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Research Article

Scymnini (Coleoptera:Coccinellidae) associated with major sucking pests of Kerala

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ABSTRACT: An extensive survey was undertaken to explore the diversity of fauna of Scymnini associated with sucking pests viz., mealybugs, aphids and whiteflies on fruits, vegetables, plantation crops, ornamentals and other associated plants across Kerala during 2015-17. Scymnini along with associated prey were collected, and in the laboratory, beetles were dissected to study the male genitalia for identification, while prey were identified by the expert in the concerned taxa at NBAIR. The study recorded 14 species of Scymnini in five genera associated with 19 species of prey (12 mealybugs, 5 aphids and 2 whiteflies). The five genera include *Axinoscymnus, Cryptolaemus, Horniolus, Nephus* and *Scymnus. Scymnus*, the predominant genus was represented by three subgenera viz., *S. (Scymnus), S. (Pullus) and S. (Neopullus). S.(Pullus) coccivora* Ayyar recorded the maximum prey range of six species of mealy bugs. *Nephus regularis* (Sicard) was recorded for the first time in Kerala. The study identified *Toxoptera odinae* (van der Goot) as a new prey record for *S. (P.) pyrocheilus* Mulsant.

KEY WORDS: *Axinoscymnus*, *Cryptolaemus*, *Horniolus*, *Nephus*, Predatory Coccinellids, Scymnini, *Scymnus,* Sucking Pests

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INTRODUCTION

Coccinellid beetles always attracted the attention of biocontrol scientists and have been exploited as predators of sucking pests. Scymnini grouped under the subfamily Coccinellinae (Seago *et al*., 2011), includes very small, pubescent coccinellids predaceous on a wide variety of sternorrhynchan Hemiptera. Though Scymnini of the Indian region is rich and diverse, scores of species still remain undescribed (Poorani, 2015).

The damage caused by sucking pests especially mealybugs, aphids and whiteflies to agricultural crops in Kerala has greatly increased for the past many years.Thorough knowledge on the faunal composition of Scymnini associated with these sucking pests in agricultural ecosystems is very important for exploring the possibility of exploiting them in biocontrol programmes. Eight species of Scymnini belonging to four genera have been reported so far from Kerala (Poorani, 2002; Jose, 2003; Najitha, 2016). However, there is no systematic study on the fauna of Scymnini in agricultural ecosystems of Kerala. Hence the present study was undertaken to record the species composition of Scymnini associated with major sucking pests in different crop plants of Kerala.

MATERIALS AND METHODS

The present study to explore the diversity of Scymnini in different agricultural ecosystems of Kerala was undertaken in the Department of Agricultural Entomology, College of Horticulture, Vellanikkara during 2015-17. Extensive surveys were undertaken across 12 districts of Kerala covering 36 localities. The details of the localities surveyed are furnished in Table 1.

The plants surveyed during the study included vegetable crops: amaranthus, bhindi, brinjal, chilli, cowpea; fruit crops: annona, banana, guava, jack, papaya, pineapple; plantation crops and spices: arecanut, black pepper, coconut, coffee; ornamental plants: bottle palm, *Celosia*, croton, evergreen, *Hibiscus*, Indian lotus, *Mussaenda*, *Zinnia*;

medicinal plants: long pepper, tulsi and other plants in the vicinity of the fields surveyed: *Colocasia*, *Gliricidia*, Lantana, *Macaranga peltata*, maize, *Mikania*, *Mucuna*, siam weed, star gooseberry, tapioca.

Table 1. Localities surveyed for the collection of Scymnini

District	Location	Latitude (^{0}N)	Longitude (^{0}E)
Kasaragod	Padannakkad	12.26	75.11
Kannur	Panniyur	12.07	75.40
Wayanad	Banasurasagar	11.67	75.97
	Kariampady	11.68	76.13
	Pulpally	11.79	76.16
	Ambalavayal	11.61	76.21
Kozhikode	Mukkam	11.32	75.99
Malappuram	Tavanur	10.85	75.98
Palakkad	Vadakarapathy	10.78	76.85
	Vadakkenchery	10.59	76.48
	Vandazhy	10.57	76.52
Thrissur	Avinissery	10.47	76.22
	Chalakkudy	10.31	76.34
	Chazhur	10.43	76.14
	Chembukkavu	10.53	76.22
	Cherpu	10.40	76.20
	Chirakkakkode	10.56	76.29
	Elavally	10.56	76.08
	Kodannur	10.46	76.18
	Kottepadam	10.54	76.27
	Marakkal	10.54	76.31
	Mannuthy	10.52	76.26
	Moorkkanikkara	10.51	76.28
	Olarikkara	10.52	76.18
	Ollur	10.48	76.24
	Parakkad	10.50	76.14
	Pattikkad	10.54	76.33
	Payyanam	10.51	76.32
	Vellanikkara	10.54	76.28
Ernakulam	Perumbavur	10.13	76.48
	Vazhakulam	9.94	76.63
Idukki	Pampadumpara	9.79	77.16
Kottayam	Kumarakom	9.62	76.43
Alappuzha	Kayamkulam	9.17	76.51
Thiruvananthapuram	Sreekaryam	8.53	76.91
	Vellayani	8.42	76.98

During survey, both adults and immature stages of beetles were collected along with the associated prey *viz*., aphids, mealybugs and whiteflies. The adult beetles were collected by aspiration, beating or sweeping, while immature stages were collected along with their prey by detaching the affected plant parts. In the laboratory, immature stages were reared for the emergence of adults. The beetles were dry preserved for further identification, whereas the prey specimens were preserved in 70 per cent alcohol. The genitalia of male beetles were prepared by digesting in 10 per cent potassium hydroxide and later the genital parts were dissected in glycerol under a stereomicroscope (Leica EZ4 HD). The beetles were identified upto species level using taxonomic keys based on the morphology of male genitalia (Sasaji, 1971; Poorani, 2015; NBAIR 2013). However, those specimens the species of which could not be established with the available literature, identification was done only upto generic level.

RESULTS AND DISCUSSION

A total of 14 species of Scymnini in five genera *viz*., *Scymnus, Axinoscymnus*, *Cryptolaemus*, *Horniolus* and *Nephus* associated with 19 species of prey were recorded during the present study (Table 2).

Genus *Scymnus*

Scymnus was found to be the most common genus of Scymnini associated with mealybugs and aphids. The genus was represented by 9 species under three subgenera *viz*., *S.* (*Pullus*): 7 species; S. (*Scymnus*): one species; S. (*Neopullus*): one species. The species identified include, *S.* (*P.*) *latemaculatus* Motschulsky, *S.* (*P.*) *pyrocheilus* Mulsant, *S.* (*P.*) *coccivor*a Ayyar and *S.* (*S.)nubilus* Mulsant. Unidentified species of *S.* (*Pullus*) are represented as sp. 1 to sp. 4. Of the total eight subgenera of *Scymnus* reported from the world (Chen *et al*., 2013), so far only three subgenera were recorded from India (Poorani, 2002).

In the study, *S.* (*S.*) *nubilus*, *S.* (*P.*) *latemaculatus*, *S.* (*P.*) *pyrocheilus* and *S.* (*P.*) sp.3, were found in association with only aphids. This is in agreement with the prey range listed for *S.* (*P.*) *latemaculatus* and *S.* (*P.*) *pyrocheilus* in the prey-predator catalogue of predaceous coccinellids (Omkar and Pervez, 2004). NBAIR also recognised aphids as the common prey of *S.* (*P.*) *latemaculatus*, though its association was also reported with coccids. The study identified *Toxoptera odinae* (van der Goot) as a new prey record for *S.* (*P.*) *pyrocheilus.* In this study, *S.* (*P.*) *coccivora*, *S.* (*P.*) sp. 1, *S.* (*P.*) sp.2 and *S.* (*P.*) sp. 4 was found to feed only on mealybugs. However, aphids, mealybugs, whiteflies, scales and mites were reported as prey of *S.* (*P.*) *coccivora* (Omkar and Pervez, 2004; NBAIR 2013).

In the present study, *S.* (*P.*) *coccivora* recorded the widest prey range which included *Ferrisia virgata*, *Planococcus citri*, *Coccidohystrix insolita*, *Paracoccus marginatus*, *Phenacoccus solenopsis* and *Pseudococcus longispinus*. This was followed by *S.* (*P.*) *latemaculatus* with *Aphis craccivora*, *A. gossypii* and *Pentalonia nigronervosa* as prey and *S.* (*P.*) *pyrocheilus* with *Aphis gossypii*, *A. craccivora* and *Toxoptera odinae* as prey.

Table 2. Fauna of Scymnini on different sucking pests of Kerala

Host plant	Prey	Scymnini
Amaranthus	*Phenacoccus solenopsis* Tinsley	*Scymnus* (*Pullus*) sp. 1
Annona	*Planococcus citri*(Risso) *Toxoptera odinae* (van der Goot)	*Nephus* sp. *S.* (*Pullus*) *pyrocheilus* Mulsant
Arecanut	Not known	*S.* (*Pullus*) sp. 1
Banana	*Pentalonia nigronervosa* Coquerel *Aleurodicus* *dispersus* Russell	*S.* (*Pullus*) *latemaculatus* Motschulsky *Axinoscymnus puttarudriahi* Kapur and Munshi
Bhindi	*Phenacoccus solenopsis* Tinsley	*S.*(*Pullus*) sp. 1
Black pepper	*Ferrisia virgata* (Cockerell) *Formicococcus polysperes* Williams	*S.*(*Pullus*) sp. 2 *Horniolus sororius* Poorani
Bottle palm	*Pseudococcus longispinus* (Targioni and Tozzetti)	*S.* (*Pullus*) *coccivora* Ayyar
Brinjal	*Aphis gossypii* Glover *Coccidohystrix insolita* (Green)	*S.* (*Pullus*) *latemaculatus* Motschulsky *S. (Pullus) pyrocheilus* Mulsant *S.* (*Pullus*) *coccivora* Ayyar *S.*(*Pullus*) sp. 2
Celosia	*Pseudococcus jackbeardsleyi* Gimpel and Miller	*S.*(*Pullus*) sp. 2
Chilli	*Aphis gossypii* Glover *Bemisia tabaci* (Gennadius) *Aleurodicus dispersus* Russell	*S.* (*Pullus*) *latemaculatus* Motschulsky *S.*(*Pullus*) sp. 3 *Axinoscymnus puttarudriahi* Kapur and Munshi
Coconut	*Pseudococcus* sp.	*S.*(*Pullus*) sp. 4 *S.*(*Pullus*) sp. 1
Coffee	*Planococcus citri* (Risso)	*S.*(*Pullus*) sp.1 *S.*(*Pullus*) sp. 4
Colocasia	*Aphis gossypii* Glover *Ferrisia virgata* (Cockerell)	*S.* (*Pullus*) *latemaculatus* Motschulsky *S.* (*Pullus*) sp. 2
Cowpea	*Aphis craccivora* Koch *Aphis gossypii* Glover *Ferrisia virgata* (Cockerell)	*S.* (*Pullus*) *latemaculatus*Motschulsky *S. (Pullus) pyrocheilus* Mulsant *S.* (*Pullus*) sp. 1
Croton	*Ferrisia virgata* (Cockerell), *Planococcus citri* (Risso) *Phenacoccus madeirensis* Green	*S.* (*Pullus*) *coccivora* Ayyar *Nephus regularis* (Sicard)
Eupatorium	*Aphis gossypii* Glover	*S.* (*Pullus*) *latemaculatus* Motschulsky *S. (Pullus) pyrocheilus* Mulsant
Evergreen	*Ferrisiavirgata* (Cockerell)	*S.*(*Pullus*) sp. 1
Gliricidia	*Aphis craccivora* Koch	*S.(Scymnus) nubilus* Mulsant *S.* (*Pullus*) *latemaculatus*Motschulsky *S. (Pullus) pyrocheilus* Mulsant
Guava	*Aphis gossypii* Glover *Ferrisia virgata* (Cockerell) *Aleurodicus dispersus* Russell	*S.* (*Pullus*) *latemaculatus* Motschulsky *S. (Pullus) pyrocheilus* Mulsant *S.* (*Pullus*) *coccivora*Ayyar *S.* (*Pullus*) sp. 1 *Axinoscymnus puttarudriahi* Kapur and Munshi

Hibiscus	*Aphis gossypii* Glover *Phenacoccus solenopsis*Tinsley, *Paracoccus marginatus*Williams and Granara de Willink	*S.* (*Pullus*) *latemaculatus* Motschulsky *S. (Pullus) pyrocheilus* Mulsant *S.* (*Pullus*) *coccivora*Ayyar *S.* (*Pullus*) sp. 1 *S.* (*Pullus*) sp. 2 *S.* (*Pullus*) sp. 4
Jack	*Planococcus* sp.	*Nephus* sp
Long pepper	*Ferrisia virgata* (Cockerell)	*S.* (*Pullus*) sp. 2
Lotus	Aphids	*S.*(*Neopullus*) sp.
Macaranga peltata	*Planococcus* sp.	*Cryptolaemus montrouzieri* Mulsant
Maize	*Rhopalosiphum maidis* (Fitch)	*S.(Scymnus) nubilus* Mulsant *S.*(*Pullus*) sp. 3
Mikania	*Aphis gossypii* Glover	*S.* (*Pullus*) *pyrocheilus* Mulsant
Mussaenda	*Planococcus citri* (Risso)	*S.* (*Pullus*) *coccivora* Ayyar
Mucuna	*Nipaecoccus viridis* (Newstead)	*S.*(*Pullus*) sp. 2
Papaya	*Paracoccus marginatus* Williams and Granara de Willink	*S.* (*Pullus*) *coccivora* Ayyar *S.*(*Pullus*) sp.1
Pineapple	*Dysmicoccus neobrevipes* (Beardsley) *Dysmicoccus brevipes* (Cockerell)	*S.*(*Pullus*) sp. 4
Star gooseberry	*Bemisia tabaci* (Gennadius)	*Axinoscymnus puttarudriahi* Kapur and Munshi
Tapioca	*Paracoccus marginatus* Williams and Granara de Willink	*S.* (*Pullus*) *coccivora* Ayyar *S.*(*Pullus*) sp.1
Tulsi	Aphids	*S.*(*Pullus*) sp. 3
Zinnia	*Phenacoccus solenopsis* Tinsley	*S.* (*Pullus*) sp.2

Genus *Axinoscymnus*

Only one species, *Axinoscymnus puttarudriahi* Kapur and Munshi was recorded in the genus. It was found to prey upon whiteflies, *Bemisia tabaci* on chilli and star gooseberry, and *Aleurodicus dispersus* on banana, chilli and guava. NBAIR also reported the species as specific to whiteflies. This is the only species reported from India so far under the genus (Poorani, 2002).

Genus *Cryptolaemus*

Cryptolaemus montrouzieri Mulsant was found feeding on *Planococcus* sp. on a weed plant, *Macaranga peltata*. *Cryptolaemus montrouzieri* is a native of Australasian region and was introduced into India in 1898 on Nilgiri Hills as a biocontrol agent in coffee (Mayne, 1953). It is considered as a common predator of mealybugs and soft scales in South India. Its presence in plain lands of Kerala was not reported so far and doubtful. However, this study recorded the natural occurrence of *C. montrouzieri* in one of the locations at Thrissur district surveyed.

Genus *Horniolus*

One species in the genus, *Horniolus sororius* Poorani was reported in association with pepper root mealybug. *H. sororius* is one of the two species of *Horniolus* reported from South India and described by Poorani (2015) from Karnataka. Najitha (2016) reported this species (as *Horniolus* sp.) as a predator of pepper root mealybug from Kerala.

Genus *Nephus*

Of the two species recorded in the study, only one species, *Nephus regularis* (Sicard), associated with the mealybug, *Phenacoccus madeirensis* on croton could be identified. Occurrence of this species from Kerala is a new record.

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REFERENCES

Chen XS, Wang XM, and Ren SX. 2013. A review of the subgenus Scymnus of Scymnus from China (Coleoptera: Coccinellidae). *Ann Zoologici*. **63**: 417–499. Crossref.

Jose Q. 2003. *Taxonomy of predatory coccinellid beetles (Coccinellidae: Coleoptera) in rice and vegetables.* M.Sc. (Ag.) thesis, Kerala Agricultural University, Thrissur, p. 62.

Mayne WW. 1953. *Cryptolaemus montrouzieri* Mulsant in South India. *Nature* **172**: 85. Crossref. PMid:13072589

Najitha U.2016. *Bionomics and management of root mealybugs on black pepper.* Ph.D. thesis. Kerala Agricultural University, Thrissur, p. 124.

NBAIR [National Bureau of Agricultural Insect Resources]. 2013 Factsheets on agriculturally important insects. Available from: *http://www.nbair.res.in/Featured_insects/predators.php*

Omkar and Pervez A. 2004. Predaceous coccinellids in India: predator-prey catalogue. *Orient Insects* **38**: 27-61. Crossref.

Poorani J. 2002. An annotated checklist of the Coccinellidae (Coleoptera) (excluding Epilachninae) of the Indian subregion. *Orient Insects* **36**: 307–383. Crossref.

Poorani J. 2015. Two new species of Scymnini (Coleoptera: Coccinellidae) from Karnataka, India. *Biodivers Data J*. **3**: e5296. Crossref.

Sasaji H. 1971. *Fauna Japonica. Coccinellidae (Insecta: Coleoptera)*. Academic Press of Japan, 340p.

Seago AE, Giorgi JA, Li J, Slipinski A. 2011. Phylogeny, classification and evolution of ladybird beetles (Coleoptera: Coccinellidae) based on simultaneous analysis of molecular and morphological data. *Mol Phylogenet. Evol.* **60**: 137-151. Crossref. PMid:21426943