

Original Research Article

<https://doi.org/10.20546/ijcmas.2023.1208.011>

## Study on Insect Pest Complex and their Natural Enemies in Mango

K. Nishmitha\*, A. M. Maruthesh and Arati Yadawad

Agricultural and Horticultural Research Station, Ullal (Kapikad), Mangalore - 575 020, India  
Keladi Shivappa Nayaka Agricultural and Horticultural University, Shivamogga - 577 204, India

\*Corresponding author

### ABSTRACT

The experiment were conducted on Study of insect pest complex and their natural enemies in mango which were carried out at Agriculture and Horticulture Research Station, Ullal, Mangalore during, January to May-2023. Among various species of insect pests we were recorded only 8 insect pest of mango crop during this experimental period, among them, only five major insect pest infestation was sever during this period viz., Thrips (*Scirtothrips dorsalis* Hood, *Rhipiphorothrips cruentatus* Hood), fruit fly (*Bactrocera dorsalis* and *B. correcta*) and leaf webber (*Orthaga euadrusalis* Walker). At some point we were documented 05 natural enemies (spiders, coccinellids, chrysopids, dragonfly and mantid) on mango tree at different crop growth stages. Amongst, spider and coccinellids remained active throughout the year. All the insect pests were either significant or non-significant but positively associated with each other except for leaf webber who was negatively correlated with thrips, fruit fly, termite, spiders and coccinellids. And highly significant positive correlation was found between the natural enemies' viz., spiders and coccinellids in the mango crop ecosystem.

#### Keywords

Mango, insect pests, natural enemies, pest complex, correlation

#### Article Info

##### Received:

02 July 2023

##### Accepted:

06 August 2023

##### Available Online:

10 August 2023

### Introduction

Mango (*Mangifera indica* L.) is universally known as king of fruits which is an economically significant fruit crop in India. The most important mango producing states of India are Uttar Pradesh, Andhra Pradesh, Bihar, Karnataka, Himachal Pradesh, Maharashtra, Odisha, Tamil Nadu, Gujarat and West Bengal and Valsad, Kheda, Junagadh, Surat and Banaskantha are the well-known districts of Gujarath for farming of this fruit crop (Zala and Bharpoda, 2022). Rajapuri, Kesar, Alphonso and

Langra are the most popular varieties grown in Gujarat. Mango is currently becoming more trending on worldwide as well as domestic markets.

Both fresh fruits and processed goods made from mangoes are in high demand. This increased the demand for improved mango fruit yield as well as quality of the mango fruits. At the global level, the crop is attacked by 492 distinct insect species, 17 different mite species and 26 different nematode species. Among them, 188 bug species have been recognized from India (Tandon and Verghese,

1985). Srivastava (1997) documented diverse insect-pests viz., hoppers, mealy bugs, gall midges, shoot gall psylla, fruit flies, fruit-sucking moth, thrips, ant, termites, grey weevil, flea weevil, leaf-cutting weevil, whiteflies, stone weevil, bark-eating caterpillar, shoot borers, stem borer, scale insects, leaf webbers and leaf miner on mango. Copiousness of insect pests invades the mango crop biome at the same time and cause significant damage to the crop. Pest proliferation is enormously useful to identify the ideal crop stage so that an "Integrated Pest Management" method may be adopted, that can be both ecologically friendly and economically feasible. These investigations of the crop ecological system serve as critical to recognizing insect prevalence with regard to the crops and environment. In general, succession refers to the act of a pest continually emerging before another in an organized sequence of fluctuation or overlapping pattern. Understanding the order of appearance of various pests and the important period during which pest control measures should be implemented is made easier with information on the succession of different pests of a crop. With these factors in consideration, research on succession of insect pest complex and their natural enemies in mango were carried out. Research studies of pest succession also provide an idea of concurrently development of insect-pests causing identical damage during a specific phase of growth in crops and this may be beneficial in establishing "Integrated Pest Management".

## **Materials and Methods**

To study the insect pest complex and their natural enemies in mango, experiment was carried out at Agriculture and Horticulture Research Station, Ullal, Mangalore during January to April-2023 on Mallika variety. Trees with similar size and canopy that were approximately the same in age (15 years) were selected for this experiment. The observations of different pests were recorded from three randomly selected trees from orchard at weekly interval (Standard Meteorological Week wise) from 1<sup>st</sup> week of January 2023 (1<sup>st</sup> IMW) to 4<sup>th</sup> week of April 2023 (35<sup>th</sup> SMW) (35<sup>th</sup> SMW) (Zala and Bharpoda,

2022). The experiment plot was kept free from plant protection applications during the investigations phase.

## **Method of recording observations of different insect pests**

### **Thrips**

For the purpose of counting the population of thrips, ten terminal twigs from the lower canopy of each experimental tree were selected at random.

### **Leaf webber**

The number of webs/tents formed by the pest was counted from each direction by covering the whole tree.

### **Fruit fly**

Five methyl eugenol traps were set up in the mango orchard after the flowering started so as to record the observations of mango fruit flies that occurred. From flowering to the end of the mango season, weekly counts of male fruit flies were taken from each trap.

### **Termite**

A total of five spots on ten trees of each (all four corners and at centre of orchard) were examined for termite infestation in the orchard. Number of trees with symptoms of termite out of ten trees in each spot was noted.

### **Natural enemies**

The population of predatory spiders and coccinellids were recorded from four twigs of each selected tree at weekly interval.

### **Correlation Analysis**

Simple correlation was worked out between various pests and their natural enemies using their weekly mean population by adopting a standard statistical method (Steel and Torrie, 1980).

## Results and Discussion

Study on insect pest complex and their natural enemies in mango, nine insect pests were documented on mango crop at Agriculture and Horticulture Research Station, Ullal, Mangalore during, January to April-2023. Status of major insect pest as well as occasional insect pest of mango was given in Table 1 and Table 2 respectively.

During February to March month thrips population was more. Bana *et al.*, (2015) reported that the incidence of thrips was scrutinized throughout year and acquired major pest status. The conclusion of present investigations was more or less in close agreement with the findings of Bana *et al.*, (2018), reported that thrips remained more active during vegetative (new flush) and flowering cum fruit setting stages.

During our investigation period Fruit flies population was high at the end of March to April-2023. Fruit fly trap impregnated with Methyl eugenol which was concur with fruiting and harvesting stages of the crop. Parallel findings were narrated by Bana *et al.*, (2018) and Bana *et al.*, (2017). Mango leaf webber population was found maximum during April-May month and attained major pest status by lowering productivity due to severe webbed and dried leaves.

The present findings are more or less in close agreement with result of Kannan and Rao (2006) who described that maximum frequency during first fortnight of April. In supplementary to major insect pests, occasional pests also recorded during our study viz., ash weevil, scale insect, red ant, mealy bug and termite which was not causing any ruthless and noticeable damage to the crop. Among the documented occasional insect pests ash weevil and scale insect were found attacking on leaf; red ant and mealy bug were found attacking on twig and fruit; termite were found attacking on tree trunk/branches. Comparatively current findings were in close agreement with findings of Bana *et al.*, (2018). And also recorded a total of 05 natural

enemies (Spiders, Coccinellids, Chrysopids, Dragonfly and Mantid) were found associated with mango tree at different crop growth stages (Table 3). Spider and coccinellids remained detectable during crop growth and appeared as most important natural enemies of insect pests of mango, whereas chrysopids, dragonfly and mantid associated with mango tree occasionally (Table 3).

The results depicted in Table 4 revealed that there was a significant positive or negative association between a range of insect pests and their natural enemies in mango ecosystem. Thrips were showed tremendously significant positive involvement with fruit fly ( $r = 455^{**}$ ) and termite ( $r = 0.415^{**}$ ). The positive association was also recognized between thrips and spiders as well as coccinellids but negative correlation relationship with leaf webber. And leaf webber, showed highly significant negative relationship with fruit fly, termite, spiders and coccinellids ( $r = -0.420^{**}$ ,  $-0.590^{**}$ ,  $-0.570^{**}$  and  $-0.520^{**}$ , correspondingly). Fruit fly showed non-significant correlation with termite, spiders and coccinellids. Termite showed highly significant positive association with spiders ( $r = 0.810^{**}$ ) and coccinellids ( $r = 0.740^{**}$ ) which exposed the concurrent incidence and multiplication of these insect pests in mango crop.

There was highly significant positive association ( $r = 0.898^{**}$ ) was established between natural enemies viz., spiders and coccinellids in the mango crop ecosystem [Table 4]. Bana *et al.*, (2018) reported that hoppers, thrips, leaf webber, gall midge, scale insects, mealy bug and fruit fly as major pests of mango while shoot borer, stem borer, ash weevil, leaf miner, mite, red ant, semilooper, fruit borer and hairy caterpillar as minor/ sporadic levels in South Gujarat.

No much information on the association between/ among various insect pests as well as their natural enemies was available in the past literatures and therefore, present findings could not be compared and discussed in light of earlier reports.

**Table.1** Status of major insect pests of mango

SL. No	Insect pests	Order and Family	Period of major activity	Plant parts mostly damaged
1.	Thrips ( <i>Scirtothrips dorsalis</i> Hood, <i>Rhipiphorothrips cruentatus</i> Hood)	Hemiptera, Cicadellidae	February-March	New flush/inflorescence
2.	Fruit fly ( <i>Bactrocera dorsalis</i> , <i>B. correcta</i> , <i>B. zonata</i> )	Thysanoptera, Thripidae	March-April	Fruits
3.	Leaf webber ( <i>Orthaga euadrusalis</i> Walker)	Lepidoptera, Pyralidae	April-May	Leaf

**Table.2** Status of occasional insect pests of mango

SL. No	Insect pests	Order and Family	Plant parts mostly damaged
1.	Ash weevil, <i>Myloccerus spp</i>	Coleoptera, Curculionidae	Leaf
2.	Scale insect, <i>Aspidiotus destructor</i> Signoret	Hemiptera, Diaspididae	
3.	Red ant, <i>Oecophylla smaragdina</i> Fabricius	Hymenoptera, Formicidae	Twig and fruit
4.	Mealy bug, <i>Drosicha mangiferae</i> Green	Homoptera, Margarodidae	
5.	Termite, <i>Odontotermes spp.</i>	Isoptera, Termitidae	Tree trunk/branches

**Table.3** Occurrence of natural enemies of insect pests of mango

SL. No	Natural enemies	Occurrence
1.	Spiders	Throughout year
2.	Coccinellids	
3.	Chrysopids	occasional
4.	Dragonfly	
5.	Mantid	

**Table.4** Correlation coefficient (r) between major insect pests and their natural enemies on mango

Insect pests	Insect pests				Natural enemies	
	Thrips	Leaf webber	Fruit fly	Termite	Spiders	Coccinellids (adult)
Thrips	-	-	-	-	-	-
Leaf webber	-0.218	-	-	-	-	-
Fruit fly	0.455**	-0.420**	-	-	-	-
Termite	0.415**	-0.590**	0.258	-	-	-
<b>Natural enemies</b>						
Spiders	0.210	-0.570**	0.080	0.810**	-	-
Coccinellids (adults)	0.195	-0.520**	-0.079	0.740**	0.898**	-

Note: \* Correlation is significant at 0.05 levels; \*\* Correlation is significant at 0.01 levels

However, seasonal synchrony of coccinellids with mango sucking pests may represent an important cause of mortality of hoppers and thrips (Prabhakar and Roy, 2010). Sushil Kumar (2006) reported simultaneous occurrence of the hopper, spiders and coccinellids. These findings are more or less in agreement with the present results.

Only eight insect pest species were found during these studies, out of the nine species of insects that were documented at various stages of the mango crop viz., thrips (*Scirtothrips dorsalis* Hood, *Rhipiphorothrips cruentatus* Hood), fruit fly (*Bactrocera dorsalis* and *B. correcta*) and leaf webber (*Orthaga euadrusalis* Walker) attained most important status prevailing in a severe form.

Five insect pests were reported only as stray/occasional pests during crop growth without causing any severe and perceptible damage to the crop. During the studies, a total of 05 natural enemies (spiders, coccinellids, chrysopids, dragonfly and mantid) were found associated with mango tree at different crop growth stages.

Among them, spider and coccinellids remained active throughout the year. All the insect pests were either significant or non-significant but positively associated with each other except leaf webber found negatively correlated with thrips, fruit fly, termite,

spiders and coccinellids.

There was highly significant positive association was established between the natural enemies' viz., spiders and coccinellids in the mango crop ecosystem. Thus, the strategy for the management of insect pests becomes sound and economical by incorporating the information on occurrence and pest succession.

## References

- Anonymous., 2012, Manual for Mango Pest Surveillance. Jointly published by National Centre for Integrated Pest Management, New Delhi, ICAR Research Complex for Eastern Region, Research Centre, Ranchi, Central Research Institute for Dryland Agriculture, Hyderabad, and Central Institute for Subtropical Agriculture, Lucknow.
- Bana, J. K., Kumar S, Sharma, H. 2018, Diversity and nature of damage of mango insect pests in south Gujarat ecosystem. *J Entomol and Zool Stud.*, 6(2): 274-278.
- Bana, J. K., Ghoghari, P. D., Kalaria, G. B., Saxena, S. P. and Shah, N. I. 2015, Efficacy of IPM Modules against Mango Hopper Complex. *Indian J Ent.* 77: 320-322. <http://dx.doi.org/10.5958/0974-8172.2015.00069.3>
- Bana, J. K., Sharma, H., Kumar Sushil. and Singh P.

- 2017, Impact of weather parameters on population dynamics of oriental fruit fly, *Bactrocera dorsalis*, Hendel (Diptera: Tephritidae) under south Gujarat mango ecosystem. *J Agromet.* 19: 78-80. <https://doi.org/10.54386/jam.v19i1.762>
- Kannan, M. and Rao, N. V. 2006, Ecological studies on mango fruit fly, *Bactrocera dorsalis* Hendel. *Annals Pl Prot Sci.*, 14(2): 340-342.
- Prabhakar, A. K. and Roy, S. P. 2010, Evaluation of the consumption rates of dominant coccinellid predators on aphids in north- east Bihar. *The Bioscan.*, 5(3): 491-493.
- Srivastava, R. P., 1997, Mango insect pest management. International book distributing company, Charbagh, Lucknow, India., 6(1): 451-463.
- Steel, R. G. D. and Torrie, J. H. 1980, Principles and procedures of Statistics. *Publ. Mcgraw Hill Book Company*, New York. 10(1): 320-332
- Sushil, Kumar., 2006, Population dynamics and some management aspects of mango hopper. (Ph. D. Thesis, Navsari Agricultural University, Navsari)., 4(2): 132-141
- Tandon, P. L, and Verghese, A., 1985, World list of insect, mite and other pests of mango. Technical Document, No. 5, IIHR, Bangalore., 6(3): 122-131.
- Zala, M. B. and Bharpoda, T. M., 2022, Seasonal occurrence of major insect pests of mango. *Pharma Innov J.*,11(7):21-28.

#### How to cite this article:

Nishmitha, K., A. M. Maruthesh and Arati Yadawad. 2023. Study on Insect Pest Complex and their Natural Enemies in Mango. *Int.J.Curr.Microbiol.App.Sci.* 12(08): 94-99.

doi: <https://doi.org/10.20546/ijcmas.2023.1208.011>