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A comprehensive study on pest complex of *Flemingia* spp. from Jorhat, Assam

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Abstract

Study on insect pest complex of *Flemingia macrophylla* (Willd) and *Flemingia semialata* (Roxb) was carried out in the plots maintained for lac insect conservation under ICAR-Network Project on Conservation of Lac Insect Genetic Resources (NPCLIGR) in the Department of Entomology, Assam Agricultural University, Jorhat from April to December during two consecutive years viz., 2015 and 2016. The results revealed the occurrence of 15 phytophagous pests namely *Hyposidra talaca succensaria* (Walker), *Orgyia* sp., *Somena scintillans* (Walker), *Euproctis* sp., *Archips* sp., *Omiodes diemenalis* (Guenee), *Dasychira (Olene) mendosa* (Hubner), *Monolepta signata* (Olivier), *Apion clavipes* (Gerst), *Plannococcus* sp., *Bemisia tabaci* (Genn.), *Oxyrachis* sp., *Aphis craccivora* (Koch), Jassids and *Callosobruchus chinensis* (Linn.), infesting the particular host plants. Out of these 15 species, 7 belonged to the order Lepidoptera, 3 Coleoptera and 5 Hemiptera. These pests were categorized as defoliators (9 species), sucking pests (5 species) and stored grain pest (1 species). Pest incidence was more during July-October and declined subsequently. The pests belonging to the order Lepidoptera were found in abundance dominated by *Archips* sp. followed by the Hemipterans.

Keywords: *Flemingia*, phytophagous, lepidoptera, coleoptera, hemiptera

1. Introduction

Flemingia macrophylla (Willd) and *Flemingia semialata* (Roxb) are small woody leguminous shrubs belonging to the family Fabaceae, having medicinal properties and widely used for lac cultivation in India and China [1]. The fruits of this plant also contain flemingin, an active component used for dyeing especially silk cloth [2]. Lac is a world known valuable by product of tiny lac insect, *Kerria lacca* (Kerr.) (Hemiptera: Tachardiidae), and is presently commercially cultivated on *Flemingia* spp. in addition to *Kusum*, *Palas* and *Ber* [3]. India is the largest producer of lac in the world and Jharkhand is the leading state, producing about 58% of the total, followed by Chhattisgarh (16%), Madhya Pradesh (12%), Maharashtra (6%), Odisha (3%) and West Bengal (2%) [3]. Though, Assam was known as a center of lac production since very early days, presently it produces only 150 tons accounting for only 0.17% of the total production in the country [3]. In India, systematic raising of host plants for lac cultivation are limited and most of the lac hosts are scattered in forests and adjoining cultivable lands. Further, the cultivation of lac insect on those trees take more time as the gestation period is more as compared to *Flemingia* spp. [4]. Keeping this in view, the ICAR-Indian Institute of Natural Resins and Gums (IINRG) introduced *Flemingia*, a bushy shrub having economical attributes as host plant for lac cultivation. Out of several production constraints, insect pests on *F. semialata* have been reported from IINRG, Namkum, Ranchi [5]. But no report on insect pests associated with *Flemingia* spp. has been found from North East India. So, the present investigation was carried out with the objective of getting acquainted with the different insect pests attacking *Flemingia* spp. under Jorhat condition of Assam to formulate suitable management approaches.

2. Materials and Methods

2.1 Method of survey

The investigation was carried out in the plots maintained for lac insect conservation under ICAR-Network Project on Conservation of Lac Insect Genetic Resources (NPCLIGR) at Department of Entomology, Assam Agricultural University (AAU), Jorhat, to record the insect pest associated with the selected lac host plants, *F. macrophylla* and *F. semialata*, from April

to December during two consecutive years 2015 and 2016. The observations were made twice weekly. For sampling, five plants were selected randomly in each plot. The samples were collected separately using entomological sweeping nets of 30 cm diameter and 80 cm depth and immature stages were collected by hand and reared under laboratory condition till the adult emergence. The collected adult insects were killed using carbon tetrachloride and preserved in insect box whereas, soft bodied insects were preserved in 70% ethyl alcohol and taxonomic study was conducted under the stereo-binocular microscope. The important taxonomic characters of the collected specimens were identified by using dichotomous keys, visual observation and confirmed with the help of published nature guide. The unidentified specimens were sent to the Biosystemic Laboratory, Division of Entomology, at ICAR-Indian Agricultural Research Institute, New Delhi for proper identification.

3. Results and Discussion

The present study revealed the occurrence of 15 species of phytophagous pests belonging to different orders viz., Lepidoptera, Coleoptera and Hemiptera (Table 1). These pests were categorized as foliage feeders, sucking pests and stored grain pests. The pests belonging to the order Lepidoptera were found in abundance followed by Hemiptera and Coleoptera.

A. Foliage Feeders

I. *Hyposidra talaca successaria* Walker (Lepidoptera: Geometridae)

The larvae of black looper (Fig. a) were found defoliating the leaves of *Flemingia* spp. plants during the months from July to September, 2015 and 2016. The occurrence of this pest has been also reported on tea plantation from West Bengal [6] and Jorhat [7]. From the observations, it was found that the early instar larva cut small holes along the margin, whereas, the full grown larva fed voraciously on matured leaves, initially from the margin towards the mid rib, leaving the mid rib uneaten. Similar feeding patterns were also observed on *F. semialata* and tea from Ranchi [5] and Jorhat [7] respectively.

II. *Orgyia* sp. (Lepidoptera: Lymantriidae)

The larvae of Tussock moth (Fig. b) were found feeding on leaves of *F. macrophylla* during the months of July and August, 2015 and 2016. The newly emerged young leaves were the main source of food for the larvae.

III. *Somena scintillans* Walker (Lepidoptera: Lymentriidae)
Another defoliator, Yellow Tail Tussock Moth (Fig. c), was found to cause damage by feeding on the leaves of *Flemingia* spp. during the month of September-October, 2015 and 2016. Similar seasonal incidence of the pest was reported on *F. semialata* from Ranchi [5].

IV. *Euproctis* sp. (Lepidoptera: Lymentriidae)

From the observations, it was recorded that during the month of April-July, 2015 and 2016 the early instar of the tussock moth (Fig. d) were gregarious and fed voraciously on a single leaf. However, the later instars fed solitarily on nearby leaves. The larvae fed on the leaves initially from the margin, gradually they moved towards the mid rib. This pest has been reported as an important forest pest which fed on the foliage of many dicotyledonous tree species including the important forest tree *Terminalia arjuna* [8]. Occurrence of the pest was also reported from Ranchi on the lac host plant *F. semialata* [5].

V. *Archips* sp. (Lepidoptera: Tortricidae)

Larvae of *Archips* sp. (Fig. e) were found feeding by typically rolling the leaves from the margin and scraping on the inner content of the rolled leaves. This pest was noticed during the month of July-September, 2015 and 2016.

VI. *Omiodes diemenalis* Guenee (Lepidoptera: Crambidae)

The bean leaf roller (Fig. f) was found to be a major pest of *Flemingia* spp., which fed the leaves of the plant gregariously during the months from April to July, 2015 and 2016. Distribution of this pest has also been reported from Korea (new record), China, Japan, Taiwan, Malaysia, India, Australia, Samoa and Africa [9] in the host plants of *Vigna* sp. (Leguminosae), Solanaceae, Urticaceae, Cruciferae in Southeast Asia and *Nicotiana tabacum* L. (Solanaceae) in China [10].

VII. *Dasychira (Olene) mendosa* Hubner (Lepidoptera: Lymantriidae)

The larvae of brown tussock moth (Fig. g) caused severe damage to the plants of *Flemingia* spp. by feeding on the leaves of the plant from its outer margin. The infestation of this pest occurred regularly during the months of July-October, 2015 and 2016. The host-plant range is very large and includes tea, castor, sorghum, sun hemp, maize, pigeon pea, lantana, mango, ber, sapota, brinjal, potato, coffee, cotton, teak, *Acacia catechu*, *Cannabis sativa* etc.

VIII. *Monolepta signata* Olivier (Coleoptera: Chrysomelidae)

Adults (Fig. h) were found feeding on the parenchyma of both upper and lower surface of the leaves of *F. semialata* and *F. macrophylla*, producing numerous irregular shot holes on it. Occurrence of this pest has been reported on Bengal gram (*Cicer arietinum* L.) from Bangladesh [11].

IX. *Apion clavipes* Gerst (Coleoptera: Apionidae)

It was a pod boring weevil (Fig. i) which occurred regularly during the months from July to September, 2015 and 2016 on *F. macrophylla* and *F. semialata*. The weevil is regarded as a major pest of Pigeon Pea in the Northeast region of India as they directly infested the economic part of the crop with considerable numbers [12].

B. Sucking Pests

I. *Plannococcus* sp. (Hemiptera: Pseudococcidae)

Mealy bug (Fig. j) was observed during July to November, 2015 and 2016. They suck the sap from the leaves and stems of the plant causing yellow coloured damaged symptom. Nymphs fed on underside of the leaves, causing heavy damage to nursery and grown up plants. The bugs commonly fed on new plant growths resulting in wilted and crinkled leaves. The pest is of common occurrence on curry leaf plant, *Murraya koenigii* Lin., *Poinsettia* spp. and other flowering plants [13]. It also attacks Arabica and Robusta coffee, cotton, banana, carambola, cocoa, ginger and mango [14].

II. *Bemisia tabaci* Genn. (Hemiptera: Aleyrodidae)

The whitefly (Fig. k) was found to be a serious sucking pest of *Flemingia* plant which suck the sap from the under surface of leaves. Due to their feeding black moulds develop affecting the photosynthesis of the plant. Occurrence of this pest was observed during August to October, 2015 and 2016.

III. *Oxyrachis* sp. (Hemiptera: Membracidae)

Cow bug tree hopper (Fig. l) was observed on *F. macrophylla* and *F. semialata* plants during the month of September and October, 2015 and 2016. Both nymphs and adults suck the sap from the leaves and other tender parts which reduced the vigour of the plants.

IV. *Aphis craccivora* Koch (Hemiptera: Aphididae)

Among the sucking pests, *A. craccivora* Koch (Fig. m) was recorded as a major pest on *F. macrophylla* plants. Both nymph and adults were found to suck the sap from lower surface of the leaves and terminal portion of shoots. The population of this pest commenced from August to November, 2015 and 2016. The incidence of aphids led to the development of sooty mould on infested parts. Further, the aphids were noticed in association with ants. Occurrence of this pest with similar feeding patterns was reported on chickpea from Hissar, India [15] and on cowpea from Nigeria and Guam [16]. In Jorhat, Assam, seasonal incidence of this aphid has been reported on summer green gram [17].

V. Jassids

Jassids (Fig. n) were found feeding the plants of *F. semialata* by sucking the cell sap and making the leaves curly, yellow, dry and finally dropping down on the ground. Infestation of the pest was high during the months of October and November. Similar feeding patterns of the pest were observed by from India on cotton, brinjal, okra, sunflower, cowpea, china-rose, pigeon pea and several grasses including durva lawns (*Cynodon dactylon* L.) [18].

C. Stored Grain Pests

I. *Callosobruchus chinensis* Linn. (Coleoptera: Bruchidae)

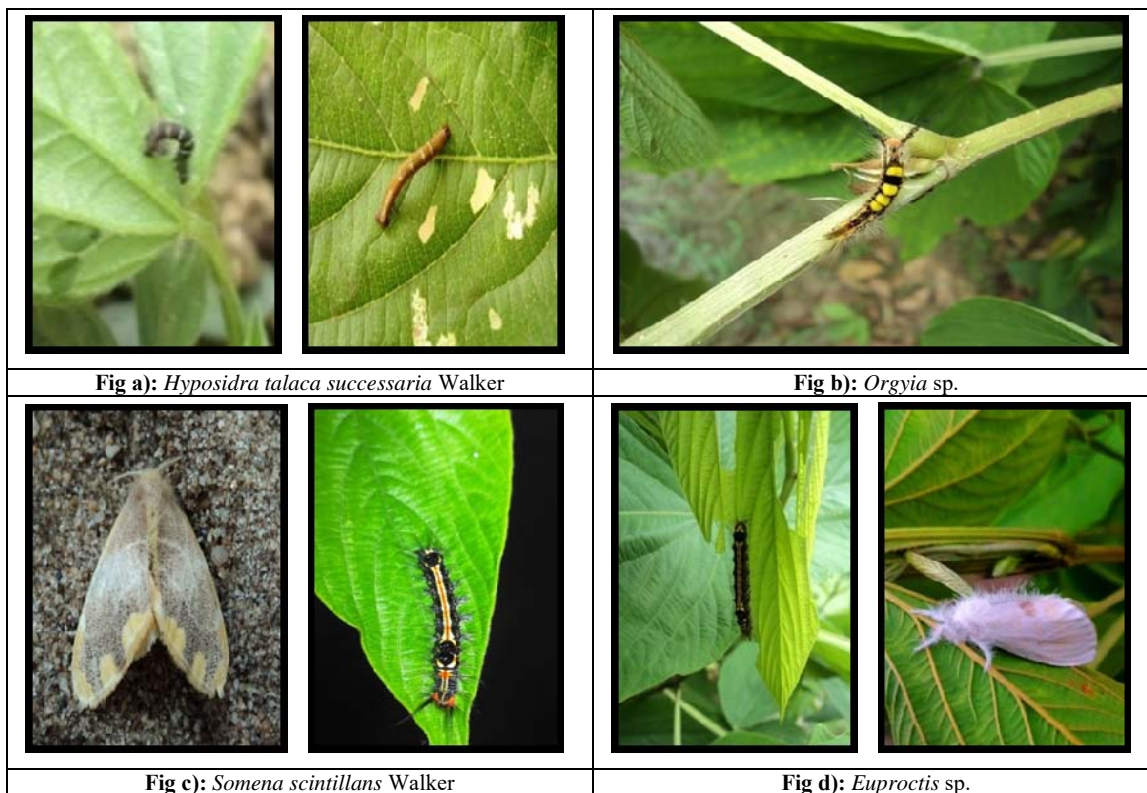
Among the stored grain pests, *C. chinensis* (Fig. o) damaged the seeds of *F. macrophylla*. The seeds are completely hollowed out by larvae, and characteristic emergence holes were evident after the adult emergence. The Pulse beetle has been reported as a serious pest of legumes [19] whose population builds rapidly in storage and damage in terms of holed seeds can render unprotected grains unsuitable for food or seed within 2-4 months of storage [20].

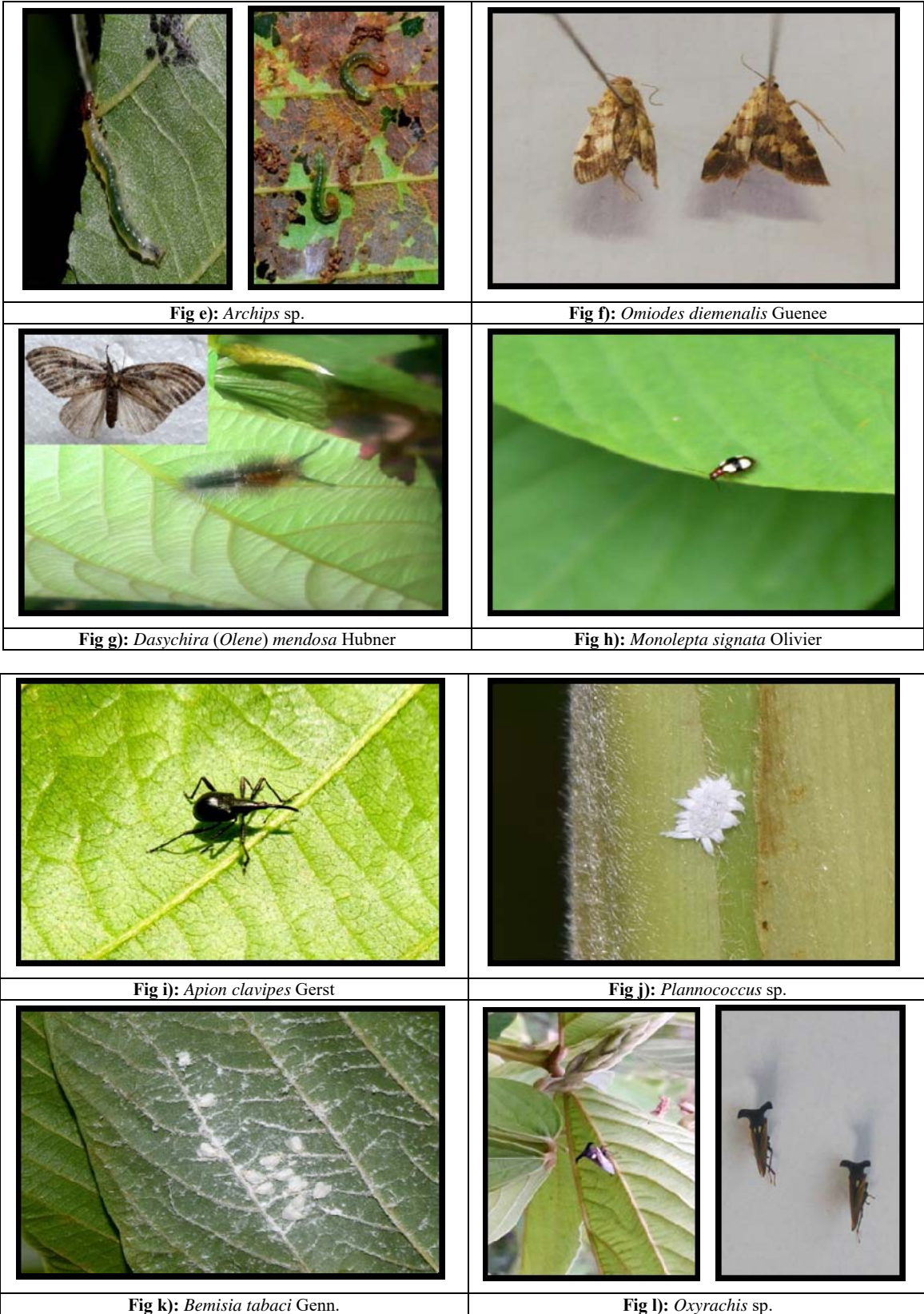
4. Conclusion

Present investigation revealed 15 phytophagous pest of *Flemingia* spp. which caused considerable damage to the crop. Out of these, the order Lepidoptera, particularly *Archips* sp. was found to be most destructive. Therefore, further study is necessary in order to formulate an integrated pest management module to provide a better crop growth for sustainable lac production.

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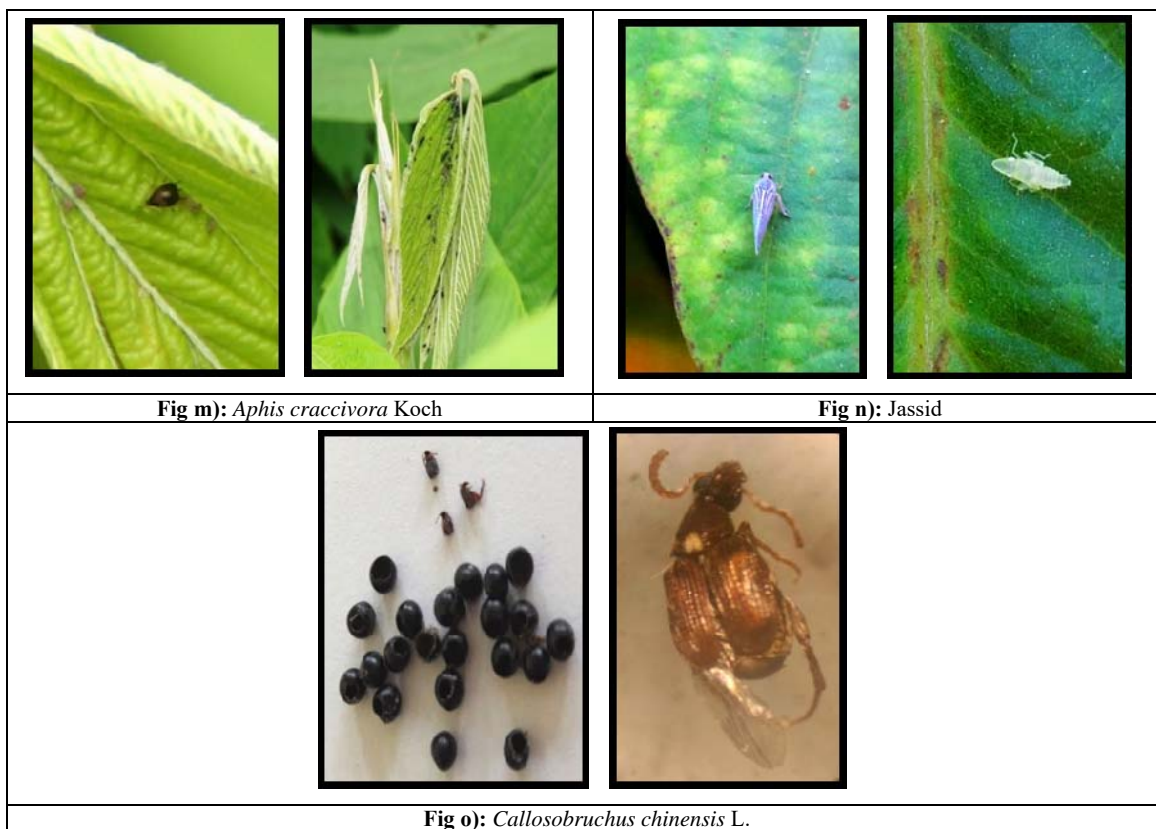


Table 1: Pest recorded on *F. macrophylla* and *F. semialata* at Assam Agricultural University, Jorhat

Sl. No.	Pest	Common Name	Order	Family	Destructive stage	Plant part affected
Foliage Feeders						
1.	<i>Hyposidra talaca successaria</i>	Black inch worm	Lepidoptera	Geometridae	Larva	Leaves
2.	<i>Orgyia</i> sp.	Yellow tussock moth	Lepidoptera	Lymantriidae	Larva	Leaves
3.	<i>Somena scintillans</i>	Yellow tail tussock moth	Lepidoptera	Lymantriidae	Larva	Leaves
4.	<i>Euproctis</i> sp.	Tussock moth	Lepidoptera	Lymantriidae	Larva	Leaves
5.	<i>Archips</i> sp.	Bell moth/Tortrix moth	Lepidoptera	Tortricidae	Larva	Leaves
6.	<i>Omiodes diemenalis</i>	Bean leaf roller	Lepidoptera	Crambidae	Larvae	Leaves
7.	<i>Dasychira (Olene) mendosa</i>	Brown Tussock Moth	Lepidoptera	Lymantriidae	Larvae	Leaves
8.	<i>Monolepta signata</i>	Flea beetle	Coleoptera	Chrysomelidae	Adult	Leaves
9.	<i>Apion clavipes</i>	Pod weevil	Coleoptera	Apionidae	Adult	Leaves and pod
Sucking Pests						
10.	<i>Plannococcus</i> sp.	Mealy bug	Hemiptera	Pseudococcidae	Nymph and adult	Stems and leaves
11.	<i>Bemisia tabaci</i>	Whitefly	Hemiptera	Aleyrodidae	Nymph and adult	Leaves
12.	<i>Oxyrachis</i> sp.	Cow bug tree hopper	Hemiptera	Membracidae	Nymph and adult	Leaves
13.	<i>Aphis craccivora</i>	Black aphid	Hemiptera	Aphididae	Nymph & adult	Suck the cell sap from leaves and stem
14.	Jassids	Jassids	Hemiptera	-	Nymph & adult	Suck the cell sap from leaves
Stored Grain Pest						
15.	<i>Callosobruchus chinensis</i>	Pulse beetle, Gram Dhara	Coleoptera	Bruchidae	Grub and adult	Feed the seeds and produce holes in it.

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