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Population dynamics of pomegranate sucking pests under high density planting in Tamil Nadu

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Abstract
Field observation on population dynamics of major sucking pest complex of pomegranate planted under high density planting was conducted in farmer's holdings in Tamil Nadu during 2015-2016. The highest number of thrips was recorded during third week of April which merges with sixteenth standard week (15.9 nos / 3 terminal shoots). Regarding mealy bugs, third week of February which merge with eighth standard week (53.6 numbers / 15 cm stem length / plant). The peak period of aphids was recorded during seventh standard week (75.8 numbers / 3 terminal shoots) and the whitefly was recorded during fourth week of March (50.4 numbers /15 cm stem length / plant). Maximum temperature influenced the infestation of thrips (r = 0.466) and whitefly (r = 0.654) positively and the impact of minimum temperature on the infestation of mealy bug (r = 0.367) and whitefly (r = 0.397) was significant and positive.

Keywords: Pomegranate, Seasonal incidence, *Aphis punicae, Siphoninus phillyreae*

1. Introduction
Pomegranate (*Punica granatum* L.) native of Iran to the Himalayas in northern India is cultivated since ancient times throughout the Mediterranean region of Asia, Africa and Europe (Holland *et al.,* 2009) [3]. Pomegranate is one of the important fruit crop in India cultivated in arid and semiarid regions of Gujarat, Maharashtra, Karnataka, Uttar Pradesh, Andhra Pradesh and Tamil Nadu (Balikai *et al.,* 2011) [2]. The adaptability of the crop to extremes of temperature (-12 to + 44°C), suitability to marginal lands with poor fertility, rocky lands with shallow depth etc., pave the way for its potential production in various ecosystem (Pal *et al.,* 2014)[7]. India is the largest producer of pomegranate in the world and the total area under cultivation is 107.00 thousand ha with the production of 743.00 thousand tons (Verghese and Rashmi, 2014) [9]. Although India is the largest producer, its productivity is only 6.9 MT/ha. Totally 91 insects, 6 mites and 1 snail pest feeding has been reported on pomegranate crop in India (Balikai *et al.,* 2011) [2]. Among the pests complex, damage due to sucking pests *viz.,* thrips, mealy bugs, aphids and whitefly is major in India. Yield loss incurred due to pest problem results in the reduced income, poverty, food insecurity and loss of biodiversity. To develop an IPM module against these noxious pests there is a need to conduct monitoring studies. Keeping this background, the present investigation on monitoring of population dynamics of sucking pest complex of pomegranate was undertaken.

2. Materials and Methods
The studies on seasonal occurrence of sucking pests of pomegranate under high density planting were carried out in Thondamuthur, Coimbatore. The pomegranate garden maintained under pesticide free environment was selected for observation of seasonal incidence of pests. The study was carried out for during peak period of occurrence October 2015 to May 2016. Weekly observation was made in pomegranate farm under high density planting available at Thondamuthur, Coimbatore. Ten plants of variety Bhagwa was selected at random for observing the presence of various pest. The occurrence of pests was noted as population per unit sample or damage caused by the pest. Weekly counts on sucking pest population was correlated with weather parameters *viz*., maximum temperature (T_{max}), minimum temperature (T_{min}), relative humidity (RH), rainfall and solar radiation obtained from the automatic weather station installed at Tamil Nadu Agricultural University, Coimbatore.

2.1 The sampling methodology for different pests is detailed below:

2.1.1 Thrips: The number of thrips in 3 terminal branches per plant in 10 randomly selected plants by tapping the shoots on white sheet.

2.1.2 Mealy bugs: The number of mealy bugs (both nymphs and adults) from 15 cm stem length/plant of 10 randomly selected plants

2.1.3 Aphids: The number of aphids in 3 terminal shoots (each of 2.5 cm shoot length) per plant in 10 randomly selected plants.

2.1.4 Whitefly: The number of nymphs and adults of whitefly from 15 cm shoot length /plant in 10 randomly selected plants.

2.2 Statistical analysis

The seasonal pest occurrence noted as population during the study period was (dependent variable) correlated with weather factors (independent variable) *viz.,* maximum temperature, minimum temperature, maximum relative humidity, minimum relative humidity and total rainfall obtained from TNAU, Coimbatore. Simple correlation was performed using SPSS 16.0 statistical package to associate the incidence of pomegranate sucking pests with various biotic factors.

3. Results and Discussion

The monitoring of population insect pest revealed that the mean population of thrips was maximum during the second week of February, second and third week of April (14.5, 15.3 and 15.9 nos / 3 terminal shoots) (Table 1) and the maximum temperature influenced the infestation of thrips with positive correlation (r = 0.466) (Table 2). This finding was supported by the report of Nadaf *et al.* (2014) [6] who also observed positive correlation of temperature with thrips. The population of mealy bug *Ferrisia virgata* was maximum during first, second and third week of February with 45.1, 50.9 and 53.6 numbers / 15 cm stem length / plant (Fig.2), respectively and mealy bug population also showed positive and significant correlation with minimum temperature (r = 0.367). The mealy bug incidence normally seen during the fruiting stage, which coincides with February was in agreement with the findings of Mani and Krishnamoorthy (1990) [5], Karuppuchamy (1994) [4] and Shevale and Kulgud (1998) [8] who reported incidence of mealy bug *Ferrisia* spp during fruiting stage. Pomegranate aphids *Aphis punicae* was maximum during 7th and 8th SMW of February with population of 75.8 and 75.2 numbers / 3 terminal shoots, the higher incidence of aphid was observed on tender shoots during the month of February and March both in hills and plains reported by Karuppuchamy (1994) [4] well supports the present observation. The negative correlation with minimum temperature (r = - 0.36), morning relative humidity (r= -0.41) and evening relative humidity (r = -0.43) with aphid occurrence obtained in the present study was in line with the reports of Aswathanarayana reddy *et al.* (2014) [1]. that the correlation between incidence of aphid and evening relative humidity r = (-0.6019) was significant and negative. The peak incidence of whitefly *Siphoninus phillyreae* was noted during the last week of March with mean population 50.4 numbers /15 cm stem length / plant and third week of March with mean population 44.5 numbers / 15 cm stem length / plant of whitefly (Table 1). The incidence of whitefly showed significant positive correlation with maximum and minimum temperature (r =0.654 and 0.397), significant negative correlation with morning and evening relative humidity (r = -0.602 and r = -0.580) (Table 2). Shevale and Kulgud (1998) [8] recorded abundant whitefly population during March to June on pomegranate in Maharashtra also coincides with the observation on the higher incidence of whitefly during March obtained in the present study.

Table 1: Monitoring of population dynamics of sucking pests of pomegranate during 2015-2016.

Month/year	SMW	Thrips (No. of Thrips/ 3 terminal shoots)	Mealy bugs (No. of mealy bugs in 15 cm stem length/plant)	Aphids (No. of aphids /3 terminal shoots)	Whitefly (No. of whitefly - 15 cm stem length/plant)
Oct-15	41	1.8	0	0	0
Oct-15	42	4.5	0	0	0
Oct-15	43	6.7	0	0	0
Oct-15	44	11.5	0	0	0
Nov-15	45	3.3	6.1	0	0
Nov-15	46	0.7	12.8	0	0
Nov-15	47	7.6	26.4	0	0
Nov-15	48	9.3	23.9	0	0
Dec-15	49	10.8	16.5	0	0
Dec-15	50	7.5	15.1	7.7	0
Dec-15	51	10	12.8	11.4	0
Dec-15	52	10	9.2	17.2	0
Jan-16	1	10.5	5.4	20.8	0
Jan-16	2	10.4	13.8	22	0
Jan-16	3	10.2	22.8	44.1	0
Jan-16	4	10.6	30.6	64.8	0
Jan-16	5	12.1	39.5	69.2	5.4
Feb-16	6	11.8	45.1	74.7	10.6
Feb-16	7	14.5	50.9	75.8	16.3
Feb-16	8	13.3	53.6	75.2	20.1
Feb-16	9	11.1	41.5	67.5	26.6
Mar-16	10	9.7	31.9	53.8	30.2
Mar-16	11	11.6	24.1	42.7	36.8
Mar-16	12	11.4	16.8	27.8	44.5
Mar-16	13	14	12.1	16.6	50.4
Apr-16	14	14.9	9.5	8.6	40.5

Apr-16	15	15.3	5.6	2.2	28.4
Apr-16	16	15.9	1.8	0	19.7
Apr-16	17	14.7	0	0	14.1
May-16	18	13.2	0	0	7.5
May-16	19	6.4	0	0	2.3
May-16	20	3.6	0	0	0

*Mean of 10 observations

Table 2: Influence of weather parameters on population dynamics of sucking pest of pomegranate during 2015-2016.

Variables	Correlation coefficient			
	Thrips	Mealy bugs	Aphids	Whiteflies
Maximum temperature (T_{max}) (ºC)	0.466**	-0.158	0.024	0.654**
Minimum temperature (T_{min}) (ºC)	0.085	0.367*	-0.363*	0.397*
Morning RH (%)	-0.578**	-0.205	-0.412*	-0.602**
Evening RH (%)	-0.583	-0.163	-0.438*	-0.580**
Rainfall (mm)	-0.237	-0.251	-0.307	-0.269

**. Correlation is significant at the 0.01 level
*.Correlation is significant at the 0.05 level

Thrips *(Scirtothrips dorsalis)* | Aphids *(Aphis punicae)*

Two tailed mealy bug *(Ferrisia virgata)* | Mealy bug (*Ferrisia virgata*) - Fruit

Citrus mealy bug *(Planococcus citri)* | Whitefly *(Siphoninus phillyreae)*

Fig 1: Major sucking pests infesting pomegranate under high density planting in Tamil Nadu

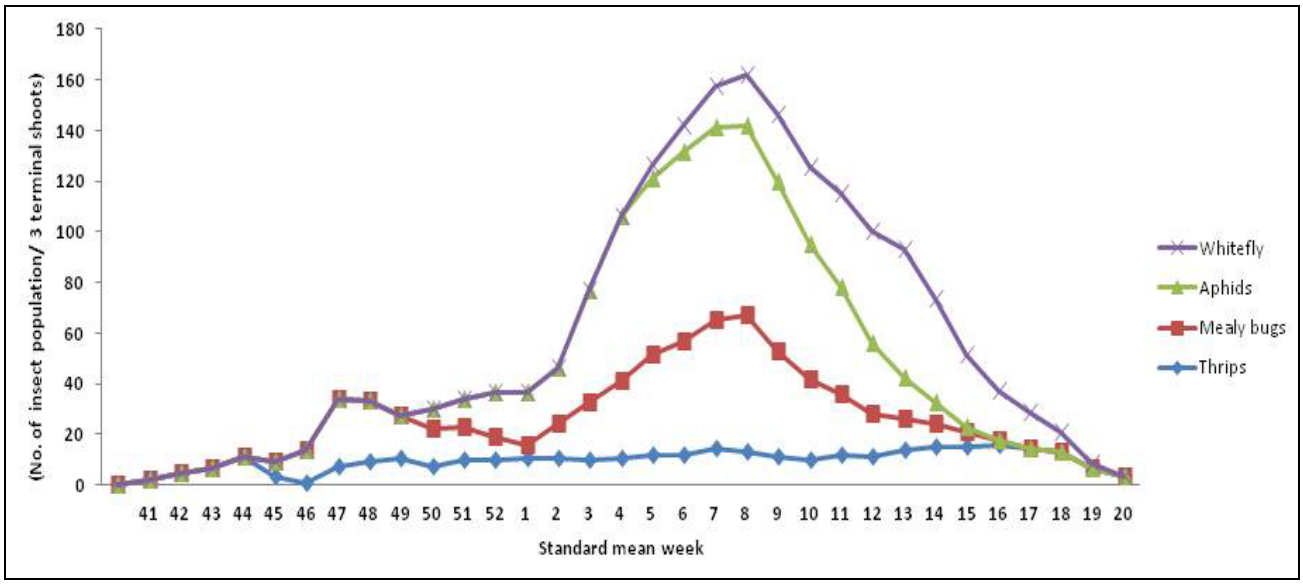

Fig 2: Population dynamics of sucking pest complex of pomegranate during 2015-2016

4. Conclusion

From the thorough analysis of the present findings it can be concluded that regarding abundance of thrips, *Scirtothrips dorsalis* was maximum during second week of February, second and third week of April and *Aphis punicae* was as maximum during 6th and 7th Standard mean week (February). Mealy bug *Ferrisia virgata* was maximum during first, second and third week of February. The peak incidence of whitefly *Siphoninus phillyreae* was noted during the last week of March. Based on this we have to take control measures to managing the sucking pests of pomegranate under high density planting.

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