



RESEARCH ARTICLE

# Arthropod Diversity of Pomegranate Crop under High Density Planting in Tamil Nadu

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### ABSTRACT

Received : 16<sup>th</sup> November, 2020

Revised : 23<sup>rd</sup> November, 2020

Revised : 03<sup>rd</sup> December, 2020

Accepted : 17<sup>th</sup> December, 2020

Insects associated with pomegranate (*Punica granatum* L.), was observed from 2015 to 2016 in four major pomegranate growing districts of Tamil Nadu viz., Coimbatore, Erode, Tiruppur and Karurat monthly intervals. A total of 31 species under two genera and sixteen families of six orders was documented. In addition, seven natural enemies in association with pomegranate pests were also recorded. Among the different functional groups, phytophagous groups were dominated, followed by predators and parasitoids.

**Keywords:** Arthropod; Pomegranate; *Deudorix Isocrates*; *Aphis punicae*; *Siphoninus phillyreae*

### INTRODUCTION

Pomegranate is one of the important fruit crops in India and is being cultivated in arid and semiarid regions of Gujarat, Maharashtra, Karnataka, Uttar Pradesh, Andhra Pradesh and Tamil Nadu (Balikai *et al.*, 2011). India is the largest producer of pomegranate in the world. The total area under cultivation of pomegranate in India is 107.00 thousand ha and production is around 743.00 thousand tons. Although India is the largest producer, its productivity is only 6.9 MT/ha. Totally 91 insects, 6 mites and 1 snail pest feeding on pomegranate crop have been reported in India (Verghese and Rashmi, 2014). The above reports confirmed that the commercially growing pomegranate farmers are facing several pest problems in their field, with no practical eco-friendly solutions. Further, to increase production and productivity, farmers are growing pomegranate under high density planting, which accommodates 1000 plants per hectare compared to 750 plants per hectare in the normal planting. Since the introduction of high-density planting in pomegranate is new, systematic study on the occurrence of pests under high density planting is wanting. Hence, to address the problem of pests under high-density planting with their natural enemies were studied in Tamil Nadu.

### MATERIAL AND METHODS

Intensive field studies were conducted during the year 2015 to 2016 for recording the insect pests and their natural enemies that are associated with pomegranate. The survey was carried out in four major pomegranate growing districts of Tamil Nadu viz., Coimbatore, Erode, Tiruppur and Karur (Table 1). In each district, minimum of three farmer's fields

were randomly selected and in field, ten plants were selected at random for observations on insect pests, natural enemies and type of damage. The insects were collected by hand picking and by using sweep nets from the study area. The young ones of the lepidopteran insect pests along with damaged flushes were collected in the study area, reared until their pupation and observed for the emergence of parasitoids if any. The predators and parasitoids collected from the study area during the survey were identified in the biocontrol laboratory, Department of Agricultural Entomology, Tamil Nadu Agricultural University, Coimbatore.

**Table 1. List of villages surveyed in pomegranate growing districts of Tamil Nadu**

District	Name of the village	Geographical coordinates
Coimbatore	Theethipalayam	10.9694° N, 76.8956° E
	Thondamuthur	10.9899° N, 76.8409° E
	Narasipuram	11.2388° N, 76.9974° E
Erode	Pazhamangalam	11.1647° N, 77.8124° E
	Kalathuminra palayam	11.1272° N, 77.7591° E
	Unjalur	11.1283° N, 77.8772° E
	Sivagiri	11.1179° N, 77.7881° E
	Kaara valasu	11.1181° N, 77.7893° E
	Kodumudi	11.0788° N, 77.8867° E
Tiruppur	Manupatty	10.4946° N, 77.2398° E
	Elaiyamuthur	10.4845° N, 77.2973° E
	Pallapalayam	10.9927° N, 77.0838° E
	Thumbalapatti	10.5201° N, 77.2570° E
	Kallapuram	10.4347° N, 77.2915° E
Karur	Kolathur palayam	10.7616° N, 77.5806° E
	Pallapatti	10.7202° N, 77.8900° E
	Vellapatti	10.0110° N, 77.7927° E
	Keeranur	10.5724° N, 78.7862° E

The farmers representing four districts of Tamil Nadu viz., Coimbatore, Erode, Tiruppur and Karur maintaining pomegranate under high-density planting were interviewed with the questionnaire. In addition, observations were also made during the survey in the pomegranate field to record the pest and their intensity

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## RESULTS AND DISCUSSION

### Occurrence of pests and their natural enemies

The incidence of pests was recorded periodically on pomegranate under high-density planting during the survey. The observation showed the presence

of twenty-four pests in pomegranate under high-density planting (Table 2). Among twenty-four pests, one belongs to the order Coleoptera, ten from the order Hemiptera, nine from the order Lepidoptera, two in order Orthoptera, one in order Acarina.

**Table 2. List of pests associated with pomegranate under high density planting October 2015 – May 2016**

Common Name	Scientific name	Family	Order	Location
Thrips	<i>Scirtothrips dorsalis</i> Hood	Thripidae	Thysanoptera	Coimbatore
Aphids	<i>Aphis punicae</i> Passerini	Aphididae	Hemiptera	Tiruppur
Two tailed mealy bug	<i>Ferrisia virgata</i> (Cockerell)	Pseudococcidae	Hemiptera	Erode
Citrus mealy bug	<i>Planococcus citri</i> Risso	Pseudococcidae	Hemiptera	Coimbatore
Whitefly	<i>Siphoninus phillyreae</i> Haliday	Aleyrodidae	Hemiptera	Tiruppur
Hard scale	<i>Diaspidiotus sp</i>	Diaspididae	Hemiptera	Coimbatore
Soft scale	<i>Lepidosaphes punicae</i>	Coccidae	Hemiptera	Coimbatore
Tea mosquito bug	<i>Helopeltis theivora</i> Waterhouse	Miridae	Hemiptera	Coimbatore
Scutellerid bug	<i>Scutelleria nobilis</i>	Scutelleridae	Hemiptera	Tiruppur
Coreid bug	<i>Cletus sp</i>	Coreidae	Hemiptera	Tiruppur
Red cotton bug	<i>Dysdercus koenigi</i> Fabricius	Pyrrhocoridae	Hemiptera	Erode
Two spotted spider mite	<i>Tetranychus urticae</i> Koch	Tetranychidae	Acarina	Coimbatore
Fruit sucking moth	<i>Eudocimaphalonia</i> (Clerck)	Noctuidae	Lepidoptera	Erode
Ash weevil	<i>Myloccerus subfasciatus</i> Guerin-Meneville	Curculionidae	Coleoptera	Erode
	<i>Myloccerus viridanus</i> Fabricius	Curculionidae	Coleoptera	Coimbatore
	<i>Myloccerus discolor</i> Boheman	Curculionidae	Coleoptera	Coimbatore
Castor semilooper	<i>Achaea janata</i> (Linnaeus)	Noctuidae	Lepidoptera	Coimbatore
Tobacco cut worm	<i>Spodoptera litura</i> Fabricius	Noctuidae	Lepidoptera	Coimbatore
Black hairy caterpillar	<i>Euproctis fraterna</i> (Moore)	Lymntriidae	Lepidoptera	Erode
Tussock hairy caterpillar	<i>Notolopus sp</i>	Lymntriidae	Lepidoptera	Coimbatore
Stem hairy caterpillar	<i>Euproctis lunata</i> Walke	Lymntriidae	Lepidoptera	Karur
Hairy caterpillar	<i>Euproctis sp</i>	Lymntriidae	Lepidoptera	Erode
Slug caterpillar	<i>Parasa lepida</i> (Cramer)	Cochilididae	Lepidoptera	Coimbatore
Grass hopper	<i>Aiolopus strepens</i> Latreille	Arctididae	Orthoptera	Coimbatore
Wingless grasshopper	<i>Neorthocris sp</i>	Arctididae	Orthoptera	Tiruppur
Fruit borer	<i>Deudorix Isocrates</i> (Fabricius).	Noctuidae	Lepidoptera	Coimbatore

The natural enemies recorded during the survey in the pomegranate ecosystem are listed in Table 3 & Fig. 1. The entomophages recorded against aphid, mealy bugs, whiteflies were *Chilomenes sexamaculata* Fabricius, *Cryptolaemus montrouzieri* Mulsant, *Coccinella septempunctata* Linnaeus, *Chrysoperla zastrowi sillemi* (Esben-Petersen), *Scymnus craccivora* Ayyar and *Mallada sp*. The parasitoid found associated with castor semilooper was larval parasitoid *Microplitis maculipennis* Szepilgeti. General predators like preying mantis and spiders were also found in pomegranate cropping. Similar observation on pomegranate was also reported by Ananda *et al.* (2009) in Karnataka. They highlighted the occurrence of thirteen sucking pests feeding on pomegranates. Hemiptera (8 species), thysanoptera (3 species) and two acarina pests. Likewise, the occurrence of 91 insects, 6 mites and one snail pest was documented on pomegranate (Balikai *et al.*, 2011). Karuppuchamy

(1994) reported on the presence of 15 insect species and four non insect pests of pomegranate. Butani (1979) reported that about 45 species of insects attack the pomegranate shrub. Jadhav and Ajri (1985) reported the sucking pests like thrips, aphids, mealy bugs, white flies, and mites from various part of India. About 100 pests belonging to 12 orders and 38 families and 64 natural enemies of seven orders and 14 families were recorded on pomegranate orchards of Turkey (Ozturk and Ulusoy, 2009). In addition, 7 natural enemies were recorded associated with pomegranate pests under high-density planting. Four from the family Coccinellidae and one each from Chrysopidae, Braconidae and Mantidae. Present observation on the association of natural enemies with pomegranate pest was also reported by Ananda *et al.* (2009) who reported five species from Coccinellidae, two from Mantidae and one each from Chrysopidae and Aphelenidae in the pomegranate eco system.

**Table 3. Natural enemies recorded in pomegranate**

Name of natural enemy	Stage of natural enemy collected	Family	Order	Host
<i>Menochilus sexmaculatus</i> Fabricus	Grub and Adult	Coccinellidae	Coleoptera	Aphid, Mealy bug
<i>Cryptolaemus montrouzieri</i> Mulsant	Grub and Adult	Coccinellidae	Coleoptera	Aphid, Mealy bug
<i>Coccinella transversalis</i> Fabricus	Grub and Adult	Coccinellidae	Coleoptera	Aphid, Mealy bug
<i>Chrysoperla zastrowi sillemi</i> (Esben-Petersen)	Grub and Adult	Chrysopidae	Neuroptera	Aphid, Whitefly
<i>Microplitis maculipennis</i> Szepliget	Pupa and adult	Braconidae	Hymenoptera	Castor semilooper
<i>Scymnus craccivora</i> Ayyar	Grub	Coccinellidae	Coleoptera	Aphids, mealy bugs
Praying mantis	Adult	Mantidae	Dictyoptera	Hairy caterpillars

**Assessment of farmer's perception on pests of pomegranate under high-density**

The data obtained from the survey on the occurrence of pomegranate pests and its natural enemies are presented in the (Table 4). Eighty per

cent of farmers expressed fruit borer *Deudorix isocrates* as the major pest, whereas 86.6 per cent of farmers expressed fruit sucking moth *Othreisfullonia* as the major pest of pomegranate.

**Table 4. Perception of pomegranate growers on the relative importance of major pests damaging pomegranate**

Pests	*Farmer's responses (%)	Order of relative importance
Fruit borer <i>Deudorix isocrates</i>	80	Major
Fruit sucking moth <i>Othreisfullonia</i>	86.66	Major
Thrips <i>Scirtothrips dorsalis</i>	70	Major
Aphid <i>Aphis punicae</i>	63.33	Major
Two tailed mealy bug <i>Ferrisia virgata</i>	73.33	Major
Whitefly <i>Siphoninus phillyreae</i>	60	Major
Ash weevil <i>Myllocerus subfasciatus</i>	36.66	Minor
Castor semilooper <i>Acheae janata</i>	43.33	Minor
Two spotted spider mite <i>Tetranychus urticae</i>	26.66	Minor

\* Total no. of farmers contacted - 30 \*Multiple answers possible

Among sucking pests, thrips (*Scirtothrips dorsalis*), aphid (*Aphis punicae*), two-tailed mealy bug (*Ferrisia virgata*) and whitefly (*Siphoninus phillyreae*) were the major pests recorded and

pomegranate whiteflies were identified based on the Martin(2004), which was supported by the responses 70, 63.3, 73.3 and 60 per cent of the farmers, respectively.

**Table 5. District - wise distribution of pests in pomegranate under high density planting and their level of infestation**

Districts	<i>Deudorix isocrates</i>		<i>Othreisfullonia</i>		<i>Scirtothrips dorsalis</i>		<i>Aphis punicae</i>		<i>Ferrisia virgata</i>		<i>Siphoninus phillyreae</i>		<i>Myllocerus subfasciatus</i>		<i>Acheae janata</i>		<i>Tetranychus urticae</i>	
	I*	S*	I*	S*	I*	S*	I*	S*	I*	S*	I*	S*	I*	S*	I*	S*	I*	S*
Coimbatore		M		M		H		H		M		M		H		M		L
Erode		H		H		H		L		H		H		M		-		M
Tiruppur		H		H		H		M		H		H		H		L		M
Karur		H		M		H		L		M		H		L		-		-

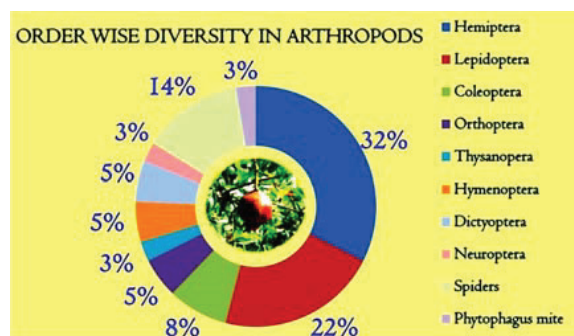
Pest Grade	Fruit borer (%)	Fruit sucking moth (%)	Thrips	Aphid	Mealy bug	Whitefly	Ash weevil	Castor semilooper	Mite
Low	< 20	< 20	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Medium	21-40	21-40	6-10	6-10	6-10	6-10	6-10	6-10	6-10
High	>40	>40	>10	>10	>10	>10	>10	>10	>10

\* I-Incidence, S- Severity, L-Low, M- Medium, H-High

The other pests viz., ash weevil *Myllocerus subfasciatus*, castor semilooper *Acheae janata*, and non-insect pest, two-spotted spider mite *Tetranychus*

*urticae* recorded as minor pests in pomegranate under high density planting was similar to the opinion expressed by few farmers. Table 5.

Represents the distribution of pomegranate pests under high density planting and their severity. The scores indicated that the level of infestation of fruit borer *Deudorix isocrates* and fruit sucking moth *Othreisfullonia* were high in pomegranate planting of Erode, Tiruppur and Karur districts of Tamil Nadu, Whereas the occurrence of thrips *Scirtothrips dorsalis* was high in all four districts.



**Figure 1. Insect order wise diversity in pomegranate under high density planting**

The incidence of mealybug *Ferrisia virgata* was high in Erode and Tiruppur districts but low in Coimbatore and Karur districts. The damage by the aphids *Aphis punicae* was high in Coimbatore districts compared to other districts. The whitefly incidence was high in Erode, Tiruppur and Karur but low in Coimbatore district. The occurrence of ash weevil *Myloccerus subfasciatus* was high in Coimbatore and Tiruppur districts. Regarding the incidence of castor semilooper *Acheae janata*, Coimbatore and Tiruppur showed the presence, whereas it was not recorded in Erode and Karur. The other pest noted during the survey was two-spotted spider mite *Tetranychus urticae*, whose incidence was low in Coimbatore as compared to the medium level of infestation noted in Erode and Tiruppur districts. The pest was not found in the Karur district

## CONCLUSION

The above reports confirmed that the commercially growing pomegranate farmers are facing a number of pest problems in their field, with no practical eco-friendly solutions. Further, in order to increase production and productivity, farmers are growing pomegranates under high-density planting, which accommodates 1000 plants per hectare as compared to 750 plants per hectare in the normal planting. Since the introduction of high-density planting in pomegranate is new, systematic study on the occurrence of pests under high-density planting is needed.

## FUNDING AND ACKNOWLEDGMENT

There is no funding. The authors are grateful to Dean, School of Post Graduate Study (SPGS), Director, Professor and Head, Department of Entomology and Central for Plant Protection Studies

and Tamil Nadu Agricultural University for the help rendered during my research period.

## Ethics statement

No specific permits were required for the described field studies because no human or animal subjects were involved in this research.

## Originality and plagiarism

On behalf of all the authors, I assure that the work is original and the others works reported here are properly cited.

## Consent for publication

All the authors agreed to publish the content.

## Competing interests

There was no conflict of interest in the publication of this content

## Data availability

All the data of this manuscript are included in the MS. No separate external data source is required. If certainly, this will be extended by communicating with the corresponding author through corresponding official mail; [elaento@gmail.com](mailto:elaento@gmail.com)

## Author contributions

Research grant	-	-
Idea conceptualization	-	KE & SS
Experiments	-	KE
Guidance	-	SS
Writing-original draft	-	KE
Writing- reviewing & editing	-	SS

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