EULOPHID PARASITOIDS AS BIOCONTROL AGENTS

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Eulophids are a group of small parasitic hymenopterans, mostly entomophagous parasitoids and few phytophagous forms. The family is large - sized with about 4260 nominal species occurring in 550 nominal genera. It is one among the twenty families coming under the Super family Chalcidoidea of the order Hymenoptera. They are found in abundance among the vegetation especially the green pastures. Entomophagous eulophids include several species emerging from egg-sacs of spiders and majority attacking insect Pterygota. Predominant among them are larval parasites. Egg parasitoids, egg-larval parasites and pupal parasites are also met with. Pupal parasites are usually gregarious, hundreds of them develop in a single lepidopterous pupa. Ectoparasitism is found in the subfamily Eulophinae and some Tetrastichinae. Eulophines are ectoparasitic on insects burrowing or mining on plant tissues. Bulk of Tetrastichines develops as parasites in galls and egg, larval or pupal parasites on lepidopterans and dipterans. Lepidoptera, Diptera, Coleoptera and Homoptera are the main host groups. A good number are suspected to show phytophagy. Almost all the species in Entedoninae are endoparasitic on coleopterous, lepidopterous and dipterous hosts developing in plant tissues. Little is known of the biology of the subfamily Euderinae. Still some are found to be parasitic on small beetles developing on bracket fungi growing on dead wood.

Figure 1 : Eulophid parasitoid feeding on mealy bug host

DIAGNOSTIC FEATURES

Body weakly sclerotised, mostly less than 3mm. long with or without metallic reflections ; antenna with two to four funicle segments ; mesosoma with well developed prepectus ; mesoscutum with notauli complete , incomplete or absent ; scutellum often with a pair of sub-median grooves ; each leg with four-segmented tarsi.

IMPORTANCE

Majority of Eulophids are entomophagous , either primary or secondary parasitoids of other insects including several major pests of agricultural crops. They attack Insecta Pterygota and egg- sacs of spiders. Most of them are larval parasites. Egg and pupal

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parasitoids are also met with. The main host groups are Lepidoptera, Diptera, Coleoptera and Homoptera that are leaf-miners , gall makers and insect larvae burrowing in plant tissues.

Figure 2: Eulophid parasitoid laying egg on host

*Trichospilus pupivor*us Ferriere and *Tetrastichus howardii* (Oliff) (= *Tetrastichus Israeli* Mani & Kurian) are widely used pupal parasites to control the black headed caterpillar pest , *Opisina arenosella* Walker (= *Nephantis serinopa* Meyrick) of coconut in Kerala(India). *Elasmus nephantidis* Rohwer belonging to the family Eulophidae is a larval parasitoid of the above pest employed in biological control of the same. In order to control the sugarcane leaf hopper, *Pyrilla perpusilla* Walker, its egg parasitoid eulophid *Tetrastichus pyrillae* Crawford is made use of especially in states like Punjab(India).

Tetrastichus howardii (Oliff) (= *Tetrastichus ayyari* Rohwer) is a pupal parasitoid of the sugarcane shootborer, *Chilo infuscatellus* Snellen. The eggs of *Epilachna vigintioctopunctata* Fabricius and *E. dodecatigma* Mulsant, pests of brinjal, tomato, potato and cucurbits are hosts to *Tetrastichus ovularum* and *Achrysocharis appanai*. Pleurotropis epilachnae parasitise the larva of *E. vigintioctopunctata* Fabricius and *E. dodecatigma* Mulsant. Another species of *Pleurotropis*, *P. foveolatus* is parasitic on the pupa of *E. vigintioctopunctata* Fabricius and *E. dodecatigma* Mulsant. *Tetrastichus schoenobii* Ferriere is found to be parasitic on the eggs of paddy stem borer, *Scirpophaga incertulas* walker. The pupal parasite *Tetrastichus howardii* (Oliff) (= *Tetrastichus israeli* Mani& Kurian) is made use of in the control of Rice leaf roller pest, *Cnaphalocrocis medinalis* Guenee. A species of *Pediobius* and *Elasmus* are found to be parasitic on the Rice case worm, *Nymphula depunctalis* Gueneand a species of *Tetrastichus* parasitizes the Top shoot borer of sugarcane, *Scirpophaga nivella*.

Figure 3: Eulophid parasitizing a host larva

Among the pests mentioned in the table, except Epilachna beetles and Pyrilla bugs, all belong to the order Lepidoptera. Among the parasitoids mentioned, many species of

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Tetrastichus like T. howardii (Oliff), T. pyrillae Crawford, T. Schoenobii Ferriere and T. ovularum are parasitic on Lepidopterans. Tetrastichus Haliday, thus is one of the important genera of the family Eulophidae with wide application in biocontrol of agricultural pests. The members of this genus show a subhorizontal propodaeum with inverted Y-shaped median and paraspiracular carinae, densely reticulate sub median areas ; submarginal vein with one or two dorsal setae; and mesoscutum with a median longitudinal sulcus.

Table 1: Parasitoids of some common crop pests with bio- control potential

Eulophid parasitoid	Pest species	Host plant
Trichospilus pupivorus	*Opisina arenosella (= Nephantis serinopa)*	Coconut
Tetrastichus howardii (= Tetrastichus israeli)	*Opisina arenosella (=Nephantis serinopa)*	Coconut
Elasmus nephantidis	*Opisina arenosella (=Nephantis serinopa)*	Coconut
Tetrastichus pyrillae	*Pyrilla Perpusilla*	Sugarcane
Tetrastichus howardii (=Tetrastichus ayyari)	*Chilo infuscatellus*	Sugarcane
Tetrastichus ovularum	*Epilachna vignitioctopunctata & E. dodecastigma*	Brinjal/tomato/ potato/cucurbits
Pleurotropis epilachnae	*Epilachna vignitioctopunctata & E. dodecastigma*	Brinjal/tomato/ potato/cucurbits
Achrysocharis appanai	*Epilachna vignitioctopunctata & E. dodecastigma*	Brinjal/tomato/ potato/cucurbits
Pleurotropis foveolatus	*Epilachna vignitioctopunctata & E. dodecastigma*	Brinjal/tomato/ potato/cucurbits
Tetrastichus sp.	*Scirpophaga nivella*	Sugarcane
Tetrastichus schoenobii	*Scirpophaga incertulas*	Paddy
Tetrastichus howardii (=Tetrastichus israeli)	*Cnaphalocrocis medinalis*	Paddy
Elasmus sp. & Pediobius sp.	*Nymphula depunctalis*	Paddy

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