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Qualitative Composition of Insect pests of Mung bean (*Vigna radiata* L.) and their Natural Enemies associated with different stages of crop

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Abstract
Moong (Mung bean); *Vigna radiata* is an important pulse crop in our country after Chick Pea and Pigeon pea. It is also known as Green gram a highly nutritious, quick-growing legume crop growing in two season in Sidhi district *i.e.* in summer and in wet (rainy) season as Kharif crop. The current study was carried out during wet season, of Kharif crop. Nearly 10 species of the insect pest have been founds main damaging pests in the crop. Four species belonged to order Hemiptera and three to Lepidoptera whereas, Coleoptera, Thysanoptera and Diptera share one species each of insect pest. All the major parts of this legume plant *viz*. leaf, stem, pod and seed were found to be infested. Out of 10 insect pest species, four are sap suckers, two are foliage feeder, one as flower feeder, one as stem feeder and two as pod feeder are recorded. During the course of investigation, five species of natural enemies were found to be associated with the insect pest of Moong of which the Coccinellid beetle was recorded as a major one.

Keywords: Moong, *Vigna radiata*, foliage, sap sucker, natural enemies, insect pest

Introduction
Moong or Mung bean (*Vigna radiata*) is also known as Green gram and is a native crop of India. It is the third most important pulse crop grown in India accounts 54% of world production and about 14% of production contributed from Madhya Pradesh only. It has been known for an excellent source of protein, dietary fiber, minerals and vitamins and also found a significant amount of polyphenols, polysaccharides and peptides. It has also a long history of traditional medicinal use and ability to fix Nitrogen for atmosphere.
An estimated 200 insect pest that belongs to 48 families from the orders, Coleoptera, Diptera, Hemiptera, Hymenoptera, Isoptera, Lepidoptera, Orthoptera, Thysanoptera and 07 mites of the order Acarina are known to infest Green gram and Blackgram (R. Swaminathan *et al*, 2012) [6]. Usually, various insect pests can damage Mung bean in entire crop growth stages and cause severe yield losses. In India, Mung bean is attacked by more than 64 insect pests (Lal, 1985) [6]. The most important pests include Pod borer, Aphids, pod bug, Spotted pod borer, Stem flies, Thrips, Whiteflies, Leaf hopper, and Hairy caterpillars.
Hence there is a great scope to study insect pests of Mung beans. An attempt is made here to determine what appears to be the major pest of Moong crop and their associated natural enemies at different stages of Moong crop of Sidhi block.

Materials and Methods
The experiment was carried out during Kharif season, 2021-2022 at Sidhi block, district Sidhi (M.P.). A survey for appearance and spread of different types of insects in Moong crop was made on farmer's fields and Govt. Farms in Sidhi block, Sidhi District of Madhya Pradesh, during wet (rainy) season. The total of eight villages and five fields were marked in each selected village to record the data of outbreak and population of the pest during the entire growing season (July to October).
The methods for insect collection were- sweeping nets to collect insects from Moong crop every week. Some insects were collected by hand picking method also. Insect collection was done every week from random sites in the villages.

Identification of the insects

All the insects collected were preserved in 70% ethyl alcohol in multipurpose containers (jars and bottles) from the crop fields and brought to the laboratory for identification and analysis. Most of the insects were identified up to genus and species with help of the expert and by using identification keys provided in different books. The collection of insects includes phytophagous insects, predatory insects, parasitoids and neutral insects.

In this study insects from 08 orders were observed and identified from the crop field till harvesting. Name of pest and natural enemies found in Mung bean listed with their common name, scientific name, family, order and damaging stage with category of major and minor pests and Natural enemy or Beneficial insects.

Results and Discussion

One of the major factors for low yield of Mung bean crops is the extensive damage caused by insect pests.

Insect pests

APHIDS: *Aphis Craccivora* (Aphididae; Hemiptera)

The nymph and adults cause the damage by sucking the plant sap and totally denude the crop. Infested pods become fragile. Their waste product honeydew causes sooty mould on crops. Severe infestation May result in complete drying of affected pods. They also act as vectors for (CMV) viruses.

Bihar Hairy Caterpillar: *Spilosoma obliqua* (Arctiidae; Lepidoptera)

These cause severe defoliation in the Mungbean crop. The pest caterpillar eats away all the green matter (chlorophyll) of the leaves. The fully grown caterpillar feeds on leaves, tender stems and branches. The infested leaves will have a white, papery and powdery appearance.

Blister Beetle: *Mylabris pustulata* Thunberg (Meloidae; Coleoptera)

This is a major pest of the Mung bean crop and it severely damages the flower buds, flower, tender pods and young leaves. It discards the development of pods leading to poor yield. Its appearance was observed during the flowering period of the Mungbean crop.

JASSID (LEAF HOPPER): *Empoasca kerri* (Cicadellidae; Hemiptera)

This is the major sucking insect of the Mung bean crop. Both stages nymphs and adults suck cell sap from the leaves and severe attack results in brittle and dry up of leaves. The primary symptom of a leafhopper infestation is cupping of leaves from the edges downward. Severe infestation resulting in poor plant growth.

Flower thrips: *Megalurothrips distalis* (Thripidae; Thysanoptera)

The insect feeds on floral parts, and is a serious threat to Mung bean crops. The flowers shed before opening and terminal branches become longer. In Severe infestation, the plants grow busy and there are a few pods with shrivelled grains.

POD Bug: *Riptortus pedestris* (Coreidae; Hemiptera)

The nymph and adults suck the juice (cell sap) causing harm to leaves, flower buds, stem and pods. Green pods become significantly harmed before maturity white patches can be seen on pods. The bugs are seen clustered around on the pods. Considerable yield loss occurs.

Spotted POD Borer: *Maruca vitrata* (Crambidae; Lepidoptera)

It attacks buds, bore into pods and sometimes stems also. The larva constructs a web out of leaves, buds, flower and mature pods and feeds inside the web, while flower, bud and pods grow and damage them.

Stemfly: *Ophiomyia phaseoli* (Agromyzidae; Diptera)

The stem fly maggots bore the nearest vein of leaf and then reach the stem through petiole and bore down the stem inside ultimately a tunnel across the root. The yield becomes poor, reduced plant growth and withering. The leaf drooping and the plant becoming yellow are the symptoms of stem fly infestation.

White fly: *Bemisia tabaci* (Aleyrodidae; Hemiptera)

The damage is caused by both nymphs and adults by sucking and piercing cell sap from leaves and are found in large numbers. Damaged leaves may look cupping, downward curling and sick appearance. Severe infestation results in defoliation, development of sooty mould due to secretion of honey dew leads to reduction in photosynthesis process and shedding of leaves. The incidence of this pest was observed in the field from seedling to vegetative stage.

POD Borer: *Helicoverpa armigera* (Noctuidae; Lepidoptera)

It is a polyphagous pest predominantly feeds on pod crops, including Moong. The larva feeds on the leaves, flowers, pods and seeds inflict severe damage resulting in decreased yield. Infestation is identified by rounded chew marks and angular holes.

Table 1: Insect pest of Moong (*Vigna radiata*)

Sr. no.	Order	Family	Scientific name	Common name	Plant part affected	Crop stage	Status
1.	Lepidoptera	Arctiidae Crambidae Noctuidae	*Spilosoma obliqua* *marcua vitrata* *Helicoverpa armigera*	Bihar hairy caterpillar Spotted pod borer Pod borer	Leaves Pods, stem pods	Vegetative Pod formation to pod maturity Developing pod	Major Minor Major
2.	Hemiptera	Aphididae Cicadellidae Coreidae Aleyrodidae	*Aphis craccivora* *Empoasca kerri* *Ripotortus pedestris* *Bemisia tabaci*	Aphids Leaf Hopper Pod bug White fly	Pods Leaves Leaves, flowers, Greenpods Leaves	Developing Pod Vegetative Vegetative Reproductive Seedling Vegetative	Major Major Major Major
3.	Coleoptera	Meloidae	*Mylabris pustulata*	Blister beetle	Flower, bud and	Reproductive	Major

					pods		
4.	Diptera	Agromyzidae	*Ophiomyia phaseoli*	Stemfly	Leaves and stem	Vegetative	Major
5.	Thysanoptera	Thripidae	*Megalurothrips distalis*	Flower thrips	Flowers	Flower part Reproductive	Major

Natural enemies

Lady Bird Beetle; *Cheilomenes sexamaculata* and *Coccinella septempunctata* (Coccinella: Coleoptera)
These predatory species were observed during the investigation and noticed as a potential predator of Aphids. They also feed on the white fly larva and mites.

Lacewing: *Chrysoperla cornea* (Chrysopidae: Neuroptera)
Larva have a voracious appetite for aphids. They also feed on mites, small insects, thrips, whitefly larva and insect eggs. Adults feed on honeydew, nector and pollen.

Praying Mantis: *Mantis religiosa* (Mantidae: Mantodae)
They have folded legs and are well known predators. Both adults and young wait for insects that stray close to them then they grab them. The small insects, thrips etc are their pray.

Assassin Bug: *Rhynocoris marginatus* (Reduviidae: Hemiptera)
They have slender bodies and dull colours and have a curved beak which they use to pierce beetles, grasshoppers and beetles.

Spiders (Green LYNX Spider): *Peucetia viridana* (Oxyopidae: Araneae)
These are favourable biological control agents in agriculture. They are important predators of pests such as thrips, caterpillars, aphids, leafhopper, flies and plant bugs. These are the most important natural enemy of pests of Moong.

Table 2: Natural Enemies associated with insect pest of Mun gbean

Sr. no.	Order	Family	Scientific name	Common name	Host	Status
1.	Coleoptera	Coccinellidae	*Coccinella Septempunctata* *Cheilomenes sexmacuiata*	Spotted ladybird beetle Zig zag lady bird beetle	Aphids and whitefly larva	Major Major
2.	Neuroptera	Chrysopidae	*Chrysoperla cornea*	Lacewing	Aphids, Thrips White fly	Minor
3.	Mantodae	mantidae	*Mantis religiosa*	Praying mantis	Small insect thrips	Minor
4.	Hemiptera	Reduviidae	*Rhynocoris marginatus*	Assassin bug	Beatles, Grasshopper	Minor
5.	Araneae	oxyopidae	*Peucetia viridana*	Spider\(Green lynx spider)	Thrips caterpillar, Aphids, leafhopper, flies plant bug	Major

Conclusion

In the dietary system pulses are one of the most important food crops in the world due to their greater protein content. India is the largest producer and consumer of pulses world wide, and one of the significant pulse crops of the country is Mung bean. Mung bean has been under cultivation since prehistoric times in India and is the largest producer accounting 54% of world production. The farmers of India facing acute problem of insect pests which affected the crop from seed germination to crop maturity. The main aim behind this research was to monitor different insect pest of Mungbean and their natural enemies and try to resolve the problem of farmers through biological agents. So that farmers can rid of the harmful insect pest by providing shelter to their natural predators in their fields. Along with this proper management practices need to be adopted to control pests of Moong crop.

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