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CORRELATION AND REGRESSION OF MANGO THRIPS (*SCIRTOTHRIPS DORSALIS* HOOD) IN HIGH-DENSITY MANGO PLANTATION UNDER SOUTH GUJARAT CONDITIONS

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ABSTRACT:

Studies on population dynamics of mango thrips and their correlation and regression with abiotic factors in the high-density plantation of Kesar mango orchard under drip irrigation were conducted during 2017 to 2019 at mango orchard of Soil & Water Management Research Unit, Navsari Agricultural University, Navsari, Gujarat. Maximum (18.20, 8.00 and 9.80 thrips/twig) population of the thrips was recorded at 11th, 50th and 1st SMW in 2017, 2018 and 2019 respectively. Correlation analysis with various weather parameters indicated that sunshine showed a significant positive correlation with thrips whereas maximum temperature, evening relative humidity and evaporation rate had a significant negative correlation with the incidence of thrips. Among those abiotic factors, Maximum Temperature and Morning Relative Humidity were founded the highest impactable factors so far by simple and stepwise regression analysis

KEYWORDS: *Mango, Thrips, Population dynamics, Regression, Correlation, Navsari, Gujarat.*

INTRODUCTION:

Mango is one of the major fruit crops of south Asia from ancient times and at present; it is a prominent horticulture crop of India. It is grown in India to large extent and is considered as a king of all the fruits. Adoption of the High Density Planting (HDP) system with proper canopy

management practices coupled with a drip-fertigation system is highly essential to increase productivity (**Kumar 2013**). Among the mango pests, thrips are major yield limiting factors in south Gujarat and elsewhere (**Kumar *et. al.,* 1994**). It is a polyphagous, cryptic mannered pest having short life cycle, high mobility towards development of insecticide resistance and infest a wide variety of host plants (**Anonymous 2011**). Nymph and adult thrips suck cell sap from tender leaves, shoots, inflorescence and fruits of the mango, which results in silvery shine with leaf edges, curling upwards, stunted growth, discoloration of buds and panicles, malformed, premature drops and bronzing of the fruit surface with feeding scars on fruits, thus adversely affects the quality of the marketable produce. (**Bana *et.al.,* 2018**).

MATERIAL AND METHOD:

An experiment was carried out at Mango orchard of Soil & Water Management Research Unit, Navsari Agricultural University, Navsari (AES-III heavy rainfall zone), Gujarat from 2017 to 2019. Mango (var. *Kesar*) orchard having the age of 10 years and planted at 5m x 5m (High density) was selected for the experiment. The total area of an orchard is 1.0 hector with 400 mango trees having a drip irrigation system. Total 25 trees were selected randomly for taking observations. Weekly observations of mango thrips were taken from 5 twigs per tree. Thrips populations were recorded by tapping the inflorescence on a simple white paper. Observations of thrips were further correlated with meteorological data to workout correlation and regression analysis. Correlation between the pest population and weather parameters viz., maximum temperature, minimum temperature, morning relative humidity, afternoon relative humidity, evaporation, rainfall, wind speed and sunshine hours, was assessed using Carl Pearson's correlation analysis. Statistical analysis of the data was carried out by using the SPSS software. Whole experiment area was kept free from any insecticidal spray.

RESULTS AND DISCUSSION:

The population of thrips on mango (Table-1) was recorded from 1st to 22nd and 44th to 52nd SMW during the year 2017. It was recorded in the range of 0.80 to 18.20 thrips/twig. The highest thrips population (18.20 thrips/twig) was recorded in the third week of March (11th SMW). The thrips population on mango was not recorded from 23rd to 43rd SMW due to rainfall and humid weather. Thrips population on mango had significantly positive correlated with bright sunshine (hrs), whereas highly significant negatively correlated with minimum temperature, evening relative humidity and rainfall for the year 2017 (Tabel-2). Bana *et. al.,* 2018, also found that thrips on mango trees remained more active during vegetative (new flush) and flowering cum fruit

setting stages (February-March). **Bhut *et. al.,* 2017**, The maximum population thrips per inflorescence was notice during the month of first fortnight of February to Second fortnight of March.

The population of thrips on mango (Table-1) was recorded from 1st to 52nd SMW during the year 2018. Thrips population was ranged between 0.4 to 4.2 per leaf during 1st to 7th SMW. From 8th to 39th SMW thrips was not observed on mango and then again thrips population started from 40th to 52nd SMW which was ranged between 0.4 to 8 thrips/leaf on mango during 2018. The highest thrips population was observed on mango during 50th SMW which was 8.0 thrips/leaf. Thrips population on mango (Tabel-2) was significantly positive correlated with bright sunshine whereas, highly significant negatively correlated with minimum temperature. Rainfall and morning relative humidity showed a negative correlation with thrips incidence on mango during 2018. **Tipawan T. and Jarun T. (2015)** also found the negative correlation between thrips and humidity as well as rainfall on mango.

The population of thrips on mango was started from 1st to 21st and 49th to 52nd SMW. Which was ranged from 0.40 to 9.80 thrips per leaf. There was no thrips population found during 22nd to 48th SMW during the year 2019. The highest (9.80 thrips/leaf) thrips activity was observed during 1st SMW (Table-1). The population of thrips on mango trees was found a highly significant negative correlation with minimum temperature while a significant negative correlation with evening relative humidity. Bright sunshine was found positively correlated while other remaining factors found a positive or negative correlation but non-significant with thrips population during the year 2019 (Tabel-2). **Gundappa *el. al.,* 2016** also reported that Humidity and Minimum temperature were significant negative factors affecting thrips on mango.

Population dynamics of thrips was studied during 2017, 2018 and 2019 and also pooled (Table-1) analysis of all three years together. In the pooled analysis, it is observed that the highest activity of thrips was recorded during 52nd to 3rd SMW (4th week of December to 2nd week of January) is the most favourable activity time. The correlation coefficient was the workout for thrips their relation with different weather parameters (Table-2). Among different weather parameters, evening relative humidity and evaporation rate had a negative highly significant correlation with thrips. It indicates that slightly change in these weather parameters highly affects the thrips population. Thrips had a highly significant negative correlation with maximum temperature and morning relative humidity significant while, positive correlation with wind

speed which shows that minimum change in these weather factors can lead a significant change in thrips population and activity on mango.

Data after full and stepwise regression analysis presented in Table 3 shows correlation and regression model of mango thrips with different weather parameters which indicates that Morning relative humidity and Maximum temperature were highly significant negative correlated with thrips activity especially during 52nd to 2nd SMW while during 52nd to 2nd SMW peak activity of thrips was observed. These two climatic factors are responsible for the outbreak of this pest. **Gundappa *el. al.,* 2016** found Step wise regression analysis revealed that maximum temperature, minimum temperature and maximum relative humidity explained 50 per cent variations in thrips population.

CONCLUSION:

Mango growers of south Gujarat having Kesar variety in high density plantation (5 x 5m) needs to observe mango thrips population during 52nd to 2nd standard meteorological week and take proper management measure for managing mango thrips.

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Table 1: Incidence of thrips on mango tree (No. of thrips/tree)

Standard Meteorological week	No. of thrips/ twig			
	2017	2018	2019	Pooled
1	4.80	4.20	9.80	6.27
2	6.20	3.60	9.60	6.47
3	5.80	2.20	7.00	5.00
4	5.20	0.80	7.20	4.40
5	6.40	0.80	6.80	4.67
6	8.60	0.60	5.20	4.80
7	11.20	0.40	5.00	5.53
8	13.40	0.00	6.40	6.60
9	14.20	0.00	4.00	6.07
10	16.00	0.00	3.80	6.60
11	18.20	0.00	3.60	7.27
12	16.20	0.00	4.20	6.80
13	10.60	0.00	4.00	4.87
14	8.20	0.00	3.00	3.73
15	5.60	0.00	2.20	2.60
16	4.00	0.00	2.00	2.00
17	7.20	0.00	1.80	3.00
18	6.80	0.00	1.60	2.80
19	3.80	0.00	2.40	2.07
20	3.60	0.00	0.80	1.47
21	3.80	0.00	0.40	1.40
22	1.20	0.00	0.00	0.40
23	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00
31	0.00	0.00	0.00	0.00
32	0.00	0.00	0.00	0.00
33	0.00	0.00	0.00	0.00
34	0.00	0.00	0.00	0.00
35	0.00	0.00	0.00	0.00
36	0.00	0.00	0.00	0.00
37	0.00	0.00	0.00	0.00
38	0.00	0.00	0.00	0.00
39	0.00	0.00	0.00	0.00
40	0.00	0.40	0.00	0.13
41	0.00	1.60	0.00	0.53
42	0.00	2.00	0.00	0.67
43	0.00	1.80	0.00	0.60
44	0.80	1.20	0.00	0.67
45	1.00	2.20	0.00	1.07
46	1.80	4.60	0.00	2.13
47	2.60	4.80	0.00	2.47
48	4.20	3.40	0.00	2.53

Standard Meteorological week	No. of thrips/ twig			
	2017	2018	2019	Pooled
49	3.20	6.20	2.40	3.93
50	1.80	8.00	4.80	4.87
51	7.60	7.60	5.80	7.00
52	5.20	6.80	7.20	6.40
AV.	**4.02**	**1.22**	**2.13**	**6.27***
* zero data excluded from the analysis				

Table 2: Correlation of mango thrips with weather parameters

Abiotic factors	Correlation Matrix			
	2017	**2018**	**2019**	**Pooled**
Maximum temperature (°C)	0.231	-0.265	-0.200	-0.680**
Minimum temperature (°C)	-0.693**	-0.682**	-0.895**	0.099
Morning relative humidity (%)	-0.528*	-0.309	-0.376	-0.709**
Evening relative humidity (%)	-0.696**	-0.194	-0.658*	-0.052
Wind speed (km/hr)	-0.240	-0.388	-0.266	0.424*
Bright sunshine (hrs/day)	0.500*	0.586*	0.421	0.322
Evaporation (mm)	-0.737**	-0.174	-0.397	0.336

Table 3: Correlation and regression studies between mango thrips and weather parameters

Insect	X_1 = **Tmax**	X_2 = **Tmin**	X_3 = **MRH**	X_4 = **ERH**	X_5 = **WS**	X_6 = **BSSH**	X_7 = **Evapo**	Regression equation	R^2
Thrips	-0.680**	0.099	-0.709**	-0.052	0.424*	0.322	0.336	**Y=** -14.205 + (0.645) x X_1 + (-1.280) x X_2 + (-0.034) x X_3 + (0.257) x X_4 + (1.429) x X_5 + (-0.119) x X_6 + (1.622) x X_7	0.774

Stepwise regression analysis		
Insect	**Regression equation**	**R^2**
Thrips	**Y=** -8.142 - 0.170 (Tmax) - 0.348 (MRH)	0.456

Peak activity of thrips on mango and its Correlation & Regression				
Insect	**Peak SMW**	**Correlation (r)**	**Regression Equation**	**R^2**
Thrips	52nd – 2nd	MRH (-0.709**) Tmax (-0.680**)	**Y=** -8.142 - 0.170 (Tmax) - 0.348 (MRH)	0.456

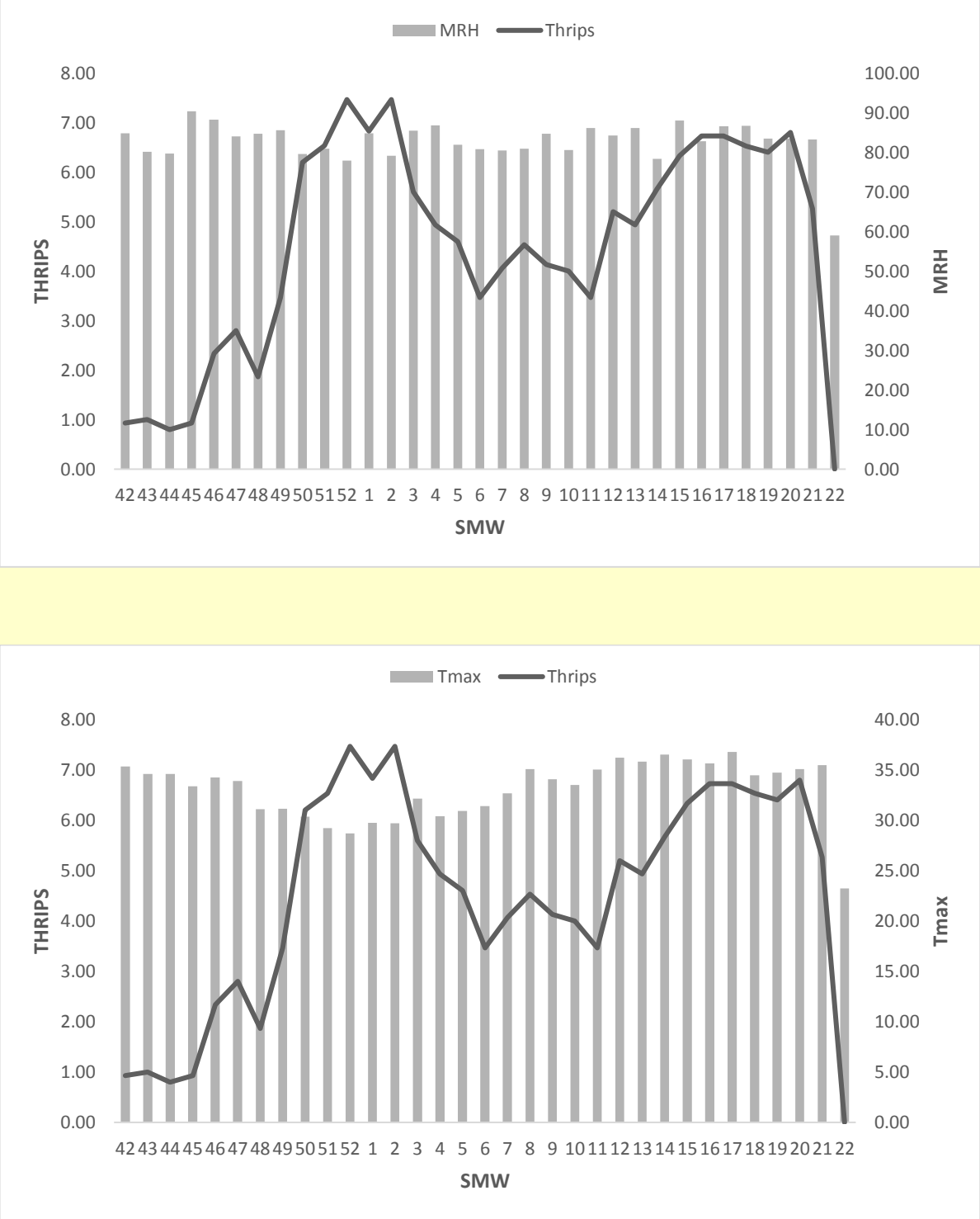

Figure 1: Correlation of mango trips population with weather parameters.