



AN INVENTORY OF MOTHS IN THE VEGETABLE AGROECOSYSTEMS OF NORTHERN KERALA

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ABSTRACT

Occurrence of moths in agroecosystems of Northern Kerala is very scanty, especially in the mixed vegetables. Hence monitoring was done with surveys in mixed vegetable agroecosystems of five districts of northern Kerala covering five districts viz., Malappuram, Kozhikode, Wayanad, Kannur and Kasaragod during October 2018 to 2019 over 91 nights. A total of 424 moths were collected and identified under 24 species representing 4 families viz., Erebiidae, Crambidae, Noctuidae and Eupterotidae. *Herpetogramma bipunctalis* (Crambidae), *Syntomoides imaon* (Erebiidae), *Agrotis* sp. (Noctuidae) and *Eupterotis mollifera* (Eupterotidae) are the dominant species collected. The pest attacks are noticed more in brinjal and cowpea and were less in tomato and colocasia.

Key words: Lepidoptera, faunistics, Erebiidae, Crambidae, Noctuidae, Eupterotidae, mixed vegetables, agroecosystems, pests, northern Kerala, brinjal, cowpea, tomato, colocasia

Moths pose serious threat to major crops of agriculture, horticulture and forestry. Identification and control of these are major concerns for scientists and agricultural workers. Moth caterpillars have a great impact on plants by eating the various plant parts (TNAU, 2018). Their larval stages are particularly sensitive to environmental changes that affect plant quality and quantity as their diets acting as good indicators of changes in the terrestrial ecosystems. Nocturnal macro moths are highly diverse and ecologically important group of insects that play key role as prey for birds and bats, and are potential indicators of ecosystem health and change across a wide variety of landscapes (Erhardt and Thomas, 1991; Kitching et al., 2000; Summerville and Thomas, 2004). Many farmers reported crop loss due to the caterpillar attack in the mixed vegetable cultivation fields from northern Kerala during past few years. Apart from a few articles on moths from Kerala, no such comprehensive studies have been carried out on the occurrence of moths in the mixed vegetable agroecosystems of Kerala. The present work concentrates on the study of moths in the mixed vegetable agroecosystems of northern Kerala. In the present study, 424 specimens of moths representing 24 species under 4 families viz., Erebiidae, Crambidae, Noctuidae and Eupterotidae from mixed vegetable agroecosystems of Kerala are included and the details presented herein.

MATERIALS AND METHODS

Adult moths were surveyed from the mixed vegetable agroecosystems of northern Kerala, covering five districts viz., Malappuram, Kozhikode, Wayanad, Kannur and Kasaragod from October 2018- 2019 using vertical light sheet over 91 nights. The survey was from four zones in each district. Thirurangadi (11.0420° N, 75.9281° E), Vengara (11.0510° N, 75.9825° E), Tirur (10.9167° N, 75.9245° E) and Parappanangadi (11.0540° N, 75.8555° E) from Malappuram district; Kalpetta (11.6103° N, 76.0828° E), Sulthanbathery (11.6629° N, 76.2570° E), Pulpally (11.7923° N, 76.1663° E) and Muthanga (11.6691° N, 76.3695° E) from Wayanad district; Thalassery (11.7491° N, 75.4890° E), Koothuparamba (11.8319° N, 75.5655° E), Thalipparamba (12.0351° N, 75.3611° E) and Irikkur (11.9869° N, 75.5539° E) from Kannur district; Kasaragod (12.4996° N, 74.9869° E), Kanhangad (12.3311° N, 75.0915° E), Cheruvathur (12.2165° N, 75.1626° E) and Nileshwaram (12.2596° N, 75.1281° E) from Kasaragod district; and Kuttyadi (11.6543° N, 75.7535° E), Perambra (11.5640° N, 75.7564° E), Balussery (11.4413° N, 75.8202° E) and Mukkam (11.3212° N, 75.9963° E) from Kozhikode district. The collected specimens were processed as per standard techniques (Holloway et al., 2001). The specimens were then identified up to species level with available literature: Hampson G F (1891-1896), Bell and Scott



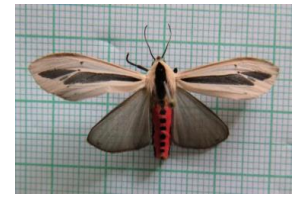
1. *Noorda blitealis*



2. *Olepa ricini*



3. *Chrysodeixis chalcites*



4. *Creatonotos gangis*



5. *Xanthodes transversa*



6. *Acanthodelta janata*



7. *Eupterote mollifera*



8. *Agrotis* sp.



9. *Anomis sabulifera*



10. *Aloa lactinea*



11. *Helicoverpa armigera*



12. *Diaphania indica*



13. *Euproctis fraterna*



14. *Eudocima homaena*



15. *Herpetogramma bipunctalis*



16. *Spilosoma obliqua*



17. *Olene mendosa*



18. *Spoladea recurvalis*



19. *Anomis flava*



20. *Syntomoides imaon*



21. *Somena scintillans*



22. *Omiodes indicata*



23. *Maruca vitrata*



24. *Spodoptera litura*

Figs. 1-24. Moths collected from mixed vegetable agroecosystems of Kerala

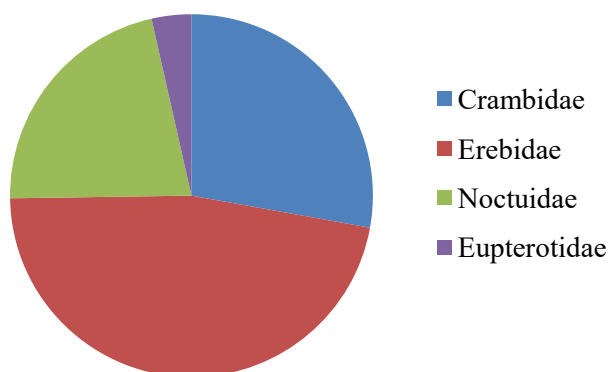


Fig. 25

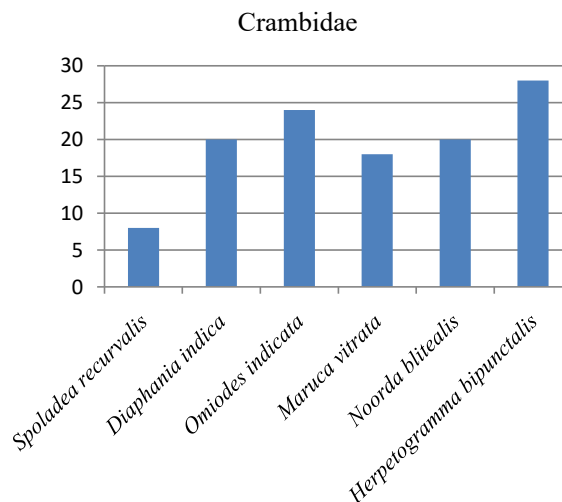


Fig. 26

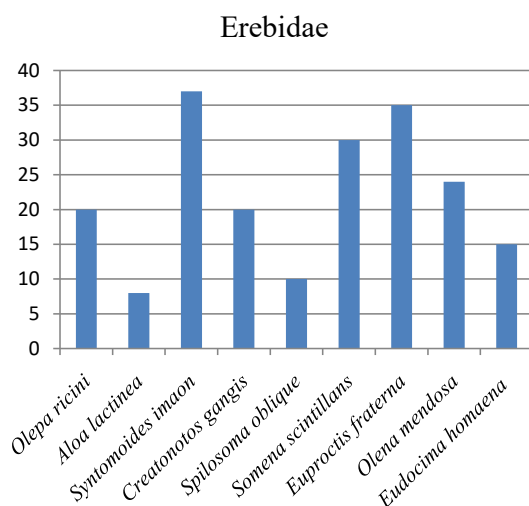


Fig. 27

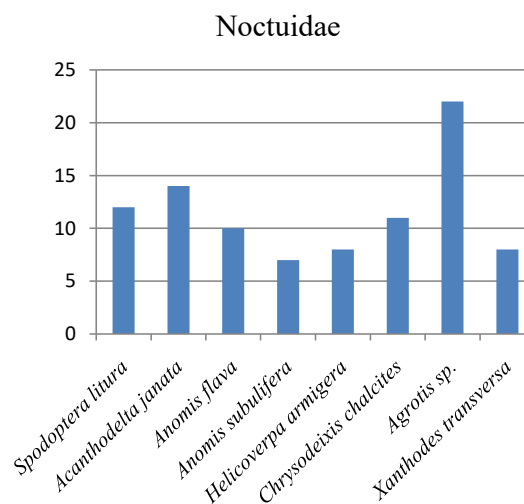


Fig. 28

Figs. 25-28. Relative abundance of moths in vegetables

(1937), Barlow (1982), Holloway (1983; 1985; 1986; 1988; 1989; 1996- 1998, 2003; 2011), Pinratana and Lampe (1990), Robinson (1994), Kendrick (2002), Mathew et al. (2004a,b; 2005; 2007; 2018), Kononenko and Pinratana (2005; 2013), and Kirti and Singh (2015; 2016). Some specimens were also compared with the reference collection housed at WGRC, ZSI, Kozhikode and GPRC, ZSI, Patna. The collected specimens were deposited in the 'National Zoological Collections' of the Zoological Survey of India, Western Ghats Regional Centre, Kozhikode (ZSIK). Adult specimens were photographed using Canon Powershot SX430 camera.

RESULTS AND DISCUSSION

A total of 424 specimens representing 24 species of 23 genera were collected and studied. Family Erebidæ dominated the samples and within Erebidæ, subfamily Arctiinae dominated with 95 examples representing 5 species; whereas Lymantriinae was represented by 89 specimens representing four species. In addition 15 specimens of *Eudocima homaena* were collected. In addition, Crambidae is the second largest family with 118 specimens representing three subfamilies (Spilomelinae, Noordinae, Pyraustinae) under six

Table 1. Checklist of moths occurring on mixed vegetable ecosystems of Kerala

Family	Subfamily	Species	Specimens	Host plants, damage	Material examined
Crambidae	Spilomelinae	<i>Spoladea recurvalis</i> Fabricius, 1794	8	Pest of bhendi. Feed on the flowers causes Circular boreholes on fruits. Larva thrust only part of their body inside the fruit	Kasaragod, 10.10.2018; 2exs. Kalpetta, 11.10.2018; 4exs. Parappanangadi, 14.10.2018; 2exs. Kanhagad, 17.11.2018; 7exs. Irikkur, 20.11.2018; 4exs. Mukkam, 02.12.2018; 5exs.
		<i>Diaphania indica</i> (Saunders, 1851)	20	Larvae feed on Cucurbitaceae	Sulthanbathery, 04.12.2018; 4exs. Tirur, 08.12.2018; 4exs. Tiurangadi, 10.12.2018; 5exs. Parappanangadi, 14.01.2019; 7exs. Vengara, 15.01.2019; 4exs.
		<i>Omiodes indicata</i> (Fabricius, 1775)	24	Larvae feed on cowpea (<i>Vigna unguiculata</i>)	Pulpally, 10.01.2019; 4exs. Mukkam, 04.02.2019; 5exs. Cheruvathoor, 08.02.2018; 7exs. Thalipparamba, 10.02.2019; 6exs. Nileshwaram, 02.03.2019; 5exs. Cheruvathoor, 04.03.2018; 7exs. Parappanangadi, 10.03.2018; 4exs. Balussery, 02.04.2019; 4exs.
		<i>Maruca virata</i> F., 1787	18	Minor, occasionally serious. Pest of cowpea (<i>Vigna unguiculata</i>). The larvae damage flower buds, flowers and developing pods and also web the inflorescences	Balussery, 02.04.2019; 8exs. Perambra, 05.04.2019; 8exs. Mukkam, 08.04.2019; 5exs.
Erebidae	Noordinae	<i>Noorda blitealis</i> Walker, 1859	20	Larvae feed on <i>Moringa oleifera</i>	Kalpetta, 14.04.2019; 7exs. Perambra, 05.04.2019; 7exs. Kuttiyadi, 01.05.2019; 7exs. Kalpetta, 14.04.2019; 4exs.
	Pyraustinae	<i>Herpetogramma bipunctalis</i> (F., 1794)	28	Minor pest brinjal. Larvae feed on brinjal	Tirurangadi, 04.05.2019; 2exs. Tirur, 08.05.2019; 2exs.
	Arctiinae	<i>Olepa ricini</i> F., 1775	20	Larvae feeds on brinjal, sweet potato, banana, <i>Cucurbita</i> etc.	Parappanangadi, 10.05.2019; 4exs. Cheruvathoor, 15.05.2019; 2exs. Kalpetta, 02.06.2019; 12exs.
		<i>Aloa lactinea</i> Cramer, 1777	8	Highly polyphagous and feeds on almost all green vegetation. Especially cashew, cucurbits	Sulthanbathery, 04.06.2019; 10exs. Pulpally, 10.06.2019; 5exs. Mukkam, 14.06.2019; 5exs.
Lymantriinae		<i>Syntomoides imaon</i> (Cramer, 1779)	37	Larvae feeds on sweet potato, sandalwood, etc.	Kasaragod, 04.07.2019; 5exs. Nileshwaram, 08.07.2019; 7exs. Kalpetta, 10.07.2019; 4exs. Vengara, 18.07.2019; 4exs.
		<i>Creatonotos gangis</i> (L., 1763)	20	Polyphagous and feeds on several host plants including coffee, sweet potato	Muthanga, 14.10.2019; 5exs. Muthanga, 14.10.2019; 4exs.
		<i>Spilosoma oblique</i> Walker, 1859	10	Major pest of cucurbits	Kalpetta, 20.09.2019; 4exs. Perambra, 08.10.2019; 2 exs.
		<i>Somena scintillans</i> Walker, 1856	30	Minor, sporadically serious pest of cucurbits and cowpea	Kalpetta, 20.09.2019; 10exs. Sulthanbathery, 20.10.2019; 8exs. Pulpally, 22.10.2019; 5exs. Balussery, 24.10.2019; 7exs.

(Contd.)

(Contd. Table 1)

Noctuidae	<i>Euproctis fraterna</i> Moore, 1883	35	Larvae feeds on the leaf of mango, sapota, ber, citrus, pigeonpea, coffee, tea, cocoa, etc.	Muthanga, 14.10.2019; 8exs. Sulthanbathery, 20.10.2019; 10exs. Perambra, 08.10.2019; 10exs. Mukkam, 24.09.2019; 5exs. Vengara, 15-01-2019; 2exs. Kalpetta, 10.07.2019; 5exs. Balussery, 24.10.2019; 8exs. Kasaragod, 18.10.2019; 7exs. Kuttyadi, 02.10.2019; 4exs. Tirur, 28.09.2019; 4exs. Vengara, 15.01.2019; 4exs. Thalassery, 28.10.2019; 4exs.
	<i>Olene mendosa</i> Hubner, 1823	24	Larvae feeds on mango, sapota, brinjal, sweat potato, tea, coffee, teak.	Vengara, 15-01-2019; 2exs. Kalpetta, 10.07.2019; 5exs. Balussery, 24.10.2019; 8exs. Kasaragod, 18.10.2019; 7exs. Kuttyadi, 02.10.2019; 4exs. Tirur, 28.09.2019; 4exs. Vengara, 15.01.2019; 4exs.
	<i>Eudocima homaena</i> Hubner (1816)	15	Major pest of citrus and many vegetables.	Thalassery, 28.10.2019; 4exs. Koothuparamba, 29.10.2019; 3exs. Koothuparamba, 29.10.2019; 4exs.
	<i>Spodoptera litura</i> (F., 1775)	12	Major pest of brinjal, banana, colocasia. In most plants, extensive defoliation and complete stripping of plants occur due to larval feeding.	Thalapparamba, 27.09.2019; 4exs. Muthanga, 14.10.2019; 4exs.
	<i>Acanthodelta janata</i> (L., 1758)	14	Major pest of citrus. It is a leaf eater and in severe cases, the larvae completely defoliate the plants, leaving behind only the midribs of leaves and stems.	Irikkur, 30.09.2019; 2exs. Kalpetta, 10.07.2019; 4exs. Pulpally, 02.09.2019; 2exs. Balussery, 24.10.2019; 2exs. Perambra, 08.10.2019; 4exs. Muthanga, 14.10.2019; 4exs.
Heliothinae	<i>Anomis flava</i> F., 1775	10	Pest of bhendi, hibiscus, etc. Caterpillar fed on the leaves and cause defoliation	Balussery, 24.10.2019; 4exs. Vengara, 15.01.2019; 2exs. Muthanga, 14.10.2019; 3exs.
	<i>Anomis subulifera</i> F., 1775	7	Larvae feeds on bhendi.	Koothuparamba, 29.10.2019; 2exs. Mukkam, 04.09.2019; 2exs.
	<i>Helicoverpa armigera</i> (Hübner, 1816)	8	Major pest of bhendi. Minor pest of cowpea. Larvae feed on flowers with rear part of the body and granular faeces are present on the plant or affected pods. In sunflower, bhendi, leaf feeding results in large, irregular holes and capsules also have boreholes.	Balussery, 24.10.2019; 3exs. Perambra, 08.10.2019; 3exs. Kalpetta, 10.07.2019; 2exs.
	<i>Chrysodeixis chalcites</i> (Walker [1858] 1857)	11	Larvae feeds on tobacco, tomato, sunflower, brinjal etc.	Kalpetta, 10.07.2019; 4exs. Perambra, 08.10.2019; 4exs. Kuttyadi, 02.10.2019; 2exs.
	<i>Agrotis</i> sp. (Hufnagel)	22	Polyphagous on several hosts including peas, tobacco etc.	Pulpally, 05.10.2019; 1exs. Kuttyadi, 02.10.2019; 5exs. Pulpally, 05.10.2019; 4exs. Vengara, 08.10.2019; 4exs.
Eupterotidae	<i>Xanthodes transversa</i> Guenee, 1852	8	Larvae feed on bhendi, brinjal	Tirurangadi, 04.05.2019; 5exs. Nileshwaram, 25.10.2019; 5exs. Thalassery, 28.10.2019; 4exs.
	<i>Eupterote mollifera</i> Walker, 1855	15	Major pest of <i>Moringa oleifera</i> . Hairy caterpillar feeds on leaf base	Koothuparamba, 29.10.2019; 4exs. Kalpetta, 04.10.2019; 5exs. Pulpally, 05.10.2019; 3exs. Perambra, 08.10.2019; 5exs. Kuttyadi, 10.10.2019; 2exs.

genera (*Spoladea*, *Diaphania*, *Omiodes*, *Maruca*, *Noorda* and *Herpetogramma*). Noctuidae with 92 species representing subfamily Hadeninae included major pest *Spodoptera litura*; in subfamily Catocalinae with three species under two genera (*Acanthodelta*, *Anomis*) and in subfamily Heliiothinae, eight specimens of *Helicoverpa armigera* were collected; Plusiinae is represented by *Chrysodeixis chalcites* (= *eriosoma*) with eleven specimens, and Noctuinae by *Agrotis*. Nolidae is represented by *Xanthodes transversa*. Eupterotidae, is represented by single species, *Eupterote mollifera* (Table 1; Figs. 1-28). This study provides baseline data to further strengthen the diversity studies of moths in mixed vegetables crops. Most of the species dealt here are considered as major and minor pests of various agricultural crops. This was studied by noticing the damage caused by the larvae in the leaves, flower, stem etc. of crops.

ACKNOWLEDGEMENTS

The authors thank the Director, Zoological survey of India, Kolkata, for providing necessary facilities; also to NBAIR-Bangalore, TNAU-Coimbatore, Dr M Jafer Palot, Scientist B, ZSI-Pune for their help in identification, providing the details about pest status; and Dr P Girish Kumar, Zoological Survey of India Kozhikode, for constructive feedback on the manuscript.

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(Manuscript Received: February, 2020; Revised: April, 2020;

Accepted: April, 2020; Online Published: May, 2020)

Online published (Preview) in www.entosocindia.org Ref. No. 20063