Israel Journal of Entomology vol. II, 1967,

The Phenology of the Alfalfa Weevil, Hypera variabilis Hbst. in Israel. *

by

Venezia Malamed-Madjar.

SUMMARY

A survey was made of leguminous crops growing throughout Israel during 1956 - 1963, with the purpose of obtaining information on the occurrence and phenology of the alfalfa weevil, Hypera variabilis . It was found that the alfalfa weevil was more abundant in the northern than in the central and southern parts of the country.

The pest prefers alfalfa to other leguminous crops, and the number of larvae found in it was significantly higher than that found in other crops.
Larvae were also found in vetch, but never in clover.

The adults which walse up from aestivation appear in December, while the peak of their population occurs in January. As the new generation begins to appear in April there is a slight rise in the adult population. The peak in the larvel population occurs in March.

Introduction.

The occurrence of the alfalfa weevil in Israel was mentioned in the 1930's by Bodenheimer (1) and Rivnay (5). However, at the time, this insect was not considered an important pest or one which was liable to cause serious damage. Only in recent years, with the extension of the irrigation field area, and thus with the increase of favourable conditions, did the damage by this weevil increase also.

Due to the lack of knowledge on the phenology of this pest, the survey of leguminous crops was made in various parts of the country. The survey was carried out during the period 1956-1963, and the aim was to obtain information on the date of its appearance, its abundance on the different crops at the various localities, and to follow the fluctuations in its population.

Methods.

Observation fields were selected in the northern, central and southern areas of the country: the Hula valley, Carmel coast, Bet Dagan, Masmiya, Be'er Tovyia and Gilat. Visits were made regularly once in two weeks, to each of the observation fields. While walking slowly in all corners of the field, one hundred sweeps with an insect net of dense fabric were made over the crop.

Sweeps were made between the hours of 10.00 and 12.00 noon, when the insects were most active. This time was chosen on the basis of previous observations in a large alfalfa field near the Experiment Station grounds. On that occasion, the survey lasted for three complete days, with one hundred sweeps made every hour between 8.30 and 15.30; the respective number (average for one hundred sweeps) of beetles caught in these sweepings in the various hours of the day are given herewith.

Hour	8.30	9.30	10.30	11.3	12.30	13.30	14.30	15.30
Number of weeviles caught	11	14	16	25	14.5	9.5	11 and	8

The weevils that were caught during the present survey were brought to the laboratory for identification and counting. Unknown species were identified by R.T. Thomson of the British Musuem. The material collected was compared with these identified specimens.

Results.

Geographical Distribution.

The populations of the alfalfa weevil at the various localities are presented in Table 1.

In the northern Negev (Gilat), the adult and larval population was very low, explained by the low rainfall in that area. The largest population, as determined by the large number of larvae caught, was found in the northern part of the country. Due to the difficulties encountered in catching the adults, there was no correlation between the number of larvae and adults.

Distribution among crops.

The abundance of the pest in three leguminous crops is shown in Table 2.

Table 1. THE ABUNDANCE OF H. variabilis ADULTS AND LARVAE IN VARIOUS PARTS OF THE COUNTRY (Number of individuals in 100 sweeps)

Site and region	Adults	Larvae
Hula valley, Northern	150	5716
Carmel coast, Northern	101	6559
Bet Dagan, Central	226	2754
Masmiya, Southern	92	3508
Be'er Toviya, Southern	100	2463
Gilat, Southern	26	1536

Table 2. THE ABUNDANCE OF ADULTS AND LARVAE OF H. variabilis IN VARIOUS HOST PLANTS (Number of individuals per 100 sweeps)

Host	Adults	Larvae
Alfalfa	156	8200
Vetch	324	918
Clover	44	0

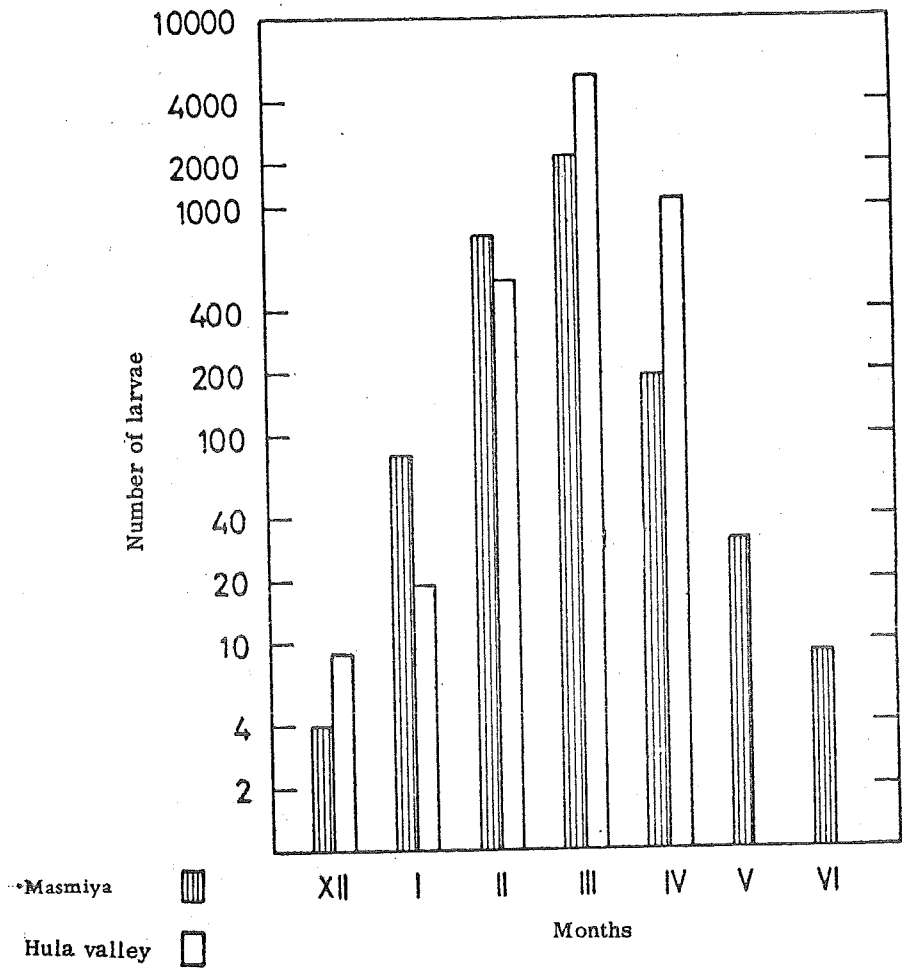
The large number of larvae in alfalfa was outstanding. In vetch, the number of larvae was lower regardless of the large number of adults which were caught in those fields. In clover, no larvae were found, although some adults were present in the field.

At Bet Dagan, the first appearance of adults, after waking up from the summer diapause, was in December (whereas at other localities the first adults appeared in November). The peak was reached in January, after which a decline took place. With the appearance of the new generation in April, a rise in the adult population occurred. In May, the rise in temperature caused a decline in the activity of the beetles, and in June only single individuals were caught in the net. At that time, most of the beetles were in diapause.

The fluctuations of the larval population in the Hula area and at Masmiya are presented in Fig. II.

Fig. II. Seasonal fluctuations of the larvae populations of H. variabilis at Masmiya and the Hula valley.

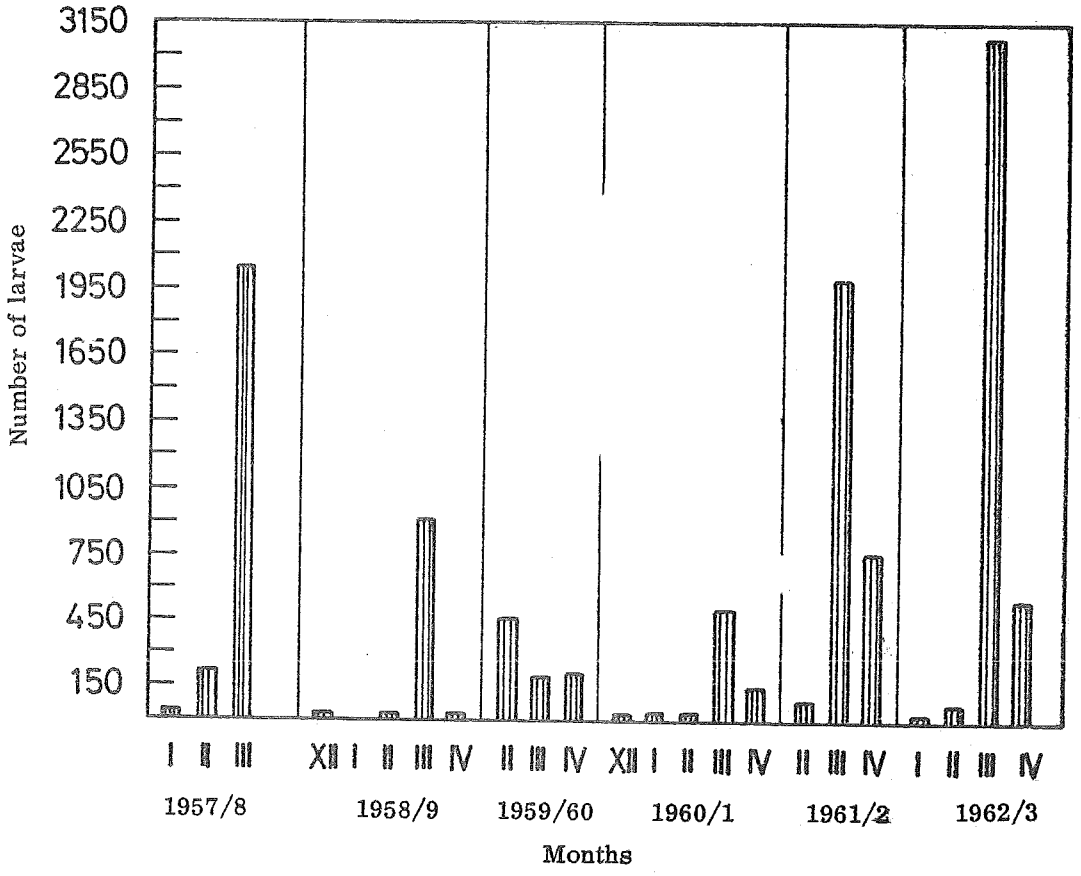
(Each column presents the monthly average of larvae caught during all the years of the survey.)



At both localities, the first larvae appeared in December, but only in February was a distinct rise in their population noticed, and in both places the peak was reached in March. In the Hula valley, many larvae were collected also in April, but none were found in May or June. The same picture was obtained also along the Carmel coast. On the other hand, at Masmiya the population dropped considerably in April, but some larvae were found as late as May and June. A similar picture was obtained also at other sites in the southern area, namely at Bet Dagan and Be'er Toviya.

Fluctuations of the larval populations in the Hula valley for the seven years of the survey are shown in Fig. III.

Fig. III. The fluctuation of the larvae population of H. variabilis in the Hula valley during 1957-1963.

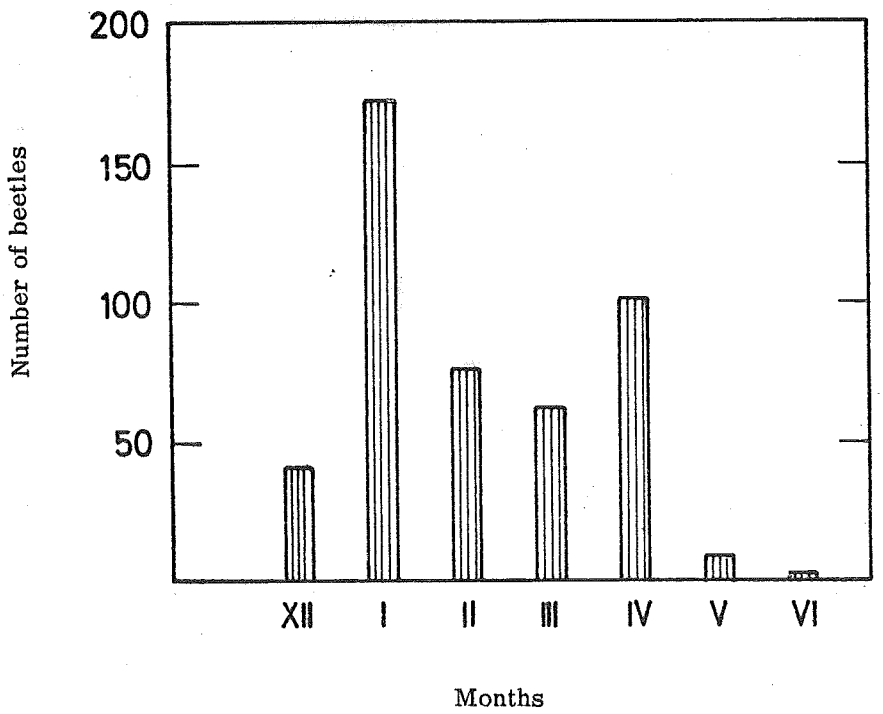


Fluctuations in Population.

Adults: The fluctuation in the adult population of Hypera variabilis at Bet Dagan is illustred in Fig. I.

Fig. I. Seasonal fluctations in the adult population of H. variabilis at Bet Dagan.

(Each column presents the monthly average of adults caught during the years of the survey)



There were distinct differences in the number of larvae in the various years, which may have been due to the differences in the climatic conditions during the development period (December-April) in the various years. Thus, the rain in December affects the date of the emergence of the aestivating adults, while the decrease in the temperature during the winter to below the threshold of reproduction (11°C.) prevents oviposition. The temperatures and precipitation at Dafna (Hula valley) for the various years are given in Table 3. Large larval populations occurred in 1957/58, 1961/62 and 1962/63, in which years precipitation was plentiful, and favourable temperatures prevailed during December-February.

Table 3. AVERAGE MONTHLY TEMPERATURES, AND AMOUNT OF PRECIPITATION, DURING THE RAINY SEASON IN THE YEARS 1957-1963 AT DAFNA (Hula valley).

	1957/58		1958/59		1959/60		1960/61		1961/62		1962/63	
Month	Temp. (°C)	Rain (mm)	Temp. (°C)	Rain (mm)	Temp. (°C)	Rain (mm)	Temp. (°C)	Rain (mm)	Temp. (°C)	Rain (mm)	Temp (°C)	Rain (mm)
November	18.5	49.0	18.8	2.7	17.5	27.4	19.4	103.4	17.1	-	21.7	Drops
December	13.5	184.5	14.8	79.3	14.8	42.3	16.6	32.5	13.8	-	14.1	223.9
January	12.3	232.3	12.4	153.2	13.2	115.2	11.7	95.5	13.5	123.3	13.3	123.9
February	13.6	26.6	8.1	131.0	14.2	33.4	10.8	174.5	11.9	96.3	14.7	97.7
March	16.1	34.4	12.4	68.1	14.9	118.0	13.4	40.1	17.4	10.4	13.5	68.2
April	19.9	9.3	19.1	10.2	18.5	19.3	18.0	58.9	17.8	8.0	18.3	47.2

In 1958/59, the number of larvae caught was much reduced. Precipitation in December was poor and the temperature in February was below the threshold of oviposition, and therefore the number of larvae was lower. The lowest number of larvae was found in 1959/60 and 1960/61, during which precipitation was poor (in 1959/60 in December and February, and in 1960/61 in December and January).

Discussion.

Analysing the results of the survey regarding the distribution and abundance of the alfalfa weevil in the various crops, one must take into consideration the drawbacks in the method by which the survey was made, namely the sweeping with the insect net. The adults of the weevil react very quickly to every slight movement in the field, and surely reacted to the sweeping action; some feigned death, dropped to the ground, and thus escaped the net. On the other hand, the larvae are stationary, between the leaves on the top of the plant, and easily caught in the net. The number of larvae caught present the true picture of the pest's abundance in the field. It should be borne in mind that the neonate larvae which are still in the stem were not included in the counts.

Regardless of the drawbacks, this method is accepted by other writers (3, 4) and under the conditions of our survey, it was the most suitable method.

The fact that no larvae were caught in clover fields shows that this insect cannot develop in this plant, although adults may feed on it when no other food is available.

The survey showed that in the fields in the southern part of the country larvae were found as late as May and June, while in the north they disappeared in April. It was earlier (2) pointed out that the rise in temperature in the spring may shorten the preoviposition period, and often weevils of the new first generation which matured early in the season may lay eggs and give rise to a second generation. It seems that, due to the higher temperature, such sexually mature beetles were available in those southern fields, and the larvae collected in May and June were probably the offspring of these beetles.

During six years of the survey, the peak of the larval population did not always occur at the same date. The threshold of oviposition of the weevil is 11^{0}C. (2). If the temperature in January and February when the major portion of the egg laying usually occurs, is about 11-12^{o}C, oviposition ceases, and is resumed only when the temperature rises above the threshold. Larval development is also retarded by low temperatures, and in years of low temperatures the population peak may occur two or three weeks later than usual.

References.

1. Bodenheimer, F.S. 1930. Die Schädlingsfauna Palästinas. Verlag Paul Parey, Berlin.

2. Melamed-Madjar, Venezia. 1963. The biology of the alfalfa weevil Hypera variabilis in Israel. Ktavim 13(1):41-49. (in Hebrew).

3. Michelbacher, A.E. and Essig, E.O. 1934. A progress report on the behaviour of the alfalfa weevil in middle California, 1933. J. econ. Ent. 27(6):1192-1127.

4. Milliron, E.E. and MacCreary, D. 1955. The alfalfa weevil in Delaware, 1953-4. J. econ. Ent. 48(3):283-289.

5. Rivnay, E. 1936. A pest of alfalfa and clover. Hassadeh 16: 546. (In Hebrew).

6. Snow, S.J. 1925. The Alfalfa Weevil in Nevada and its Control by Spraying. Bull. Nev. agric. Exp. Stn. No. 108.