

A SURVEY ON DIVERSITY AND INTERACTION OF ARTHROPODA COMMUNITIES ON *MANGIFERA INDICA* TWO DIFFERENT AREAS AT KOZHIKODE DISTRICT, KERALA AND COIMBATORE DISTRICT, TAMILNADU

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Abstract

Mango (*Mangifera indica* L.) is a juicy stone fruit (drupe) produced from numerous species of tropical trees belonging to the flowering plant genus *Mangifera*, cultivated mostly for their edible fruit. Most of these species are found in nature as wild mangoes. Mangoes are native to South Asia. Here we, briefly examine the diversity and interaction of Arthropoda Communities on *Mangifera indica* two different areas at Kozhikode district, Kerala and Coimbatore district, Tamil Nadu. In the study 16 insects were identified belonging to 8 different orders. Our results indicate that the insect interaction was different in both areas and the leaf was affected more than other parts.

Keywords: *Mangifera indica*, Flowering plant, Arthropoda communities, Insects, Juicy stone

1.Introduction

Mango (*Mangifera indica* L.) belonging to family Anacardiaceae, aptly called the king of fruit crops is the most important commercially grown fruit crop in India and other tropical countries. In the estimated 1.35 million living species of animals, more than 9 lakhs are insects. The insect class is further divided into 29 orders which can be broadly grouped as winged and wingless insects. Mango trees are vulnerable to attack by a number of insect and mite pests. About 400 species of insect pests are known to occur on mango in different parts of the world (Pena *et al.*, 1998).

The study aimed to investigate the diversity and interaction most affected by the arthropoda communities on *Mangifera indica*. Whenever the population of any insects increases significantly so as to cause appreciable economic loss then it attains a status of the pest. (Roopavathy, 2019). The survey was done in the two sites in Kozhikode district in Kerala and Coimbatore district in Tamil Nadu. The identification was done and the insects were arranged according to their order and area affected

2.Materials and Method

2.1 STUDY AREA

The study was done in Kozhikode district, Kerala and Coimbatore district, Tamil Nadu. Two sites were selected from both states. The field studies for recording the pest diversity on mango and the effect caused by them were noted from August 2019-January 2020.

2.2 COLLECTION OF INSECTS

Data were taken at the end of every week on the tagged leaves, shoots, fruits, inflorescence of mango plants. The attack of different parts on mango was recorded by recording the number of damaged parts randomly from each direction.

2.3 COLLECTION METHOD

2.3.1 Hand collection

This method is commonly used as a simple method for collection of insects. Hand collection of insects from each sapling was carried out for 30 minutes to collect representative individuals of all species seen in the quadrat after the baits (Gokulakrishnan *et al.*,2014).

2.3.2 Pit-fall Trap method

Trap is a device by which insects are attracted to something, that is so arranged that once they get into it, they cannot get out of it. It consists of a 2.5 litre plastic jar with an opening of 9 cm, diameter. A tripod stand was used to place plastic plates for protecting the jar from rain. In the study each jar was provided with 30 ml of methyl parathion solution.

2.3.3 Scented trap method

A plastic jar of 2.5 litre capacity was used to fabricate a scented trap and baited with 20ml saturated jiggery solution with two tables of baker's yeast.0.05% methyl parathion emulsion and 0.5ml of pineapple essence.

2.3.4 All out-search method

The most commonly used method is the All-out search method. The ants were just picked using brushes or forceps. Care should be taken to collect all castes from a colony in the case of polymorphic species.

2.4 IDENTIFICATION METHODS

Pertinent details, such as the binomial name of – Insect, date of collection, name of collection site and the other relevant data of the insect was recorded. The insect was collected first later it was identified with the help of their morphological features and mode of actions. The collected insects were photographed by using a good clarity camera.

2.5 MODE OF INFESTATION

The insects were collected from different parts of the tree and it was clear that the mode of action of each was different. It was noted that some infect only one particular part and some affect more than one part. Some lead to the total destruction of the tree itself.

2.6 STATISTICAL ANALYSIS

By plotting the graph, it was clear that the difference in the mode of action and the insects causing it. By doing this which order insect and which part was affected more was able to find out. By this analysis it was able to compare the data from both places and was able to come to a conclusion.

3.RESULTS

The insects were identified, and it was noted that the insect caused adverse effects on various parts as well as the whole tree. The insect which induced negative effect is noted in the **Table.1**

The insects which were collected from the trees include leafhopper **Fig-1**, meal bugs **Fig-2**, psyllids **Fig-3**, scales **Fig-4** (Hemiptera) Stone Weevils **Fig-5**, Mango Stem Borers **Fig-6**, Leaf Mining **Fig-7**, Leaf cutting weevil **Fig-8** (Coleoptera) Mango leaf Webber **Fig-9**, Early shoot borer **Fig-10** (Lepidoptera) Fruit Flies **Fig-11**, Gall Midge **Fig-12** (Diptera) Thrips **Fig-13** (Thysanoptera), Termites **Fig-14** (Isoptera), Ants **Fig-15** (Hymenoptera), Mites **Fig-16** (Arachnida). Of all the insects which were identified, 4 are Hemiptera (34%), 4 Coleoptera (29%), 2 Lepidoptera (17%), 2 Diptera (10%), 1 Thysanoptera (4%), 1 Isoptera (4%), 1 Hymenoptera (3%), 1 Arachnida (1%). Hemiptera is the class of insects mainly seen Lepidoptera, Coleoptera, Diptera, Thysanoptera, Isoptera and Arachnida in Kozhikode and it was compared with Coimbatore. It was noted that the affected parts were same in both places.

3.1 AFFECTED PARTS

It was noted that leaf was the most affected part of the tree followed by shoot, fruit, inflorescence, stem, panicle and lastly the root.

	COMMON NAME	SCIENTIFIC NAME	ORDER	FAMILY	AREA AFFECTED
	Leafhopper	<i>Idioscopus nitidulus</i>	Hemiptera	Cicadellidae	Leaf
2.	Mango Mealybugs	<i>Drosichamangiferae</i>	Hemiptera	Pseudococcidae	Fruit Inflorescence Leaf
3.	Mango shoot Gall Psyllid	<i>Apsyllacistellata</i>	Hemiptera	Psyllidae	Shoot
4.	Scales	<i>Aspidiotus destructor</i>	Hemiptera	Coccidae	Leaf Fruit Inflorescence
5.	Stone Weevils	<i>Sternochetus gravis</i>	Coleoptera	Curculionidae	Fruit
6.	Mango Stem Borers	<i>Bactrocerarufomaculata</i>	Coleoptera	Cerambycidae	Stem
7.	Leaf Mining	<i>Rhynchaenus mangiferae</i>	Coleoptera	Curculionidae	Leaf
8.	Leaf-cutting weevil	<i>Deporaus marginatus</i>	Coleoptera	Rhynchitidae	Leaf

9.	Mango leaf Webber	<i>Orthagaexvinaceae</i>	Lepidoptera	Pyralidae	Leaf
10.	Early shoot borer	<i>Chlumetiatransversa</i>	Lepidoptera	Noctuidae	Shoot
11.	Fruit Flies	<i>Bactroceradorsalis</i>	Diptera	Tephritidae	Fruit
12.	Leaf Gall Midge	<i>Procontariniamatteiana</i>	Diptera	Cecidomyiidae	Leaf
13.	Thrips	<i>Thripstabaci</i>	Thysanoptera	Thripidae	Leaf Fruit
14.	Termites	<i>Odontotermes</i>	Isoptera	Termitidae	Root Stem
15.	Ants	<i>Oecophyllasamargdina</i>	Hymenoptera	Formicidae	Leaves
16.	Mites	<i>Oligonychusmangiferus</i>	Arachnids	Acari	Leaves Inflorescence Fruit

TABLE 1: INSECT COLLECTED, THEIR SCIENTIFIC NAME, ORDEER, FAMILY, AREA AFFECTED

Name of pests	Stage of damage	Period of damage									
		Aug-Sept		Sept-Oct		Oct-Nov		Nov-Dec		Dec-Jan	
1. Leaf Hopper	Nymphs and Adults	+	+	-	+	-	-	-	-	+	-
2. Mealy Bugs	Nymphs and Adults	+	+	+	+	+	++	+	+	+	+
3. Shoot Gall Psyllid	Adults	+	+	+	+	+	+	+	+	+	+
4. Scales	Nymphs and Adults	+	++	+	+	+	++	+	+++	+	+
5. Stone Weevils	Grubs	+	+	-	-	-	+	-	-	-	-
6. Stem Borers	Grubs	+	+	+	+	+	+	+	+	+	++

7. Leaf Mining	Adults	+	++	+	++	+	++	+	++	+	++
8. Leaf-cutting weevil	Adults	+	+	++	+	+	+	+	+	+	+
9. Leaf Webber	Adults	+	+	+	++	+	++	++	++	+	+
10. Early shoot borer	Larvae	+	+	+	+	+	+	+	-	++	-
11. Fruit Flies	Larvae and Adults	-	-	-	-	-	-	-	+	+	+
12. Leaf Gall Midge	Nymphs and Adults	+	+	+	-	+	-	+	-	+	-
13. Thrips	Nymphs and Adults	+	+	+	-	-	-	-	-	+	+
14. Termites	Nymphs and Adults	+	-	+	-	+	-	+	-	+	-
15. Red Ant	Nymphs and Adults	++	+	-	-	-	-	-	+	+	++
16. Mites	Larvae	-	+	-	-	-	-	-		+	-

TABLE 2: THE STAGE AND PERIOD OF DAMAGE INDUCED BY THE INSECTS ON *MANGIFERA INDICA* (KOZHIKODE AND COIMBATORE)

++ indicated Maximum damage in the observed period at Kozhikode.

+ indicated Lowest damage in the observed period at Kozhikode.

++indicated Maximum damage in the observed period at Coimbatore.

+indicated Lowest damage in the observed period at Coimbatore.

- &- indicated No damage

Name of pests	Affected Part by Insect					
	Leaf	Fruit	Inflorescence	Stem	Shoot	Root
1. Leaf Hopper	•					
2. Mealy Bugs	•	•	•			
3. Shoot Gall Psyllid					•	

4.	Scales	•	•	•			
5.	Stone Weevils		•				
6.	Stem Borers				•		
7.	Leaf Mining	•					
8.	Leaf-cutting weevil	•					
9.	Leaf Webber	•					
10.	Early shoot borer					•	
11.	Fruit Flies		•				
12.	Leaf Gall Midge	•					
13.	Thrips	•	•				
14.	Termites				•		•
15.	Red Ant	•					
16.	Mites	•	•	•			

TABLE 3: AFFECTED PART BY INSECT ON *MANGIFERA INDICA*

PROPORTION OF INSECT ORDER OBSERVED AT KOZHIKODE

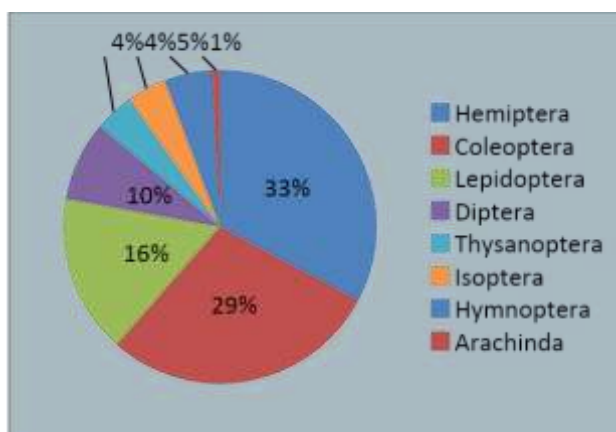


Fig-1 Leafhopper

AFFECTED AREAS ON *MANGIFERA INDICA*

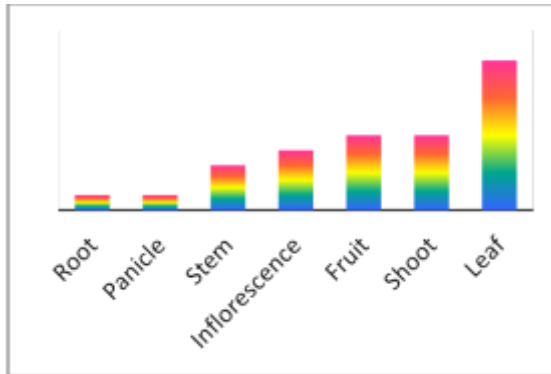


Fig-2 Mealybugs

COMPARISON OF INSECT ORDER ON *MANGIFERA INDICA* OF KOZHIKODE WITH TAMILNADU

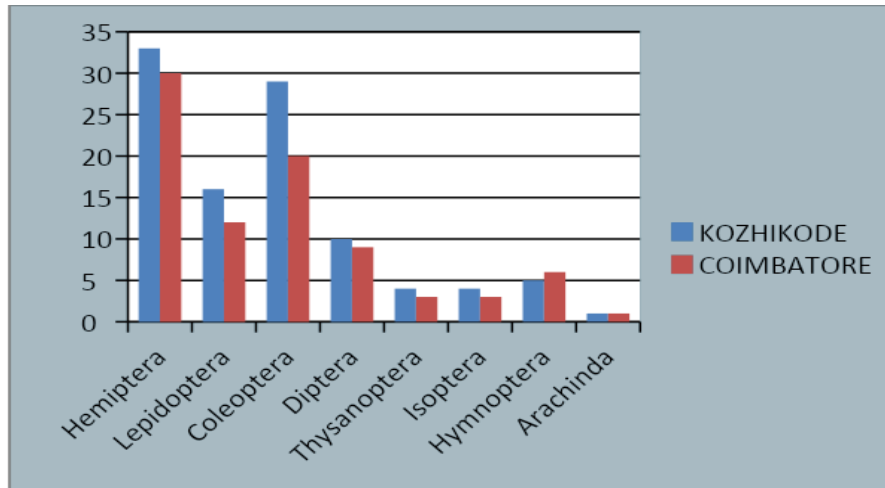


Fig-3 Shoot Gall Psyllid



Fig- 4 Scales



Fig- 5 Stone weevils



Fig-6 Stem Borer Fig-7 Leaf Mining Fig -8 Cutting weevils Fig-9 Leaf Webber



Fig-10 Shoot borer Fig- 11 Fruit Flies Fig-12 Gall Midge Fig-13 Thrips



Fig-14 Termites Fig-15 Red Ant Fig-16 Mites

4. Discussion

Hemiptera is a large order and its members vary in habits. Most bugs are terrestrial, but many are aquatic and a few are external parasites of vertebrates (Borror and White, 1970). In the present study, Hemiptera is the first largest order.

Hill (1983) stated, Coleoptera is the largest order in the animal kingdom. Many scarabs feed on plant materials such as grasses, foliage, fruits, and flowers and some are serious pests of various agricultural crops .In this observation, order Coleoptera was the second most common

(4 species). There are many species and some of the larvae are leaf eaters while some adults are fruit piercers (Hill, 1983). The order Diptera family Tephritidae is small to medium-sized and is usually found on flowers or vegetation. Larvae are plant feeders and a few are pests of fruits (Borrer and White, 1970).

It was also assumed by Harris (1998) that termite will only inflict damage on unhealthy trees, but this is no longer accepted as a lot of presumed healthy fruiting trees were found with nests and mud tubes. The species identified in the study was *Odontotermes*. Depending on the host plant species, up to 98% of thrips pupate in the soil. Ants contribute a conspicuous component of terrestrial biodiversity and are the most divergent group among all social insects. These act as ecosystem engineers.(Roopavathy, 2019 and 2018). Various insects were collected from both the places. It was noted that common insects were seen in both places. The insects collected from Kozhikode in Kerala and Coimbatore in Tamil Nadu, were collected, as a primary step for the research study. The collected insects were identified. It was noted that the insect belonged to different orders. The orders include Hemiptera, Coleoptera, Lepidoptera, Diptera, Thysanoptera, Isoptera, Hymenoptera, Arachnida.. It was clear from the study that the leaf affected by the insect was more and the root was only affected less. From the study it was known that some insects only lead to destruction of some part of the leaf and tree. It was also noted that some insects that were said to be abundant were not seen in the survey due to climatic, soil and other changes. The survey carried out for 6 months helped in investigating interaction and diversity of insects in *Mangifera indica*.

5. Conclusion

The collected insects were identified and taxonomically arranged. It was noted that the insect belonged to different orders they are Hemiptera, Coleoptera, Lepidoptera, Diptera, Thysanoptera, Isoptera, Hymenoptera, Arachnida. Though Coleoptera being the largest order, Hemiptera was most abundant one seen. It was clear from the study that the leaf affected by the insect was more and the root was only affected less. From the study it was able to know that some insects only lead to destruction of some part of the leaf and tree and some insect was said to be abundant was not seen in the survey due to climatic, soil and other changes. The survey carried out for 6 months helped in investigate interaction and diversity of insect in *Mangifera indica*.

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