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Seasonal variation in the importance of pollen volatiles on the reproductive biology of the sunflower moth

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Females of the sunflower moth, *Homoeosoma electellum* (Hulst), preferentially oviposit in plants with recently opened inflorescences (Teetes & Randolph, 1969; DePew, 1983), due to the presence of an oviposition stimulant present in the pollen (Delisle *et al.*, 1989). McNeil & Delisle (1989) demonstrated that at 25°C and 16L:8D, virgin females initiated calling behaviour (the emission of the sex pheromone) at a significantly younger age following emergence, spent more time calling, and had a higher rate of ovarian development than individuals held under the same conditions without pollen. While pollen is not used as a food source by sunflower moth adults, it is an essential resource for neonate larvae that are initially unable to feed on other flower parts due to the high levels of the major terpenoid (Rossiter *et al.*, 1986). However, any given host plant will only be available as a suitable oviposition site for a short time period following anthesis as the pollen load will decline due to the action of pollinators, wind and rain. Furthermore, in natural ecosystems host plants are patchily distributed so that the availability of suitable oviposition sites are also unpredictable in space. McNeil & Delisle (1989) proposed that the ability to initiate or delay reproduction depending on the presence or absence of pollen, was a life history strategy permitting sunflower moth females to cope with unpredictable habitat quality. In the presence of suitable hosts rapid maturation permits females to exploit temporarily available oviposition sites, while in the absence of pollen delayed maturation provided females the opportunity to disperse in search of suitable hosts, sometimes over considerable distances (Arthur & Bauer, 1981).

Effect of temperature and daylength. In the present study we wished to determine whether temperature and daylength, cues of predictable seasonal habitat deterioration, modified sunflower moth females' response to pollen. No significant difference was observed in the mean age of calling (2-3 days following emergence) when virgin females were held from emergence at 15°, 20° or 25°C in the presence of pollen. Similarly, in the absence of pollen the mean age of calling was about six days, regardless of whether females were placed at 15° or 25°C upon emergence. Furthermore, daylength had no significant effect on the age of first calling when females were held at 25°C in the presence of pollen. However, in the absence of pollen females held under 12L:12D called at a significantly younger age (3-4 days) than those at 16L:8D. Masaki (1978) reported that the rate of development in the univoltine cricket, *Teleogryllus emma* Ohmachi & Matsumura, varied with daylength and was greatest when the insect was reared under short day conditions. He proposed that this was an adaptation permitting the insect to reach sexual maturity at the appropriate time to produce diapausing eggs before the onset of winter. A similar situation may be occurring in the sunflower moth which overwinters

as a diapausing prepupa. We propose that under fall conditions the energetic costs of dispersing in search of suitable hosts with a well developed egg complement are considerably less than those associated with a delay in the onset of reproduction until suitable hosts are found if, as the result of such delays, some progeny produced do not reach the prepupal stage before the onset of winter.

References

Arthur, A.P. & D.J. Bauer (1981). Evidence of the northerly dispersal of the sunflower moth by warm winds. *Environ. Entomol.* **10**: 523-528.

Delisle, J., J.N. McNeil, E. W. Underhill & D. Barton (1989). *Helianthus annuus* pollen, an oviposition stimulus for the sunflower moth, *Homoeosoma electellum*. *Entomol. exp. appl.* **50**: 53-60.

DePew, L.J. (1983). Sunflower moth (*Lepidoptera*: *Pyralidae*): Oviposition and chemical control of larvae on sunflowers. *J. Econ. Entomol.* **76**: 1164-1166.

Masaki, S. (1978). Seasonal and latitudinal adaptations in life cycles of crickets. In: H. Dingle (ed.), *Evolution of Insect Migration and Diapause*. New York: Springer Verlag.

McNeil, J.N. & J. Delisle (1989). Host plant pollen influences calling behavior and ovarian development of the sunflower moth, *Homoeosoma electellum*. *Oecologia* **80**: 201-205.

Rossiter, M., J. Gershenzon & M.T. Mabry (1986). Behavioral and growth responses of specialist herbivore, *Homoeosoma electellum*, to major terpenoid of its host, *Helianthus* spp. *J. Chem. Ecol.* **12**: 1505-1521.

Teetes, G.L. & N.M. Randolph (1969). Chemical and cultural control of the sunflower moth in Texas. *J. Econ. Entomol.* **62**: 1444-1447.