Survey Based Diversity of Mango Insect Pests at Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, Madhya Pradesh, India

Comment [u1]: Arthropods diversity in mango or as per results it is rectify seasonal abundance of different insect-pests in mango crop in MP

Abstract

The only purpose of conducting this research is to know the diversity of insects. This research is completely field based, which was selected at different twelve locations of Jawaharlal Nehru Agricultural University, Jabalpur, Madhya Pradesh campus. In this research, 38 insect pests with different species were recorded whose nature of causing harm has been told. The principle insect pests of mango are hopper, mealy bug, midge, fruit fly, bark eating caterpillar, shoot borer, leaf webber and stone weevil.

Key words: Mealy bug, fruit fly, shoot borer, 38 insect pests and diversity.

1. Introduction

Mango (*Mangifera indica* L.) is one of the most popular tropical and subtropical fruit crop~~s~~ worldwide. The fact that it is commonly referred to as the "King of Fruits" throughout the tropical world reflects its popularity and importance. India is the world's greatest mango producer, accounting for 40.48 % of global mango production (Anonymous, 2013). Mango has been cultivated in India for over 4000 years, with over 1200 varieties said to exist (Chowdhury, 2015). On a global scale, more than 300 insect pest species have ~~attacked the vegetative and reproductive phases of the mango crop~~been reported to attack mango plants and in our coutry only 188 have been documented (Pena *et al.*, 1998 and and Verghese, 1985). ~~India has 188 species of which 188 have been documented (Tandon and Verghese, 1985).~~ Hoppers species such as *Amritodus atkinsoni* Lethierry, *Idioscopus clypealis* Lethierry, and *Idioscopus nitidulus* Walker stay active and inflict up to 100% losses in mango crops from the emergence of new flush through flowering cum fruit setting stages (Bana *et al.*, 2016; Kumar *et al.*, 2014). Both nymph and adult hoppers have been seen sucking cell sap from young leaves, fragile shoots, inflorescences or panicles, and the rachis of young fruits, preventing flowers from blooming and immature fruits from falling. Hoppers also excrete large amounts of honey dew, which causes the production of sooty mould, which interferes with the plants photosynthesis. Fruit flies, *Bactrocera dorsalis* Hendel, *Bactrocera zonata* Saunders and *Bactrocera correcta* Bezzi, are a serious bottleneck in mango production (Bana *et al.*, 2017; Verghese *et al.*, 2006). Thrips nymphs and adults feed on the mango tender leaves, shoots, inflorescence and fruits, causing a silvery sheen with leaf edges curling upwards, stunted growth, discoloration of buds and

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panicles, malformed, premature drops and bronzing of the fruit surface with feeding scars on fruits, lowering the marketable produce quality. As a quarantine pest, it is quite important. Female fruit fly lays eggs in the mango skin with the help of an ovipositor during the ripening stage and after hatching, the maggots begin feeding inside the fruit pulp, causing internal discoloration, off flavours, pulp rotting and fruit drop, before pupating in the soil. It reduces mango yields by up to 80% (Verghese and Jayanthi, 2001) resulting in annual losses of Rs 29, 460 million in mango, guava, citrus, and sapota (Mumford John, 2001). The current study contributes to a better understanding of the variety of insect pests found in mango plants in JNKVV, Jabalpur, Madhya Pradesh.

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2. Materials and methods

The survey were conducted during ~~From~~ two years ~~field investigations were~~ undertaken at Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, Madhya Pradesh, to record ~~the distribution of mango and insect pests connected with the plant, as well as their mode of harm~~population and incidence of different insect-pests. Twelve spot/location were selected mango plants on the tagged leaves, shoots, fruits, and inflorescence of mango plants, data was collected ~~every seven~~at weekly intervals ~~days~~. The attack of different parts of the mango was documented by counting the number of ~~injured~~ damaged pieces in each direction at random. Hand picking and hand net were used to gather the insects in their immature and mature stages. Adults, larvae and nymphs were collected and kept in vials with 75% alcohol for eventual identification in the lab.

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3. Results and Discussion

3.1. Mango hoppers/mango ~~leaf hopper~~leafhopper

The hopper population peaks during the flowering flush, which lasts from January to April. During the vegetative flush in June-August, this was also noted. Their multiplication is aided by old, neglected and densely planted orchards that are gloomy and have high humidity levels. By piercing and sucking the sap from vulnerable portions, nymphs and adults reduce the vigour of the plant, resulting in the shedding of flower buds, blooms and early fruits. Sooty mould develops on leaves as a result of honey dew discharge, giving them a blackish look. Hoppers hibernate in the cracks between the tree bark. The clicking sounds of leaf hoppers can be heard during periods of significant infestation. The climate is most pleasant when it is warm, humid and cloudy.

3.2. Thrips

Thrips can be found throughout the year, with the exception of November and December. Thrips are polyphagous in nature and can be found in abundance in JNKVV. Laceration of leaf tissues caused by nymphs and adults draining the cell sap. A silvery sheen appears on damaged leaves with tiny faecal matter specks. *C. indicus* and *R. cruentatus* stipple leaves by feeding on them. *S. dorsalis* feeds mostly on inflorescences and fruits that have discoloured tissues that eventually turn brown.

3.3. Shoot borer

This pest can be found all over India and is particularly harmful to seedlings and young trees. Tunneling from the tender terminal shoots top down. Seedlings that are stunted and have a terminal bunchy look. The larvae of this moth drill into the young shoot, causing the leaves to drop and the plant to wilt. On panicles, similar symptoms have been observed.

3.4. Midge

At the floral bud burst stage, juvenile fruiting stage and on foliage, the midge infests and harms the crop. The eggs are placed between the creases between the sepals and petals on the inflorescence. The larvae dig tunnels in the axis and entirely destroy the inflorescence. Larval feeding prevents flower opening and, as a result, fruit development. Infested buds develop into long pointed galls, where pupation takes place. Infested panicles feature a distinctive right-angled bend with an exit hole through which the last instar maggots emerge to pupate in the soil. After that, the 2^{nd} generation infests very young fruits, which finally drop before reaching the marble stage. Most strongly galled leaves fall to the ground considerably sooner than typical in most mango orchards, while the majority of galled leaves remain on trees infested with anthracnose inoculum. Mango tree shoots that have been highly affected have essentially no inflorescence, resulting in minimal mango fruit production.

3.5. Fruit fly

The oriental fruit fly is one of the most problematic mango pests in the country, posing a concern for fresh fruit export. With the help of its pointed ovipositor, the female punctures the outer wall of mature fruits and inserts eggs in tiny clusters inside the mesocarp of mature fruits. The larva feeds on the pulp of fruit after hatching, which appears normal from the outside but eventually sinks down. The mature maggots fall to the ground to pupate. Fruit fly emergence begins in April and peaks in May-July, which coincides with the ripening of the fruit. From

August through September, the population slowly diminishes before becoming non-existent until March.

3.6. Mango ash grey beetle

The adult weevil has a ferruginous brown coloration. On the elytra, there is a white patch and black mottling. It has a rostrum that is slightly wider at the apex. The striae on the elytra are coarsely punctate. There is a central pale grey stripe and a small basal band laterally on the pronotum. The eggs are bright yellow and oval in shape. Grub is a tiny, apodous and bent creature. Grub is a pale white creature. Chitinized and testaceous head. Mandibles are strongly developed and toothed obtusely. Mandibles that are close to the labium. Abdominal segments are less developed than thoracic segments. Exarate, elongate and symmetrically symmetrical pupa. The white body wall of the pupal develops into a light brown colour throughout time.

3.7. Leaf webber

The season of pest infestation begins in April and lasts until December. It is a pest that has reached epidemic proportions in campus of JNKVV, particularly in old, packed orchards with considerable shadow. Leaf Webber infestations can start as early as the seedling stage and last all the way through flowering and fruiting. Several caterpillars were discovered inside a webbing of terminal leaves and fragile shoots. Caterpillars scrape and eat on the web terminal leaves at first, giving them a charred appearance.

3.8. Leaf miner

The appearance of fresh mango plant flushes causes slight leaf damage to fluctuate. The dorsal epidermis of fragile leaves is mined and fed by light brown caterpillars. Blisters of a greyish-white colour appear on the leaves as a result of mining. The mango leaf miner adult was a silvery grey coloured moth with silvery streaks on the forewings.

3.9. Stem borer

Grubs feed on the inside of the stem, burrowing upward and creating irregular tunnels that disrupt nutrient and water flow in the tissue. The withering of branches or the entire tree is caused by the drying of the terminal shoot in its early stages and severe symptoms.

3.10. Scale insect

As both nymphs and adult scales suck the sap from the leaves and other vulnerable parts, the plants vitality is decreased. Honeydew is secreted, which promotes the growth of sooty mould on mango leaves and other vulnerable areas. Infested flower spikes and fruits are also

possible. A severe scale infestation has a negative impact on the tree's growth and fruit bearing potential.

3.11. Giant Mealy bugs

In the months of April and May, the female adult descends down the tree and lays her eggs in the gaps in the soil. On leaves, inflorescence, branches, fruits and fruits speak, pinkish nymphs and adult mealy bugs can be found. This pests nymphs drain sap from leaves and inflorescence, causing dryness and flower loss, as well as a lack of fruit set. They also produce honey dew, which causes sooty mould to grow.

3.12. Mango mite/spider

The infection begins in April and gradually worsens until it reaches a peak in June. The attack of the mango bud mite causes a proliferation of shoots on the terminal, resulting in a witches broom look. Mite infection causes floral and foliar galls that resemble witches broom when the fungus *Fusarium* sp. is present (Ochoa *et al.,* 1994). *Oligonychus mangiferae* Rahman & Sapra, a common pest in India, feeds on the upper surface of mango foliage. Leaf bronzing is caused by nymphs and adults sucking the sap from leaves and vulnerable stems. Closer inspection reveals the webbing of mite colonies on the leaves. Jumping spiders are energetic hunters who hunt during the day. It climbs back up the silk tether if it falls, such as if the victim shakes it off. Although most jumping spiders are carnivorous, nectar has been observed in the diets of some species.

3.13. Red ant or weaver ants

Red ant or weaver ants reside in trees (obligately arboreal) and are noted for their remarkable nest-building behaviour, in which workers weave leaves together with larval silk to create nests. Colonies can be enormous, with over a hundred nests covering multiple trees and containing more than half a million workers. Weaver ants, like many other ant species, feed on small insects and augment their diet with carbohydrate-rich honeydew shed by the latter (Hemiptera).

3.14. Hairy caterpillar

Defoliation is the first sign of an attack. Consuming the leaf and scraping it hairy and reddish brown larvae. White hairs on a reddish-brown head.

3.15. Bark eating caterpillar

It is possible that young trees will succumb to the attack. Caterpillars eat their way through the trunk or branch junctions. Caterpillars hide in the tunnel during the day and emerge

at night to eat the bark. There is a silk gallery present. Larvae are a stout, muddy brown colour. Adults are a large yellowish-brown moth with brown wavy lines on the forewings. White is the colour of the hind wings. Males are often smaller than females.

3.16. Semilooper

Caterpillars eat the leaves and shoots, causing defoliation and a loss in photosynthesis.

3.17. Fruit borers

When the larvae hatch, they bore holes in the fruit apex or narrow tip, tunnel through the flesh and skin and then feed on the seed. Fruit deterioration and early fruit drop are caused by the infection. All stages of fruit are vulnerable. The presence of a sap stain extending from the caterpillar entry hole and accumulating on the drip point at the fruit apex is the first symptom of infection.

3.18. Termites

Termites wrap their stems and roots with earth to protect them from the sun. Termites are white in colour, prefer to be in the dark, and live underground. They eat the roots or travel upward, creating tunnels by building mud galleries on the tree.

3.19. Shoot gall psylla

The pest becomes active in August, with nymphs hatching from eggs in August and September and moving to nearby buds to suck cell sap. The buds turn into hard conical green galls as a result of feeding, which appear in September and October. Affected are the terminal shoots. Green conical galls form in the leaf axis as a result of adult insects depositing eggs or nymphs feeding. There is no flowering or fruit set as a result of the green galls developing.

Nymphs feed inside the midrib of the leaf, secreting substances (likely phenyl amino acids) that cause conical galls to grow in place of apical and axillary buds. They go into galls to finish their development. Gall development interferes directly with inflorescence production, lowering yield. Infested twigs eventually dry out and develop die-back symptoms (Singh *et al.*, 1975; Singh and Misra 1978).

3.20. Mango nut weevil

Oviposition injuries on fruits the size of marbles. The weevil's tunnels for emerging cause the ripe mango fruits to be destroyed. *Cryptorrychus mangiferae* grubs harm both the pulp and the cotyledons of the stone, but *Cryptorrychus gravis* grubs develop in the pulp and devour solely the stone fibre. The eggs are placed in fruits that are just partially formed. The grubs pass

through the pulp and into the seeds, where the pupates and adults emerge after penetrating the stone and pulp.

3.21. Lady bird beetle

Many species prey on herbivorous hemipterans like aphids and scale insects, which are agricultural pests, the majority of coccinellid species are considered helpful insects. Many coccinellids lay their eggs in aphid and scale insect colonies to ensure that their larvae have access to food right away.

3.22. Parasitoids (*Chrysocharis pentheus*)

Phyllocnistis citrella is attacked by a broad group of hymenopterous parasitoids, predominantly eulophids, but also encyrtids, elasmids, eurytomids, eupelmids, and peteromalids (Pena *et al.*, 1996; Schauff *et al.*, 1998; Ishii, 1953; Ujiye *et al.*, 1996). In Japan, Taiwan, and Thailand, more than 32 species of chalcidoids were discovered, including *Chrysocharis pentheus* (Walker) (Hymenoptera: Eulophidae), which was the dominating species in Wakayama prefecture (Ujiye and Adachi, 1995). Seven species of eulophidae, the most abundant of which was *C. pentheus*, were responsible for high levels of parasitism (70%) in the Matsuyama area (Mafi and Ohbayashi, 2004). *Chrysocharis pentheus* is a polyphagous endoparasite that can be found in North America, Europe and several Asian nations.

3.23. Long legged fly

It eats plant-harming bugs, this makes it a beneficial insect. Larvae (maggots) have been discovered in rotting plant materials, as well as feeding on small aquatic organisms. This may be feasible because the larvae of this fly prefer to live near water, which provides a more diversified growth and eating environment. There is not much else known about this fly entire life cycle.

3.24. Green bottle fly

Green bottle fly is similar to that of other flies in the calliphoridae family. The fly maggots are employed in maggot therapy, forensic entomology and can cause myiasis in animals and pets. In the spring, the common green bottle fly emerges to mate. The larvae eat decomposing organic matter.

3.25. Ant like weevil

The sugary exudates of other insects, such as hoppers, may be consumed by the adult.

3.26. Damsel fly

Damselflies trap prey using their legs as adults, and the hairs on their legs aid ensnare the victim. The damselfly will then break them apart with its serrated mandibles, either during flight or after landing.

3.27. Bruchids

Brownish grey beetle with high ivory-like dots on the dorsal side around the middle. It has long prominent serrate antenna and is tiny, short and energetic. Pygidium refers to the fact that the elytra do not completely cover the abdomen. Adults live for a brief time, are harmless, and do not feed on stored produce. During the study periods, twenty seven insect pests were recorded at campus JNKVV, Jabalpur, Madhya Pradesh mango ecosystem. Mango hoppers were observed throughout the year in mango ecosystem except during rainy months, wherein population on twig or trunk was very low or nil. Mostly, mango hopper associated with new flush and flowering stage of the plants and attained peak activity during flowering cum fruit setting stage of the crop and thereafter, population started declining gradually.

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During the study period peak periods were recorded mango hopper highly associate with month Feb.-July, thrips, ash grey beetle and midge highly recorded at month Feb.-April, shoot borer highly associated with month Feb.-Sept., peak period in fruit flies May-July, leaf webber highly recorded in month Jan.-Feb. & Oct.-Dec., leaf miner in March., stem borer in month Jan.-Dec., scale insects were highly recorded in month March-April & Oct.-Dec., giant mealy bug in month June-July & Dec., mites/spider March-April, red ants Jan.-July, Bark eating caterpillar Jan.-April & Sep.-Nov., fruit borers were highly recorded in month April-July, termites highly recorded in month Jan. & Sep.-Dec., shoot gall psylla Feb.-May, mango seed weevil or mango nut weevil or mango stone weevil Mar.-June, lady bird beetle April, parasitoids (*Chrysocharis pentheus*) April-May, green bottle fly Mar.-May, damsel fly April-May, respectively. Thrips were also recorded as a major pest and yield limiting factor in south Gujarat and elsewhere (Bana *et al.*, 2015).

Four species of thrips *viz; Rhipiphorothrips cruentatus* Hood, *Exothrips hemavarna* Ramakrishna & Margabandhu, *Haplothrips ganglbaueri* (Schmutz) and *Scirtothrips dorsalis* Hood remained more active during vegetative (new flush) and flowering cum fruit setting stages (February-March). Fruit flies were observed as major pest and recorded throughout the investigation period, wherein maximum catches were observed during April-July with the help

of methyl eugenol impregnated fruit fly trap which coincided with fruiting and harvesting stages of the crop (Bana *et al.,* 2017). Three species *viz., Deanolis spp., Conogethes punctiferalis* (Guenee) and *Citripestis eutraphera* (Meyrick) were observed insouth Gujarat. *C. eutraphera* is a new indigenous restricted mango fruit borer species and found causing extensive damage to immature fruits (Anonymous, 2016). In mainland, this pest incidence was reported from coastal region of TN and mango growing areas of KT (Jayanthi *et al.,* 2014). Mango fruits nearby were frequently observed charred around the area where the infected fruits had drilled holes loaded with frass. The most typical injury occurs when two or more fruits come into contact. Leaf gall midge, *Procontarinia matteiana* Kieffer & Cecconi recorded more or less throughout the year (Table 1) showing initiation of gall formation in new flush leading to defoliation of the leaf biomass and reduction of the photosynthetic activities (Patel *et al.,* 2011). *Orthaga* spp., the mango leaf webber, continued to be a minor pest and was in charge of decreased yield because of webbed and desiccated leaves. In south Gujarat, its active period was observed during June-Dec. and Feb.-April (Kannan and Rao, 2006). Support the current data and state that the first two weeks of November saw the highest

The newly emerged flushes were harmed by the mango leaf miner, *Acrocercops syngramma,* Meyrick, when tiny caterpillars dug beneath the top leaves dorsal sides and displayed symptoms of grayish-white epidermis. Shoot borer, *Chlumetia transversa* Walker attacked on new shoot of mango during Oct.-Feb. Verghese and Devi, (1998) reported that peak infestation in Sept-Nov under KT conditions. The mealy bug nymphs and females drew sap from inflorescence, tender leaves, shoots, fruit and sooty mould disease-produced fruit. Fruit drop was induced by a severe infestation that interfered with fruit set. The threat posed by the mango stem borer, *Batocera rufomaculata* De Geer, was spreading to more places. Due to branch drying and die-back, affected trees ceased to produce fruit. The stem borer grub persisted inside the stem, where it fed on tissues and created galleries. This survey will aid in the timely dissemination of pertinent information to the scientific community and mango producers in order to develop effective management strategies at the appropriate time.

Table no. 1: Enlist insects/pests on mango during the session, 2019-20 & 2020-21.

Sl.No.	Name of the insects/pests	Scientific name	Effected plant parts	Damaging Stage of insects/pests
1.	Mango hoppers			
1.1.		*Amritodus atkinsoni*	New flush and flowering stage	Nymphs &Adults
1.2.		*Idioscopus clypealis*		

1.3.		*Idioscopus nitidulus*		
1.4.		*Amrasca splendens*		
2.	Thrips			
2.1.		*Exothrips hemavarna*	New flush and flowering stage	Nymphs &Adults
2.2.		*Haplthrips ganglbaueri*		
2.3.		*Scirtothrips dorsalis*		
2.4.		*Rhipiphorothrips cruentatus*		
3.	Shoot borer	*Chlumetia transversa*	Newly shoot	Larvae
4.	Midges			
4.1.	Leaf gall midge	*Protocontarinia matteiana*	Leaf/vegetative stage	Adults
4.2.	Blossom midge	*Erosimya indica*	Panicle	
5.	Fruit flies			
5.1.	Oriental fruit fly	*Bactrocera dorsalis*	Fruits	Maggots
5.2.	Guava fruit fly	*Bactrocera correcta*		
5.3.	Peach fruit fly	*Bactrocera zonata*		
5.4.	Spp. of *B. dorsalis*	*Bactrocera caryeae*		
6.	Ash grey beetle	*Myllocerus spp.*	Leaf and nursery	Grub
7.	Leaf webber	*Orthaga spp.*	Leaf	Larvae
8.	Leaf miner	*Acrocercops syngramma*	Leaf damage	Larvae
9.	Stem borer	*Batocera rufomaculata*	Tree trunk	Grubs
10.	Scale insects	*Aspidiotus destructor*	Leaf	Nymphs &Adults
11.	Giant Mealy bug	*Drosicha mangiferae*	Twig and fruit	Nymphs &Adults
12.	Mites			
12.1.	Red spider mite	*Oligonychus mangiferae*	Bud and flush	Nymphs & Adults
12.2.	Bud mite	*Aceria mangiferae*		
12.3.	Two striped jumping spider	*Telamonia dimidiata*	Predatory nature	
12.4.	Daring Jumping Spider	*Phidippus audax*		
13.	Red ant	*Oecophylla smaragdina*	Twig and fruit	Nymphs & Adults
14.	Hairy caterpillar			
14.1.		*Euproctis fraternal*	Defoliation	Caterpillar/Larvae
14.2.		*Prothesia scintillans*		
15.	Bark eating caterpillar	*Inderbela tetraonis*	Larva makes webs and making zigzag galleries	Caterpillar/Larvae
16.	Semilooper	*Achaea janata*	Inflorescence	Larvae
17.	Fruit borers			
17.1.		*Deanolis spp.*	Fruit	Larvae
17.2.		*Citripestis eutraphera*		
17.3.		*Conogethes punctiferalis*		
18.	Termites	*Odontotermis obesus*	Root, Stem	Nymphs & Adults
19.	Shoot gall psylla	*Apsylla cistellata* Buckton	Shoot	Adults
20.	Mango seed weevil or mango nut weevil or mango stone	*Sternochetus mangiferae*		Grub

	weevil			
21.	Carrot rust fly	(Unidentified)		-
22.	Needle stone-fly	(Unidentified)		-
23.	Lady bird beetle	*Coccinella septumpunctata*		Grub & Adults
24.	Parasitoids	*Chrysocharis pentheus*		-
25.	Long legged fly	*Chrysosoma* spp.		-
26.	Green bottle fly	*Lucilia sericata*		-
27.	Ant like weevil	*Cylus formacarius*		Grub & Adults
28.	Damsel fly	*Ischnura heterosticta*		
29.	Bruchids	----		Grub & Adults

Table no. 2: List of insect species considered minor pests on mango.

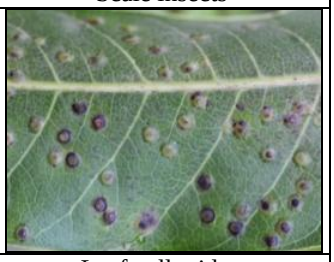
Sl. No.	Common name	Scientific name	Nature of damage
1.	Blossom feeders and webbers	*Asura ruptofascia* Hampson, *Celama anal*is Will and Westwood, *C. fasciatus* Walker, *Cosmostola laesaria* Walker, *Gymnoscelis imparatalis* Walker, *Eublemma* spp.	Webbing and feeding on the inflorescence
2.	White grub beetles	*Holotrichia consanguinea* (Blanchard)	Voracious feeding on leaves during night times
		Anomala sp.	
3.	Slug caterpillar	*Latoia lepida* (Cramer)	Feeding on leaves
4.	Leaf-cutting weevil	*Deporaus marginatus* (Pascal)	Cutting and feeding on leaves
5.	Leaf-mining weevil	*Rhynchaenus mangiferae* Marshall	Skeletonization of leaves
6.	Mango blackfly	*Aleurocanthus mangiferae*	Quaintance Suck sap from leaves
7.	Painted bug	*Coptosoma nazirae* Atkinson	Suck sap from leaves, flowers
8.	Fruit-sucking moths	*Eudocima maternal* (Linn.)	Suck sap from fruits
		E. fullonica (Clerck)	
9.	Castor capsule borer	*Conogethes punctiferalis* (Guenee)	Larvae bore the fruits

Plate 1: Enlist insect/pests photograph

Mango leaf hopper

Ladybird beetle

Bruchids

		
Shoot borer	Mango leaf minor	Two striped jumping spider
		
House fly	Mango mealy bug	Marble size fruits infested by thrips
		
Bark eating caterpillar	Ash grey beetle	Scale insects
		
Red ants	Damsel fly	Leaf gall midge
		
Green bottle fly	Hairy caterpillar eggs emerged	Stem borer symptoms

		
Gall produce by gall midge	Affected shoot by thrips	Carrot rust fly (Unidentified)
		
Needle stone-fly(Unidentified)	Fruit flies	Thrips on leaf
		
Shooty mould on leaves by mango hopper	Shooty mould on stem by mango hopper	*Chrysocharis pentheus*
		
Long legged fly	Ant like weevil	Blossom midge
		
Daring Jumping Spider	Leaf webber	Webbing by leaf webber

Termite

Infested plants by stem borer

Semilooper

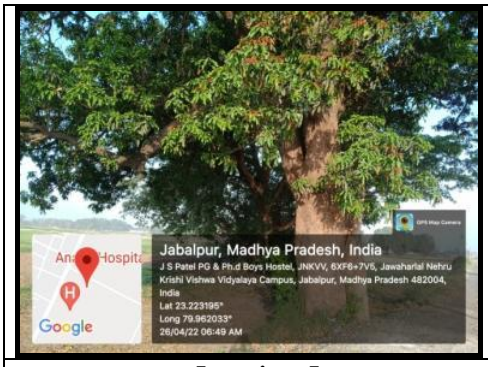
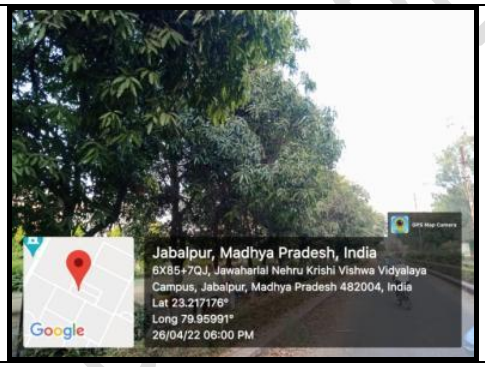
Plate 2: Different location photograph.

Location- 1

Location- 2

Location-3

Location-4

	
Location- 5	**Location- 6**
	
Location- 7	**Location- 8**
	
Location- 9	**Location-10**

	
Location- 11	**Location- 12**

Table no. 3: Insect/pests status during session, 2019-20 & 2020-21.

Sl.No.	Insect/pests	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1.	Mango hoppers	+++	++++	++++	++++	++++	++++	++++	+++	+++	++	++	++
2.	Thrips	+	++++	++++	++++	++	+	+	+	+	+	++	+++
3.	Shoot borer	+	++++	++++	++++	++++	++++	++++	++++	++++	+	+	+++
4.	Midges	+	++++	++++	++++	++	++	+	+	++	++	++	+++
5.	Fruit flies	+	+	+	+	++++	++++	++++	++	+	+	+	+
6.	Ash grey beetle	+	++++	++++	++++	++	++	+	+	+	+++	+++	+++
7.	Leaf webber	++++	++++	+++	++	+	+	+	+	+++	++++	++++	++++
8.	Leaf miner	--	++	++++	+++	+	+	+	+	+	+	+	+
9.	Stem borer	++++	++++	++++	++++	++++	++++	++++	++++	++++	++++	++++	++++
10.	Scale insects	+	+++	++++	++++	+	+	+	+	+	++++	++++	++++
11.	Giant Mealy bug	+	+	+	+	++	++++	++++	++	++	+	+	++++
12.	Mites/Spider	+++	+++	++++	++++	+++	+++	++	++	++	++	+++	+++
13.	Red ant	++++	++++	++++	++++	++++	++++	++++	+	+	+	++	++
14.	Hairy caterpillar	+++	+++	++	++	+	+	++	++	++	+	++	+++
15.	Bark eating caterpillar	++++	++++	++++	++++	+	+	+	+++	++++	++++	++++	+++
16.	Semilooper	++	++	++	++	+++	++	++	++	++	+++	++	++
17.	Fruit borers	+	+	+	++++	++++	++++	++++	+	+	+	+	+
18.	Termites	++++	+	+	++	++	+	+	++	++++	++++	++++	++++
19.	Shoot gall psylla	+	++++	++++	++++	++++	+	+	+	+	+	+	+
20.	Mango seed weevil or mango nut weevil or mango stone weevil	+	++	++++	++++	++++	++++	+++	+	+	+	+	+
21.	Carrot rust fly	+	++	+++	+++	++	++	+	+	+	+	+	+
22.	Needle stone-fly	+	+	+	+	++	+	+	+	+	+	+	+
23.	Lady bird beetle	+	+	+	++++	++	++	+	+	+	+	+	+
24.	Parasitoids (*Chrysocharis pentheus*)	+	+	+++	++++	++++	+	+	+	+	+	+	+
25.	Long legged fly	+	+	++	++	++	+	++	+	+	+	+	+
26.	Green bottle fly	+++	+++	++++	++++	++++	+++	+++	+++	++	+	+	++
27.	Ant like weevil	+	+	+	++	+	+	+	+	+	+	+	+
28.	Damsel fly	++	++	++	++++	++++	+++	+++	++	+	+	+	++
29.	Bruchids	+	+	+	++	+	+	+	+	+	+	+	+

(+: Low population; ++: Meadium population; +++; High population; ++++: Very high population)

4. Conclusion

During the years 2019-20 and 2020-2021, researchers looked into the prevalence of mango insect pests. Another aspect that added to the complexity of insect problems in mango was a shift in crop phenology caused by climate change. The study described here would be extremely useful for managing mango pests during various seasons in order to increase mango quality and quantity.

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