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Influence of biotic and abiotic factors on pest incidence and natural enemies in guava (*Psidium guajava L*)

ABSTRACT

A study on seasonal incidence of insect pests and their natural enemies in different guava varieties was carried out at Horticultural College and Research Institute, Periyakulam during 2022-23. The experimental results revealed that tea mosquito bug (8.75%), fruit borer (0.75%), mealybugs (12.25% and 2.80 %) and aphids (2.40%) ~~was~~ were less in L-46, followed by red flash (1.55- 21.35%), L-49 (0.86- 13.50%) in guava ecosystem. The guava variety, Lalit was found to be more susceptible to tea mosquito bug (22.60%) , fruit borer (2.65%), mealy bug (25.60%), spiraling whitefly (23.45%), scales (5.75%) and papaya Mealybug (12.70%). The coccinellids population was high in lalit (1.80/tree) followed by Allahabad Safeda (1.70/tree) and L-49 (1.60/tree), whereas the spiders were found high in red flash guava (0.70/tree) but in lalit it was 0.15 per tree. The fruit fly damage, mealybugs, spiraling whitefly, aphids, scales, papaya mealybug and spiders was more during hot weather and was positively correlated with maximum and minimum temperature whereas they are negatively correlated with other weather parameters *viz.*, rainfall, wind speed and relative humidity. The fruit borer incidence was recorded high during rainy days (0.103) with high wind speed (0.344) and minimum temperature (0.004). The coccinellids beetle were more during cloudy and rainy period (0.765), high wind speed (0.554) and relative humidity (0.338).

Keywords: Guava, pests and natural enemies, seasonal incidence, biotic and abiotic factors

Introduction

Guava is cultivated commercially in India and is popular as all season fruit with rich nutritional and medicinal properties ~~value,reasonableprice~~, ~~suitability for transportand consumer preference~~. The ~~guava~~ area under tropical and subtropical regions is expanding due to its high ~~requirement~~ demand for fresh fruits and processed products in global trade. Guava is the fourth widely cultivated fruit crop in India with 0.15 million hectare, producing 1.80 million tonnes of fruit (Reference ??) . Insect pests infestation is the most significant limiting factor of guava production which deteriorate yield and market value of fruit .Various insect species cause damage to guava and their abundance differ with geographic locations, food sources and weather factors. The major pests include whiteflies, mealy bugs, tea mosquito bugs, fruit flies and castor capsule borer. Besides, mites and birds also cause a lest amount of loss. Weather factors play role in multiplication, growth, development and distribution of insects and influence on their seasonal abundance.Temperature, humidity and rainfall are most influential parameters of meteorological factors affecting insect population dynamics. Seasonal population dynamics of any insect pest provide knowledge on relationship between weather factors and insect abundance. It indicates the farmers of a particular area or region about management program of the pest. So, the growers can take proper control measures to prevent loss due to insect attack. Hence, the research was framed to survey and documentation of pests and its natural enemies in different guava varieties and to study the influence of weathers parameters on incidence of pests and natural enemies in guava.

Materials and methods

Studies on the Seasonal incidence of pests and natural enemies in different ~~Cg~~guava varieties and management of tea mosquito bug using bio – pesticides were carried out at Horticultural College and Research Institute, Periyakulam during 2022. ~~The survey was conducted in different guava varieties for the incidence of pests and natural enemies~~ The survey was conducted in different guava varieties for the incidence of pests and natural enemies at Central farm, Horticultural College and Research institute, Periyakulam during May to July, 2022. The varieties surveyed were Allahabad Safeda , Red fleshed, Lalit, Lucknow 49 (Sardar) and Lucknow 46. Twenty plants were randomly selected from each Guava varieties were observed by visual counting the pests and natural enemy population

and their infestation from 10 randomly selected fruits and twigs ~~per~~ at weekly intervals. The visual inspection of twigs, leaves and fruits was carried out and per cent damage on growing shoots, leaves and fruits were recorded. For fruit fly exit hole or deformation of fruit were taken as identification mark of infestation. The study area was kept free of insecticidal spray during the period of observation. The varietal screening studies data obtained was analyzed statistically using Randomized Block Design after suitable transformation.The weather parameters taken for the study were Maximum temperature, Minimum temperature, Rainfall, Wind velocity and Relative Humidity. These weather data were collected from the weather station of Horticultural College and Research Institute, Periyakulam. The data from the weather station was correlated with the pests population and based on that seasonal incidence of Guava pests was studied.

Results and Discussion

Insect pests and natural enemies on guava varietiess

The incidence of pests and natural enemies in different guava varieties revealed that the tea mosquito bug, fruit fly, castor capsule borer, mealy bug, spiraling whitefly, aphids, scales, papaya Mealybug and predatory coccinellid beetles were found to be the major pests and predators in guava ecosystem of Horticultural College and Research Institute, Periyakulam (Table 1 and Fig 1.). Arifunnahar*et al.*,. (2016) stated that insects like spiralling whitefly, tea mosquito bug, scale insects, mealy bugs, aphids, thrips, coreid bug, fruit fly, fruit borer, stem borer, hairy caterpillar and leaf weevil are affecting guava in south India. Among the different varieties, L-46 was found to be less susceptible for tea mosquito bug (8.75%), fruit borer (0.75%), mealybugs (12.25% and 2.80 %) and aphids (2.40%) followed by red flash (1.55- 21.35%), L-49 (0.86- 13.50%) (Table 2), whereas, in Allahabd Safeda, the per cent damage by fruit fly (3.50%) and aphids (4.50%) was high compared to other guava varieties. The guava variety, Lalit was found be more susceptible for insect pests, which recorded tea mosquito bug (22.60%) , fruit borer (2.65%), mealy bug (25.60%), spiraling whitefly (23.45%), scales (5.75%) and papaya Mealybug (12.70%), but, Lalit was found be more susceptible for insect pests, which is in accordance with Ganga visalakshy. (2019) who reported that pests causes more than 60 per cent yield loss in guava.The coccinellids population was high in lalit (1.80/tree) followed by **Allahabad Safeda** (1.70/tree) and L-49

(1.60/tree), whereas the spiders were found high in red flash guava (0.70/tree) but in lalit it was 0.15 per tree (Table 2).

Seasonal incidence of insect pests and their natural enemies in guava

The seasonal incidence of insect pests and their natural enemies in guava revealed that the fruitfly damage, mealybugs, spiraling whitefly, aphids, scales, papaya mealybug and spiders was more during hot weather and was positively correlated with maximum and minimum temperature (0.0249 and 0.0909, 0.269 and 0.390, 0.063 and 0.048, 0.329 and 0.421, 0.140 and 0.007, 0.266 and 0.420 and 0.644 and 0.624, respectively) whereas they are negatively correlated with other weather parameters *viz.,* rainfall, wind speed and relative humidity (Table 3). The fruit borer incidence was recorded high during rainy days (0.103) with high wind speed (0.344) and minimum temperature (0.004). The coccinellids beetles were more during cloudy and rainy period (0.765), high wind speed (0.554) and relative humidity (0.338). Baker *et al.,* (2012) and Giddi*et al.,* (2021) reported that the abundance of insect pest of guava is related with weather factors and the lowest population density is during the winter season. Al- Fawaeer*et al.,* (2013) reported that the Guava fruit fly showed most abundance in months April to March and September to November, which coincide with the Guava fruiting season .

Table 1. Insect pests and natural enemies on guava varieties

S.No.	**Insect Pests on guava varieties**		
	Common Name	**Scientific Name**	**Family and Order**
1.	Tea mosquito bug	*Helopeltisantonii* (Signoret)	Miridae: Hemiptera
2.	Fruit fly	B*actroceradiversus*	Tephritidae: Diptera
3.	Fruit borer	*Conogethespunctiferalis* (Guenée)	Pyraustidae: Lepidoptera
4.	Mealy bug	*Ferrisia virgata* (Cockerell)	Pseudococcidae: Hemiptera
5.		*Maconellicoccushirsutus* (Green)	
6.	Spiraling whitefly	*Aleurodicusdispersus* (Russell)	Aleyrodidae: Hemiptera
7.	Aphids	*Aphis gossypii (*Glover)	Aphididae: Hemiptera
8.	Guava scale	*Chloropulivinariapsidii*(Maskell)	Coccidae: Hemiptera
9.	Papaya Mealybug	*Paracoccusmarginatus (*Williams)	Pseudococcidae: Hemiptera
10.	Coccinellid beetles	*Coccinellaseptumpunctata C. rependa*	Coccinellidae: Coleoptera

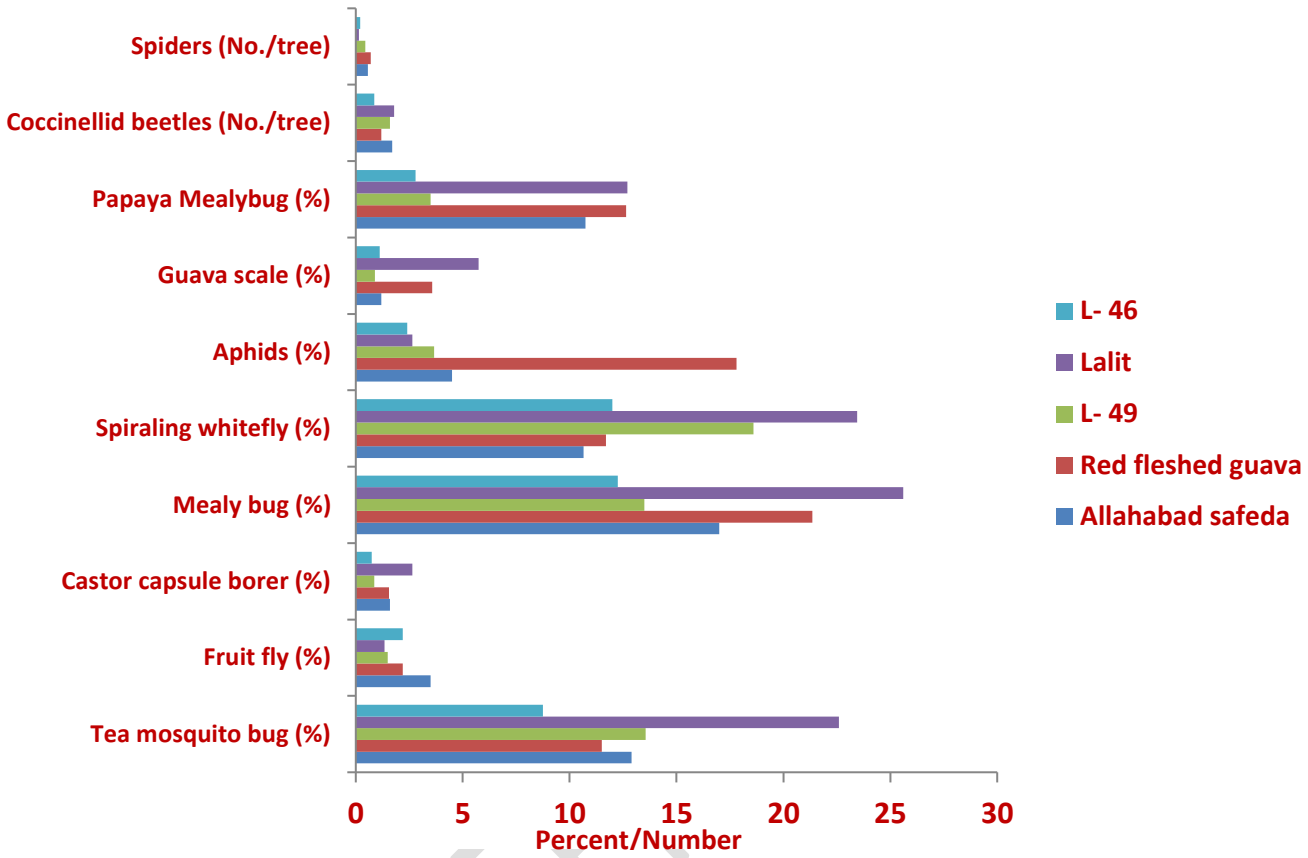

Figure 1. Insect pests and natural enemies on guava varieties

Table 2. Incidence of insect pests and natural enemies on guava varieties at Central farm, Horticultural College and Research Institute, Periyakulam during May- July, 2022

Variety	Tea mosquito bug (%)	Fruit fly (%)	Fruit borer (%)	Mealy bug (%)	Spiraling whitefly (%)	Aphids (%)	Guava scale (%)	Papaya Mealybug (%)	Coccinellid (No./tree)	Spiders (No./tree)
Allahabad Safeda	12.90 (21.04)^{c}	3.50 (10.78)^{d}	1.60 (7.26)^{d}	17.00 (24.34)^{c}	10.65 (19.04)^{a}	4.50 (12.25)^{d}	1.20 (6.29)^{c}	10.75 (19.13)^{c}	1.70 (1.64)^{b}	0.56 (1.25)^{b}
Red Fleshed guava	11.50 (19.82)^{b}	2.20 (8.52)^{c}	1.55 (7.15)^{c}	21.35 (27.51)^{d}	11.74 (19.94)^{b}	17.80 (24.95)^{e}	3.57 (10.89)^{d}	12.65 (20.83)^{d}	1.20 (1.48)^{d}	0.70 (1.30)^{a}
L- 49	13.55 (21.59)^{d}	1.50 (7.03)^{b}	0.86 (5.31)^{b}	13.50 (21.55)^{b}	18.65 (25.54)^{c}	3.67 (11.04)^{c}	0.90 (5.44)^{a}	3.50 (10.78)^{b}	1.60 (1.61)^{c}	0.45 (1.21)^{c}
Lalit	22.60 (28.37)^{e}	1.35 (6.67)^{a}	2.65 (9.36)^{e}	25.60 (30.38)^{e}	23.45 (28.95)^{d}	2.65 (9.40)^{b}	5.75 (13.87)^{e}	12.70 (20.87)^{d}	1.80 (1.67)^{a}	0.15 (1.07)^{e}
L- 46	8.75 (17.20)^{a}	2.20 (8.53)^{cb}	0.75 (4.96)^{a}	12.25 (20.48)^{a}	12.00 (20.26)^{b}	2.40 (8.91)^{a}	1.12 (6.07)^{b}	2.80 (9.63)^{a}	0.87 (1.37)^{e}	0.20 (1.20)^{d}
CD (P=0.05)	0.427	0.085	0.169	0.538	0.431	0.216	0.196	0.259	0.016	0.006

Figures in parentheses are square root transformed values * and arcsine transformed values **

Means followed by a common letter in a column are not significantly different

Values are mean of twenty replications

Table 3. Correlation co-efficient between incidence of insect pests and natural enemies on guava with weather parameters during May- July, 2022

Weather Parameter	Weather Parameter correlation Coefficient								
	Fruit fly	Fruit borer	Mealy bug	Spiraling whitefly	Aphids	Guava scale	Papaya Mealybug	Coccinellid beetles	Spiders
Max Temp (°C)	0.0249	-0.009	0.269	0.063	0.329	0.140	0.266	-0.278	0.644
Min Temp (°C)	0.0909	0.004	0.390	0.048	0.421	0.007	0.420	-0.298	0.624
Rainfall (mm)	-0.3918	0.103	-0.634	-0.687	-0.295	-0.169	-0.165	0.765	-0.651
Wind speed	-0.1633	0.344	-0.086	-0.475	-0.059	-0.057	-0.469	0.554	-0.237
Relative humidity (%)	-0.1630	-0.025	-0.456	-0.167	-0.382	0.003	-0.457	0.338	-0.653

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