



ISSN (E): 2277- 7695

ISSN (P): 2349-8242

NAAS Rating: 5.03

TPI 2019; 8(7): 790-792

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www.thepharmajournal.com

Received: 13-05-2019

Accepted: 22-06-2019

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Seasonal incidence of insect pests of groundnut in relation to meteorological parameters

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Abstract

Population dynamics of insect pests studied in groundnut was studied along with influence of weather parameters on insect pests during *kharif* 2017-18 with the variety, Kadiri-6 (K6). The results indicated that the population of thrips incidence was maximum at 31st standard week (3.25 per plant) followed by 30th standard week (23-29th July). The leafhopper population was ranged from 1.10 (25th standard week) and the highest number of leafhoppers (1.40 per plant) were observed during 34th standard week. The groundnut variety Kadiri – 6 was sown during *kharif*, 2017. Influence of thrips and leaf hoppers was highest during the season.

Correlation studies revealed that maximum temperature (0.540), minimum temperature (0.398), sunshine hours (0.57) and evaporation (0.581) was found to be positive whereas morning relative humidity (-0.333), evening relative humidity (-0.408), rainfall (-0.214) and rainy days (-0.232) were negatively correlated with the incidence of thrips. The population of leaf hoppers was increased gradually and reach peak during 34th standard week (1.40 per plant) followed by viz., 30th standard week (1.30 per plant), 26th standard week (1.15 per plant), 25th standard week and 27th standard weeks (1.10 per plant), 37th standard week (1.05 per plant), respectively.

Keywords: Groundnut, thrips, leaf hoppers, weather parameters, correlation, regression

Introduction

Groundnut is an important oilseed crop grown worldwide and India is a major groundnut growing country in the world. Groundnut productivity is influenced by degree of insect pest infestation and drought stress. Groundnut crop is attacked by about 90 species of insects. The major insect pests of groundnut are thrips, leaf hoppers (*Empoasca kerri*) ((Mer *et al.*, 2016)^[10], *Aphis craccivora* having multiple host and damage occurred on various crops worldwide (Minja *et al.*, 1999; Ahmad *et al.*, 2007)^[11]. It causes main damage by sucking sap and act as a vector of near about seven viral diseases; including groundnut rosette virus and peanut stripe in this crop (Padgham *et al.*, 1990)^[12].

Thrips (*Scirtothrips dorsalis*, Hood) attacks on the newly sprouting leaf and plant shoots by feeding the contents of plant sap and causing desorting and streaking, that reduce productivity (Gallo *et al.*, 2002)^[5]. Attack of this pest from germination to 50-70 day after sowing and main critical condition is in between 50-60 days after germination (Devaki *et al.* 2013)^[4]. Leafhoppers suck the sap from the leaves and petioles and mainly it prefers the first three terminal leaves and feeding symptoms induce yellowing of foliage that begins at the tip, known as hopper burn (Khan and Hussain, 1965)^[9]. A heavy infestation on young plants cause stunting and leaf tip turns yellow with a typical 'vshape' marking. On close examination of infected plants, nymphs can be seen on the underside of infected plants. Thus, the sap feeders play a vital role in Groundnut crop for reducing yield.

Materials and Methods

Field experiment was conducted in Agricultural Research Station, Ananthapur during *kharif*, 2017 to study the seasonal incidence of thrips and leaf hoppers infesting groundnut. The popular variety Kadiri – 6 was sown with a spacing of 30 X 10 cm. The plot size was 5 m X 5 m and replicated three times. All the recommended agronomic practices were followed in the cultivation of the crop except the plant protection measures. Beginning from 30th day after sowing, observations were made on the incidence of thrips and leaf hoppers from 25th standard week (18 -24th June) to 39th standard week (24-30th September) at weekly interval.

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Observations were made at weekly interval on number of thrips and number of leaf hoppers per plant damage in a randomly selected plants and expressed as per cent leaflet damage. The incidence of thrips and leaf hoppers were correlated with weather parameters. The data on weather parameters viz., maximum, minimum temperature, relative humidity (RH), wind velocity, and rain fall were recorded daily and presented as weekly average. The data were analyzed by multiple correlation and regression to study the relation between weather parameters and per cent damage incidence due to thrips and leaf hoppers (Gomez and Gomez, 1984)^[6].

Results and Discussion

1. Seasonal incidence of *Scirtothrips dorsalis* and *Empoasca kerri* during *kharif*, 2017

The incidence of thrips was noticed from 25th standard week (1.60 per plant) to 39th standard week (1.00 per plant). The population was increased gradually and reached peak during 31st standard week (3.25 per plant). Overall results indicated The present observations on number of thrips per plant are in agreement with the findings of Ranga Rao and Vijaya Laksmi (1992)^[14] who reported that the *S. dorsalis* population was peak during August with three thrips per terminal and supported by Ahir *et al.*, 2017^[1] noticed that peak incidence of thrips in the 34th SMW and 37th SMW during *kharif*, 2003.

The results are in accordance with Kandakoor *et al.* (2012)^[8] and Radhika (2013)^[13] who also observed higher thrips population in wetter end of the season compared to drought stress days (Table.1).

Similarly, the incidence of leaf hoppers was noticed from 25th standard week (1.10 per plant) to 39th standard week (0.55per plant). The population was increased gradually and reached peak during 34th standard week (1.40 per plant). 26th standard week (1.15 per plant), 25th standard week and 27th standard weeks (1.10 per plant), 37th standard week (1.05 per plant), respectively. The lowest incidence of leaf hoppers (0.30 per plant) recorded on 35th standard week. Similar observations have been reported by Kandakoor *et al.* (2012)^[8] and Yadav *et al.* (2012) where in *E. motti* was the most abundant on top three leaves of tender groundnut plants during August and September months (Table.1).

2. Per cent damage due to the incidence of thrips and leaf hoppers during *kharif*, 2017

The per cent damage of leaf due to the incidence of thrips (number of thrips per top 3 leaves) and was ranged from 12.94(25th standard week) to 31.42 (36thstandard week). The per cent damage due to the incidence of leaf hoppers ranged from 12.94 to 31.42 and the highest per cent damage was noticed in 36th standard week i.e. first week of September (31.42), respectively (Table.1).

Table 1: Population dynamics of insect pests of groundnut during *kharif*, 2017

Standard Meteorological Week (SMW)	Number of thrips per plant	Number of leaf hoppers per plant	Per cent leaf damage by thrips	Per cent leaf damage by leaf hoppers
25 (18 -24 th June)	1.60	1.10	12.94	19.25
26 (25 1 st July)	1.75	1.15	18.62	21.18
27 (2 – 8 th July)	2.0	1.10	19.30	20.47
28 (9 – 15 th July)	1.05	0.75	15.85	18.62
29 (16 – 22 nd July)	1.10	0.75	17.00	18.73
30 (23 – 29 th July)	2.40	1.30	23.15	23.67
31(30 th July – 5 th August)	3.25	0.75	25.18	19.53
32 (6 -12 th August)	1.60	1.00	14.89	21.47
33 (13 -19 th August)	1.61	1.38	15.01	24.35
34 (20- 26 th August)	1.65	1.40	15.70	28.12
35 (27- 2 nd September)	1.60	0.30	27.01	15.24
36 (3-9 th September)	1.40	0.7	31.42	16.38
37 (10- 16 th September)	1.70	1.05	20.25	18.54
38 (17 – 23 rd September)	1.70	0.65	14.24	17.21
39 (24-30 th September)	1.00	0.55	17.46	15.37

3. Correlation studies between weather parameters and thrips and leaf hoppers

Thrips

The correlation studies revealed that among the weather parameters viz., maximum temperature, minimum temperature, mean temperature, wind speed, sunshine hours (ssh) and evaporation showed positive association, whereas morning and evening relative humidity, rainfall and rainy days showed negative influence. Among all the parameters correlated maximum temperature (+0.54), mean temperature (+0.502), sunshine hours (+0.570) and evaporation (+0.581) showed significant positive impact on population dynamics of thrips and same was reported by by Kadam *et al.* (2017)^[7], Ashfaq *et al.* (2010)^[3]. Kandakoor *et al.* (2012)^[8] also reported that thrips showed positive correlation to maximum

(r=0.277) and minimum temperature (r=0.087). Thus, temperature had a major role of influence on thrips populations (Table.2).

Leaf hoppers: In case of leaf hoppers both the temperatures i.e., maximum temperature (-0.33), minimum temperature (-0.30), morning relative humidity (-0.060), rainfall (-0.214), rainy days (-0.157) and evaporation showed negative impact and evening relative humidity(+ 0.209), sunshine hours (ssh) showed positive correlation but none of the parameters had significant influence on leaf hopper dynamics in groundnut during *kharif*, 2017. The findings of present investigation are in close conformity with the finding of Yadav *et al.* (2012) (Table.2).

Table 2: Correlation and regression studies related to insect pest incidence in relation to weather parameters

Pests	Maximum temperature (0 °C)	Minimum temperature (0 °C)	Mean temperature (0 °C)	Morning Relative Humidity (%)	Evening Relative Humidity (%)	Wind Speed (Kmph)	Rain fall (mm)	Rainy days	Sunshine hours (hours /day)	Evaporation (mm /day)	Regression (R ²)
Per cent damage of leaves (%)	-0.026	-0.113	-0.057	0.220	-0.108	-0.126	0.423	0.344	0.654	0.164	0.82
Thrips	0.540	0.398	0.502	-0.333	-0.408	0.206	-0.214	-0.232	0.570	0.581	0.73
Leaf hoppers	-0.330	-0.300	-0.327	-0.060	0.209	0.000	-0.055	-0.157	0.053	-0.133	0.76

4. Regression studies

The regression studies revealed that all the weather parameters of *kharif*, 2017 together influence the incidence of thrips (73 per cent) (R² = 0.73) and leaf hoppers (76 per cent)

(R² = 0.76) population dynamics in groundnut where more number of dry spells observed during crop growth period and indicated that all the weather parameters together causes foliar damage per cent of 82 (Table.3).

Table 3: Regression equation to insect pest incidence in relation to weather parameters

Pest	Regression equation	R ²
Foliar damage (%)	Y= 74.28 -73.97 Max Temp -66.25 Min Temp +139.98 T mean +0.41 Mor RH -1.08 Eve RH -0.61 WS +0.17 Rf -1.84 Rainyday +1.15 Ssh +1.17 Evap	0.820
Foliar damage by thrips (%)	Y=-13.88-28.89 Max Temp -28.04 Min Temp +57.68 T mean -0.03 Mor RH -0.01 Eve RH -0.22 WS +0.01 Rf -0.22 Rainyday +0.02 Ssh +0.46 Evap	0.730
Foliar damage by leaf hoppers (%)	Y= 144.02+93.13 Max Temp +91.35 Min Temp -187.36 T mean -0.89 Mor RH +0.25 Eve RH +0.30 WS -0.03 Rf -0.45 Rainyday +1.64 Ssh -2.72 Evap	0.760

Conclusions

The study revealed that positive association of temperature, sunshine hours and evaporation on thrips and negative association of relative humidity, rainfall and rainy days with the incidence of thrips and peak activity of thrips recorded in last week of July and leaf hoppers were recorded in last week of June, 2017. The leaf hopper incidence was positively correlated with evening relative humidity, sunshine hours and maximum temperature. The negative association with minimum temperature, morning relative humidity, rainfall and rainy days due to more number of dry spells during crop growth period in *kharif*, 2017.

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