Plant Archives Vol. 25, Supplement 1, 2025 pp. 3068-3072 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2025.v25.supplement-1.418

STUDIES ON POPULATION DYNAMICS OF MAJOR PESTS OF GUAVA AND THEIR NATURAL ENEMIES IN DHARWAD KARNATAKA INDIA

Kruthika K.S.[1*], K.P. Gundannavar[1], D.N. Kambrekar[2] and M.S. Biradar[3]
[1]Department of Entomology, College of Agriculture, Dharwad, University of Agricultural Sciences, Dharwad – 580005 (Karnataka), India
[2] ICAR-KVK, University of Agricultural Sciences, Dharwad-580 005, Karnataka (India)
[3]Department of Horticulture, University of Agricultural Sciences, Dharwad-580 005, Karnataka (India)
*Corresponding author E-mail: kruthikaks2018@gmail.com
(Date of Receiving : 18-10-2024; Date of Acceptance : 09-01-2025)

ABSTRACT

Studies on population dynamics of major pests of guava revealed that, the highest infestation of sucking pests such as tea mosquito bug, mealy bug and spiraling whitefly was recorded during the second fortnight of October. Further, the highest incidence of fruit fly was noticed during September first fortnight. The peak population of natural predators such as coccinellids, reduviids and spiders was noticed in second fortnight of October. The correlation analysis showed that, all the sucking pests except tea mosquito bug and predators had significantly negative correlation with relative humidity and rainfall, but a non- significant positive correlation with the minimum temperature and significantly positive with the maximum temperature.
***Keywords*:** Correlation, guava, natural enemies, population dynamics

Introduction

Guava, *Psidium guajava* L. is a climacteric fruit originated in Tropical America has been cultivated widely in many countries in the world. In India it was introduced early in seventeenth century. It belongs to the family Myrtaceae and is a major source of Vitamin A, B and C and also contains high amounts of calcium and pectin (Anita *et al*., 2012). Guava is an important fruit crop commercially cultivated and it claims to be the 4th most important fruits in area and production after mango, banana and citrus. It is eaten as such or as cooked and used for making jam and jelly. Due to its high calorific value, guava fruit is an excellent choice for the middle income group peoples and hence it is also called as "Poor man's apple".

India is the largest producer of guava in the world having an area of about 307 thousand ha with a production of 4516 thousand million tonnes (First advance estimates). The largest producer is Uttar Pradesh (983.59 thousand tonnes) followed by Madhya Pradesh (776.75 thousand tonnes) and Bihar (434.41 thousand tonnes). Karnataka having an area of 7.18 thousand ha with 140.23 thousand million tonnes of production and 19.52 million tonnes ha^{-1} productivity. The total area under guava fruit crop in Dharwad district accounts for 563 ha with a production of 10191 metric tonnes (Anon., 2019). The most important commercially grown varieties in Dharwad district are Lucknow-49, Allahabad Safeda and Navalur local. Among them Lucknow-49 is very popular.

Various insect species causes damage to guava in different regions of the world and their abundance vary with geographical locations, availability of food sources and the season of the year. As many as 80 insect pests have been reported on guava. Of these, the most important are sucking pests which includes mealy bug (*F. virgata* Cockerell), tea mosquito bug (*H. antonii),* and in some regions spiraling whiteflies (*A. disperses* Russel*)* are the primary reasons for the hindrance for the guava production, where both nymphs and adults will suck the sap from the leaves, twigs, flowers and also attacks fruits where the infested

fruits will turn into uneven shapes with poor yields and quality.

Apart from sucking pests, fruit flies (*Bactrocera* spp.) also cause a major loss, where the maggots bore inside the fruits and start feeding on the soft pulp. The attack of these pests causes several effects including fruit quality and its production. Seasonal population dynamics of any insect pest provide knowledge on relationship between weather factors and the insect abundance. This helps the farmers to take timely management practices of the concerned pest in a particular area or region.

Material and Methods

The field experiment was conducted at Main Agricultural Research Station, Saidapur farm, Dharwad during July 2023-December 2023. The incidence of mealy bug, tea mosquito bug, spiralling whitefly and fruit fly were studied by recording observations in the guava orchards. Observations on insect population were recorded from the guava crop at 15 days interval.

In an orchard five plants were randomly selected and five branches in each plant was observed for mealybug on the basis of number of mealybugs per leaf, number of mealybugs per twig and mealybugs per fruit using magnifying lens directly in the field. For tea mosquito bug, observation recorded as number of affected leaves per branch, number of affected flower buds per branch and number of affected fruits per branch.

The data obtained was converted into per cent damage using following formula,

$$\text{Per cent damage} = \frac{\text{No. of young leaves/ flower buds /fruits damaged}}{\text{No. of young leaves/ flower buds / fruits observed}} \times 100$$

Whereas observation on spiraling whitefly like number of whiteflies (nymphs and adults) per leaf, number of egg mass per leaf was taken and per cent leaf infestation was calculated using the formula,

$$\text{Per cent incidence} = \frac{\text{Number of leaves infested}}{\text{Total number of leaves examined}} \times 100$$

For fruit fly observation, 10 ripen fruits were randomly collected from each branch separately with label and brought to the laboratory. To assess the maggots population in each fruit, fruits were cut in to two halves by sharp knife and maggots were counted from each half. Observations were made as number of maggots per fruit and per-cent fruit damage calculated as,

$$\text{Per cent incidence} = \frac{\text{Number of fruits infested}}{\text{Total number of fruits examined}} \times 100$$

Correlation analysis was performed to find out the extent of influence of weather parameters like temperature, relative humidity and rainfall on the population dynamics of above-mentioned pests. The trial was conducted in unprotected condition.

Results and Discussion

The data regarding the population dynamics of major pests of guava and their natural enemies and the correlation of weather parameters with the incidence of the major sucking pests and fruit fly is represented below.

Tea mosquito bug, *Helopeltis antonii* Signoret

The tea mosquito bug incidence was recorded from first fortnight of July with infestation of 4.52 per cent on young leaves, 2.34 per cent of flower bud damage and 4.52 per cent fruit damage which coincided with onset of monsoon. The infestation gradually increased and reached its peak (11.14 % leaf damage, 10.63 % flower bud damage and 11.67 % fruit damage, respectively) during October second fortnight. However, the infestation level started declining thereafter (Table 1).

The present findings are in line with the findings of Onkarappa and Kumar (1997) and Sunilkumar (2000), who also noted that pest incidence on guava occurred from July to November. Patil and Naik (2004) and Anandkumar (2022) observed that pest activity peaked in October and then decreased, with no damage reported from December onwards.

The correlation analysis revealed a non-significant negative relationship between the incidence of tea mosquito bugs and maximum temperature, while a non-significant positive correlation was observed with minimum temperature. Additionally, both relative humidity and rainfall displayed non-significant positive correlations with tea mosquito bug incidence (Table 2). These findings align with those of Kalita *et al*. (2018), who reported an insignificant positive correlation with maximum temperature, but significant positive correlations between relative humidity, minimum temperature, total rainfall, and *H. theivora* infestation.

Mealybug, *Ferrisia virgata* Cockerell

Mealy bug activity was first observed in the first fortnight of July, with an initial population of 3.16 mealy bugs per leaf, 1.50 mealy bug per twig and 3.07 mealy bug per fruit. The population gradually increased, peaking at 4.43 mealy bugs per leaf, 2.58

per twig and 6.81/fruit, respectively during the second fortnight of October. Following this peak, the infestation level began to decline, with the least recorded incidence in the second fortnight of December (Table 1). The current findings closely align with those of Khan (2018), Md Rhul *et al*. (2019), and Giddi *et al*. (2023), who observed the highest population of mealy bugs in November. In contrast, Muna *et al.* (2014) reported peak infestation occurring in late July and early August.

The correlation analysis revealed a significant positive relationship between mealy bug incidence and maximum temperature, along with a non-significant negative correlation with minimum temperature. Additionally, relative humidity and rainfall showed significant negative correlations with mealy bug incidence. Weather factors were found to influence 74.70% of mealy bug incidence (Table 2). These findings are consistent with those of Khan (2018) and Giddi *et al.* (2023), who also reported the impact of minimum temperature, rainfall, and humidity on mealy bug populations.

Spiralling whitefly, *Aleurodicus disperses* Russel

The egg mass of spiralling whitefly was noticed from first fortnight of July with 2.17 egg masses/ leaf. The number gradually increased on leaves and reached highest (4.72/ leaf) during second fortnight of October. The spiralling whitefly (nymphs and adults) was noticed on leaves and reached highest (7.28/ leaf) during second fortnight of October. Thereafter, the infestation level started declining and was least recorded during second fortnight of December with 1.95/ leaf. However, infestation on leaf by the pest was recorded from first fortnight of July with 38.85 per cent leaf infestation. Then, the level of infestation started increased over time and recorded highest infestation (55.47 %) during October second fortnight (Table 1). These findings are consistent with those of Mani and Krishnamoorthy (2000) and Devi *et al*. (2023), who reported that whitefly populations were most abundant during October and November, respectively.

The correlation analysis showed that spiraling whitefly incidence had a non-significant negative correlation with relative humidity and a positive correlation with minimum temperature. There was also a significant positive correlation with maximum temperature and a negative correlation with rainfall (Table 2). These findings align with those of Sushmitha *et al*. (2020) and Giddi *et al.* (2023), who reported that maximum and minimum temperatures were positively correlated with whitefly incidence, while rainfall and humidity were negatively correlated.

Fruit fly, *Bactrocera correcta*

The fruit fly infestation was recorded on fruit from first fortnight of July with 4.25 maggots per fruit with fruit damage of 35.53 per cent. Then, the level of infestation increased over time and recorded highest infestation (55.63 %) during September first fortnight with 6.75 maggots/ fruit. The occurrence of the pest continued till second fortnight of November with 17.65 per cent fruit damage and 1.25 maggots per fruit and no incidence was observed during December month (Table 1). These findings are consistent with those of Ravikumar and Viraktamath (2006) and Rajitha and Viraktamath (2006), who reported a peak fruit fly population per trap during August to September. However, Math *et al*. (2018) observed a peak population between July and November, which differs from these results.

Correlation analysis revealed a significant positive correlation between maximum temperature and the fruit fly maggot population. Additionally, the correlation between fruit fly incidence and weather parameters, such as relative humidity and rainfall, was found to be significantly negative (Table 2). These findings are in line with those of Ravikumar and Viraktamath (2006) and Math *et al*. (2018), who also reported a positive correlation with maximum and minimum temperatures, and a negative correlation with relative humidity and rainfall.

Natural enemies (Predators)

Jumping spider, *Telamonia dimidiata* Simon

The spiders remained constantly active throughout the period of observation. Initially the occurrence of spiders was noticed during first fortnight of July with 0.28 per branch. Gradually the population increased and reached its peak during October second fortnight (0.98/ branch), which coincided with the peak activity of sucking pests (Table 3).

Coccinellids, *Coccinella transversalis* Fabricius

The coccinellids remained constantly active throughout the period of observation. Initially the occurance of coccinellids was noticed during first fortnight of July with 0.04 per branch. Gradually the population increased and reached its peak during October first fortnight (0.68/ branch), which coincided with the peak activity of sucking pests (Table 3).

Reduviid bugs, *Zelus renardii* Kolenati

The reduviids remained active throughout the period of observation. Initially the occurrence of

reduviids was noticed during first fortnight of July with 0.18 per branch. Gradually the population increased and reached its peak during October first fortnight (0.95/ branch) (Table 3). The present findings are in concord with Prashanth *et al*. (2023) who observed the peak population reduviids during 8th and 9th SMW. Predators also play an important role in the natural control of *Helopeltis* spp. in cashew ecosystem. The main predators of *Helopeltis* include spiders, reduviids, mantids and ants (Saroj *et al.,* 2016).

Conclusion

The study on population dynamics of major insect pests infesting guava were studied from July-December 2023 at fortnightly intervals. The maximum infestation of sucking pests namely tea mosquito bug on leaf, flower bud and fruit, whereas spiraling whiteflies on leaves and mealy bug on leaf, twig and fruit were observed during the second fortnight of October month. Further, the maximum incidence of fruit fly was noticed in the first fortnight of September month. The correlation data between various weather parameters and the population of the sucking pests and fruit fly revealed that the maximum temperature had a significant positive correlation with the mealy bug, spiraling whitefly and fruit fly incidence but negatively correlated with the tea mosquito bug. Whereas minimum temperature favours the incidence of tea mosquito bug, spiraling whitefly and fruit fly but not the mealy bug. Relative humidity and rainfall has a significant negative effect on the incidence of mealy bug, spiraling whitefly and fruit fly population but has a positive correlation with tea mosquito bug infestation.

Table 1: Population dynamics of major sucking pests and fruit fly infesting guava during July 2023 – December 2023

Month	Fortnight	Sucking pests									Fruit fly	
		Tea mosquito bug			Mealy bug			Spiraling whitefly				
		Young leaves damage (%)	Flower bud damage (%)	Fruit damage (%)	No. of mealy bug/ leaf	No. of mealy bug/ twig	No. of mealy bug/ fruit	No of egg mass/ leaf	No. of spiraling whitefly/ leaf	Leaf infestation (%)	No. of maggots/ fruit	Fruit damage (%)
July	**I**	4.52	0	0	3.16	1.50	3.07	2.17	4.24	38.85	4.25	35.53
	II	5.63	2.34	4.52	3.34	1.61	3.82	2.27	4.85	42.23	4.36	37.65
August	**I**	5.75	5.62	5.25	3.56	1.85	4.94	2.36	4.75	41.58	5.38	48.35
	II	6.62	7.24	7.65	3.98	1.91	5.51	2.63	4.92	42.64	5.85	50.95
September	**I**	6.68	7.64	7.75	3.94	1.86	5.30	2.75	4.66	41.04	6.75	55.63
	II	7.65	8.42	8.63	3.86	1.97	5.82	3.32	5.14	44.32	6.42	53.43
October	**I**	9.23	9.36	9.09	4.22	2.32	6.75	3.75	6.53	47.63	5.05	45.05
	II	11.14	10.63	11.67	4.43	2.58	6.81	4.72	7.28	55.47	4.86	41.76
November	**I**	10.56	10.43	10.87	3.88	1.96	6.04	4.12	7.14	53.31	2.14	26.03
	II	9.86	9.16	9.08	4.16	1.88	4.10	4.00	6.56	48.85	1.25	17.65
December	**I**	8.02	8.22	8.83	4.04	0.42	3.71	2.91	3.76	35.04	00	00
	II	4.56	3.05	4.21	1.62	0.22	2.08	2.05	1.95	21.05	00	00
Mean		**7.49**	**6.84**	**7.30**	**3.68**	**1.67**	**4.86**	**3.09**	**5.15**	**42.67**	**3.86**	**34.34**

Table 2: Relationship of weather parameters with insect pests of guava during July 2023 - December 2023

Insect pests	Correlation coefficient (r) Meteorological parameters				Co-efficient of determination (r^2)	Regression equation
	Temperature (°C)		Relative Humidity (%) (X_3)	Rainfall (mm) (X4)		
	Maximum (X_1)	Minimum (X_2)				
Tea mosquito bug	-0.755**	0.554	0.698**	0.928**	0.784	Y = -8.870 +(0.194) x X_1+(0.213) x X_2 +(0.000) x X_3+(0.069) x X_4+0.447
Mealy bug	0.953**	-0.243	-0.659**	-0.771**	0.747	Y = -12.117 +(0.683) x X_1 +(0.049) x X_2+ (0.007) x X_3+(0.010) x X_4 +0.268
Spiralling whitefly	0.897**	0.029	-0.487	-0.728**	0.746	Y = -4.056 +(0.236) x X_1+(0.062) x X_2+ (0.006) x X_3+(0.000) x X_4+ 0.102
Fruit fly	0.598**	0.142	-0.537	-0.428**	0.854	Y = -11.597 + (0.435) x X_1+ (0.383) x X_2+ (-0.045) x X_3+ (0.006) x X_4+0.224

**Significant at 0.05

Table 3: Population dynamics of natural enemies of guava recorded during July 2023- December 2023

Month	Fortnight	Mean number of predators /branches		
		Spiders	Coccinellids	Reduviids
July	I	0.28	0.04	0.18
	II	0.36	0.08	0.25
August	I	0.55	0.24	0.36
	II	0.76	0.18	0.66
September	I	0.85	0.22	0.88
	II	1.24	0.51	0.86
October	I	1.28	0.68	0.95
	II	0.98	0.64	0.91
November	I	0.78	0.46	0.87
	II	0.69	0.25	0.69
December	I	0.61	0.18	0.48
	II	0.56	0.19	0.39
Mean		**0.75**	**0.31**	**0.62**

References

Anandkumar, V. (2022). Investigation on Tea mosquito bug, *Helopeltis* spp. infesting guava. *Ph.D thesis*, University of Agricultural Sciences, Dharwad.

Anita, M., Sivaram, V. and Jayaramappa, K.V. (2012). Influence of bee attractants on pollination and yield parameters in guava (*Psidium guajava* L.). *The International Journal of Plant Reproductive Biology*, **4**(1): 8-17.

Anonymous (2019). Horticulture crop statistics of Karnataka state at a glance, Karnataka State Department of Horticulture, Bengaluru, Pp: 35-43.

Giddi, T.D., Emmanuel, N. and Sekar, V. (2023). Seasonal incidence of sucking pest complex of guava cv. Taiwan white in Andhra Pradesh. *The Pharma Innovation Journal,* **12**(3): 4154-4158.

Kalita, H., Gopi, R., Avasthe, R.K. and Yadav, A. (2018). Bio-ecology of tea mosquito bug, *Helopeltis theivora* (Waterhouse), an emerging pest of Red cherry pepper, *Capsicum annum* var. *Cerasiforme* in Sikkim, Himalaya. *Indian Journal of Hill Farming,* **31**(2): 261-266.

Khan, M.M.H. (2018). Abundance, damage severity and management of guava mealybug, *Ferrisia virgata* Cockerell. *SAARC Journal of Agriculture*, **16**(2): 73-82.

Mani, M. and Krishnamoorthy, A. (2000). Population dynamics of spiralling whitefly, *Aleurodicus dispersus* Russel and its natural enemies on guava in India. *Entomon,* **25**: 29-34.

Math, M., Kotikal, Y.K. and Ganiger, V.M. (2018). Species diversity and population dynamics of fruit flies in guava ecosystem. *International Journal of Current Microbiology and Applied Sciences*, **7**(12): 2269-2283.

Md Rhul Amin, Shubati Khisa, Habibur Rahman, Rayhanur Jannat and Muhammad Badruzzaman, 2019, Seasonal abundance on major chewing and sucking insects of guava. *Bangladesh Journal of Zoology,* **47**(1): 97-105.

Muna Al-Fwaeer, Ibtihal Abu-Obaid, Firaz Al-Zyoud, Asem Abo-Alosh and Manal Halaybeh (2014). Population dynamics of the Hybiscus mealybug *Maconellicoccus hirsutus* Green and its parasitoid on guava trees in Madaba-Jordan. *International Journal of Agriculture and Forestry,* **4**(3): 171-177.

Onkarappa, S. and Kumar, C.T.A. (1997). Biology of tea mosquito bug, *Helopeltis antonii* Sign. (Miridae:Hemiptera) on neem. *Mysore Journal of Agricultural Sciences,* **31**: 36-40.

Patil, G.R. and Naik, L.K. (2004a). Studies on the seasonal incidence of tea mosquito bug on guava cultivars. *Karnataka Journal of Agriculture Sciences,* **17**(2): 339-340.

Prashanth, G., Sunitha, N.D. and Chavan, S. (2023). Population dynamics of major insect pests and their natural enemies in brinjal ecosystem. *Journal of Farm Sciences*, **36**(1): 75-80.

Rajitha, A.R. and Viraktamath, S. (2006). Response of fruit flies (Diptera: Tephritidae) to different coloured bottle traps in guava orchard. *Pest Management in Horticultural Ecosystems*, **12**(2): 170-172.

Ravikumar, C.H. and Viraktamath, S. (2006). Influence of weather parameters on fruit fly trap catches in Dharwad, Karnataka. *Pest Management in Horticultural Ecosystems,* **12**(2): 143-151.

Saroj, P.L., Bhat, P.S. and Srikumar, K.K. (2016). Tea mosquito bug (*Helopeltis* spp.) – A devastating pest of cashew plantations in India: A review. *Indian Journal of Agricultural Science,* **86**(2): 151–162.

Sunilkumar, (2000). Studies on seasonal incidence and loss estimation in guava due to tea mosquito bug, *Helopeltis antonii* Signoret (Hemiptera: Miridae). *M.Sc.(Agri) Thesis*, University of agricultural Sciences, Dharwad, p.51.

Sushmitha, S., Sujatha, A. and Emmanuel, N. (2020). Impact of weather parameters on rugose spiraling whitefly, *Aleurodicus rugioperculatus* and its natural enemies. *Journal of Entomology and Zoology Studies*, **8**(6): 726-730.