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Mulberry Defoliators: Distribution and Occurrence from Aurangabad (M.S.), India

Sunil B. Avhad and Chandrashekar J. Hiware

ABSTRACT

A field investigation on the seasonal incidence of frequently occurring leaf eating pests of mulberry was carried out for two annual cycles from Aurangabad district of Maharashtra state. The present survey was conducted during June 2009 to May 2011. The result shows that, different pests are damaging the Mulberry cop from the study area which causes heavy economical loss to sericulture farmers. The pests occurred were leaf roller, Bihar hairy caterpillar, cutworms, Red hairy caterpillar, Jassid / leaf hopper, Southern green stink bug / Pentatomid bug, Tree hoppers, Litchi bug, wasp moth and wingless grasshopper etc. In the present study classification, occurrence and type of damage and symptoms of the defoliator insect communities was also worked out in the mulberry field from various sites in Aurangabad district of Maharashtra state, India.

Keywords: Mulberry Defoliators, Distribution, Occurrence, Aurangabad

1. Introduction

The modern sericulture technology not only paid rich dividends by increasing silk production but also drastically disturbed natural seri-ecosystem. The pest population of silkworm and its host plants has increased and frequently there is outbreak of new pest. It causes extensive damage to silk host plants, which resulted in the deterioration of quality and quantity of leaves of silk host plants and ultimately fluctuation in cocoon production ^[1]. The increase in the productivity of silk per unit area can be achieved by adopting suitable production technology combined with management of pests and diseases of mulberry. About 300 insect and non-insect species of pests are known to occur on mulberry ^[2]. 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 ^[3].

Defoliating insects are common in all agricultural ecosystems, feeding on different host plants. They are detrimental to the health and productivity of plants. Depending upon the duration and the severity of defoliation, plant growth may be negatively affected. Defoliator's causes' considerable damage to mulberry and early detection and management are the key factors to control them. The two major groups of defoliators that cause damage to plants through their chewing mouthparts include the caterpillars and beetles. Other chewing insects occasionally damaging the plants include grasshoppers, katydids and their relatives ^[4].

The perennial nature of mulberry combined with monocultural practices, harbours several pests throughout the year with seasonal variations ^[5]. The production of appreciable quantity of quality mulberry leaf is often hampered by insect pests belonging to large number of insect orders. Apart from insect pests, predators, parasitoids, natural and detritivores also survive on mulberry plant. Studies on diversity are the preliminary for any management work ^[6]. Extensive damage to 800 acres of mulberry by Bihar hairy caterpillar, *Spilarctia obliqua* has been reported from Mysore and Chamaraajanagar district during the year 1993 ^[7]. Narendram (2001) explained that taxonomy is the foundation of biodiversity ^[8].

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Sunil B. Avhad *

Dr. Babasaheb Ambedkar
Marathwada University, Aurangabad
(M.S.), India.

Chandrashekar J. Hiware

Dr. Babasaheb Ambedkar
Marathwada University, Aurangabad
(M.S.), India

Correspondence:

Sunil B. Avhad *

Dr. Babasaheb Ambedkar
Marathwada University,
Aurangabad (M.S), India.
E-mail: sunil_zoology@rediffmail.com

Hence a present survey was conducted in mulberry garden to study the distribution and occurrence of the defoliator insect fauna associated with mulberry fields from Aurangabad district of Maharashtra state causing damage to the mulberry plants which in turn effects on the sericulture industry from this area and economical loss to farmers.

2. Materials and Methods:

1. Study area description:

After detailed survey of the Aurangabad district, some of the



Fig 1: Collection site of mulberry insect defoliators from Aurangabad district, Maharashtra, India.

2. Collecting Methods:

Different defoliator insect pests were collected from mulberry gardens in and around the selected fields of Aurangabad districts, Maharashtra, India by standard insect collection techniques [9,10].

3. Killing Methods:

- a) **Use of liquid:** All defoliator insects pests must not be allowed to dry at once they are dead. They should be placed directly into a liquid preservative usually 70 - 95% ethyl alcohol. Formalin should not be used for storing insects as it makes specimens hard and difficult to examine.
- b) **Freezing:** Insects can be killed by placing them in a freezer. This method is particularly suitable for reared moths and butterflies.
- c) **Pinching:** Larger butterflies can be stunned or killed by pinching the thorax between the thumb and fore finger.
- d) **Killing bottles:** Most insects can be killed in killing bottles. The bottle should be wide mouthed and made of glass; polypropylene or polyethylene. Absorbent paper should be placed inside the bottle to soak up condensation, regurgitated or defecated liquid and to prevent insects from damaging each other.

4. Insect sampling and Identification: All the sites were sampled monthly with different collection methods with more or less regular periodicity. All the specimens were identified with the help of available literature and Zoological Survey of India, Entomology Section, Pune division.

3. Results:

The present investigation shows that there was occurrence of

mulberry fields were selected for the collection of defoliator insect pests. The selected fields were from different tehsils of Aurangabad districts and are Aurangabad (University campus), Khultabad (Shulibhanjan), Gangapur (Ambewadi), Sillod (Kaigaon), Paithan (Nilajgaon) and Phulambri (Dongergaon) are shown in shown in **Figure No. 1**. Insects were collected by visiting each mulberry garden for 2 annual cycles i.e. from June (2009) - May (2011) with more or less monthly periodicity.

defoliating insect pests from mulberry garden surveyed from various sites in Aurangabad district, Maharashtra for two consecutive years June (2009) - May (2011). Amongst the defoliators, 5 Lepidopterans, 4 Hemipteran and 1 Orthopteran species are recorded. The occurrence of defoliators from various sites shows that, the incidence of five Lepidopterans namely Viz. Leaf roller, Bihar hairy caterpillar, Cutworm, Red hairy caterpillar and Wasp moth, Four Hemipteran namely Viz. Jassid/leaf hopper, Southern green stink bug/Pentatomid bug, Tree hoppers and Litchi bug and one Orthopteran is wingless grasshopper species were recorded.

The Occurrence of defoliators on sites from various Tehsils was shows that all 10 species recorded from Phulambri and Gangapur. In Paithan Bihar hairy caterpillar, cutworm and wingless grasshopper whereas but no occurrence of Leaf roller, Red hairy caterpillar and Jassid/leaf hopper. Aurangabad and Sillod shows same species occurrence but cutworm, Leaf roller and Jassid/leaf hopper are not showing occurrence during study period. In Khultabad there was occurrence of red hairy caterpillar and wasp moth, Jassid / leaf hopper and wingless grasshopper but no occurrence of Leaf roller, Bihar hairy caterpillar and cutworm. A detail of occurrence in various collection sites from Aurangabad district are shown in **Table No. 1**. The defoliators, which cause significant damages, are Bihar hairy caterpillar and wingless grasshopper which followed by Wasp moth, Cutworm, Red hairy caterpillar, Leaf roller and Leaf hopper.

The defoliators insect based on their orders namely Lepidoptera, Hemiptera and Orthoptera having total 10 insect species was found around mulberry garden of Aurangabad district, Maharashtra state, India were describe with their classification, locality and habitat, occurrence and Type of damage and symptoms were described below as follows:

Table 1: Incidence of mulberry defoliators in various sites from Aurangabad

Sr. No.	Mulberry defoliators	Occurrence of defoliators on sites from Tehsils					
		Aurangabad	Sillod	Paithan	Phulambri	Khultabad	Gangapur
1.	Bihar hairy caterpillar	+	+	+	+	-	+
2.	Cutworm	-	-	+	+	-	+
3.	Leaf roller	-	-	-	+	-	+
4.	Red hairy caterpillar	+	+	-	+	+	+
5.	Wasp moth	+	+	+	+	+	+
6.	Jassid/ Leaf hopper	-	-	-	+	+	+
7.	Southern green stink bug/ Pentatomid bug	+	+	+	+	+	+
8.	Litchi bug	+	+	+	+	+	+
9.	Tree hoppers	+	+	+	+	+	+
10.	Wingless grasshopper	+	+	+	+	+	+

+: Occurrence (Present)

- : No occurrence (Absent)



A) *Spilosoma obliqua* Walker



B) *Amasacta albistriga* Walker



C) *Amata passalis* Fabricius



D) *Diphania pulverulentalis* Hamson



E) *Spodoptera litura* Fabricius



F) *Empoasca flavescens* Fabricius



G) *Nezara viridula* Linnaeus



H) *Oxyrachis tarandus* Fabricius



I) *Tessaratoma javanica* Thunberg



J) *Neorthacris acuticeps nilgriensis* Uvarov

Fig 2: Occurrence of mulberry defoliators in various sites from Aurangabad. Order: Lepidoptera (A - E), Order: Hemiptera (Figure F-I), Order: Orthoptera (J).

3.1. Order: Lepidoptera

3.1.1 *Spilosoma obliqua* Walker (Figure No. 2A)

- **Classification:** [Common name: Bihar hairy caterpillar; Phylum: Arthropoda; Class: Insecta; Order: Lepidoptera; Family: Arctidae; Genus: *Spilosoma*; Species: *obliqua*]
- **Locality and Habitat:** From the mulberry plant, *Morus alba* L., from all mulberry fields except Khultabad, Aurangabad district, Maharashtra, India.
- **Occurrence:** The pest is found to occur frequently from August to February.
- **Type of damage and symptoms:** Gregarious young caterpillars feed upon the chlorophyll layer of leaf exposing the veins. Late instar caterpillars are voracious eater of mulberry leaves. The affected leaves look dead, dried and easily fall off. Clear branches without leaves can also be noticed after a severe attack.

3.1.2. *Amasacta albistriga* Walker (Figure No. 2B)

- **Classification:** [Common name: Red hairy caterpillar; Phylum: Arthropoda; Class: Insecta; Order: Lepidoptera; Family: Arctidae; Genus: *Amasacta*; Species: *albistriga*]
- **Locality and Habitat:** From the mulberry plant, *Morus alba* L., from all mulberry fields except Paithan, Aurangabad district, Maharashtra, India.
- **Occurrence:** During September.
- **Type of Damage and symptoms:** In the early instars, larvae feed gregariously on the same leaf by scrapping the lower surface of tender leaves leaving the upper epidermal layer intact. In later stages, the damage will be severe and the entire plant is eaten and looks like as if grazed by cattle.

3.1.3. *Amata passalis* Fabricius (Figure No. 2C)

- **Classification:** Common name: Wasp moth; Phylum: Arthropoda; Class: Insecta; Order: Lepidoptera; Family: Amatidae; Genus: *Amata*; Species: *passalis*]
- **Locality and Habitat:** From the mulberry plant, *Morus alba* L., from all six mulberry fields, Aurangabad district, Maharashtra, India.
- **Occurrence:** Mostly found from February to August.
- **Type of Damage and Symptoms:** Reduction in leaf yield. Branches without leaves are noticed in the garden.

3.1.4. *Diphania pulverulentalis* Hamson (Figure No. 2D)

- **Classification:** [Common name: Leaf roller; Phylum: Arthropoda; Class: Insecta; Order: Lepidoptera; Family: Pyralidae; Genus: *Diphania*; Species: *pulverulentalis*]
- **Locality and Habitat:** From the mulberry plant, *Morus alba* L., from Phulambri and Gangapur mulberry fields, Aurangabad district, Maharashtra, India.
- **Occurrence:** Summer and autumn seasons.
- **Type of Damage and symptoms:** The caterpillars roll the leaves. They tie or fold one to several blades of leaves of mulberry with silken thread and feed internally in the leaf folds. As a result, quality and quantity of leaves is adversely affected. The pest is troublesome to rainfed and irrigated mulberry crops. By egg laying, apical shoots are destroyed. The pest cause a great problem to chawki rearing by contaminating the leaves since pathogens harbour and increase the incidence of pebrine disease silk worms.

3.1.5. *Spodoptera litura* Fabricius (Figure No. 2E)

- **Classification:** [Common name: Cutworm; Phylum: Arthropoda; Class: Insecta; Order: Lepidoptera; Family: Noctuidae; Genus: *Spodoptera*; Species: *litura*]
- **Locality and Habitat:** From the mulberry plant, *Morus alba* L., from Paithan, Phulambri and Gangapur mulberry fields, Aurangabad district, Maharashtra, India.
- **Occurrence:** Mostly from August to February on mulberry.
- **Type of Damage and symptoms:** The caterpillars cause the damage to shoot of young plants by cutting them. The cut portion of the shoot dries up and finally falls down. The caterpillars also cause damage to leaves by feeding upon them. Newly sprouted mulberry garden or young plant gardens skeletonized totally in severe infestation.

3.2 Order: Hemiptera

3.2.1. *Empoasca flavescens* Fabricius (Figure No. 2F)

- **Classification:** [Common name: Jassid / Leaf hopper; Phylum: Arthropoda; Class: Insecta; Order: Hemiptera; Family: Cicadellidae; Genus: *Empoasca*; Species: *flavescens*]
- **Locality and Habitat:** From the mulberry plant, *Morus alba* L., from Phulambri, Khultabad and Gangapur mulberry fields, Aurangabad district, Maharashtra, India.
- **Occurrence:** From July to October months.
- **Types of Damage and Symptoms:** Both nymphs and adults suck the cells sap from leaves at the time of sucking cell sap jassids inject toxins in the plant body as result that leaves becomes curly and edges of the leaves start burning this is called as "hopper burn". The hopper burn is caused by the toxic virus and jassids is a vector very first a triangular brown spot at the tip of leaf is appear. Secondly, jassids secrete honeydew like substance on leaf surface further, it cause sooty mould and affect photosynthesis of plant. In general, the jassids affect the quality and quantity of leaves. The jassids also suck the cell sap from tender's stems of twigs.

3.2. 2. *Nezara viridula* Linnaeus (Figure No. 2G)

- **Classification:** [Common name: Southern green stink bug/ Pentatomid bug; Phylum: Arthropoda; Class: Insecta; Order: Hemiptera; Family: Pentatomidae; Genus: *Nezara*; Species: *viridula*]
- **Locality and Habitat:** From the mulberry plant, *Morus alba* L., from all six mulberry fields, Aurangabad district, Maharashtra, India.
- **Occurrence:** in all season.
- **Types of Damage and Symptoms:** Nymphs and adults suck the cell sap from tender leaves and stems and devitalize the host plants.

3.2.3. *Oxyrachis tarandus* Fabricius (Figure No. 2H)

- **Classification:** [Common name: Tree hoppers; Phylum: Arthropoda; Class: Insecta; Order: Hemiptera; Suborder: Homoptera; Family: Membracidae; Genus: *Oxyrachis*; Species: *tarandus*]
- **Locality and Habitat:** From the mulberry plant, *Morus alba* L., from all six mulberry fields, Aurangabad district, Maharashtra, India.
- **Occurrence:** in all season.

- **Types of Damage and Symptoms:** Foliar distortion was noticed because of continuous sucking of cell sap by the *Oxyrachis tarandus* (Fabricius). Due to the sucking of cell sap and injection of toxins through saliva by these insects, the physiology plants get affected. In addition to this, sooty mould, *Capnodium* sp. develops on honey dew droplets on different plant parts, which results in the production of poor quality leaves. In future, it may become major pest, because mulberry crop is grown round the year and these hoppers may prefer it an alternate host whenever the main host plant are not available.

3.2.4. *Tessaratomia javanica* Thunberg (Figure No. 2I)

- **Classification:** [Common name: Litchi bug; Phylum: Arthropoda; Class: Insecta; Order: Hemiptera; Family: Tessaratomidae; Genus: *Tessaratomia*; Species: *javanica*]
- **Locality and Habitat:** From the mulberry plant, *Morus alba* L., from all six mulberry fields, Aurangabad district, Maharashtra, India.
- **Occurrence:** From June to January.
- **Types of Damage and Symptoms:** Nymphs and adults suck the cell sap from tender leaves and stems and devitalize the host plants.

3.3. Order: Orthoptera

3.3.1 *Neorthacris acuticeps nilgriensis* Uvarov (Figure No. 2J)

- **Classification:** [Common name: Wingless Grasshopper; Phylum: Arthropoda; Class: Insecta; Order: Orthoptera; Family: Acrididae; Genus: *Neorthacris*; Species: *acuticeps*]
- **Locality and Habitat:** From the mulberry plant, *Morus alba* L., from all six mulberry fields, Aurangabad district, Maharashtra, India.
- **Occurrence:** From July – August, more frequently.
- **Types of Damage and Symptoms:** Nymphs and adults of this pest voraciously feed upon the mulberry leaves and leaf yield is reduced considerably. Branches of plants without leaves are observed in the mulberry garden.

4. Discussion:

Vijay Kumar et al., (2005) has found occurrence of red hairy caterpillar in CSR and TI centre in Tamil Nadu^[4] and Rajadurai, (2005) also recorded mulberry defoliator occurrence in CSR and TI centre Mysore, consisting 13 species of Lepidoptera, 3 Coleopteran and 2 Orthopteran species. Further they are categorized into major pests (1 species), sporadic pest (1 species) and minor pests (16 species). A field investigation by Hemalata et al., (2008) on the seasonal incidence of frequently occurring leaf eating pests of mulberry viz., leaf roller, Bihar hairy caterpillar and wingless grasshopper was undertaken in Tumkur district (Karnataka) for two consecutive years which shows severe to moderate infestation was recorded in rainy and winter season, while mild infestation was recorded in summer due to these pests^[12].

Sathe, (1998) and Sengupta et al., (1990) shows the distribution of Bihar hairy is widely distributed in oriental region as sporadic pest of several agricultural crops^[13,3]. As a mulberry pest, it is reported from Bihar, A.P, Karnataka, Mahashtra, Tamil Nadu, Madhya Pradesh, Uttar Pradesh, Punjab etc. The cutworms are distributed in tropical and subtropical parts of the world and also in India. Leaf roller also occurrence of new to India: Andhra Pradesh, Karnataka, and Tamil Nadu. The Jassids/leaf hoppers are reported from India

and Bangladesh. Wingless grasshopper pest distribute in India and Malaysia. Similar results were observed by Vijaya Kumar et al., (2005) has reported that the incidence of Red hairy caterpillar, *Amasacta albistriga* Walker which is serious pest of ground nut, seas am, Cow pea, mung bean, cotton, Bajara, sorghum (Jawar), finger millet, castor and many other crops has found to be infesting mulberry^[11]. The pest is gregarious in early instars and highly migratory in late instars. Though not a regular pest, it causes extensive damage and economic loss to mulberry crop.

The lepidopteran insect pests causing damages to the mulberry in different part of the world in a very concise form. It is evident from available literature that the more than 20 lepidopteran species belonging to *Pyrilidae*, *Arctiidae*, *Lymantridae*, *Noctuidae*, *Geometridae*, *Amatidae*, *Syntotomidae* and *Tortricidae* cause damage to mulberry crop in different parts of world^[14]. Recently the lepidopteran leaf roller *Diaphania pulverulentalis* (Hampson) has attained a serious pest status in the south of India during rainy and winter months with high percentage of infestation^[3,15,16,17]. Similar observations were recorded by us during study period.

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