is usually followed by an oviposition cycle. All eggs laid by copulated females are fertile, and uncopulated females always fail to lay any eggs. The copulation process usually takes place during the second period of feeding in both sexes. When the adults are ready for copulation, the male weevil mounts on the back of the female weevil holding her at the end of the thoracic segments by his front legs while his middle legs rest on her elytra and the hind legs keep free. Then the male presses with his snout at the area between the prothorax and the bases of elytra, while the antennae remain in normal position. The female weevil is capable of free movement and feeding during coitus with the male on her back. Coitus usually lasts for a few minutes but it may extend up to three hours or more.

b) Oviposition:

Eggs are laid in batches, each following a copulation. Consequently, the number of egg batches laid by a certain female weevil is equal to the number of its copulations. Before laying any eggs, the female weevil makes an egg-laying puncture by running through the following steps successively:

- I. The weevil rests on the stem of the host plant with its snout parallel to it longwise and head directed downwards.
- II. The weevil inserts the snout at an angle slightly towards the base of the stem until the apex of the snout reaches the hollow cavity of the stem.
- III. The weevil pushes its head downwards steadily making an elongated slit inside the stem tissues, then it withdraws the snout outside the puncture.

To lay eggs, the female weevil either turns or walks forward until the terminal end of its abdomen faces the egg-laying puncture, then extends its ovipositor to full length and inserts it into the puncture. Deposited eggs are stuck to the inner tissues of the stem cavity with

sticky material secreted by the ovipositing female weevil. Finally, the weevil withdraws the ovipositor outside the stem of the host plant and plugs up the puncture with the sticky secretion.

c) Oviposition periods and female adult longevity:

– Pre-oviposition period: In female adult weevils, the pre-oviposition period consists of two feeding periods separated by an aestivation period. At 24.5 °C and 59.6 R.H., the pre-aestivation feeding period lasted for 53 to 80 days, with an average of 66.4 ± 3.98 days. The aestivation period extended from 147 to 189 days, with an average of 162.3 ± 4.37 days, at 28 °C and 61.7% R.H. The post-aestivation feeding period covered from 28 to 52 days, with an average of 40.4 ± 4.24 days, at 18.5 °C and 62.1% R.H.

– Oviposition period: At 15.8 °C and 67.2% R.H., the oviposition period ranged from 38 to 71 days, with an average of 60.0 ± 3.23 days.

– Post-oviposition period: At 18.2 °C and 67.7% R.H., the female adult weevils lived for 8 to 44 days, with an average of 21.9 ± 3.78 days, after they finished laying their eggs.

– Female adult longevity: The total longevity of the female weevils ranged from 327 to 388 days, with an average of 350 ± 6.23 days under mean conditions of 19.8 °C and 65.6% R.H.

d) Egg-laying capacity:

At 15.8 °C and 67.2% R.H., the female weevil laid 8–24 egg groups with a mean of about 13 groups. The total egg-laying capacity ranged from 305 to 740 eggs, with an average of 521 ± 29.03 eggs/female.

e) Male adult longevity:

In male adult weevils, the longevity consists of two feeding periods separated by an aestivation period. At 24.5 °C and 59.6% R.H., the pre-aestivation feeding period lasted for 43 to 76 days, with an average of 61.9 ± 2.48 days. The aestivation period extended from 140 to 181 days, with an average of 160.3 ± 3.73 days at 28 °C and 61.7% R.H. The post-aestivation feeding period covered from 83 to 119 days, with an average of 105.5 ± 3.05 days at 17.1 °C and 66.4% R.H. The total longevity of the male weevils ranged from 299 to 345 days, with an average of 327.9 ± 4.99 days, at mean conditions of 23.2 °C and 62.6% R.H.

Under the prevailing laboratory conditions, the pre-aestivation feeding period of the adult weevils collected from the fields during February, 1974, extended until late May. Aestivation started by mid-May and continued until late November, but some weevils terminated their aestivation in late January, 1975. Under the same conditions, egg deposition occurred between early December, 1974, and mid-March, 1975.

E. Total life-cycle duration:

The total duration of a complete life-cycle under laboratory conditions varied from 371 to 432 days in females and from 344 to 389 days in males, with averages of 394.4 ± 6.11 and 371.3 ± 4.88 days, respectively.

The results obtained in the present investigation are generally in agreement with those reported by Mackie and Carter (1939), Reynolds et al. (1955) and Hammad and El-Sherif (1969) on the biology of *H. brunneipennis* in U.S.A. and Egypt.

3.5. Seasonal abundance

The quarter-monthly populations of *H. brunneipennis* larvae and adult weevils in Egyptian clover fields in the Giza region during the three successive seasons 1971/72 to 1973/74 are shown in fig. 2. The figure indicates that the adult weevils retain their activity after the

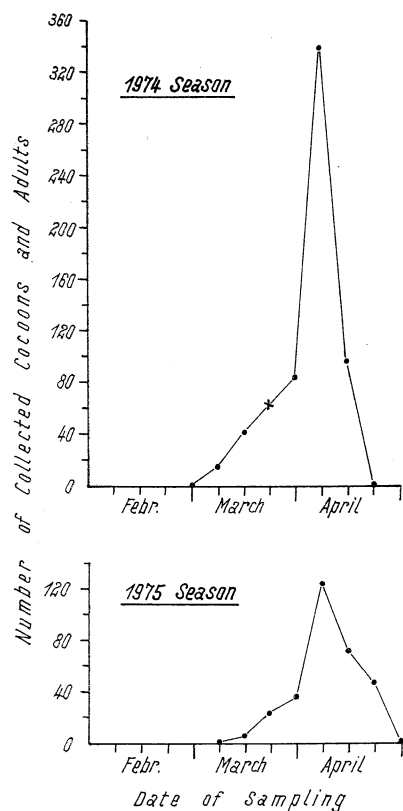


Fig. 3. Weekly numbers of *Blathyplectes curculionis* cocoons and adult wasps emerging from *Hypera brunneipennis* larvae collected from Egyptian clover and alfalfa fields in Nubariah locality, Tahrir Province, during the 1974 and 1975 seasons

aestivation period by late November or early December. Weevils occur in oscillating numbers from December till March. Another period of relatively high population of weevils takes place during April when the weevils of the new year's generation begin to emerge. The maximum abundance of weevils during that period was observed by late April (24 weevils/100 double net-strokes in the 1973/74 season). The weevil population on Egyptian clover, as well as on the other host plants, decreases sharply during the first half of May, and they completely disappear from the middle of the latter month. Between mid-May and late November or early December, weevils spend their aestivation period hiding underneath the bark of eucalyptus, casuarina and date palm trees. Large numbers of the aestivating weevils could be collected during summer months when the bark of these trees was removed. Fig. 2 further indicates that the larvae begin to occur in the fields about mid-February. Larval population tends to increase progressively thereafter until a peak of maximum abundance is almost reached by late March (72, 48 and 234 larvae/100 double net-strokes in the 1971/72 to 1973/74 season, respectively). This peak is followed by a gradual decrease in the number of larvae, which disappear completely before mid-May.

Macki and Carter (1939) stated that in California the adult weevils of *H. brunneipennis* spend their aestivation period in the ground around the bases of the stools of lucerne plants, in cervices in the bark of eucalyptus trees or on the offshoots of date palm trees, and that aestivation is terminated by early December. Reynolds et al. (1955) mentioned that in Cali-

fornia the adults of *H. brunneipennis* also appear in lucerne fields in December, and larvae become most abundant from February to April. Hammad and El-Sherif (1969) reported that in Egypt adult aestivation of *H. brunneipennis* starts by late May.

3.6. Natural enemies

Observations on the natural enemies of *H. brunneipennis* in Egypt indicated the occurrence of the Ichneumonid solitary internal parasite, *Bathyplectes curculionis* Thoms. Parasitized larvae were collected from Beni-Suef, Giza and El-Gharbia governorates between February and April. High rates of parasitism were recorded from Minya governorate and Tahrir province. The total number of parasite cocoons and adults emerging from about equal uncultured weekly samples of *H. brunneipennis* larvae collected from Egyptian clover and alfalfa fields in Nubariah locality, Tahrir province, from late February till late April during both 1974 and 1975 are shown in fig. 3. This figure indicates that the first parasite cocoons were obtained from the larvae of *H. brunneipennis* collected from the fields during the first week of March in 1974 and the second week of the same month in 1975. Cocoon population increased gradually thereafter towards peaks of 332 and 116 cocoons/weekly sample in 1974 and 1975, respectively, reached by early April in both seasons. After that peak, the number of cocoons decreased rapidly, and no cocoons resulted from the host larvae collected after mid-April in 1974 and the 3rd week of the same month in 1975. Adult parasite wasps emerged by late March in 1974 and around the middle of March in 1975. The highest numbers of alive wasps/weekly sample (18 in 1974 and 8 in 1975) occurred by early April.

Preliminary laboratory investigations on the biology of *B. curculionis* revealed that the mated female wasp flies rapidly towards the host larva until the body of the former becomes parallel to the dorsum of the latter. Then, the female wasp inserts its ovipositor into the larvae body for few seconds through which egg deposition occurs. Female wasps usually prefer the second or newly-moulted third instar larvae for oviposition. Formerly parasitized larvae may be revisited by the female wasps that can oviposit into their bodies successfully. The egg of *B. curculionis* is broadly oval in shape with a thin and almost colourless chorion. It measures 0.60 mm in length and 0.25 mm in width. Prior to hatching, the larva is easily seen through the translucent chorion. At 20 °C, the incubation period of the parasite eggs lasted for 4 to 6 days, with a mean of 5.2 days. Hatching begins with the appearance of a slit on the chorion at the cephalic end of the egg, then the first instar larva of the parasite escapes into the haemocoel of the host's larva through this slit. The parasite larva has three internal instars. The first instar larva is of a translucent white or almost colourless body, and measures 0.60 mm, 0.20 mm and 0.23 mm in length, width and tail length, respectively. The second instar larva, which measures 2.06 mm in length and 0.33 mm in width, is characterized by a rather straight and uniformly rounded creamy body. The third instar, or mature, larva is creamy in colour, cylindrical in shape and measures about 4 mm in length and 1.64 mm in width. Its body gradually tapers towards the head, and becomes broader at the abdominal region. The total larval period of the parasite until spinning its cocoon lasted for 7 to 9 days, with a mean of about 8 days. Parasitized larvae of the host transform into prepupae inside silken cocoons with the parasite's larvae inside their bodies. Mature larvae of the parasite issue from the prepupae of the host and pupate inside separate cocoons encountered by the cocoons of the host. Parasite cocoons are 3.1 mm long by 1.7 mm wide each. Their colour varies from light brown to chocolate brown with a median distinct broad whitish band. At 20 °C and 55% R. H., the development of the parasite from egg to cocoon stages was completed in 14 to 18 days, with a mean of about 16 days. The prepupae of the parasite remain inside their cocoons until next spring, when they pupate and issue as adult wasps.

Van den Bosch (1953; 1959) recorded *B. curculionis* as a well adapted parasite associated with *H. brunneipennis* on wild clover and lucerne in spring in California, and added that the parasite destroys about one third of the larval population of *H. brunneipennis* in the coastal areas. Van den Bosch (1964a) further contributed that, in Egypt, parasitism on the larvae of *Hypera* sp. by *B. curculionis* reaches 26.7 and 44% for the first and second parasite generations, respectively. The same author (1964b) stated that in the larvae of *H. brunneipennis* haemocyte reaction to the eggs of *B. curculionis* is rapid, occurring within five hours after egg deposition. Butler and Ritchie (1967) indicated that *B. curculionis* develops approximately twice as fast as *H. brunneipennis* during the egg and larval stages, but pupae remain in diapause at temperatures above 50 °F (15 °C). In Egypt, Tawfik and Ata (1973) stated that the larvae of *H. brunneipennis* are attacked on clover plant by the anthocorid predator *Orius albidipennis* (Reut.).

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Summary

S. I. El-Sherif, M. F. S. Tawfik, and A. H. El-Heneidy: The biology of the Egyptian alfalfa weevil, *Hypera brunneipennis* Boh. (Coleoptera: Curculionidae)

Field observations in various parts of Egypt have testified a significant attack of the Egyptian alfalfa weevil *Hypera brunneipennis* Boh. on *Trifolium alexandrinum*, *Medicago sativa*, *Trigonella foenum-graecum* and *Linum usitatissimum*. Adult weevils were found to occur in the Giza region in 1971/72 to 1973/74 between the end of November and the middle of May, with a relatively high population in April. The larvae begin to occur in mid-February. Their number increases until the end of March and then gradually decreases until May. The biology of the insect is reported, including *Bathyplectes curculionis* Thoms. (Hym. Ichn.), a solitary internal larval parasite on *H. brunneipennis*.

S. I. El-Sherif, M. F. S. Tawfik und A. H. El-Heneidy: Die Biologie des Ägyptischen Luzernekäfers *Hypera brunneipennis* Boh. (Coleoptera: Curculionidae)

Feldbeobachtungen in verschiedenen Bezirken Ägyptens bestätigten einen bedeutsamen Befall von *Trifolium alexandrinum*, *Medicago sativa*, *Trigonella foenum-graecum* und *Linum usitatissimum* mit dem Ägyptischen Luzernekäfer *Hypera brunneipennis* Boh. Adulte Käfer traten im Gebiet von Giza in den Jahren 1971/72 bis 1973/74 von Ende November bis Mitte Mai, mit besonders hoher Populationsdichte im April auf. Die Larven erscheinen Mitte Februar. Ihre Anzahl nimmt bis Ende März zu und dann bis Mai beständig ab. Es wird über die Biologie des Schädlings sowie über *Blatyplectes curculionis* Thoms (Hym. Ichn.), einen solitären Endoparasiten des Larvenstadiums von *H. brunneipennis*, berichtet.

S. I. El-Sherif, M. F. S. Tawfik и A. H. El-Heneidy: Биология египетского люцернового жука *Hypera brunneipennis* Boh. (Coleoptera: Curculionidae)

Полевые наблюдения в различных регионах Египта подтвердили значительную заражённость *Trifolium alexandrinum*, *Medicago sativa*, *Trigonella foenum-graecum* и *Linum usitatissimum* египетским люцерновым жуком *Hypera brunneipennis* Boh. Взрослые жуки появлялись в области Гиза в период с 1971 по 1972 г.г. и 1973 по 1974 г.г. с конца ноября до середины мая, причём наиболее высокая плотность популяции приходилась на апрель. Личинки появляются в середине февраля. Их численность возрастает к концу марта и постоянно уменьшается к маю. Сообщаются сведения о биологии вредителя, а также о *Blatyplectes curculionis* Thoms., который является солитерным эндопаразитом личинки люцернового жука *H. brunneipennis*.

S. I. El-Sherif, M. F. S. Tawfik et A. H. El-Heneidy: La biologie du *Hypera brunneipennis* Boh. égyptien (Coleoptera: Curculionidae)

Des observations in campo dans différents districts d'Egypte confirmaient une attaque importante de *Trifolium alexandrinum*, *Medicago sativa*, *Trigonella foenum-graecum* et *Linum usitatissimum* par *Hypera brunneipennis* Boh. Des coléoptères adultes se présentaient dans la région de Giza dans les années 1971/72 à 1973/74 de fin de novembre à mi-mai et, avec une densité de population particulièrement haute, dans le mois d'avril. Les larves apparaissent à mi-février. Leur nombre augmente jusqu'à fin de mars et diminue alors constamment jusqu'au mois de mai. On informe sur la biologie du parasite ainsi que sur *Blatyplectes curculionis* Thoms., un endoparasite solitaire du stade le larve de *H. brunneipennis*.

S. I. El-Sherif, M. F. S. Tawfik y A. H. El-Heneidy: La biología de *Hypera brunneipennis* Boh. egipto (Coleoptera: Curculionidae)

Observaciones in campo en diferentes comarcas de Egipto confirmaron un ataque importante de *Trifolium alexandrinum*, *Medicago sativa*, *Trigonella foenum-graecum* y *Linum usitatissimum* por *Hypera brunneipennis* Boh. Coleópteros adultos se presentaron en la región de Giza en los años de 1971/72 hasta 1973/74 desde fines de noviembre hasta mediados de mayo con una densidad de población particularmente alta en el mes de abril. Las larvas aparecen mediados de febrero. Su número aumenta hasta fines de marzo y disminuye entonces constantemente hasta el mes de mayo. Se informa sobre la biología del parásito así que sobre *Blatyplectes curculionis* Thoms., un endoparásito solitario del estadio de larva de *H. brunneipennis*.

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Authors' adresses:
Dr. Samir I. El-Sherif
M. F. S. Tawfik
Dept. of Economic Entomology
and Pesticides
College of Agriculture
University of Cairo/AR Egypt
A. H. El-Heneidy
Institute of Plant Production Research
Ministry of Agriculture /AR Egypt