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**Reproductive biology of *Diadegma semiclausum*
Hellen (Hymenoptera: Ichneumonidae)**

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Abstract

The ichneumonid *Diadegma semiclausum* Hellen has been recorded in many parts of the world as an important parasitoid of diamondback moth, *Plutella xylostella* (Linnaeus), a serious pest of brassica vegetable crops worldwide. Some aspects of reproductive biology were studied in controlled laboratory conditions of $21\pm 1^{\circ}\text{C}$, 16:8 h (light:dark) and 50-60% RH. *Diadegma semiclausum* adults emerge only during the photophase. It has a protandrous emergence pattern because the male developmental time is shorter than the female. Most males emerge in the first half of the photophase whereas females emerge during the second half. Both males and females become sexually mature in <12 h after emergence. When paired with 3-d-old virgin mates, more newly emerged females (<12-h-old) mate, compared to newly emerged males. Females, immediately after eclosion (<1-h-old), do not carry mature eggs in their ovaries, and hence this is a strong synovigenic species. Maternal age affects the egg load, which reaches the maximum by 8 d after emergence. Egg resorption occurs in host deprived females and the number of mature eggs declines with age when >20 d. Females can mature eggs without a food supply, suggesting that it is an autogenous species. Host and plant cues do not enhance the initiation of the egg maturation process in newly emerged females. The longevity of adults *D. semiclausum* is immensely affected by food availability. Sugar fed individuals live 15-20 fold longer than those not provided with food or water after emergence. Females live longer than males. Body size does not affect the longevity of males, but large females live longer than small females, in the absence of food. A single mating does not affect the longevity of either males or females. Egg laying reduces the longevity of the females. Males show active courtship behaviour. Mating success increases with an increasing mate age. Female age is more important than male age, for mating success. Body size does not affect mating success. Neither age nor body size affects the premating and mating periods. Adults mainly mate during the photophase. Repeated mating occurs in continuously paired males and females. A single male can repeatedly mate the same female up to 5 times during 16 h of pairing. Mating duration and mating intervals decrease non-linearly in subsequent matings, after the first mating.

Females oviposit during the photophase. More eggs are laid in the first few oviposition bouts. More fertilised eggs are deposited in the first two oviposition bouts.

Host stage affects body size and developmental time of offspring. The developmental period of the parasitoid is the longest if the host is parasitised at the second instar. Males developing in the third and fourth instars and females in the third instar DBM larvae have the largest developmental periods. The host stage does not affect the sex ratio, parasitism rate and emergence rate. The sex ratio is highly male-biased. Parasitoids produce more female offspring, at higher host density conditions. Parasitism rate is inversely related to the host density. Fecundity is greater at a higher host density. At the density of 30 hosts, a *D. semiclausum* female can parasitise > 600 larvae in her lifetime. Longevity, host larvae mortality, parasitoid emergence rate and egg load at death, are not affected by host density. The parasitism rate reduces with the increase of the female's age. The sex ratio becomes increasingly male-biased, with the increase of age in parasitising females.

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