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Moth (Lepidoptera: Heterocera) Fauna of Delhi with Notes on Their Role as Potential Agricultural Pests

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Abstract

The present study deals with moth inventory in Delhi carried out from 2014 to 2015. During the study 36 species of moths belonging to 31 genera and 7 families were added to the existing moth fauna of Delhi. After the present study, the moth fauna of Delhi comprises a total of 47 species belonging to 42 genera and 9 families. Among these, species richness was found to be highest for family Noctuidae (17 spp.) followed by Erebidae (11 spp.) and Spingidae (6 spp.). The paper also provides information about moths acting as potential agricultural pests of common vegetables and crops of Delhi region based on secondary data.

Keywords: Agricultural pests, Delhi, Heterocera, Moth

1. Introduction

Insects being largest faunal group form a major component of the biodiversity of any area and hence, documentation of this group is indispensable to any scientific study and conservation programme [1]. Moths (Lepidoptera: Heterocera) represent one of the most heterogeneous groups among insects. There are about 1, 27,000 species of moths from all over the world [2] and of these, over 5000 species are reported from India [3-11].

Moths play a very important role in urban landscapes as agricultural pests [12, 13], night pollinators [14, 15] and indicators of ecological health [16]. But studies on moths are highly neglected in the National Capital region of India that represents one of the unique urban habitats in the world having a city forest, the Delhi Ridge at the bank of river Yamuna and traversed by one of the oldest mountain system of the world, the Aravalli hills. So far only 11 species of moths belonging to 11 genera and 7 families are reported from Delhi [17]. The present study aims to document this faunal group in Delhi region based on sampling carried out from 2014 to 2015 and also to find out their role as potential agricultural pests in this region based on secondary information.

2. Materials and Methods

The study was carried out from April 2014 to March 2015 following opportunistic search and light trap collection in selected residential areas of Delhi and their surroundings within 1 km range. Opportunistic search was carried out in all possible microhabitats i.e. tree bark, leaves, bushes, herbs/grasses, shrubs, ceiling/wall/floor of houses, on grounds and under street light poles during evening hours of day (6 - 9 pm). Light trap was also set during the same time period using a 160W mercury vapour bulb over a 3x3m² white cloth sheet which was hung between two vertical poles. The moths sitting on the white cloth were picked into the killing bottles containing chloroform (CHCl₃). Later they were stretched properly using entomological pins and have been kept properly in the insect box for later identification. Wing measurements were done in millimetres by measuring the length of the straight line between the two forewing tips. Identification was done using manuals of Bell and Scott [3] and Hampson [7-10]. Also secondary data was analysed to find out moths playing role as potential agricultural pests of common vegetables and crops grown in Delhi region.

3. Results and Discussion

During the study 40 species of moths belonging to 35 genera and 7 families were recorded from the study area of which 36 species of 31 genera and 7 families were added to the existing

moth fauna of Delhi. (Table 1, Figures 3, 4) Only four species viz. *Chiasmia fidoniata*, *Euproctis lunata*, *Trigonodes hyppasia* and *Dichagyris flammatra* which were previously reported by Ghosh and Varshney ^[17] from this region was recorded during the present study. Majority of moth species previously reported from this region remained unnoticed and the reason may be our study was random and only a limited area was covered during the study.

After the present study, the moth fauna of Delhi comprises a total of 47 species belonging to 42 genera and 9 families. Among these, species richness was found to be highest for family Noctuidae (17 spp.) followed by Erebidae (11 spp.) and Sphingidae (6 spp.) (Figure 1). Polyphagous nature of

Noctuidae members may account for their higher species richness. The study also revealed that among the heteroceran species so far reported from Delhi, 19 species belonging to 17 genera and 6 families are potential agricultural pests of common vegetables and crops of this region ^[12, 13, 18-25] (Table 2; Figure 2).

Delhi being an urban area, first time reporting of 36 spp. of moths from this region is highly encouraging. We expect many more species from the area in future through systematic surveys covering all seasons of the year and that will no doubt help to understand overall species diversity as well as seasonal variations in moth abundance in this region and underlying biotic interactions.

Table 1: List of moth fauna first time recorded from Delhi

Genus/species	Common Name	Wingspan (in mm)	Micro habitat	Locality
Super family: Bombycoidea				
Family: Eupterotidae				
<i>Eupterote fabia</i> (Cramer, 1779)	Monkey moth	84	House ceiling	Dwarka
Family: Sphingidae				
<i>Acherontia styx</i> Westwood, 1847	Death's-head hawk moth	104	Grass	Dwarka
<i>Clanis phalaris</i> (Cramer, 1777)	-	115	House wall	Dwarka
<i>Hippotion celerio</i> (Linnaeus, 1758)	Vine-striped hawk moth	78	Tree Bark (<i>Aurocaria</i> sp.)	Dwarka
<i>Psilogramma</i> sp.	-	86	Grass	Janakpuri
<i>Thereetra oldenlandiae</i> (Fabricius, 1775)	Impatiens hawk moth	61-70	Shrub (<i>Petunia</i> sp.)	Dwarka
Super family: Geometroidea				
Family: Geometridae				
<i>Cleora acaciaria</i> (Boisduval, 1833)	-	28-30	Light trap	Dwarka
<i>Cleora cornaria</i> (Guenée, 1857)	-	33-35	Light trap	Dwarka
Family: Lasiocampidae				
<i>Trabala vishnou</i> (Lefèbvre, 1827)	-	50	Grass	Dwarka
Superfamily: Noctuoidea				
Family: Erebidae				
<i>Achaea janata</i> (Linnaeus, 1758)	Castor semi-looper moth	60-64	Light trap	Dwarka
<i>Amata cyssea</i> Stoll, 1782	Handmaiden moth	28-30	House wall	Dwarka
<i>Cretonotos gangis</i> (Linnaeus, 1763)	-	40-41	Grass, Light Trap	Dwarka, Pusa
<i>Dysgonia torrida</i> (Guenée, 1852)	Jigsaw moth	39-40	Grass	Dwarka
<i>Lymantria</i> sp.	-	25	Light trap	Dwarka
<i>Ophiura triphaenoides</i> (Walker, 1858)	-	33-41	Light trap	Dwarka, Janakpuri, Srinivas Puri
<i>Spirama retorta</i> (Clerk, 1764)	Indian owlet moth	60	Grass	Dwarka
<i>Utetheisa pulchella</i> (Linnaeus, 1758)	Crimson speckled moth	31-35	Tree leaf (<i>Acacia</i> sp.)	Dwarka, Srinivas Puri
Family: Noctuidae				
<i>Acontia lucida</i> (Hufnagel, 1766)	Pale Shoulder moth	27-30	Light trap	Kashmere Gate
<i>Asota ficus</i> Fabricius, 1775	-	49	Light trap	Kashmere Gate
<i>Agrotis ipsilon</i> (Hufnagel, 1766)	Dark sword-grass moth	47-50	Light trap	Dwarka
<i>Chrysodeixis chalcites</i> (Esper, 1789)	Golden twin-spot moth	34-35	Light trap	Dwarka
<i>Digama hearseyana</i> Moore, 1859	-	32-34	Light trap	Dwarka
<i>Helicoverpa armigera</i> (Hübner, 1809)	Cotton bollworm moth	35-37	Light trap	Dwarka, Janakpuri, Pusa, Srinivas Puri
<i>Helicoverpa assulta</i> (Guenée, 1852)	Oriental tobacco budworm moth	34-35	Light trap	Dwarka
<i>Helicoverpa peltigera</i> (Denis and Schiffermuller, 1775)	Native budworm moth	34-35	Light trap	Dwarka
<i>Mythimna loreyi</i> (Duponchel, 1827)	Maize caterpillar moth	34-37	Light trap	Mayur Vihar, Pusa
<i>Mythimna separata</i> Walker, 1865	Oriental armyworm moth	45-50	Light trap	Dwarka
<i>Pandesma</i> sp.	-	37	Light trap	Dwarka
<i>Spodoptera litura</i> (Fabricius, 1775)	Oriental leafworm moth	35	House Wall	Dwarka, Srinivas Puri
<i>Spodoptera exigua</i> (Hübner, 1808)	Beet armyworm moth	27-30	Light trap	Dwarka
<i>Thysanoplusia orichalcea</i> (Fabricius, 1775)	Golden plusia	38-42	Light trap	Dwarka
<i>Xestia</i> sp.	-	30	Grass	Dwarka
Superfamily: Pyraloidea				
Family: Crambidae				
<i>Cnaphalocrocis</i> sp.	-	37	Light trap	Dwarka
<i>Diaphania indica</i> (Saunders, 1851)	Cucumber moth	15	Light trap	Dwarka
<i>Maruca vitrata</i> (Fabricius, 1787)	Bean pod-borer moth	27-28	House Ceiling	Dwarka
<i>Spoladea recurvalis</i> (Fabricius, 1775)	Hawaiian beet webworm moth	22	Light trap	Dwarka

Table 2: Heteroceran pests feeding /attacking common crops/vegetables grown in Delhi

Common crops /vegetables grown in Delhi	Heteroceran pests recorded from Delhi during the study
Maize	<i>Chrysodeixis chalcites</i> , <i>Earias insulana</i> *, <i>Helicoverpa armigera</i> , <i>Mythimna loreyi</i> , <i>M. separata</i> , <i>Spodoptera exigua</i> , <i>S. litura</i>
Soybean	<i>Agrius convolvuli</i> *, <i>C. chalcites</i> , <i>Maruca vitrata</i> , <i>M. separata</i> , <i>S. exigua</i> , <i>S. litura</i> , <i>Thysanoplusia orichalcea</i>
Castor	<i>Achaea janata</i> , <i>Asota ficus</i> , <i>H. armigera</i> , <i>S. litura</i> , <i>S. exigua</i> , <i>Trabala vishnou</i>
Pulses (chick pea/pigeon pea/black gram)	<i>A. convolvuli</i> *, <i>H. armigera</i> , <i>M. vitrata</i>
Cabbage	<i>S. litura</i> , <i>T. orichalcea</i>
Tomato	<i>Acherontia styx</i> , <i>C. chalcites</i> , <i>H. armigera</i> , <i>S. exigua</i> , <i>T. orichalcea</i>
Potato	<i>H. armigera</i> , <i>S. exigua</i> , <i>T. orichalcea</i>
Brinjal	<i>A. styx</i> , <i>C. chalcites</i> , <i>S. litura</i>
Cauliflower	<i>Agrotis ipsilon</i> , <i>S. litura</i> , <i>T. orichalcea</i>
Lady's finger	<i>H. armigera</i> , <i>S. exigua</i> , <i>E. insulana</i> *
Sweet potato	<i>A. convolvuli</i> *, <i>Cretonotos gangis</i>
Beet root	<i>Hippotion celerio</i> , <i>S. litura</i>
Taro	<i>H. celerio</i> , <i>S. litura</i> , <i>Theretra oldenlandiae</i>
Onion	<i>S. exigua</i> , <i>C. chalcites</i> , <i>A. ipsilon</i> , <i>T. orichalcea</i>
Garlic	<i>A. ipsilon</i> , <i>S. exigua</i>
Pea	<i>A. ipsilon</i> , <i>M. separate</i>
Gourd	<i>Diaphania indica</i>
Turnip	<i>M. separata</i> , <i>S. litura</i>
Radish	<i>T. orichalcea</i>
Chilly	<i>H. armigera</i>

Note: * Heteroceran pests previously reported from Delhi [17]

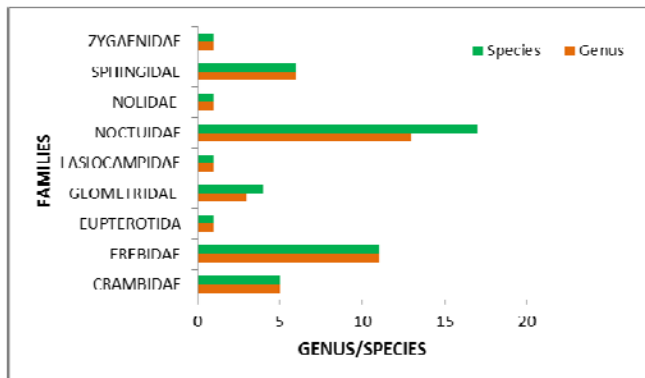


Fig 1: Moth diversity of Delhi

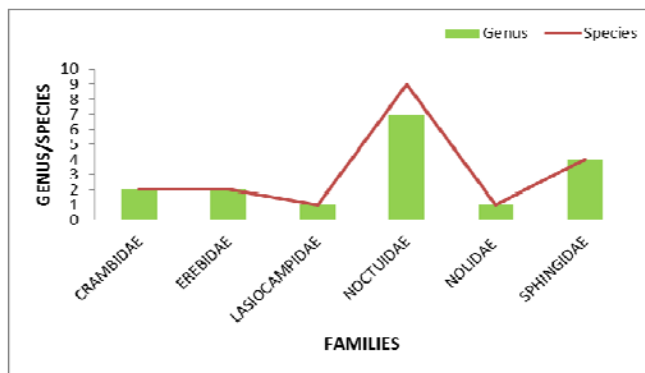


Fig 2: Heteroceran pests of common crops/vegetables in Delhi.

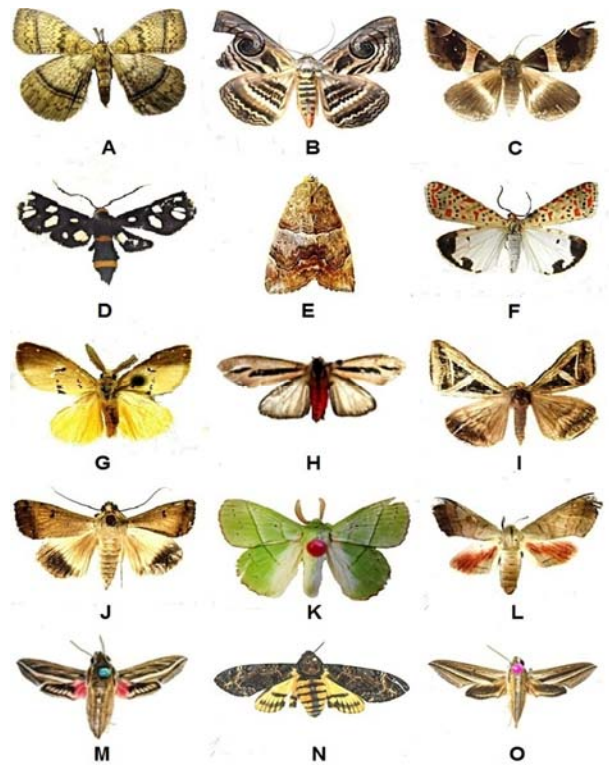


Fig 3: A (Eupterotidae): *Eupterote fabia* (A); B-J (Erebidae): *Spirama retorta* (B), *Dysgonia torrida* (C), *Amata cyssea* (D), *Achaea janata* (E), *Utetheisa pulchella* (F), *Euproctis lunata* (G), *Cretonotos gangis* (H), *Trigonodes hyppasia* (I), *Ophiusa triphaenoides* (J); K (Lasiocampidae): *Trabala vishnou* (L); L-O (Sphingidae): *Clanis phalaris* (L), *Hippotion celerio* (M), *Acherontia styx* (N), *Theretra oldenlandiae* (O).

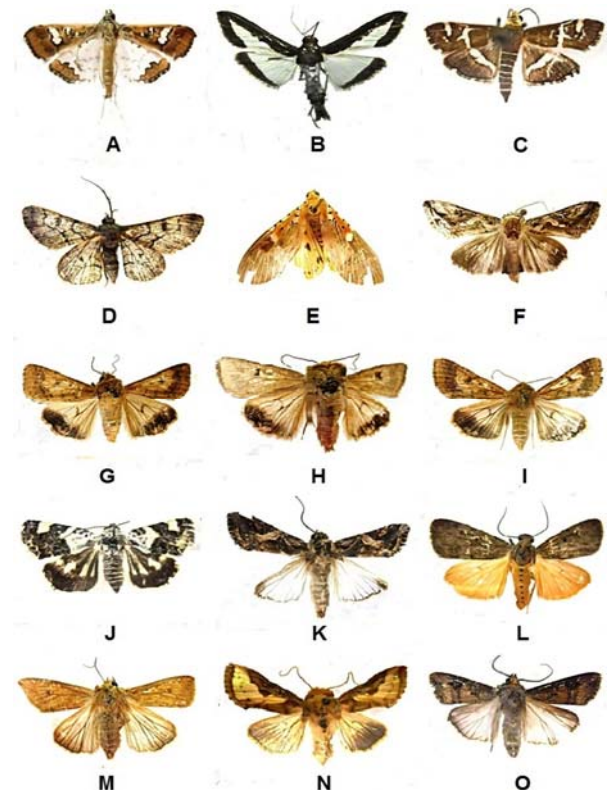


Fig 4: A-C (Crambidae): *Maruca vitrata* (A), *Diaphania indica* (B), *Spoladea recurvalis* (C); D (Geometridae): *Cleora cornaria* (D); E-O (Noctuidae): *Asota ficus* (E), *Chrysodeixis chalcites* (F), *Helicoverpa armigera* (G), *Helicoverpa peltigera* (H), *Helicoverpa assulta* (I), *Acontia lucida* (J), *Spodoptera litura* (K), *Digama hearseyana* (L), *Mythimna separata* (M), *Thysanoplusia orichalcea* (N), *Agrotis ipsilon* (O).

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