

## Larval Parasitoids

These wasps sting (lay their eggs in) caterpillars and usually kill it before they would normally pupate. Some wasps put one egg in each caterpillar and one wasp develops (eg *Diadegma semiclausum*) or put multiple eggs in and multiple wasps emerge (eg *Cotesia glomerata*). Usually the wasps are highly specific and will only attack one or a very few species. These two are examples only of the type of parasitism that occurs in very many caterpillars.



*Diadegma semiclausum*

(Solitary parasite of Diamondback moth, *Plutella xylostella*).



*Cotesia rubecula*

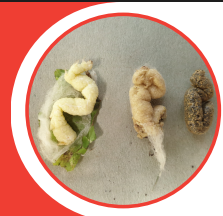
A solitary parasite of *Pieris rapae*



*Cotesia glomerata*

## Polyembryonic Parasitoids

These wasps are tiny and sting the egg of their host, but the larval parasitoids do not develop immediately. The egg divides many times (some many hundreds of times) and the caterpillar is killed late in the larval stage.



*Litomastix*

A polyembryonic parasite of looper caterpillars, *Chrysodeixis*



*Pteromalus*

These wasps sting caterpillars just as they are about to pupate or when they have pupated. This one is *Pteromalus*, attacking a Cabbage white butterfly caterpillar.



## Ectoparasites

All of the above examples of parasitoids are species that insert their eggs inside the host and develop inside. However some lay their eggs externally and the juveniles develop either internally or in some species can develop externally.

The photo above shows a caterpillar attacked by a wasp that has attached eggs to the outside of the caterpillar. The juveniles develop inside the host.

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# BIOLOGICAL CONTROL OF CATERPILLARS



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# Introduction

Caterpillars are pests in many crops because their feeding can seriously damage the plant or the crop to be harvested and so they usually need to be controlled. Insecticides are often applied as first alternatives but there are also naturally occurring biological control agents that can contribute and have significant impact on pest populations. The biological control agents can be predators, parasitoids or pathogens. Here are some of the common insect predators and parasitoids that attack caterpillars. Knowing how to recognize them is the first necessary step and knowing which insecticides are safe to use with them allows biological control and pesticides to work together.



1

## Caterpillars

Caterpillars are the juvenile stages of moths or butterflies. Common pests are Cabbage White Butterflies and Diamondback Moth (which only develop on brassica plants), Heliiothis, Cutworm and Armyworm (which attack a range of crops).

These species have their own specific parasites which are usually species of wasps but could also be species of flies. Generalist predatory insects and spiders will attack a range of caterpillar species. Both the egg stages and the caterpillars can be targeted by these natural enemies.

1 – Armyworm; 2 – Heliiothis (*Helicoverpa armigera*); 3 – Centre grub; 4 – Diamondback moth



2



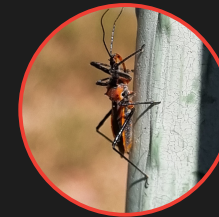
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## Predatory Bugs

Damsel bugs (also known as nabids) are true bugs but they do not feed on plants, only on insects. They prefer to eat small caterpillars but will also feed on aphids.



Assassin bugs (L) and Shield bugs (R) eat larger caterpillars.

## Parasitic Wasps

Each species of caterpillar has its own set of parasitoids that will attack it. These include wasps that will attack eggs, caterpillars or even pupae. They usually live inside the body of the host and so are invisible for much of their life cycle.

## Egg Parasitoids

The most well-known species of egg-parasitoid is *Trichogramma*, which completes its juvenile stages inside moth eggs and emerges as an adult with wings. Parasitised eggs turn black while unparasitized eggs usually have a brown ring just before the caterpillar hatches.

