In view of this, D. Nadel et al (1966), carried out control tests wherein a protein hydrolyzate was employed as an attractant and malathion as the insecticide. The hydrolyzate was Zitan 85 and was used at the rate of 220 ml per dunam with 55 ml of a. i. of malathion. This latter was used as a 25% wettable powder in 3 liters of water for ground spot treatments, and as a 50% emulsifiable concentrate in one liter of water for areal applications.

Four applications were made at weekly intervals during June early July, and four in August-September, at 7-12 days intervals.

Satisfactory control of the fly was thereby obtained.

LEPIDOPTERA

Spodoptera littoralis Boisd.

Spodoptera littoralis spread into Israel late in the last or early in this century. It was first mentioned in Egypt in 1880 (Bishara et al. 1940). Judging from the rate of its spread along the Eastern Mediterranian shores, one may surmise that it took about two decades before it became well established in Israel. During the first three decades of the century, the pest was of no great importance. It assumed a prominent role when new crops were introduced, thereby establishing a continuous large-scale supply of food throughout the period when caterpillars may be active. Today severe attacks of this pest may entirely destroy the cotton bolls. In addition, this pest may reduce tomato yields by boring into the fruit and destroy other vegetables. In recent years it became a serious pest to apple orchards as well as vineyards.

The situation of the pest becomes more grave when mild, comparatively arid winters precede the summer, as happened during 1959-1963, when the densities of the Spodoptera populations were very serious. The gravity of the pest became accentuated when the insect became hard to kill. Although young larvae could be killed with many insecticides, older larvae were not killed except with high dosages of parathion. The insect is now considered as the arch-enemy of summer field crops in Israel and no wonder the entomologists concerned began to look for other means to control the pest.

Integrated control against Spodoptera littoralis

a. In cotton fields.

Farmers and agricultural officers noticed that larvae of Spodoptera littoralis were often devoured by predators. Other larvae bore dipterous eggs, probably Eutachina larvarum L. Fields in which insecticidal applications were not made were claimed to be less infested by S. littoralis than those treated with chemicals. This was attributed to the adverse effects of insecticides on beneficial insects.

A preliminary survey of beneficial insects in cotton fields was conducted by Vermes in 1961. About ten predators, excluding spiders, were recorded, and also two parasites. Only Hippodamia variegata and Chrysopa carnea, the most common, were actually observed feeding on larvae and eggs of this pest.

Several spiders were observed feeding upon the larvae; especially one unidentified species proved very active against the pest.

Of the parasites, Chelonus submuticus Wesm. and related species attack S. littoralis eggs and develop in the larvae.

Refraining from the use of chemical control, according to the above mentioned observations, yielded encouraging results in 1962, when populations of the pest were quite low. In 1963, when populations were as high as usual, chemical control became imperative again, and the same number of applications were necessary (Rivnay 1964). This method of refraining from chemical control can be practised only under certain conditions of low S. littoralis populations. This could be predicted only after a better study of the factors affecting the S. littoralis population was made.

b. In peanut fields.

It was customary to treat peanut fields against Spodoptera littoralis whenever larvae were observed under the plants. Often 7-9 applications were carried out during the season. These applications, consisting frequently of parathion, carbaryl, DDT and other non-selective insecticides, caused more harm than benefit by accentuating the infestation of mites and other sucking insects.

Teich (1965) proposed an approach to Spodoptera which is based on the fact that the presence of caterpillars does not always mean damage calling for drastic treatment; he also maintained that the elimination of the Spodoptera caterpillars need not be done by cover sprays only.

With reference to the state of the plant and the damage by Spodoptera, Teich divides the peanut growing season into three, as follows:

a) The vegetative period, namely from the sprouting of the plants to about 50 days later. During this period the pest is very scarce, and ordinarily does not call for treatment except in a summers following a dry, mild winter.

b) The blossom and gynophore period. During this period the Spodoptera larvae feed on the very soft leaves and blossom or gynophores; the plants being bushy and rich in leaves, the nibling of soft leaves if not in excess, hardly interferes with the normal formation of the pods. The feeding on gynophores and blossom is usually made by larvae larger than 10 mm. Two or three days after penetration into the ground, the gynophores are no longer subject to injury by caterpillars. It is essential to maintain a close inspection during this period.

c) The nut formation period. During the period the nuts swell and mature, new gynophores are superfluous as there is no time left to enable them to complete their growth. During this period Spodoptera larvae feed on the new foliage and prevent the over-development of the foliage, a fact which brings about a more uniform maturation of the nut crop.

Teich recommends therefore a weekly inspection during the vegetative period. The treatment level is set by him at 2-3 Spodoptera larvae per plant.

Two inspections per week should be made during the blossom period. The foliage and flower consumption should serve as a criterion for treatment. No treatment is necessary unless five or more flowers per plant were consumed.

Also during the third, the nut period, two inspections per week should be made, five to seven caterpillars per plant larger than 10 mm should serve as a treatment level.

Teich further suggests, that the inspection unit should not exceed 50 dunams in which 10 points of inspection, two meters in each, are picked at random. Emphasis should be made on the presence of small caterpillars 10 mm long.

The rise, or the decline, of the population should also serve the farmer as a criterion for the need of treatment.

In this connection it is further recommended that bait should replace the cover applications, and insecticides with a wide spectrum of kill such as parathion, DDT or sevin should not be employed.

No preventive treatments should be made, these should be employed only in accord with treatment levels described above.

It was claimed that damage by Spodoptera was thus elimiated with one or two applications, instead of 7-9, as mentioned above.

Bacillus thuringiensis vs. Spodoptera littoralis

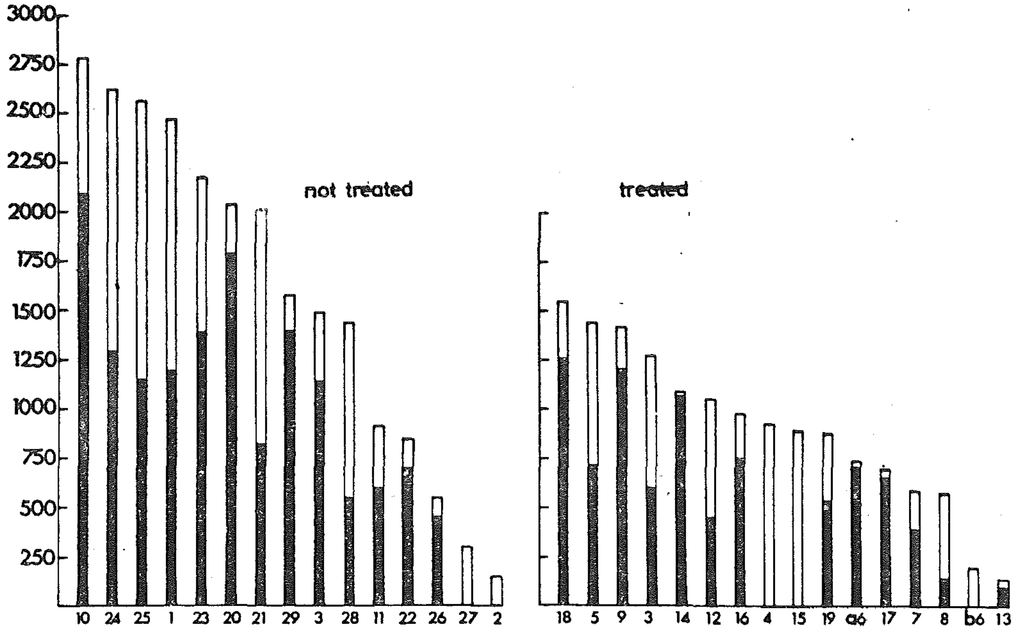
It was reported that Bacillus thuringiensis Berlin may be effective against S. littoralis (Metalnikov 1933), Rivnay & Gileadi (1961) studied the effects of B. thuringiensis on the larvae, pupae and ensuing adults.

Small plots of clover in the field were contaminated with Bacillus spores by dusting or spraying. A proprietary dust "biotrol" which contained 5 billion spores per gram, a wettable powder "larvatrol" which contained 25 billion spores per gram were employed in these experiments.

Treated clover served as food to young Spodoptera larvae 15-20 mm long of which the head capsule was 1-2 mm wide.

The experiments were followed up till after the larvae pupated, became adult, oviposited, and viability of eggs established. Larvae of the same batches, fed on non-treated clover, served as control.

Fig. 14 - Effects of Bacillus thuringiensis on Spodoptera littoralis. Egg laying (entire column) and viability of eggs (dark column) of individuals which had fed only once on food contaminated with the Bacillus.



In the first two experiments in which 25 billions of spores (larvatrol) and 20 billion spores (biotrol) were employed respectively, fresh treated clover was offered to the larvae every other day until they pupated. In these breedings very few survived to adulthood and the sexes were not equally divided, therefore it was necessary to cross couple them between the non-treated individuals as indicated in Fig. 15.

In the third experiment, in which 50 billions of spores (biotrol) per meter were applied, the larvae were offered treated leaves only once; on the third day fresh non-treated food was offered till pupation. In this breeding over a dozen couples were obtained. The egg laying of these females is presented in Fig. 14.

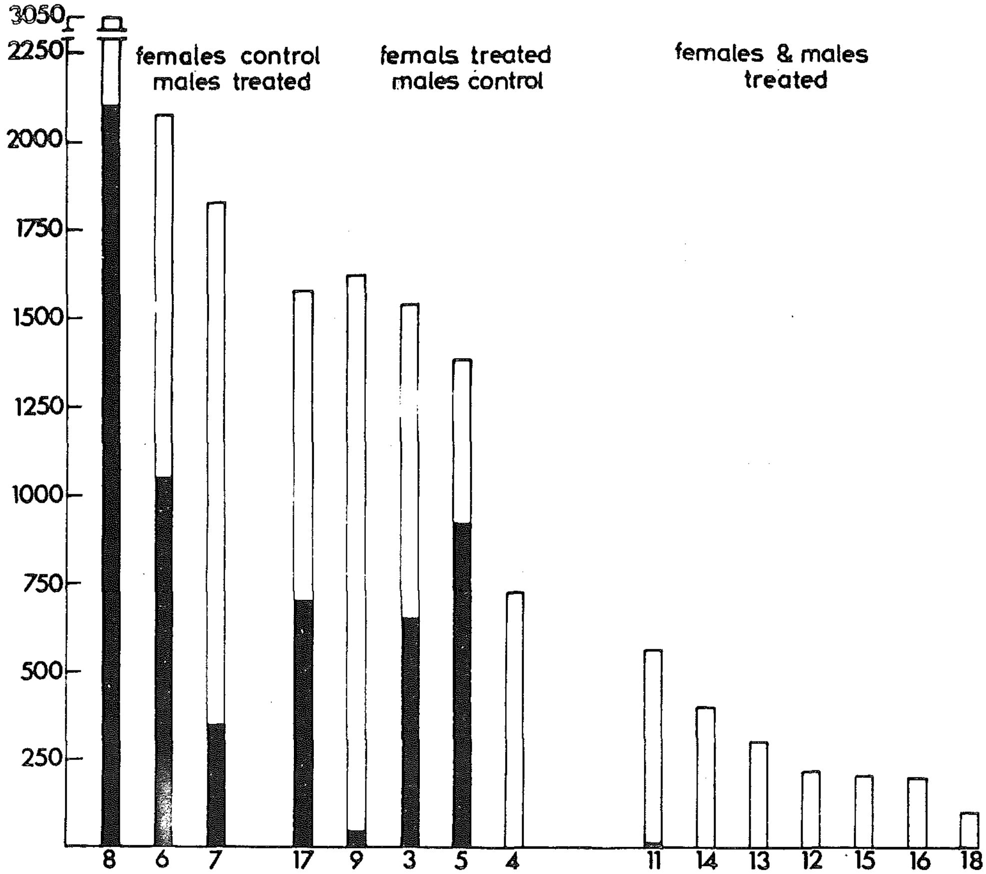
Results:

No difference in the rate of larval mortality was noted; a slight difference in the mortality of the pupae was recorded:

In the case where 25 billion spores were employed, some 30% of the pupae died as compared with 10% of the non-treated lot. In the case where 50 billions spores were applied, 48% died as compared with 15% in the non-treated.

Counts of the eggs showed that moths which were reared on clover contaminated with spores of B. thuringiensis laid less eggs, than those reared on non-treated food.

Fig. 15 - Effects of Bacillus thuringiensis on Spod. littoralis. Egg laying (entire column) and viability of eggs dark column) of individuals which had fed during the entire larval period on food contaminated with Bac. Thuringiensis.



When contaminated clover served as food throughout the larval period to both sexes, the number of eggs reduced greatly and were all non-viable.

The results of these experiments may be summed up by saying that in larvae of Spodoptera littoralis which have ingested spores of B. thuringiensis with their food, the ill effects of this Bacillus are latent; they express themselves in the adult by a reduction in the number of eggs and their becoming non-viable. The infected male may affect the eggs of the female with which he mated.

Virus against Spodoptera littoralis

Harpas & Ben Shaked (1965a) made a study of the virus causing nuclear polyhedrosis in Spodoptera in Egypt and Israel and its exploitation against it.

Various method were tried in the laboratory for obtaining viral polyhedra for infecting larvae, and to establish the proper age of the larvae and the dosages to achieve effective infection.

It was found that a suspension of from 10-50 million polyhdra per ml. was effective against small larvae. However, 50 million against older larvae did not yield uniform results, as some larvae still pupated. It was also found that a spreaderTriton x-100 (Rohm & Haas) did not affect the infectivity of the polyhedra and could be added to the suspension when applied to plants.

In laboratory trials, where alfalfa grown in trays (5x50x80) was contaminated with polyhedra, it was found that 14 days after Spodoptera eggs were introduced into the alfalfa, very little feedings was found when 50 million polyhedra per ml. were applied to the plants, while many live caterpillars which had consumed much of the foliage were found in the control plants. When 10 million polyhedra per ml. were applied, no such outstanding differences with the control were obtained.

In the field, when small plots of cotton 7 x 9 meters were treated four times, during July and August, at intervals of 14 days between the treatments, it was found that in sections treated with a suspension of 50 million polyhedra per ml. six live caterpillars and 31 dead from the virus were found, during the inspections in August, while 56 live caterpillars were found in the control plots with no dead ones from the virus.

However, due to the low infestation of Spodoptera that year, no economic evluation of such treatments could be made, but further studies were pursued.

In September 1965 a cotton field near Yavne was treated with the granular polyhedral virus. About 250 Spodoptera larvae were counted in a row of 50 meters. A suspension of virus at a dosage of 30 million polyhedra per ml. was applied. Counts made 11 days later showed a reduction of 75% of the larval population as compared to non-treated plots.

Other studies of Harpaz and Ben Shaked (1964) in the laboratory in which eggs from infected and non-infected moths were surface sterilized, and the hatching larvae were reared under aseptic conditions, demonstrated that the nuclear polyhedrosis virus of Spodoptera littoralis may be transmitted from generation to generation through the inner egg content.

The situation in 1966-67

The treatments with the virus spores against Spodoptera larvae do no offer immediate relief from this pest as the larvae succumb to the polyhedral disease when nearly mature and ready to pupate, namely after they had finished feeding. A reduction of the population does take place, and repeated treatments would have led towards the extermination of the pest had it not been for constant and continuous invasions of adults from outside the treated field.

This hold true also for the Bacillus thuringiensis. Larvae fed throughout their period of development on contaminated food would have developed into steril adults, which would have reduced the population - but again invasion of adults from outside render this method futile as far as the Spodoptera littoralis is concerned.

For the time being the control of the pest must be carried out with chemicals.

Heliothis peltigera Schiff.

In Israel Heliothis armigera, which causes damage to various field crops, is usually the dominant species of this genus. Occasionally, however, H. peltigera becomes more numerous. It is a migrant and particularly attacks safflower crops. Often when crowded, the caterpillars are attacked by a virus disease which may check the outbreak. Harpaz et Zlotkin (1965c) made a more detailed study of this virus.

Evidently, this is a nuclear polyhedral virus, and one of its symptoms, as in other virus diseases, is the hanging down of the cadavers. The authors are of the opinion that this is not a characteristic manifestation of the disease, but typical to all cases in which death is slow, relaxation of muscles gradually causing the claws to clasp the support, while the rest of the body is hanging.

Histological examinations show that in attacked tissue the nucleus is hypertrophied, often occupying the entire cell space.

The tissues mainly attacked are the blood cells, fat body, tracheal matrix and hypodermis. The latter is attacked only after the other tissues have been destroyed.

Composition of artificial medium for Spodoptera

For the purpose of mass breedings of Spodoptera littoralis, the following artificial medium was developed by Moore and Navon (1964).

1. Full-fat soy meal	30. 0 g
2. Alfalfa meal	60. 0 g
3. Brewer's yeast (1)	12. 0 g
4. Agar agar flakes	12. 0 g
5. Methyl p-hydroxybenzoate	1. 5 g
6. Sodium ascorbate (10% w/v aq. solution)	30. 0 ml
7. Acetic acid (20% v/v aq. solution)	30. 0 ml
8. Distilled water	540. 0 ml

The soy meal was prepared by grinding the dry beans twice in a Wiley cutting mill. After weighing, this material was made as homogeneous as possible by blending with part of the second portion of the water. The brewer's yeast, the methyl p-hydroxy-benzoate and remaining water were then added to the soy and thoroughly blended. This homogenate was transferred to the Erlenmeyer.

The alfalfa meal was sifted through a 100-mesh sieve and the rough material discarded. After weighing, the fine powder obtained was transferred to the Erlenmeyer flask containing the other ingredients and mixed in by shaking. The mixture was then autoclaved at 15 lbs/sq. inch for 20 minutes to effect sterilization and destroy the antitrypsin of the soy (2) - a factor which might be detrimental to larval growth. Subsequent control of food-spoiling contaminants was provided by the methyl p-hydroxybenzoate (4) and the acetic acid (1).

Notes on Chelonus submuticus Wesm.

Specimens of this parasite were obtained from Spodoptera larvae collected in the field, and breeding of it were made in the laboratory by Meir Ziv. The data given below were obtained from his unpublished notes.

Table 12 - Data on the development of Chelonus

Temperature	Length of egg & larval period	Pupal period	Life Span parasitized host	Life Span of non-parasitized host
20^{o}	26	23	24	29
23	22	11.	19.5	23
26	17	11	14	18
34	12	5.5	9.5	13

Like other members of its genus, the wasp oviposites in the eggs of the host and develops in the larval body. As seen from the table the span life of non-parasitized larvae at higher temperatures is only four days longer than the parasitized ones.

The Processionary Caterpillar Thaumetopaea wilkinsoni Tams.

The following account is based on the report of Halperin (1963): The processionary caterpillar T. wilkinsoni Tams. was probably introduced into Israel from Cyprus and the Lebanon. It is a monophagous insect feeding on pine trees of various kinds. The damage consists of the defoliation of the trees. Strong trees can survive this unjury, but weak trees, in particular those growing on poor soil and in arid zones, may succumb to the injury of the pest. In addition dermatosis may be caused by the poison secreted by this larva to those which are found in the immediate vicinity. Disturbance is caused in particular to school children in playgrounds and parks.

Although the caterpillar was first discovered in the neighbourhood of Jerusalem, it spread rapidly, regardless of the pine-free areas separating the pine forests. The infestation may be very severe. On the average about 6, 000 tents were collected in one hectare; and 150 caterpillars averaged the tent. At some sites about 2, 000 caterpillars were collected on one tree.

For Israel, this caterpillar is especially harmful, as afforestation of pine trees is being made on a large scale, and it is done on poor soil not fit for other agricultural enterprises.

During 1959-1960 the peak of its abundance was reached when 10% of the area was infested by the pest, and when a million nests were collected during the year.

A campaign against the pest was launched then which brought about a great reduction in its population. In small areas, in yards and parks, where control was necessary, application of insecticides gave some relief. The collection of the nests caused the reduction of the population. However, its costs and efforts were too much, so that biological control methods became imperative (Halperin 1963).

LIST 15 Entomophagous insects on Thaumetopaea

A Survey of the insects associated with this caterpillar was carried out by Halperin who found the following:

Ooencyrtus pityocampae Mercet	Hym. Encyrtidae
Tetrastichus servadei Dom.	Hym. Eulophidae
Exorista segregata Rond	Dip. Tachinidae
Chrysopa carnea Steph.	Neur. Chrysopidae
Tapinoma israelis Forel	Hym. Formicidae

Control with Bacteria

Following the example of Grison et al. in France, and Androvic in Yugoslavia, who controlled T. processionea and T. pityocampae with Bacillus thuringiensis, Moore et al. (1963) made trials with spore suspensions of this Bacillus against T. wilkinsoni in Israel.

The stock for the suspension was a wettable powder.

The tests were done both in the laboratory on three-year-old potted trees, and in the field on eight-year-old pine trees, in each case larvae in the third instar were on trial.

In the laboratory applications, 100 ml were given per tree, containing 0. 050, 0. 200 and 0. 800 gms of Biotrol. These concentrations caused 70-80% mortality after eight days, and about 100% at the end of 16 days.

In the field, where the application was made with a knapsack sprayer using 1. 5 gr. of biotrol and 100 ml. of water with or without 0. 5 lovo spreader, brought a reduction in the population to 15% after 11 days, and to less than 5% at the end of 20 days. The dosage was 330 ml. per one five-year-old tree, e. g. 5 gr. of biotrol per tree.

Polyhedral diseases

Harpaz et al. (1965b), following the example of Grison who studied the polyhedrosis on T. pityocampae in France, made an investigation into the nature of polyhedral diseases occurring in T. wilkinsoni in Israel.

Caterpillars of T. wilkinsoni collected in the field served as a source of inoculum with which healthy larvae were inoculated in the laboratory.

Microscopic examinations of sections and smears of heamolymph from these caterpillars showed that there were two kinds of virus involved: one causing cytoplasmic polyhedrosis in the midgut cells, and one causing a nuclear polyhedrosis in the fat cells and blood cells.

Harpaz found the same polyhedral disease in caterpillars of T. wilkinsoni which he collected in Cyprus, an indication that the virus came along to Israel with its host.

The Carob Moth Ectomyelois ceratoniae Zeller

The following account is taken from Rivnay (1953b): "As the name indicates, the ordinary food of this moth is the carob; it is common also on the pods of Acacia. More recently, however, it became injurious to grapefruit. The injury consists of the boring of the larva into the fruit at the point of contact with the sepals. As a result, a drop of gum oozes from the fruit under the button, the fruit becomes prematurely yellow and finally drops. When such fruit is cut tangentially, the albedo appears brown due to the infiltrated gum, and often dead larvae or their tunnels are exposed.

At first another moth, Cryptoblabes gnidiella was held responsible for this injury. This was due to the fact that several attempts to breed this moth failed; the larvae were always drowned by the gum before reaching maturity". A similar account is given also by Gothilf (1964).

The identity of the moth actually responsible for this injury was discovered by Shiakides of Cyprus who succeeded in obtaining adult moths. In Cyprus, where carob trees are abundant, the moth population is also more dense. The infestation period is also more prolonged there, so that the boring by larvae may occur in fruit in which gum formation is weak. In groves heavily infested, especially in sites where Acacia hedges are in abundance, infestation may reach about 33%. In groves of smaller degree of infestation, 10-12% of infested fruit is a common occurrence.

The study of the biology of this moth was carried out by Gothilf (1964). Among others, he made a survey of parasites and predators associated with this moth in Israel, and he also tried to control the moth by means of biological methods.

The following were parasites which occurred in association with the carob moth in Israel.

LIST 16 Parasites of Ectomylois ceratoniae

Clausicella suturata Rond. Dip.	Tachinidae
Phanerotoma flavitestacea Fisher Habrobracon brevicornis Vesm., Apanteles lacteus (Nees) Apanteles sp.	Hym. Braconidae
Anisopteromalus mollis Ruschka.	Hym. Pteromalidae
Perisierola gallicola Kieff.	Hym. Bethylidae
Pristomerus vulnerator Pans., Horogenes sp., Gelis sp., Herpestomus arridens Frav.	Hym. Ichneumonidae
Antrocephalus mitys (Walk.)	Hym. Chalcididae
Perilampus tristis Mayr. var.	Hym. Perilampidae
Trichogramma sp.	Hym. Trichogrammatidae

On certain occasions the total parasitization amounted to over 50% of the individual larvae. Two parasites were outstanding in their abundance: the Braconid Phanerotoma flavitestacea Fisher, whose parasitization fluctuated from 10-35% and the Tachinid Clausicella suturata Rond. which in some localities parasitized 15-35% of the larval population. Whereas the peak of occurrence of the Braconid was in August, that of the Tachinid was in September-November.

The biological control was tried with P. flavitestacea.

Trichogramma minutum Riley. imported from California did not attack the eggs of the Carob moth in laboratory breedings. However, the Russian and the Australian strains of the same species did infest the Carob moth eggs under the same conditions. (A. Rubin & I. Cohen verbal communication).

Biological notes on Phanerotoma flavitestacea Fisher

Mating of the wasps takes place soon after they emerge from their cocoons. Like other members of the genus, the female oviposits in the host egg, and the larval development continues in the host larva. This species is arrhenotokous, non-fertilized females producing male offspring only. Often more than one egg may be laid in one host egg, but ultimately, only one parasite larva develops therein.

The length of development of parasitized host larvae is equal to those harbouring a parasite, but the number of moults may be reduced by one in the parasitized individuals.

In breedings at $23^{o}C \pm 0.5^{o}C$ and 80% R. H. the following data were obtained:

Length of non parasitized host development from oviposition to pupation 31-36 days.

From egg-laying to adult 42-47 days.

Length of larval development of the parasite in the host body 29-37 days.

Three to five days later pupation takes place.

The adult males emerge about 2 days earlier than the females.

During the summer adults live several weeks. 40% of the females lived even over three months.

In the winter the longevity was prolonged. Females which emerged on the 15th of October, survived (40%) till May -e. g. six and a half months.

Mass breeding of P. flavitestacea

The mass breeding of the wasp was made on moth larvae cultured on an artificial medium.

The food medium consisted of soybean meal 43. 5%, sucrose 43. 5% and water 13%. The soybean was of roasted beans from which most of the oil was extracted. It consisted of 50% protein, 2% fat, 30% carbohydrates, 3. 5% cellulose, 8% moisture and 6. 5% ashes.

Single pairs of the moth in plastic vials were allowed to oviposit on paper. The pieces of paper containing about 2, 000 eggs were placed in cages in which about 500 female wasps were available. A fluorescent lamp was left during the night giving a diffused light which prolonged the activity of the wasps. Under such conditions about 100% of parasitism were obtained after 24 hours, whereupon the eggs were removed and placed in a tray containing the food medium for the moth larvae. A paper was placed over the food under which the larvae found shelter and as an object to be in contact with, a glass cover, was placed tightly over the tray. When emerged, the adult wasps were removed with a suction tube, which was introduced through holes made in the walls of the tray.

Release of the wasps was made soon after the emergence of moths was observed on carob trees. In one site parasitization was increased from 3-5%, in the previous year, to 22% and 38%. However, where parasitization was high no increase in its percentage was attained by the release of laboratory bred individuals.

The Leopard Moth, Zeuzera pyrina L.

The Leopard moth Zeuzera pyrina is a notorious pest, boring in the trunks and branches of its host trees, primarily olive, apple, pear and quince. Continuous attacks of the pest often bring about the drying up of branches or even entire trees. The recommended control measures consist of removing the larvae from the tunnels with the aid of wires, killing them, by placing cotton dipped in benzene in the tunnels, or a few grain of paradi-chlorobenzene. Younger larvae may be killed by spraying with diazinone or phosphamidon. These measures are either tedious, too costly, or not thoroughly effective. In view of this, attention was diverted to measures of control other than insecticides.

Lisser (1962 & 1963) who studied the biology of Zeuzera pyrina in Israel also made a survey of its predators and parasites.

Eggs which are laid upon the bark of the trees are preyed upon by various ants, whereas the larvae may be parasitized by Apanteles leavigatus Ratz and Elachertus nigritulus Zett.

With the aim of rearing the moth for the purpose of breeding parasites, or for the purpose of male sterilization, Moore and Navon (1966) made efforts to develop an artificial food medium for the larvae.

Composition of artificial food media for Z. pyrina L.

Ingredient	Medium		
	No. 1	No. 2	No. 3
Full fat soy meal	36.0 g	36.0 g	36.0 g
Sucrose	48.0 g	48.0 g	48.0 g
Brewer's yeast	24.0 g	24.0 g	24.0 g
Agar agar flakes	24.0 g	24.0 g	24.0 g
Nipagin	1.5 g	1.5 g	1.5 g
Acetic acid 20% v/v	30.0 ml	30.0 ml	30.0 ml
Sodium ascorbate 10% w/v		30.0 ml	
Pear bark homogenate (10g/70ml water)			70.0 ml
Distilled water	570.0 ml	540.0 ml	500.0 ml

The preparation of the media was as follows: The agar agar flakes were dissolved in 200 ml of distilled water in a 1-liter Erlenmeyer flask. The rest of the water (see Table 1) was used for homogenizing the remaining dry components as well as possible. This was done by means of a heavy duty Waring blender. This homogenate was transferred to the flask containing the dissolved agar and mixed in by swirling. The mixture was then autoclaved at 15 p. s. i. for 20 minutes in order to destroy the existing microflora as well as the anti-trypsin factor of the soy (Markley 1951).

After cooling to approximately 45^{o}C, the acetic acid solution was added and thoroughly mixed in by vigorous shaking. Up to this point the procedure was the same for all three media. However, in the case of medium No. 2, the acetic acid solution was incorporated together with the sodium ascorbate, and with the pearbark homogenate as was the case in medium No. 3.

The soy meal and the sodium ascorbate solution were prepared as previously described (Moore & Navon 1964). The pear-bark homogenate was obtained as follows. The bark from freshly cut one-year-old branches was detached with a scalpel and immediately blended with the proper amount of cold distilled water (about 20^{o}C). This homogenate was filtered through nylon gauze of approximately 80 mesh and only the filtrate used.

Some larvae of the fifth generation were used to test the effect of apple bark of hatching. This bark was prepared as the pear bark, and used in the same amounts.

After inoculation with neonate larvae, the boxes were again left upside down for 24 hours in a sun-lit room, in order to take advantage of the larvae's phototropism and direct them to their food. The next day, the boxes were transferred to the incuabator. When larvae of about 1. 5 cm length or more were to be transferred to fresh media, they were provided with a cavity extending to approximately half of the depth of the medium. This was obtained by pushing a glass rod about 0. 5 cm in diameter into the medium. The purpose was to hasten larval penetration. For the first month of breeding, the boxes were closed with tight fitting, one-piece, soft plastic lids. Thereafter the lids bore a copper grid of 100 mesh for ventilation.

The Citrus blossom moth Prays citri Milliere (Iponomeutidae)

The citrus blossom moth attacks the citrus flowers, in particular those of the cederate and Eureka lemon, whose flowers are available all year round. The larva feeds upon all parts of the blossom, stamen pistol included. In severe attacks the yield of fruit is reduced.

The biology and control of this pest is being pursued by Amos Rubin (1961) of the Citrus Marketing Board. Among others a survey of parasites has been carried out and it was found that the Tachinid Nemorilla maculosa Meig. parasitizes the larvae to some degree, and that there is reason to believe that larvae of Chrysopa feed upon the moth larvae.

The situation in 1966-67

Trichogramma minutum has been imported from Russia and Australia, and are being bred for release in the groves. The American strain of this parasite did not attack eggs of P. citri.

V A R I A

The Alfalfa seed Chalcid-Bruchophagus gibbus Bohn.

In a study on the status of the Alfalfa seed Chalcid, Harpaz (1954) found in July 1952 about 80% of the Alfalfa seed at the Kubeiba farm were infested with Bruchophagus gibbus Bohn. Of the wasps which emerged from the seeds there were many parasites. These belonged to Habrocytus medicaginis Gan. and Tetrastichus sp. Being so numerous, Harpaz thought, they would reduce the number of hosts in the following generations.

The Green Bug Nezara viridula L.

In Israel the green bug Nezara viridula L. is a pest of secondary importance. It attacks certain vegetables, especially tomatoes, it may leave its unpleasant odour on fruit and berries, and may suck dry the seeds of various plants. Ordinarily it is not extremely abundant, and may be controlled by certain insecticides. However, outbreaks of the bug occur in certain years, as happened in 1935 and 1949. The eggs of this bug are parasitized by a Scelionid, Telenomus megacephalus (Ashm) which keeps the bug fairly under control. It was thought that the outbreaks of the bug were due to the fact that the parasite, for one reason or another, failed to keep its host under control. Peleg (1958) made a study of this parasite and host with the endeavour to clarify the role of the parasite, its biology, phenology and ecology, details of which were lacking for Israel. Peleg reared the bug and its parasite both in- and out-doors and made field surveys. The following are his findings:

Th. wasp completes its development within 24 days at a temperature of 20°C, and R. H. 70%; and within 10 days at a temperature of 27-28°C and the same R. H. The threshold of development was set at 14.3°C while the development required 317day degrees C.

The preoviposition period is very short; right after mating the female searches for host eggs to oviposit. One female may lay as many as 198 eggs; on the average 165 are laid by one female. Most of its eggs, about 70%, are laid during the first two days, the rest within the following few days. The female may live a few days after completing its oviposition. In all, ovipositing females may live 10 days, the average length of life is 6 days at 24°C; and 4 days at 27°C; at this temperature also oviposition decreased. Parasitized eggs of Nezara are more resistant to extremely high temperatures than non-parasitized. The former totally succumbed to a 37°C and 40% R. H. after 72 hours, the latter after 36 hours. The eggs may be parasitized within the first third of its development period. After this it seems that the embryo is less susceptible to the parasite which can not feed