

POSSIBLE SOURCES OF BIOLOGICAL CONTROL FOR SUNFLOWER MOTH IN IRAN

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The sunflower moth, *Homoeosoma nebulellum* Schiff is the principal pest of cultivated sunflowers in Iran. Since few years ago, that sunflower has been cultivated in vast areas, this insect has been considered as an economical pest. In 1966 this pest was recorded from Gorgan, and later on it was found in other parts of the country as the most important pest of sunflower. At the present time it has been collected from Mazandran, Azerbaijan, Central parts of the country (Karaj and Varamin) and Southern parts such as Khuzestan and Shiraz.

Many research works have been conducted on the effectiveness of insecticides applied to control this pest, but very little has been conducted on nonchemical methods. Some of the research workers such as Carlson, 1967; Teets and Randolph, 1968 and 1970, have insisted on nonchemical measures for this pest, but nearly no report is given on biological control of it. In this paper some possible sources of biological control in Iran are reported. I hope this would be a starting point to use the biological agents to suppress the population of this pest in Iran as well as in other parts of the world.

A BRIEF NOTE ON THE BIOLOGY OF SUNFLOWER MOTH IN IRAN

The biology of this pest has been studied in Gorgan and Gonbad area since 1970. It produces four generations annually two of which are economically important, and the other two attack the wild plants and weeds such as *Cirsium sp.*, *Cardus sp.* and *Carthamus sp.* The adults emerge at the early June starting their activities one day later. On the average they live about 5 days, during which each female deposits more than 200 eggs. Most of eggs are laid on the anther of stamens, although some are laid on the other parts such as petals and sepals. The important point is the great attraction of females to the anthers for oviposition. The incubation period lasts about 4—5 days and each larva destroys

up to a maximum of 12 seeds. The pupae form 3—4 cm below the soil and the whole period for development of one generation takes about one month. In general our data show that 30—80 per cent of our plants were attacked by sunflower moth, and on each plant there has been found up to 50 larvae.

MATERIAL AND METHODS

This research has been conducted since 1969. Nearly all our observations were accomplished at the northern part of the country specially in Gorgan and Gonbad areas. Parasitized larvae of sunflower moth were picked from the sunflower fields. The parasites were emerged in laboratory, and used for identification. The percentage of parasitism was calculated on the data collected from 36 fields at 29 villages during a two year period. An attempt was made to rear the sunflower moth larvae on an artificial diet in the laboratory. This was the first step to prepare an adequate culture to raise the population of the parasitic wasp.

RESULTS AND DISCUSSIONS

For the first time during the summer 1969 I reported the presence of parasitized larvae of sunflower moth from Gonbad area. The sunflower moth larvae were parasitized by an ectoparasitic larva of a small wasp belonging to Braconid family. During 1970 those parasitized larvae were found in sunflower fields at Gorgan too, but the level of parasitism was so low compared to what was observed at Gonbad area.

Later on, this parasite was identified as *Habrobracon hebetor*.

The wasp has a yellow-brown colour, of about 3 mm long, antennae too long, in females it has 14 segments and in males includes 20 segments. Head is yellow. Compound eyes and occipute are dark. There are three dark spots on the pronotum, the middle one being extended to the neck of the insect.

The parasitic larva has a white pale appearance at the beginning, but gradually changes to red and grey. More than one larva attack the sunflower moth larvae, and we counted up to 14 parasites on each host. The female parasites lay their eggs on the dorsal part of moth larva. It seems that the female parasite paralyses the host before oviposition. Many of sunflower moth larvae were observed motionless because the female parasites were laying egg on them. The eggs are white in colour and have an arched shape. When the eggs hatch the larva starts feeding as an ectoparasite on the host. The wasp larvae are vermiform and quite active. During the two or three days after parasitism the host larvae are motionless but have a healthy appearance, then gradually their colour changes to brown and start being crumpled. Later on the integument is ruptured; a yellow brown hemolymph flows out and the skin becomes flaccid.

The parasitic larvae transform to pupae in the laboratory. They spent about 4 days at the pupal stage, and the adult wasps appeared. All the parasites were found on the fourth and third stages of host larva, and never at the first and second stages larvae were attacked by the parasite. The percentage of parasitism was calculated based on the data collected during a two year period from 36 fields belonging to 29 villages. Although the acreage of cultivated sunflower has not been stable during this period, however it shows more or less the potentiality of the parasite on the area. Table 1 shows the results of these data during 1971.

Table 1

Number of sunflower moth larvae and *Habrobracon* on 1300 sunflower plants during July 1971 at Gorgan and Gonbad area

% of plants attacked by moth larvae	No. of alive moth larvae	No. of dead moth larvae	No. of parasite larvae found	No. of moth larvae carrying the parasite
31	266	444	123	42

The dead larvae of sunflower moth were found in two, separate categories, some of them were dead with a healthy appearance, but the others were crumpled. This shows that there are certainly other factors which eliminate the population of this pest and we will discuss it later on. During 1972 another count was made on the frequency of this pest and its parasite. The results are shown in table 2.

Table 2

Number of sunflower moth larvae and *Habrobracon* on 1000 plants during 1972 at Gorgan and Gonbad area

% of plants attacked by moth larvae	No. of alive moth larvae	No. of dead moth larvae	No. of parasite larvae found	No. of moth larvae carrying the parasite
18	121	243	3	3

Another parasitic wasp belonging to Braconid family was found from samples taken in Gorgan fields. This parasite is bigger than *Habrobracon*, about 6 mm long and reddish-brown in colour. It is an ectoparasite also and attacks the larvae of pest. Nevertheless it is not so abundant and active, it has been known as *Bracon sp.* and will be studied clearly in the future. Also an Ichneumonid wasp was emerged out of one of the pest pupae and we have not found enough specimens of this parasite yet.

Besides the parasites which were mentioned, many sunflower moth larvae were found dead without any parasite on them.

Quite a number of these larvae were collected. They showed different pathological symptoms. Some of them showed lysis, getting brown

from both ends. Then the integument ruptured and the hemolymph was leaking out. In this case we were thinking at viral infection. The majority of dead larvae showed other symptoms. They started getting dark and harden at the head and thorax. The literature was reviewed and we found that Weiser (1969) has mentioned a schizogarine which produces the similar protozoonose symptoms. He named the pathogen as *Matesia povolnyi*. Weiser. Our insect pathologists believe that this pathogen is the most efficient factor to eliminate this pest in our country. They are working on this subject in collaboration with experts in France, and hope to get useful results in the future.

The important conclusion which we draw is the very high mortality of sunflower moth larvae under the natural conditions in Iran. Some of the agents which have caused this high mortality might be employed to suppress the population of this pest which is economically important. Considering the use of *Habrobracon hebetor* for biological control of this pest it might be worthed. This parasite may be reared on the other host insects such as *Plodia interpunctella* which also belongs to phycitid family (Bagheri-Zonooz, 1973). On the other hand there is the possibility of rearing the sunflower moth in the laboratory as the source of food for this parasite (Moradeshaghi, 1972).

Finally the biological control of sunflower moth will overcome a part of the problem of contamination of our environment and food by pesticides.

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