

Predatory Insects of Pest Insects in a Vegetable Eco System of the Mid Country Region of Sri Lanka

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ABSTRACT. Two species of predatory hoverflies (Diptera: Syrphidae) belong to genus *Syrphus* Fabricius (1775) were identified by a survey in vegetable growing areas of mid country region of Sri Lanka. The *Syrphus* species 1 was collected from aphid colonies on brinjal (*Solanum melongena*), cabbage (*Brassica oleracea* var. *capitata*), long bean (*Vigna sesquipedalis*), pea (*Pisum sativum*) and wing bean (*Psophocarpus tetragonolobus*). The *Syrphus* species 2 was collected from aphid colonies on cabbage (*Brassica oleracea* var. *capitata*) and cauliflower (*Brassica oleracea* var. *botrytis*). One predatory brown lacewing (Neuroptera: Hemerobiidae) species belong to genus *Micromus* Rambur (1842) from aphid colonies on cabbage (*Brassica oleracea* var. *capitata*), and another carnivorous lepidopteran species (Lycaenidae) *Spalgis epius* (Westwood, 1852) from *Pseudococcus* colonies on *Solanum xanthocarpum* were also identified by the survey.

INTRODUCTION

Coccinellids are found to be the most abundant predatory insects in vegetable growing areas in the mid country region of Sri Lanka. Fifteen species of coccinellid belonging to 12 genera of four tribes and three sub-families have been recorded in the area (Mayadunnage *et al.*, 2007). Other than the coccinellids, hoverflies, neuropterans and ape flies are also commonly found insect predators in the above region of Sri Lanka.

The family Syrphidae comprises three subfamilies, 180 genera, and about 6,000 described species (Vockeroth and Thompson, 1987). The larvae of hoverflies of the subfamily Syrphinae are considered as the specialized aphidophagous predators distributed worldwide (Chambers *et al.*, 1986; Vockeroth and Thompson, 1987). At least 49 species of Syrphidae attack green peach aphid, *Myzus persicae* (Sulzer) (Van Emden *et al.*, 1969). The adults feed mainly on pollen and nectar, or honeydew produced by aphids (Gilbert, 1981; Sobota and Twardowski, 2004). Hoverflies, along with other aphidophagous insects play a very important role in the reduction of aphid populations (Sobota and Twardowski, 2004). Therefore, they are the objects of many scientific investigations.

Brown lacewings (Neuroptera: Hemerobiidae) are small to medium size insects which are predaceous both as adults and larvae. They prefer soft-bodied insects such as aphids, mealy

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bugs, and also insect eggs. Because of the high longevity of the adults, voracious appetites (Cutright, 1923), and high reproductive rate (Smith, 1923; Sato and Takada, 2004), they are useful biological control agents (Eilenberg *et al.*, 2001). Among the Hemerobiidae, *Micromus* and *Hemerobius* species appear promising as biological control agents against aphid pests, because of their wide range of prey and habitat (New, 1988). Some species of *Micromus* and *Hemerobius* have already been utilized for this purpose, but limited work has been done.

The aepfly, *Spalgis epius* is a rare butterfly and usually most observers miss it due to its retiring nature, small size and rather drab colour. The genus includes only a single indian species (Satyamurthi, 1966). The larva of *S. epius* has been recorded as a predator on various species of pseudococcids (mealybugs) (Rao *et al.*, 1984; Reddy *et al.*, 1999) and coccids (scale insects) (Mani and Krishnamoorthy, 1996). However the activity of *S. epius* is rarely noticed at present in the field wherever insecticides are used indiscriminately (Venkatesha *et al.*, 2004). Except for being reported as a predator, not much information is available on the biology and behaviour of *S. epius*

There is a potential for using these predators against the inset pests of vegetables. Therefore, this study was undertaken to identify predaceous insects on vegetable pests in the mid country of Sri Lanka other than the coccinellids.

MATERIALS AND METHODS

The study was carried out during January 2007 to January 2008 at the Department of Agricultural Biology, Faculty of Agriculture, University of Peradeniya. The survey to collect predatory insects was carried out in the vegetable growing areas of Mid Country which include, Doluwa, Galaha, Gampola, Kundasale, Meewathura, Marassana, Matale, Peradeniya, and Thalatuoya.

Hoverflies

The study involved the collection of larval stages of hoverflies from conventional farm fields in mid country region. The collected larvae were reared until adult emergence by feeding with aphids. Adults were morphologically characterized and were identified to the species level using published literature (Weems, 1953; Daniel *et al.*, 1976; Beibienko, 1988 and Borrer *et al.*, 1989).

Neuropterans

Larval and adult stages of predatory neuropterans were collected when they were associated with aphid colonies in the same vegetable fields. Larval stages were reared in the laboratory by feeding with aphids until adult emergence. The adults were mounted, labeled and identified up to genus level using published literature (Tillyard, 1923; Borrer *et al.*, 1989).

Ape fly

Predatory larval stages of ape fly were collected when they were associated with mealybugs (*Pseudococcus* spp.) at the vegetable field established in the premises of Faculty of Agriculture, University of Peradeniya and a home garden located in the same area. Adults were mounted, labeled and identified up to species level using published literature (Bingham, 1907; Satyamurthi, 1966; Venkatesha *et al.*, 2004).

RESULTS AND DISCUSSION

Hoverflies

Forty two hover fly larvae were collected when they were associated with aphid species on brinjal (*Solanum melongena*), cabbage (*Brassica oleracea* var. *capitata*), cauliflower, (*Brassica oleracea* var. *botrytis*), long bean (*Vigna sesquipedalis*), pea (*Pisum sativum*) and wing bean (*Psophocarpus tetragonolobus*). Out of all, 34 adults emerged and eight specimens were found to be parasitized. Two different species of aphidophagous hoverflies belonging to the subfamily Syrphinae were identified from the vegetable fields of Mid Country, Sri Lanka.

Syrphus species 1

Individuals of this species were collected when they were associated with aphid species on brinjal (*Solanum melongena*), cabbage (*Brassica oleracea* var. *capitata*), long bean (*Vigna sesquipedalis*), pea (*Pisum sativum*) and winged bean (*Psophocarpus tetragonolobus*). Out of the total emerged hoverflies 20 specimens belonged to *Syrphus* species 1.

Adults are medium sized flies (length 10.0-13.0 mm); lower lobe of squamae is large and without long yellow hairs on upper side. Antennae short (Figure 1) and inserted above middle of face, arista inserted near base of oval third joint. Eyes bare, yellow scutellum largely convex and semicircular with fringe of hairs below margin. Wings simple, third vein only slightly curved, anterior cross vein before middle of discal cell (Figure 3 and 3a). Legs simple, slender, hairy; tarsal claws well developed; fore and middle legs with coxae dark brown, remaining parts more or less yellowish, except brownish; tarsi hind legs completely blackish brown. Abdomen is oval with prominent yellow cross bands (Figure 5) (Weems, 1953 ; Daniel *et al.*, 1976; Beibienko, 1988 and Borrer *et al.*, 1989).

Syrphus species 2

This species was collected when they were associated with aphid species on cabbage (*Brassica oleracea* var. *capitata*) and cauliflower, (*Brassica oleracea* var. *botrytis*). Out of the total emerged hoverflies, 14 specimens belonged to *Syrphus* species 2.

They are medium size flies (length 9.0-9.5 mm) with yellow pattern on abdomen. Lower lobe of squamae is small and without long yellow hairs on upper side. Antennae short, arista inserted near base of oval third joint (Figure 2). Eyes bare; yellow scutellum largely convex and semicircular with fringe of hairs below margin. Wings simple (Figure 4 and 4a), third vein only slightly curved, anterior cross vein occurs before middle of discal cell. Legs

simple more or less completely yellowish except hind tarsi darker brownish, slender hairy; tarsal

claws well developed. Paint, grey, dorsal stripes running longitudinally on the thorax. Abdomen is narrow, having secondary black bands (Figure 5) (Weems, 1953; Daniel *et al.*, 1976; Beibienko, 1988; Borrer *et al.*, 1989).

Neuropterans

Micromus Rambur

Sixteen specimens of *Micromus* were collected when they were associated with aphid species on cabbage (*Brassica oleracea* var. *capitata*). Adults are brown and front and hind wings similar in size and shape. Fore wings with more radial sectors. Nearly all costal cross veins branched or forked at the tip (Figure 6). Forewing consists of costal area quite narrow at base, lacking a recurrent humeral vein. The wing membrane has microtrichia, ovipositor not exerted, antenna moniliform and front legs not raptorial. Prothorax is normal size and not elongated (Figure 7) (Tillyard, 1923; Borrer *et al.*, 1989).

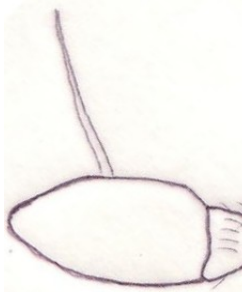


Figure 1. Antennae of *Syrphus* species 1 (4.9x10x6.23)

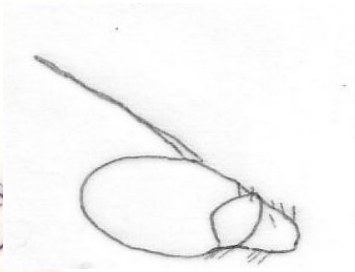


Figure 2. Antennae of *Syrphus* species 2 (4.9x10x 6.23)

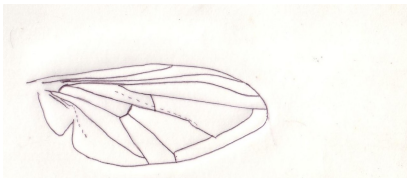


Figure 3. Wing of *Syrphus* species 1 (1x10x6.23)

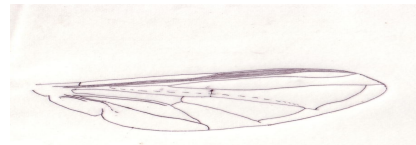


Figure 4. Wing of *Syrphus* species 2 (1x10x6.23)



Figure 3a. Wing of *Syrphus* species 1



Figure 4a. Wing of *Syrphus* species 2



Figure 5. Dorsal view of the abdomen of *Syrphus* species 1 (left) and *Syrphus* species 2



Figure 6. Fore wing (left) and hind wing of *Micromus* species



Figure 7. Habitus view of *Micromus* species

Ape fly

Spalgis epius

Six specimens of *S. epius* were collected from *Pseudococcus citri* on Thai egg plant (*Solanum xanthocarpum*). The species has been reported associated with *Planacoccus citri*

(on cocoa (*Theobroma cacao*)) (Nagalingam and Dharmadasa 2008), *Pseudococcus lilacinus* and *Pseudococcus citri* (De Silva, 1961).

The adult of *S. epius* is a small butterfly with dark brown wings above, and grey underside with dark striations. Forewing has a small quadrate spot at the cell end in male and larger and somewhat diffuse in female (Figure 8). Dorsal side of the thorax is dark and glossy, whereas ventral side is covered with layers of white hair. The antennae, head, thorax and abdomen are pale brown. The last branch of R in the front wings (R 3-5) is forked (with the branches R3 and R 4+5) and arises at the anterior apical angle of the discal cell (Figure 9) (Bingham, 1907; Satyamurthi, 1966; Venkatesha *et al.*, 2004).



Figure 8. Dorsal (A) and ventral views (B) of *Spalgis epius*

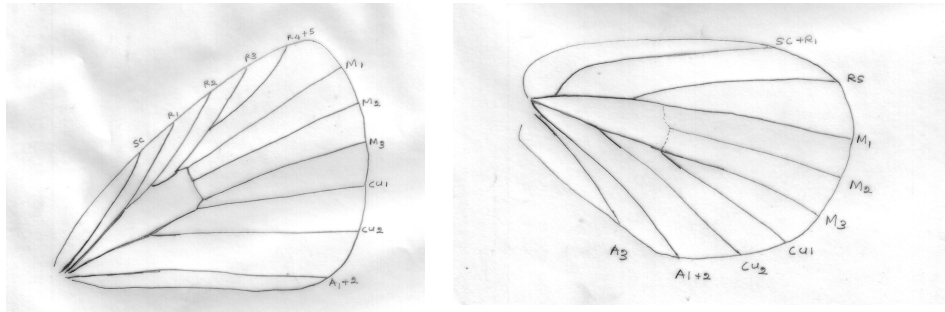


Figure 9. Fore wing (left) and hind wing (right) of *Spalgis epius* (2x10x6.2)

CONCLUSIONS

Two species of predatory hoverflies belong to genus *Syrphus* and one predatory brown lacewing species belong to genus *Micromus* and *Spalgis epius* a carnivorous butterfly species were identified in vegetable growing areas of mid country region of Sri Lanka.

Further studies are in progress for comprehensive exploration of predatory fauna in the vegetable ecosystems of mid country of Sri Lanka.

ACKNOWLEDGEMENT

The authors wish to acknowledge the Council of Agricultural Research Policy of Sri Lanka for financial support (Grant No: 12/616/464) to conduct this study. Mrs. G. Kumuduni, Mr. M.R.M. Favas and Mr. U.G.L.T. Gunawardena provided assistance during the study.

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