ECOLOGY AND CONTROL OF THE SUNFLOWER MOTH, *HOMOEOSOMA ELECTELLEM* (HULST), IN TEXAS

By

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Summary

A study of the seasonal abundance of the sunflower moth at McGregor, Texas, revealed that the species has 2 population peaks during the growing season. Larval populations on heads of Indian blanket, *Gaillardia pulchella* (Foug.), reached a peak May 2, when 59.7% of the heads were infested. Wild and cultivated sunflowers served as hosts for larvae of the next generation. Populations were extremely high during June and July, but by Aug. they had declined and remained low throughout the remainder of the year.

Nine host plants of the sunflower moth were found in the College Station and McGregor areas. *G. pulchella* (Foug.) and *G. aestivalis* (Walt) accounted for the primary hosts for the 1st-generation larvae. *Ximenesia encelioides* Cav., *Helianthus debilis* T. & G., *Coreopsis basalis* (Otto & Dietr.), *C. grandiflora* Hogg, *Engelmannia pinnatifida* Gray, and *Cassia roemeriana* Scheele, which bloomed in early spring, were suitable hosts. Larval populations in *H. annuus* L. were heavy during June and July. *H. maximiliani* Schrad was found in the early-flowering stages late in Sept., but did not become heavily infested.

Parasites were reared from sunflower moth larvae collected from 3 host plants at College Station and McGregor. Twelve parasites of families Tachinidae, Braconidae, Ichneumonidae, and Perilampidae were recovered. The tachinid, *Clausicella neomexicana* (Townsend), was the most prevalent parasite of larvae collected from heads of wild and cultivated sunflower plants. The braconids, *Chelonus altitudinis* Viereck and *Apanteles* epinotiae Viereck, were the predominant parasites reared from larvae taken from the wild host plant *G. pulchella*. Other hymenopterous parasites reared were *Apanteles homoeosomae* Muesebeck, *Agathis buttricki* (Viereck), *Agathis* sp., *Macrocentrus ancylivorus* Rohwer, *Perilampus similis* Crawford, *Diadegma* sp., *Temelucha* sp., *Pristomerus* sp. no. 1, and Pristomerus sp. no. 2.

Induction of larval diapause of the sunflower moth was found to be dependent upon both temperature and photoperiod. Diapause was induced more readily at 21 than 27°C, but only in photoperiods having 11 hr or less of light/day. Greatest percentages of diapausing larvae occurred among larvae subjected to 10 hr or less light time/day at 21°C, regardless of the photoperiodic exposure of the parents and eggs.

The incicence of diapause was extremely low when larvae were subjected to periodic reductions in either temperature or day-length. A concomitant reduction of temperature and day-length increased the percentage of diapausing larvae to some degree, but this was small compared to percentages obtained

among larvae maintained in days of 11 hr or less at 21°C.

Diapause termination may be influenced by temperature and photoperiod. Diapause termination required less time at 27 than 21°C. Also, larvae which were subject to photoperiods having 11 hr or more light/day, resumed development more rapidly than larvae held in shorter light periods.

Laboratory studies showed that this insect overwintered in the soil and that spring emergence began in early Feb. and continued until late May. Peak emergence (40.0%) occurred Apr. 26.

Chemical control tests at College Station in 1967 showed that 2 applications of methyl parathion, endosulfan, diazinon, and malathion reduced the number of sunflower moth larvae and increased yields. Similar tests at McGregor showed that only endosulfan and carbaryl reduced the larval infestation following 1 application; however, they did not increase yields. Two applications of Supracide, azinphosmethyl, methyl parathion, carbaryl, azinphosmethyl ultra-low-volume (ULV), and methyl parathion ULV increased yields. Plots treated 3 times, except those treated with malathion ULV, had lower infestations than the check plots and yields were increased, except when treated with trichlorfon.

Yields were significantly increased when methyl parathion, endosulfan, or carbaryl were applied at 5-day intervals. Applications at pre-flower, or at 10% flower, in most cases, did not significantly reduce the number of larvae or increase seed yields. Generally, insecticides applied at the 50 and 100% flower stages were most effective.

Tests at College Station in 1968 showed that 2 applications of monocrothophos, carbaryl, malathion, azinphosmethyl, mevinphos, methyl parathion ULV, Dursban, toxaphene, azinphosmethyl ULV, malathion ULV, and parathion reduced the number of larvae and increased yields. Tests at McGregor showed that Abar, endosulfan, diazinon, Supracide, methyl parathion, and naled reduced the larval infestation following 2 and 3 applications. Plots treated twice with endosulfan, diazinon, Supracide, and methyl parathion had significatnly increased yields. Following 3 applications, all treated plots yielded significatnly more seed per acre than the untreated plots.

Insecticide evaluation tests conducted at College Station in 1969 showed that 2 applications of carbofuran, carbaryl, Fundal, methomyl, Monitor, Gardona, azinphosmethyl, phosalone, dimethoate, Du Pont 1642, methyl parathion ULV, and azinphosmethyl ULV reduced the number of larvae. Except for Monitor, all materials tested increased yields. Tests at McGregor showed that 2 and 3 applications of Abar, monocrotophos, endosulfan, Supracide, and malathion significantly reduced the larval infestation. Yields were increased as results of 2 applications of methyl parathion and monocrotophos, and by 3 applications of all of the insecticides tested.

A study of the oviposition habits of the sunflower moth was conducted to determine the most effective time for insecticide application. This study indicated that the 3rd day after sunflower heads opened was the period when greatest sunflower moth oviposition occurred. Data also showed that approximately 75% of the oviposition was completed by the end of the 6th day after the heads opened.

Cultural practices which might be used as means of controlling the sunflower moth were also studied. These studies included dates of planting and resistant varieties.

Data from studies of planting dates conducted at College Station in 1968 showed that sunflower moth larvae infestations were lowest in plots that had been planted Apr. 15 or later. Highest larval numbers were found in sunflower heads from plots planted Mar. 15 and 29. Low insect levels did not always result in high seed yields, due in most cases to inadequate moisture, especially late in the growing season.

Similar studies were conducted again in 1969 at College Station and McGregor. Tests at College Station showed that lowest infestations occurred in sunflowers planted Apr. 17 or later. Studies at McGregor showed that sunflower moth larvae infestations were lowest in plots planted very early (Mar. 12) or after Apr. 25. In general, seed yields increased when larval infestations were low, except late in the season when low yields were the result of inadequate moisture.

Several sunflower varieties and hybrids were tested at McGregor in 1967-1969 to determine the existence of "resistance" to the sunflower moth. A test was conducted in 1967 to determine the degree of resistance exhibited by 14 varieties or hybrids of sunflowers based on the weight of undamaged seed per square centimeter of sunflower head and seed yield per acre. The hybrids, T66001 (S-37-388T2 x HA28), T64001 (S-37-388T2 x HA6 & 43), T56002 (S-37-388T1 x HA6 & 43) 1966V, and T56002 (S-37-388T1 x HA6, 7 & 43) 1965 Conlee, and the varieties, 'Armavirec', 'Kubanec', and 'Lethbridge 159', showed the greatest amount of "resistance". The 2 hybrids, P-21ms x 61/2608-T1-1-1 and HA6, and the varieties, 'Smena', 'Peredovik (Blacklaw sel)', 'Vostok', 'VNIIMK 8931', and 'Peredovik' appeared to be most susceptible to sunflower moth attack.

Varietal resistance studies conducted in 1968 showed that 2 hybrids, T56002 and TAM-CRD P-21 mx x TAM-CRD HA 60, and the variety 'Armavirec' were less severely damaged and lost lower amounts of seed per acre due to sunflower larvae than Valley (Morden I), 'Peredovik', "VNIIMK 8931', 'Smena', and 'Krasnodarets'.

In the 1969 test, the hybrid TAM-CRD P-21 mx x TAM-CRD HA60, and the variety 'Krasnodarets' were not damaged by sunflower moth larvae. The 'Smena' variety showed the greatest degree of susceptibility and showed a 25.3% loss in seed yield. The remaining varieties and hybrids tested were moderately damaged.

Color preference and sex attraction among sunflower moths were studied as possible avenues of controls. Board panels painted red, blue, white, yellow, and green and coated with tanglefoot were placed in the sunflower field to determine their attractiveness to sunflower moths. None of the colors were attractive to either sex of moths. Sex attraction was found to exist among sunflower moths. An average of 117 males per trap were attracted to traps baited with 5 unmated females during a 2-week test period. However, males did not attract females. Traps baited with unmated females and placed outside the sunflower field did not attract males in large numbers.

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