

Predatory Coccinellids (Coleoptera: Coccinellidae) of Vegetable Insect Pests: A Survey in Mid Country of Sri Lanka

S. Mayadunnage, H.N.P Wijayagunasekara¹, K.S. Hemachandra¹
and L. Nugaliyadde²

Postgraduate Institute of Agriculture
University of Peradeniya
Peradeniya, Sri Lanka

ABSTRACT. An extensive survey of predatory Coccinellid beetles (Coleoptera: Coccinellidae) was conducted in the vegetable grown areas of the Mid Country, Sri Lanka. A total of 2682 specimens of Coccinellids were collected. Fifteen different species belonged to 12 genera of four tribes and three sub-families were recorded. The three sub-families include Coccinellinae Latreille, 1807, Chilacorinae Mulsant, 1846, and Scymninae, Mulsant, 1846. Eight species belonged to the sub-family Coccinellinae Latreille, 1807 and tribe Coccinellini Latreille, 1807 were collected and identified as: *Anegleis cardoni* (Weise), 1892, *Coccinella sexmaculata* (Fabricius), 1781, *Coccinella transversalis* Fabricius, 1781, *Coccinella octomaculata* (Fabricius), 1781, *Illeis cincta* (Fabricius), 1850, *Micraspis discolor* (Fabricius), 1850, *Propylea dissecta* (Mulsant), 1866 and *Synonycha grandis* (Thunberg), 1781. Two species namely *Brumoides suturalis* (Fabricius), 1798 and *Chilocorus nigritus* (Fabricius), 1798 representing sub-family Chilacorinae Mulsant, 1846 and tribe Chilacorini Mulsant, 1846 were identified from the mid country. Two species occurred from sub-family Scymninae Mulsant, 1846 and tribe Aspidimerini Mulsant, 1846 were: *Cryptogonus orbiculus* (Gyllenhal), 1850, and *Pseudaspidimerus trinotatus* (Thunberg), 1781. Three species namely: *Axinoscymnus puttardriahti* Kapur and Munshi, 1965, *Scymnus (Pullus) latemaculatus* Motschulsky, 1858 and *Scymnus (Scymnus) nubilis* Mulsant, 1850 belonged to sub-family Scymninae Mulsant, 1846 and tribe Scymnini Mulsant, 1846 were also collected. Most of the Coccinellid beetles were observed while feeding on aphids and plant hoppers. Further studies are in progress to investigate the Coccinellid predatory beetles found in the mid country of Sri Lanka.

INTRODUCTION

Coccinellids or ladybird beetles belonging to the family Coccinellidae, are the most commonly known of all beneficial insects. Adult ladybird beetles are dome shaped, oval or convex, often shiny with short legs and antennae. Wing covers are dark, reddish-orange to pale-yellow, with or without black spots or irregular marks; some are solid black or black

¹ Department of Agricultural Biology, Faculty of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka.

² Department of Agricultural Biology, Faculty of Agriculture, University of Ruhuna, Sri Lanka.

with a red spot. The head is concealed from above. Larvae are elongate, somewhat flattened, and covered with minute tubercles or spines (Fleming, 2000).

The family includes about 3000 species of beetles, distributed across the world (Iperti, 1978). In the Indian subcontinent, 36 species of true aphidiphagous Coccinellids have been reported (Agarwala and Ghosh, 1988).

The majority of Coccinellids are predatory, chiefly on aphids and coccids, some feed on aleuroides or acarines and some tribes develop on fungi like *Oidium* (Iperti, 1978). They also prey on young instars of Lepidoptera and Coleoptera (Hodek, 1964). The introduction of Vedalia ladybird beetle, *Rodolia cardinalis* Mulsant, from Australia in to California in 1888 to control cotton cushion scale, *Icerya purchasi* which threatened the citrus industry, is the most successful instance of biological pest control (Fleming, 2000).

There is a potential of using Coccinellid beetles as predators of vegetable pests, which compell farmers to use farmily pesticides creating number of social, economic and health problems. The number of predatory Coccinellids species one also high when compared with other predators of vegetable pests.

The present study was undertaken to explore and prepare an inventory of the predaceous Coccinellids prey on vegetable pests in the mid country of Sri Lanka.

MATERIALS AND METHODS

The study was carried out during September 2006 - April 2007 at the Department of Agricultural Biology, Faculty of Agriculture, University of Peradeniya. The study involved the collection of Coccinellids from fields followed by preservation and identification. The survey to collect predatory Coccinellids was carried out in vegetable growing areas of Mid Country including, Doluwa, Galaha, Gampola, Kadugannawa, Kundasale, Meewathura, Marassana, Matale, Peradeniya, Pilimathalawa and Thalatuoya. Each locality was repeatedly sampled using several collecting methods such as sweep net, aspirator and hand picking.

Adult insects collected from various vegetable crops were killed in a killing bottle and mounted on pins and labeled to indicate host plants, locality and date. Naphthalene tablets were placed in the collection boxes to protect the specimens. Immature stages were reared and when adult emerged they were preserved for identification.

Identification of specimens

Field collected beetles and immature stages of Coccinellids were morphologically characterized and the adults were identified to the species level using published literature (Balbarino and Ceniza, 2005; Poorani, 2002; Poorani, 2001; Booth, 1998; Kuznetsov, 1997; Leeper, 1975; Nagaraja and Hussainy, 1967; Selhime, 1956).

RESULTS AND DISCUSSION

Fifteen species of predatory beetles belonging to four different tribes and three sub-families; Coccinellidae Latreille 1807, Chilocorinae Mulsant 1846 and Scymninae Mulsant 1846 were identified from the vegetable fields of Mid Country, Sri Lanka (Table 1).

Table 1. Predatory Coccinellids species collected from vegetable grown areas in mid country, Sri Lanka.

Sub-family	Species Identified	Number	Frequency (%)
Coccinellinae	<i>Anegleis cardoni</i> (Weise)	42	3.62
	<i>Coccinella sexmaculata</i> (Fabricius)	93	8.02
	<i>Coccinella transversalis</i> Fabricius	313	27.01
	<i>Coccinella octomaculata</i> (Fabricius)	11	0.95
	<i>Illeis cincta</i> (Fabricius)	294	25.37
	<i>Micraspis discolor</i> (Fabricius)	206	17.78
	<i>Propylea dissecta</i> (Mulsant)	118	10.18
	<i>Synonycha grandis</i> (Thunberg)	5	0.43
Chilocorinae	<i>Brumoides suturalis</i> (Fabricius)	20	1.72
	<i>Chilocorus nigritus</i> (Fabricius)	6	0.52
Scymninae	<i>Cryptogonus orbiculus</i> (Gyllenhal)	1	0.08
	<i>Pseudaspidimerus trinotatus</i> (Thunberg)	20	1.72
	<i>Axinoscymnus puttardriahi</i> Kapur and Munshi	4	0.34
	<i>Scymnus (Pullus) latemaculatus</i> Motschulsky	10	0.86
	<i>Scymnus(Scymnus) nubilis</i> Mulsant	16	1.38

Sub-family Coccinellinae Latreille

Tribe: Coccinellini Latreille

Anegleis cardoni (Weise) [Figure 1A]

Anegleis cardoni is commonly found all over the sampled areas in the Mid Country and were collected while feeding on aphids (*Aphis gossypi* (Glov), *Myzus persicae* (Sluz),

Aphis craccivora Koch). The beetle species also has been recorded in India and Pakistan (Poorani, 2002). The beetle is 4 - 5 mm in length and having three characteristic black stripes and two black dots on yellow elytra.

***Coccinella sexmaculata* (Fabricius) [Figure 1B]**

Coccinella sexmaculata was collected while feeding on insect pest such as *A. gossypi* (Glov), *M. persicae* (Sluz), *A. craccivora* Koch, *Amrasca* spp *Empoasca vitis* and *Leptocentrus* spp. Both *C. sexmaculata* and *C. transversalis* have been exhaustively studied in the subcontinent as they are highly voracious and fecund, and have a wide prey range, which includes, aphids, coccids, diaspid, aleyrodids, *etc.* (Agarwala and Yasuda 2000; Omkar and Bind, 2004). This is a small round beetle 3 - 4 mm long, its colour varies from yellow to canary yellow and forum with a black elytra and also present. The species has been recorded in, India, Nepal, Japan, Indonesia and China (Poorani, 2002).

***Coccinella transversalis* Fabricius [Figure 1C]**

Coccinella transversalis was one of two most commonest species collected up to date. It was collected while feeding on aphids (*A. gossypi* (Glov), *M. persicae* (Sluz), *A. craccivora* Koch) and leaf and plant hoppers (*Amrasca* spp, *Empoasca vitis* and *Leptocentrus* spp). *Coccinella transversalis* Fabricius and *Propylea dissecta* (Mulsant) are aphidophagous coccinellids, abundant in the agricultural fields of Lucknow, India. They co-occur in bean (*Dolichos lablab*) and deadly nightshade (*Solanum nigrum*) fields infested with aphids, *Aphis craccivora* Koch and *Myzus persicae* (Sulzer), respectively (Omkar *et al.*, 2005). Common occurrence of the species has been reported from countries such as India, Nepal, Sri Lanka, Bangladesh, Indochina, Indonesia, Australia, and New Zealand (Poorani, 2002). The adult is about 5 mm long and typically red orange with black inverted “V” markings on elytra (Balbarino and Ceniza, 2005).

***Coccinella octomaculata* (Fabricius) [Figure 1D]**

Coccinella octomaculata is very rare in Mid Country and was collected while feeding on aphids and leaf hoppers (*A. gossypi* (Glov), *M. persicae* (Sluz), *A. craccivora* Koch and *Amrasca* spp). The species is distributed almost throughout India, Pakistan, Nepal, Bangladesh (Poorani, 2002). The adult is about 8 mm long and possesses yellow-dark orange elytra with black dots.

***Illeis cincta* (Fabricius) [Figure 1E]**

Illeis cincta was the other Coccinellid species commonly found in vegetable fields of the Mid Country. This species was also collected while feeding on insect pests including *A. gossypi* (Glov), *M. persicae* (Sluz), *A. devastans* (Distant). Distribution of this beetle is limited to India, Sri Lanka and Indonesia (Poorani, 2002). The adult is 5 - 6 mm in length, with a yellow elytra.

***Micraspis discolor* (Fabricius) [Figure 1F]**

Micraspis discolor was the third most common species out of the collected predatory ladybirds in the mid country. This species was also collected while actively feeding on aphids (*A. gossypi* (Glov), *M. persicae* (Sluz), *A. craccivora* Koch) and leaf

hoppers (*Amrasca* spp). Other than in Sri Lanka, this species has been recorded in India, Bangladesh, Pakistan, and almost throughout the Orient and Palaearctic (Poorani, 2002). The adults are reddish orange and oval shape with black strips on the elytra, 5 - 6 mm in length.

***Propylea dissecta* (Mulsant) [Figure 1G]**

Propylea dissecta beetle was also found in all sampled areas in the Mid Country, and collected while feeding on Brinjal (*Solanum melongena*) aphids (*A. gossypi* (Glov) and *M. persicae* (Sluz) and Cabbage (*Brasica oleracia*) aphids (*A. craccivora* Koch). A recent study has revealed this beetle to be a potential predator of *A. craccivora* (Pervez and Omark, 2004). This beetle is also recorded from India, Bangladesh and Nepal (Poorani, 2002). The beetle is robust in appearance; 5 - 6 mm in length having red/orange elytra with black central line, similar to *Micraspis discolor* (Kuznetsov, 1997). This species is polymorphic, with typical, intermediate and pale forms (Pervez *et al.*, 2004).

***Synonycha grandis* (Thunberg) [Figure 1H]**

Synonycha grandis is a rare species in the area and collected while preying on *Aphis gossypi* (Glov) Faculty of Agriculture vegetable field at Peradeniya. This species is 12 - 14 mm long and was the largest beetle found during the survey. The species has been reported from in India, Nepal, Japan, Indonesia and China (Poorani, 2002). The species has black spots on yellow or red elytra.

Sub-family Chilocorinae Mulsant

Tribe: Chilocorini Mulsant

***Brumoides suturalis* (Fabricius) [Figure 1I]**

Brumoides suturalis was distributed in all the sampled areas in the mid country and collected while preying on aphids (*A. gossypi* (Glov), *M. persicae* (Sluz), *A. craccivora* Koch) and leaf hoppers (*Amrasca* spp). This species was also collected while preying on mealy bugs of cotton (Lefroy, 1984). The adult beetle is small, oval insect about 2.5 - 3.5 mm long (Leeper, 1975). The head and thorax are brown, the eyes black and wing covers ivory with two black stripes, one extending down the trailing edge and other through the middle of each cover (Selhime, 1956). This species has been recorded in, India, Pakistan, Bangladesh, Himalayas, Bhutan, Nepal and Sri Lanka (Poorani, 2002).

***Chilocorus nigritus* (Fabricius) [Figure 1J]**

Chilocorus nigritus was found feeding on Brinjal (*Solanum melongena*) aphids (*A. gossypi* (Glov)) at Peradeniya. This species has been reported from India, Pakistan, Sri Lanka, Bangladesh, Myanmar, China, Indonesia, Thailand, South Africa, Seychelles, Pacific, and Brazil (Poorani, 2002). This beetle is sub circular in body outline, typical coloration with elytra, pronotum (excepting lateral parts) and outer margins of elytral epipleura very dark pitchy to black, and with head, lateral parts of pronotum, legs underside and elytral epipleura yellowish brown (Nagaraja and Hussainy, 1967). Length is 3.2 - 4.0 mm (Booth, 1998).

Sub-family Scymninae Mulsant

Tribe: Aspidimerini Mulsant

***Cryptogonus orbiculus* (Gyllenhal) [Figure 1K]**

Cryptogonus orbiculus was collected from the vegetable field of Faculty of the Agriculture, Peradeniya. It was feeding on *A. gossypi* (Glov). The beetle species is also recorded in Nepal, China, Taiwan and Japan (Poorani, 2002). This species is black with an oval orange yellow spot on each elytron (Poorani, 2001).

***Pseudaspidimerus trinitatus* (Thunberg) [Figure 1L]**

Pseudaspidimerus trinitatus was collected from aphid colonies on Brinjal (*Solanum melongena*). This species have been reported from Goa, Bangladesh and Myanmar. The beetle is 1.5 - 2.0 mm in length and possesses one subscutellar and one discal spot on each elytron in the posterior half (Poorani, 2001).

Tribe: Scymnini Mulsant

***Axinoscymnus puttarudriahi* Kapur and Munshi [Figure 1M]**

Axinoscymnus puttarudriahi was collected while preying on aphids, *A. gossypi* (Glov) and *M. persicae* (Sluz). The species can also be found in India (Poorani, 2002). The 1 - 2 mm long species possesses brownish, hairy elytra with black patches.

***Scymnus (Pullus) latemaculatus* Motschulsky [Figure 1N]**

Scymnus (Pullus) latemaculatus, was collected throughout the sample areas while feeding on aphids and leaf hoppers including *A. gossypi* (Glov), *M. persicae* (Sluz), *A. craccivora* Koch and *Amrasca* spp. The 1.5 - 2.0 mm long dark brown beetle possesses densely pubescent elytra (Leeper, 1975). This species is distributed throughout Bangladesh, Thailand and Taiwan (Poorani, 2002).

***Scymnus (Scymnus) nubilus* Mulsant [Figure 1O]**

Scymnus (Scymnus) nubilus was collected feeding on *A. gossypi* (Glov), *M. persicae* (Sluz) from the vegetable field of Faculty of Agriculture, Peradeniya. Other than Sri Lanka this species has been recorded in India, Pakistan, Bangladesh, Nepal, Myanmar, and China (Poorani, 2002). This species is also 1.5 - 2.0 mm in length, possesses an outer cover coating with waxy secretion. They are somberly coloured.

The other two species were identified as *Aspidimerus circumflexus* and *Pseudaspidimerus Pseudaspidimerus flaviceps* but their identification is yet to be confirmed

CONCLUSIONS

Fifteen different species from 12 genera belonging to sub-families Coccinellinae, Chilocorinae and Scymninae existed in the mid country. The species were identified as,

A. cardoni, *C. sexmaculata*, *C. transversalis*, *C. octomaculata*, *I. cincta*, *M. discolor*, *P. dissecta*, *S. grandis*, *B. suturalis*, *C. nigrinus*, *C. orbiculus*, *P. trinotatus*, *A. puttardriahi*, *S. (Pullus) latemaculatus* and *S. nubilis*. Out of all species collected *C. transversalis* and *I. cincta* were the most common species and *M. discolor* was also found frequently in the study area. Most of the collected species were aphid-loving predators. Further studies are in progress to completely explore predatory Coccinellids fauna in the vegetable ecosystems of mid country of Sri Lanka.

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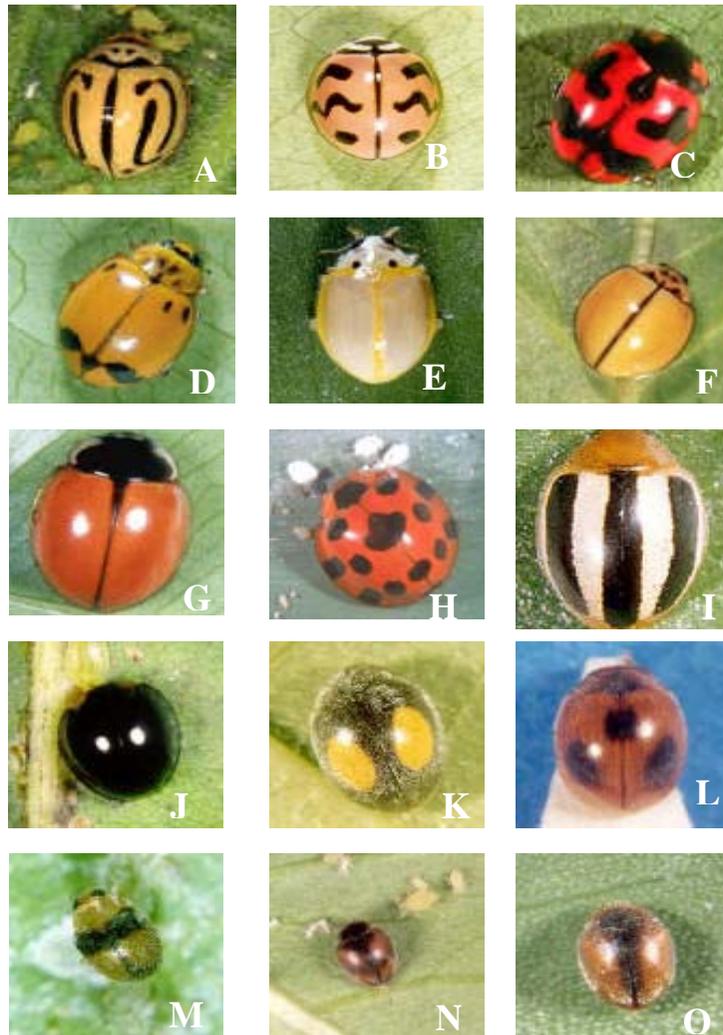


Figure 1. Photographs of dorsal view of predatory *Coccinella* spp. Collected from Mid-country region of Sri Lanka.

A. *Anegleis cardoni* (Weise), B. *Coccinella sexmaculata* (Fabricius), C. *Coccinella transversalis* Fabricius, D. *Coccinella octomaculata* (Fabricius), E. *Illeis cincta* (Fabricius), F. *Micraspis discolor* (Fabricius), G. *Propylea dissecta* (Mulsant), H. *Synonycha grandis* (Thunberg), I. *Brumoides suturalis* (Fabricius), J. *Chilocorusnigrinus* (Fabricius), K. *Cryptogonus orbiculus* (Gyllenhal), L. *Pseudaspidimerus trinotatus* (Thunberg), M. *Axinoscymnus puttardriahi* Kapur and Munshi, N. *Scymnus (Pullus) latemaculatus* Motschulsky, O. *Scymnus(Scymnus) nubilus* Mulsant

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