

# Studies On The Diversification And Identification of Major Insect Pests of Mulberry

Maria Joncy A.<sup>1</sup>, Rajeswari P.<sup>2</sup>

Department of Sericulture, Forest College and Research Institute

<sup>1,2</sup> Ph.D. Scholar, Tamil Nadu Agricultural University, Mettupalayam, Tamil Nadu, India.

**Abstract-** Mulberry (*Morus sp.*) the only host plant for rearing silkworms (*Bombyx mori*), the luxuriant, evergreen and fast rising vegetative growth of mulberry invites many insect pests which depletes the nutritive content of mulberry leaves and this ultimately reduces the raw silk quality. Mulberry is subject to the attack of a vast pest complex belonging to a large number of insect orders. Though the frequent leaf picking and pruning of the shoot restrict the attack of pests, many of them still find enough time and place on mulberry for feeding and breeding on it. To study the abundance and diversity of insect fauna present in mulberry ecosystem paves way for selecting the suitable pest management strategies. Field experiments were conducted to inventorize the diversity of insects in mulberry at Theni district of Tamil Nadu during November 2013 to April 2014. The diversification in mulberry pest complex showed that Hemiptera is the predominant order that contributes about 60.86 per cent, Hymenoptera, coleopteran, Lepidoptera, Others contributes about 22.05, 8.65, 1.98 and the 6.90 per cent respectively. Among these orders, pink mealy bug *Maconellicoccus hirsutus* (Green) pest of Hemiptera and leaf webber, *Diaphania pulverulentalis* (Hampson) of Lepidoptera order are the prevailing pests in mulberry ecosystem.

**Keywords-** Mulberry, pests, diversity, insect orders

## I. INTRODUCTION

Mulberry (*Morus spp.*) forms the sole food for growth and development of silkworm (*Bombyx mori* L.) leading to quality silk production (Kumar *et al.*, 2002). Being a perennial, blooming and high biomass producing plant with luxuriant growth under irrigated condition of recommended package and practices often leading to the breeding and multiplication of various pests. This condition leads to rapid pest proliferation, which resulted qualitative and quantitative loss of mulberry plants and ultimately low productivity in sericulture (Rahmathulla *et al.*, 2012). The major insect orders known to be the pest of mulberry in order of largest number of species attacks the mulberry are Lepidoptera, Hemiptera, Coleoptera, Thysanoptera, Orthoptera and Isoptera besides the acarids and molluscan (Sengupta *et al.*, 1990). The major pests are pink mealy bug *Maconellicoccus hirsutus* which is known to be the vector of Tukra disease

(Naik *et al.*, 2013), Thrips *Pseudodendrothrips mori*, Leaf hopper *Empoasca flavescens* (Fabricius), Spiralling Whitefly *Aleurodicus dispersus* Russela, Southern green sting bug *Nezaraviridula* (Linnaeus), Litchi bug *Tessaratomajavanica* (Thunberg), Leaf roller *Diaphania pulverulentalis* (Hampson), Bihar Hairy Caterpillar *Spilosoma oblique* (Walker), Cut worm *Spodopteralitura* (Fabricius), Red Hairy Caterpillar *Amsacta albigriga* (Walker), Wasp moth *Amata passalis* (Fabricius), Wingless grasshopper *Neorthacris acuticeps nilgriensis* (Uvarov) (Avhadet *et al.*, 2013), Ash weevil *Mylloceruscyanura* and Termite *Odontotermes obesus* (Rambur), Mite *Tetranychus* sp. (Kant and Kumar, 2007). Studies on diversity are the preliminary for any management work (Santhi and Kumar, 2010). This necessitates the precise identification of the pests and their diversity in mulberry ecosystem so that suitable control strategies can be chosen to manage the pests. The objective of this study was to determine the diversity and abundance of the insect fauna associated with mulberry.

## II. MATERIALS AND METHODS

Survey on the insect diversity was conducted at Aranmanaiputhur, Srirangapuram, Myladum Para, Lakshmiapuram villages of Theni District of Tamil Nadu during November 2013 to April 2014. The details of materials and methods are described here.

The mulberry garden was divided into five sub plots, four at corner, and one at the centre. From each sub plots twenty plants were selected at random for the observations. Thus 100 plants were observed every fortnight for November 2013 to April 2014. The number of mealy bugs, grasshoppers, scales, whiteflies, thrips, leafhoppers, bugs etc., feeding on the plants were counted. Ants attending mealy bug populations were also recorded. The average of the counted insects per twenty plants was treated as one sample. The insects were collected, observed based on the method followed by Schauff, 2002. The insects collected were identified and grouped in different orders of class Insecta (Ambrose, 2004).

## III. RESULTS AND DISCUSSION

Insects belonging to six orders were recorded. The order Hemiptera recorded 60.86 per cent of total insects and the order Coleoptera recorded 8.65 per cent. Other orders such as Lepidoptera, Odonata, Orthoptera, Hymenoptera accounted the rest. The distribution is detailed in chart.1. The details of insects recorded were given below as order wise.

### Order: Hemiptera

It was the largest hemimetabolous orders with piercing and sucking mouth parts, with two sub orders, Homoptera and Heteroptera. Insects from Homoptera suborder were observed in the field which does not possess scutellum and has uniform leathery forewings are homopterans. Insects observed from this orders were herbivores. Pseudococcids, member of the family Pseudococcidae generally called mealy bugs were the dominant insects. Santhi and Kumar (2010) also reported that the family Pseudococcidae was the largest family recorded in mulberry ecosystem among the Hemipterans. Their body was covered by mealy coating. Eggs were laid in loose cottony sac. Young ones were gregarious. These mealy bugs secreted honey dew hence attended by ants. These ants protected mealy bugs from natural enemies. There was a beneficial interaction between homopterans and ants. The parasitoid of mealy bug *Leptomastix dactylopii* was also recorded under this order. These insects were used in bio control programmes often in mealy bugs (Noyes and Hayat, 1988).

In the present study, three types of mealy bugs were observed in the field. The pink mealy bugs *Maconellicoccus hirsutus* were present throughout the survey period except rainy months. The population was low during rainy season. Due to the splash, sucking pests are washed out. The mealy bugs preferred tender leaves and twigs. Continuous feeding by mealy bugs caused severe tukra symptoms.

*Paracoccus marginatus* were also found on leaves, stem and twigs. Adult females are yellowish with short waxy filaments around the margin. The dispersal stage is the first instar crawler. The mealy bug injects a toxin as it feeds on leaves, which results in chlorosis (yellowing), stunting, deformation, early leaf drop, and build up of honeydew. Sooty mould growing on honeydew excreted by the mealy bugs interferes with photosynthesis. Heavy mealy bug infestation kills the plants. Tanwari *et al.* (2010) reported that the insects also excrete honey dew which is known to be associated with black sooty mould formation and subsequently impairs photosynthetic efficiency of the affected plants.

*Ferrisia virgata* the tailed mealy bug, which is a polyphagous pest, also infested young mulberry leaves. Their

occurrence was very meager to show any visible symptom, in few cases young shoots tips dried due to continuous feeding.

*Aleurodicus dispersus*, member of the family Aleyrodidae the white fly were minute active whitish insects resembling tiny moths. The body and wings were covered with white powdery coating. The eggs were laid in irregular spirals. The white nymphs and adults were seen on lower surface of leaves. The desapping of leaves depleted the nutritive value of leaves. Adults and nymphs of the whitefly remain in colonies under the surface of leaves. *Aleurodicus dispersus* Russell (Homoptera: Aleyrodidae) is one such polyphagous sap sucking pest first reported on mulberry by Geetha *et al.* (1998). The copious white, waxy, flocculants, material secreted by all the stages of pest is readily spread by wind, causing nuisance (Kumashiro *et al.*, 1983).

The leaf hopper, *Empoasca flavescens*, member of the family Cicadellidae adults, and nymphs fed on tender leaves and caused “hopper burn” symptoms. They were very active and jump, can move sideways. Sakthivel *et al.* (2012) documented that *Empoasca flavescens* F. (Homoptera: Cicadellidae) is the major sucking pest of mulberry in the tropical zones of south India.

### Order: Hymenoptera

Ants belonging to the member of the family Formicidae. The dominant Pink mealy bug, *M. hirsutus* population was heavily influenced by ant population. The predator population in the ant attended colonies was significantly lower. Ants were seen attending mealy bug colonies.

The mealy bug colonies in huge mulberry vegetation were easily identified by the movement of ants. Five types of ants were recorded in mulberry plants by Mahimasanthi *et al.* (2014). They were *Camponotus compressus*, *Monomorium indicum*, *Dorymyrmex pyramicus*, *Solenopsis geminata* and *Tapinoma sessile*.

### Order: Coleoptera

Coleopterans are the insects with biting and chewing mouth parts with hard exoskeleton. Forewings were hardy and hind wing membranous.

Ash weevil, *Mylocherus discolor* and *M. viridanus* member of the family Curculionidae adults were seen on mulberry leaves. The presence of this beetle was recorded throughout the survey period. Their occurrence was slightly

higher during summer months. Damage symptoms were not severe.

Two predatory beetles were recorded. *Nephusregularis*(Sic.) member of the family Coccinellidae, was the common predominant predator seen feeding on mealy bugs. This was also reported by Joshi *et al.* (2003). The carabids were found next to coccinellids in the field. Allen (1979) reported carabids as beneficial insects. They were seen inside the tukra curls. The grubs were black coloured with white mealy coating seen inside the tukra curls feeding on mealy bugs. Adults were very small oval shaped brown coloured beetles. The population of this beetle increased with increase in mealy bug population. The activity of beetles was not seen on tukra affected branches with ants.

Another yellow lady bird beetle recorded was *Illeiscincta*. The yellow coloured grubs and adults were seen on plants feeding on powdery mildew growth on leaves. Their occurrence was higher during winter months.

Table 1. Inventory of insect fauna observed in mulberry ecosystem

Order	Common name	Scientific name	Family
Hemiptera	Pink mealy bug	<i>Maconellicoccushirsutus</i>	Pseudococcidae
	Papaya mealy bug	<i>Paracoccusmarginatus</i>	Pseudococcidae
	Tailed mealy bug	<i>Ferrisiavirgata</i>	Pseudococcidae
	White fly	<i>Aleurodicusdispersus</i>	Aleyrodidae
	Leaf hopper	<i>Empoascaflavescens</i>	Cicadellidae
Hymenoptera	Carpenter ant	<i>Camponotuscompressus</i>	Formicidae
	Black ant	<i>Monomoriumindicum</i>	Formicidae
	Fire ant	<i>Solenopsisgeminata</i>	Formicidae
Coleoptera	Ash weevil	<i>Mylocherusdiscolor</i>	Curculionidae
	Predatory beetle	<i>Nephusregularis</i>	Coccinellidae
	Yellow lady bird beetle	<i>Illeiscincta</i>	Coccinellidae
Orthoptera	Wingless	<i>Neothacrisacuticepsnil</i>	Acrididae

a	s grasshopper	<i>giriensis</i>	
	Cricket	<i>Gryllus</i> sp.	Gryllidae
Lepidoptera	Leaf webber	<i>Diaphaniapulverulentalis</i>	Pyraustidae
Odonata	Dragonfly	<i>Libellulaquadrimaculata</i>	Libellulidae
	Damselfly	<i>Protoneurasp.</i>	Protoneuridae

#### Order: Orthoptera

Medium sized insects with mandibulate mouthparts, the hind legs are enlarged facilitating jumping. The short horned grasshopper *Neorthacrisnilgiriensis* member of the family Acrididae, was present throughout the survey period. Cricket, *Gryllus*sp. of Gryllidae was also present in the garden. Prabhakar *et al.* (2014) reported that wingless grasshopper, *N. acuticepsnilgiriensis* infestation occurred throughout year on mulberry.

#### Order: Lepidoptera

Lepidopterans are holometabolous insects, adults brightly coloured, winged insect with long tubular suctorial mouthparts. The larvae are soft bodied caterpillars with biting mouth parts. The pupae are generally enclosed in a cocoon.

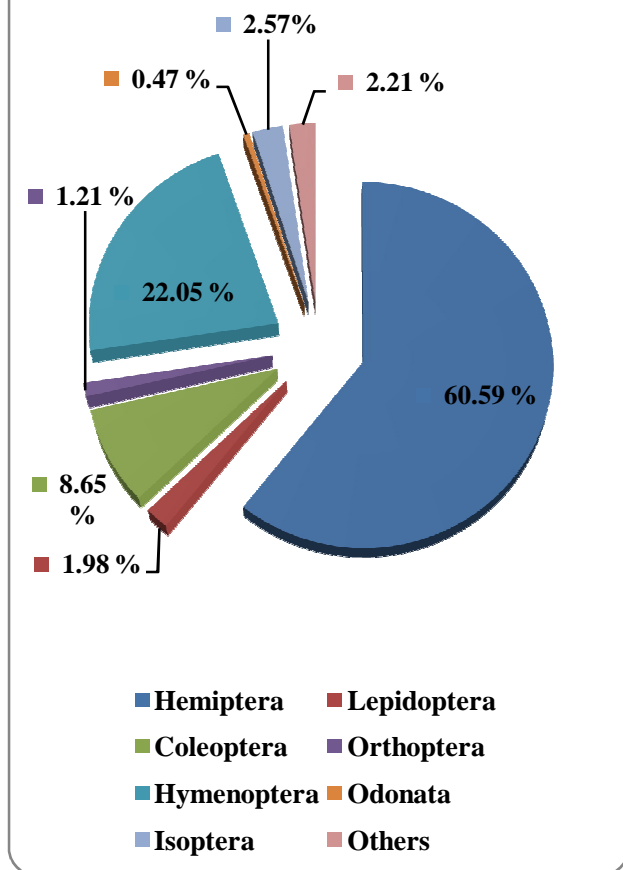
*Diaphaniapulverulentalis*, member of the family Pyraustidae, larvae damaged by folding the leaves and by webbing the tender shoots. Early instars fed from inside the web and skeletonize the leaves. Later instars fed the tender leaves voraciously. Larval feeding caused qualitative and quantitative loss of leaves. Geetha Bai *et al.* (1997) reported that the leaf webber

*Diaphaniapulverulentalis* has been observed as a severe pest of mulberry since 1995 in Karnataka state. It has also been spread to the neighbouring states of Tamil Nadu and Andhra Pradesh.

#### Order: Odonata

The dragonfly, *Libellulaquadrimaculata* of Libellulidae and Damselfly, *Protoneurasp.* of family Protoneuridae were commonly seen in the mulberry leaves. These insects were general predators. Dragonflies are voracious predators in larval and adult life stages, feeding exclusively on living prey. Larvae detect prey visually and with mechanoreceptors, primarily as sit and wait predators (Corbet, 1999).

**Chart 1. Order wise distribution of insects in mulberry eco-system**



#### IV. CONCLUSION

The diverse insect pests population was found in mulberry ecosystem. The insect diversity was due to the morphology and the chemical constituents of the plants. The Hemiptera is the dominant insect order documented and followed by Hymenoptera, coleopteran, Lepidoptera and others. Thus, the sucking pests are more prevalent in mulberry which depletes nutritive values of leaves.

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