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BIOLOGICAL CONTROL OF KEY HYMENOPTERAN PARASITOIDS

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Introduction

An insect (parasitoid) that lives on or inside the body of another insect, known as the host, from which it receives nourishment and protection as a young and ability to move free as an adult, is known as a parasitoid. Reuter (1913) coined the term parasitoid. Hymenopteran parasitoids account for nearly 78% of all parasitoids, and their abundance makes them ideal models for parasitoid research (Hawkins and Sheehan, 1994). Parasitoid species are found in many families of hymenoptera, but four families are particularly important for insect pest control, namely the Braconidae, Ichneumonidae, Chalcididae, and Trichogrammatidae (Wharton, 1993).

Braconidae

Braconidae are ecto and endo parasitoids that prey on insects in the coleoptera and lepidoptera orders. Braconids ranged in length from 3 to 13 mm, with an ovipositor that can be as long as half of the abdomen. It has only one recurring vein. Example: Larval parasitoid, Bracon hebetor parasite on the black-headed caterpillar. Chelonus blackburnii, an egg-larval parasitoid parasitises Earias sp. about 15,000 recognised species, this family is regarded as one of the largest and most significant in the order Hymenoptera (Quicke & Achterberg, 1990).

The immature stages of braconids complete their development on their host, whereas the adult species primarily oviposits in, on, or near other insects. They are crucial in the management of numerous crop-field insect pests (Lepidoptera and Diptera), Bracon brevicornis control Pectinophora gossypiella. Braconids have served a significant role in integrated pest management programs as well as the biological control of insect pests known as classical biological control, frequently with notable effectiveness (Shaw and Huddleston, 2012).

Chalcididae

Chalcidids have a non-metallic colouration and are big, sturdy species. The ventral surface of the hind femur has several tiny teeth and is noticeably enlarged. Example: the larval parasitoid Brachymeria nephantidis parasite on Opisina arenosella. There are more than 1500 species and 90 genera in the family Chalcididae worldwide (Noyes, 2011). Though a few species seek neuroptera, coleoptera, and hymenoptera, chalcidids are mostly solitary endoparasitoids of Diptera and Lepidoptera. The majority of them are idiobionts, laying their eggs in hosts that are almost fully developed (Boucek and Narendran, 1981).

Ichneumonidae

The largest class of parasitoids is called Ichneumonidae, and they resemble wasps. The antenna is filiform and longand has one segmented hind trochanter. There are two recurrent veins in the forewing. The abdomen

is three times longer when Compared to the rest of their body. At the end of the abdomen, the ovipositor was extruded. Males are winged or apterous. Example: Eriborus trochanteratus, a larval parasitoid that feeds on the coconut black-headed caterpillar, O. arenosella.

Ichneumonids are essential to the biological control of insect pests, using many different kinds of insects as their hosts. Larvae and pupae of Lepidoptera, Coleoptera, and Hymenoptera are among the common hosts (Gupta, 1991).

Trichogrammatidae

The Trichogramma parasitoid has a length of 0.25–1 mm and is quite small. It parasitises several lepidopterous insects' eggs. Its tarsi are split into three. Light yellow to dark brown in colour, the parasitoid is rarely metallic. Distal setae on the forewing have been divided into separate lines. The hind wings have hairs that resemble fringes. Example of an egg parasitoid on numerous lepidopterous pests is Trichogramma chilonis parasites on Cnaphalocrocis medinalis.

This family includes a few little wasp species, the majority of which are smaller than 1 mm in length in adults. There are over 840 species in the 80 genera that make up this family.

Trichogrammatids are significant biocontrol agents that parasitise the eggs of many different insect orders, particularly the lepidoptera. After mating, the female laid her eggs inside the host egg, and the hatched eggs consumed the contents of the host egg. When completely developed, they pupate within the host eggs before emerging as adults (Saljoqi et al., 2015).

Parasitoids attracts due to the pests

The primary cause of the parasitoid's attraction to a host habitat is the volatile compounds, which can come from the host itself, from species associated to the host, from the host's food, or from a combination of these sources. After an attack by insect herbivores, blends of volatile compounds from the plants are released into the atmosphere (Mumm and Dicke, 2010). In reaction to larval injury, many strongly odorous terpenoid chemicals are generated in early maize seedlings a few hours after the caterpillar damage, luring towards the natural enemies. Since the same terpenoids are also released from the unharmed leaves of injured plants, this reaction is systemic (Turlings et al., 1991).

Herbivore-induced plant volatiles, which are produced when plants are damaged by insects, invite the natural enemies of the pest species and safeguard the crop from harm. Plant secondary metabolites known as HIPVs improve a variety of multitrophic relationships in plant–insect communities that are found both above and below ground (Soler et al., 2007). These HIPVs have gained more attention in recent years due to their ability to lure in natural enemies of common lepidopteran pests.

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