



Studies on Field Incidence of Thrips on *Kharif* Groundnut in Relation to Weather Parameters

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ABSTRACT

Investigations were carried out to study the incidence of thrips in different areas during *Kharif*, 2011. The fixed plot survey conducted at S.V. Agricultural college farm, Tirupati and ARS, Kadiri revealed that maximum temperature, minimum temperature and wind speed had significant positive influence on thrips incidence when groundnut was sown during first fortnight of July in both the cultivars i.e., Narayani (+0.67, +0.39, +0.32) and K-6 (+0.67, +0.39, +0.32), morning relative humidity and evening relative humidity showed significant negative influence in Narayani (-0.57, -0.35) and K-6 (-0.56, -0.36), respectively.

The data analyzed by using step down regression revealed that rainfall, rainy days, sunshine hours and wind speed together influenced to an extent of 90 ($R^2=0.90$) and 89 ($R^2=0.89$) per cent of foliar damage due to thrips in D1 (29-06-11)sown Narayani and K-6 cultivars of groundnut crop. In case of Narayani sown in D2 (11-07-2011), maximum temperature, minimum temperature rainy day and wind speed influenced to the extent of 70 per cent ($R^2=0.70$), and incase of K-6 maximum temperature, minimum temperature, evening relative humidity and rainy day influenced to 73 per cent ($R^2=0.73$). Whereas, in D3 (25-07-2011)sown Narayani and K-6 morning relative humidity, evening relative humidity and rainfall resulted in 84($R^2=0.84$) and 87($R^2=0.87$) per cent thrips incidence of thrips with respect to the above weather parameters.

Key words : Groundnut, *Kharif* 2011, Thrips Incidence.

Groundnut (*Arachis hypogaea* L.) is a leading oilseed crop in India and other tropical or subtropical regions of the world. In India, it is grown in 52.64 lakh ha with a production of 69.64 lakh tonnes and with a productivity of 1323 kg ha⁻¹ thus the crop contributes to 55 per cent of the total oil seed production in the country and ranks first in the world in total area and ranks second in production. In Andhra Pradesh, it is grown in an area of 13.45 lakh ha with a production of 11.09 lakh tonnes and with a productivity of 825 kg ha⁻¹ (Directorate of economics and statistics, Govt. of Andhra Pradesh 2013).

Among the sucking insect pests, thrips majorly attack the groundnut crop, starting from vegetative stage till the harvest of the crop. Besides causing direct damage to the crop, thrips are known to cause more indirect damage by acting as vectors of viral diseases *viz*, Peanut Bud Necrosis virus, (Reddy and Wightman, 1988), Yellow Spot Virus and Stem Necrosis Virus (Prasad Rao *et al*, 2003). It is rather difficult to establish a direct cause and effect relationship between any single climatic

factor and pest / disease activity, as the effect of these weather elements on pest and disease incidence is usually confounded (Banerjee, 1972). However, development of a functionally viable model for insect pest forecast is the need of the hour for effective integrated pest management strategy.

MATERIAL AND METHODS

The field experiments were conducted at S.V. Agricultural College, Tirupati and ARS, Kadiri during *kharif*, 2011. The popular groundnut varieties Narayani and K-6 were used for the study. The experiment was laid out in a 7×5 meters plot with three dates of sowing with a seed rate of 150 kg ha⁻¹ and with a spacing of 30 x 10 cm. Observations on thrips incidence were recorded at weekly intervals starting from 14 DAS. The population dynamics of thrips species in groundnut was studied in the same experimental field laid out for studying the effect of different dates of sowing.

At S.V. Agricultural College, Tirupati, the first date of sowing was taken up immediately after

the receipt of the first monsoon showers *i.e* in June 2011(D1- 29th June) and the remaining two sowings were taken up with 15 days interval (D2- 11th July and D3-25th July). At Agricultural Research Station, Kadiri the first date of sowing was taken up in July, 2011 (D1- 29th July) and the remaining two sowings were taken up at 15 days interval (D2- 10th August and D3-25th August, 2011). All the recommended agronomic practices like fertilizer applications, weeding, hoeing etc, were taken up regularly as per the ANGRAU recommendations. The crop was raised under unprotected conditions.

Recording of Thrips Incidence

Observations on thrips incidence was recorded starting from 14 days after sowing at weekly intervals and continued till the harvest of the crop. For recording thrips incidence, 10 healthy plants were selected at random in two plots and the selected plants were marked **with pegs and the** observations were recorded on these plants during each standard week. In each plant, the total number of leaves and the number of leaves damaged due to thrips were counted and converted as per cent thrips incidence. The per cent thrips incidence was calculated by using the formula.

$$\text{Thrips incidence (\%)} = \frac{\text{No. of thrips damaged leaves}}{\text{Total leaves No. of the plant}} \times 100$$

RESULTS AND DISCUSSION

Field Incidence of thrips on groundnut during *Kharif*, 2011 at S.V. Agricultural College, Tirupati:

During *Kharif* 2011 field Incidence of thrips in terms of foliar damage was recorded from 27th standard week to the end of the season in all the three dates of sowings (July I, II fortnight and August I fortnight) of two groundnut cultivars *i.e.*, Narayani and Kadiri-6 (K-6). The data indicated that the thrips damage was first noticed in 28th, 30th and 32nd standard weeks in D1, D2 and D3 sown crops, respectively. Foliar damage was high in July first fortnight sown crop (D1) compared to July second (D2) and August first fortnight (D3) sown crops. The damage was ranged from 4.40 to 53.46 and 4.98 to 51.55 per cent in Narayani and K-6

varieties. In case of D2 sown crop, the incidence was ranged from 0.65 to 30.46 per cent in Narayani and 0.25 to 31.39 per cent in K-6 variety and highest incidence was recorded during 30th and 31st standard weeks. Similarly in D3 sown crop, the incidence was 12.25 and 16.25 per cent in Narayani and K-6 cultivars and it was high during 32nd (6Aug-12, Aug) standard week.

In D1 sown groundnut crop, foliar damage due to thrips was high during 28th to 30th standard weeks which was coinciding with 9th - 29th July and incidence was 46.58 to 53.46 per cent in Narayani and 44.56 to 51.55 per cent in K-6. Thereafter the incidence was decreasing in both the cultivars to an extent of 4.40 and 4.98 per cent, respectively by end of the season (Table 1).

The incidence of thrips was noticed from 28th to 43rd standard weeks at RARS, Tirupati. Highest incidence recorded was 44.05 per cent in D1 sown crop followed by 30.34 and 34.56 per cent in D2 and D3 sown crops respectively. Similarly highest was recorded in D2 during 32nd and 33rd weeks. Temperature favored the thrips damage in both the dates of sowing (Anonymous 2012).

Correlation studies of thrips incidence to weather parameters of *Kharif*, 2011 at S.V. Agricultural College, Tirupati:

Weather parameters like maximum temperature, minimum temperature, rainy days and wind speed showed positive association with thrips incidence in terms of foliar damage. On contrary, morning relative humidity, evening relative humidity, rainfall and sunshine hours showed negative association with thrips damage in groundnut. Among the eight weather parameters observed, maximum temperature (+0.56, +0.56), minimum temperature (+0.74, +0.75), morning relative humidity (-0.66, -0.68) and wind speed (+0.87, +0.87) showed significant influence on thrips incidence in both the cultivars of groundnut. In case of D2 sown crop, the influence of minimum temperature (+0.76, +0.79) and wind speed (+0.69, +0.70) was highly significant. Where as in case of D3 sown crop, maximum temperature (+0.59, +0.59), minimum temperature (+0.67, +0.67), morning relative humidity (-0.78, -0.83) and wind speed (+0.60, +0.65) influenced the foliar damage of thrips

Table 1. Population dynamics of thrips in groundnut in fixed plot at S.V. Agricultural College farm Tirupati during kharif, 2011

Standard week	Weather parameters							% Foliar damage by thrips							
	Max. temp (°C)	Min. temp (°C)	RH mor (%)	RH eve (%)	Rf (mm)	Rd (days)	Ssh (hours)	WS (kmph)	D1 (July I FN)		D2 (July II FN)		D3 (Aug I FN)		
									Narayani	K6	Narayani	K6	Narayani	K6	
27 (2-8, July)	34.7	24.8	73.7	45.9	46.2	2	1.8	7.4	0	0	0	0	0	0	0
28 (9-15, July)	37.0	25.9	64.7	36.7	6.8	2	5.5	9.3	47.56	0	44.56	0	0	0	0
29 (16-22, July)	36.6	27.0	63.6	38.6	1.0	0	2.0	10.7	53.46	0	51.55	0	0	0	0
30 (23-29, July)	34.9	23.9	74.3	45.7	57.6	5	4.3	8.7	46.58	30.46	47.35	31.39	0	0	0
31 (30Jul-5Aug)	33.8	25.8	71.4	49.7	15.6	1	1.9	7.7	35.16	24.29	34.16	23.97	0	0	0
32 (6Aug-12, Aug)	34.6	24.5	76.9	49.6	50.1	3	5.4	6.4	20.29	18.05	22.5	19.05	12.25	12.25	16.25
33 (13-19, Aug)	34	24.4	80.4	49.7	22.5	3	4.7	5.8	15.59	14.46	16.35	14.68	9.15	11.25	11.25
34 (20-26, Aug)	32.1	24.5	82.4	58.6	22.4	2	2.7	4.3	16.25	16.75	15.25	17.05	11.26	12.25	12.25
35 (27-2, Sept)	33.4	24.6	73.7	50.4	32.0	2	2.0	6.4	12.29	13.25	11.39	15.56	6.49	9.98	9.98
36 (3-9, Sept)	34.9	25.2	73.1	45.1	3.0	1	4.8	6.4	5.49	6.25	5.99	7.25	7.28	7.39	7.39
37 (10-16, Sept)	34.7	24.4	74.3	46.4	15.6	2	5.8	5.8	3.68	3.58	4.68	4.49	4.05	4.65	4.65
38 (17-23, Sept)	33.6	24.5	71.1	47.0	70.6	1	7.0	7.4	3.97	2.29	4.09	3.29	6.44	6.82	6.82
39 (24-30, Sept)	35.3	22.9	73.4	42.0	0.0	0	8.4	4.8	5.26	4.28	5.55	4.59	6.08	6.48	6.48
40 (1-7, Oct)	34.4	24.3	80.4	45.9	2.9	0	3.8	4.0	4.4	2.64	4.98	2.06	5.68	5.87	5.87
41 (8-14, Oct)	33.2	23.1	85.3	53.1	36.6	3	5.0	3.4	0	1.78	0	0.98	2.06	3.06	3.06
42 (15-21, Oct)	34.7	22.5	78.1	41.1	0.8	0	7.7	4.0	0	0.65	0	0.25	1.1	1.68	1.68
43 (22-28, Oct)	31.9	23.0	89.0	56	66.6	3	4.7	4.4	0	0	0	0	0.05	0.18	0.18
44 (29Oct-4, Nov)	29.0	23.0	93.4	65	75.2	4	2.0	4.4	0	0	0	0	0	0	0

Table - 1.1. Correlation studies of groundnut thrips in relation to weather parameters at S.V. Agricultural College farm Tirupati during kharif, 2011.

Weather parameter	D1		D2		D3	
	Narayani	K6	Narayani	K6	Narayani	K6
Maximum temperature (X1)	0.56	0.56*	0.26	0.29	0.59*	0.59*
Minimum temperature (X2)	0.74**	0.75**	0.76**	0.79**	0.67**	0.67**
Morning RH (X3)	-0.66*	-0.68**	-0.46	-0.49	-0.78**	-0.83**
Evening RH (X4)	-0.44	-0.44	-0.04	-0.07	-0.45	-0.47
Rainfall (X5)	-0.09	-0.11	-0.09	-0.13	-0.50	-0.46
Rainy days (X6)	0.19	0.14	0.12	0.07	-0.41	-0.40
Sunshine hours (X7)	-0.45	-0.44	-0.30	-0.30	0.16	0.20
Wind speed (X8)	0.87**	0.87**	0.69**	0.70**	0.60*	0.65**
CD @0.05	0.499		0.552		0.586	
CD @0.01	0.574		0.629		0.664	

* sig at 5%

** sig at 1%

Date of sowing (D1):29-06-2011

Date of sowing (D2):11-07-2011

Date of sowing (D3):25-07-2011

significantly and remaining weather parameters were not significant (Table -1.1).

Regression analysis

Full model regression analysis of the thrips damage with weather parameters of *kharif*, 2011 indicated that, all the weather parameters together influenced thrips damage to an extent of 93 per cent ($R^2=0.93$) in groundnut cultivar Narayani sown during July first fortnight and regression equation model developed was $Y = -513.99 + 10.85 X_1 - 2.27 X_2 + 0.32 X_3 + 2.96 X_4 - 0.20 X_5 + 0.94 X_6 - 0.98 X_7 + 9.10 X_8$. Similarly in case of K-6 variety, the influence was 90 per cent ($R^2=0.90$) and the regression model developed was $Y = -460.98 + 9.72 X_1 - 2.95 X_2 + 0.20 X_3 + 3.11 X_4 - 0.26 X_5 + 0.55 X_6 - 0.55 X_7 + 9.96 X_8$. With respect to of D2 sown crop, all the weather parameters influenced to the extent of 85 ($R^2=0.85$), 87 ($R^2=0.87$) per cent and the regression equations developed were $Y = -556.38 + 12.54 X_1 - 5.17 X_2 + 0.84 X_3 + 3.25 X_4 - 0.13 X_5 - 2.52 X_6 - 0.68 X_7 + 9.63 X_8$ and $Y = -582.85 + 13.07 X_1 - 4.95 X_2 + 0.86 X_3 + 3.34 X_4 - 0.11 X_5 - 3.08 X_6 - 0.81 X_7 + 9.51 X_8$ in Narayani and K-6 groundnut cultivars, respectively. Whereas in D3 sown crop the damage influence was up to 94 and 96 per cent ($R^2=0.94$ and 0.96) and regression equations were $Y = -182.94 + 4.39 X_1 - 2.23 X_2 + 0.03 X_3 + 1.52 X_4 - 0.12 X_5 - 1.22 X_6$

$+0.26 X_7 + 4.09 X_8$ and $Y = -134.58 + 3.48 X_1 - 1.68 X_2 - 0.24 X_3 + 1.38 X_4 - 0.12 X_5 - 0.49 X_6 + 0.49 X_7 + 3.33 X_8$ in Narayani and K-6, respectively.

The data analyzed by using forward selection regression revealed that rainfall, rainy days, sunshine hours and wind speed together influenced to an extent of 90 ($R^2=0.90$) and 89 ($R^2=0.89$) per cent of foliar damage due to thrips in D1 sown Narayani and K-6 cultivars of groundnut crop and regression equation models developed were $Y = -18.11 - 0.23 RF + 4.27 RD - 1.71 SSH + 6.55 WV$ and $Y = -435.55 + 8.20 \text{ max temp} - 0.24 RF + 1.74 RD - 0.30 SSH + 8.12 WV$, respectively. In case of Narayani variety sown in D2, maximum temperature, minimum temperature rainy days and wind speed influenced to an extent of 70 per cent ($R^2=0.70$), and the regression model developed was $Y = -184.75 + 1.84 \text{ max temp} + 4.97 \text{ min temp} + 2.88 RD + 1.40 WV$. In case of K-6, maximum temperature, minimum temperature, evening relative humidity and rainy days influenced up to 73 per cent ($R^2=0.73$) and model developed was $Y = -337.74 + 4.74 \text{ max temp} + 5.88 \text{ min temp} + 0.89 \text{ Eve RH} + 1.39 RD$. Whereas, in D3 sown Narayani and K-6 morning relative humidity, evening relative humidity and rainfall resulted in 84 ($R^2=0.84$) and 87 ($R^2=0.87$) per cent thrips incidence and developed forward selection regression equations were $Y = 37.25 - 0.70 \text{ mor RH}$

Table 1.2. Regression analysis of groundnut thrips in relation to weather parameters at S.V. Agricultural College farm Tirupati during kharif, 2011.

Regression model	Regression equation	R ² value
Narayani		
D1(full model)	Y= -513.99 +10.85 X1-2.27 X2+0.32 X3 +2.96 X4 -0.20 X5 +0.94 X6 -0.98 X7 +9.10 X8	0.93
D1 (Forward selection)	Y= -18.11 -0.23 RF +4.27 RD-1.71 SSH +6.55WS	0.90
D2(full model)	Y= -556.38 +12.54 X1-5.17 X2+0.84 X3 +3.25 X4 -0.13 X5 -2.52 X6 -0.68 X7+9.63 X8	0.85
D2 (Forward selection)	Y= -184.75 +1.84 Max. temp+4.97 Min. temp+2.88 RD +1.40 WS	0.70
D3(full model)	Y= -182.94 +4.39 X1-2.23 X2+0.03 X3 +1.52 X4 -0.12 X5 -1.22 X6 +0.26X7 +4.09 X8	0.94
D3 (Forward selection)	Y= 37.25 -0.70 mor RH +0.51 Eve RH -0.07 RF	0.84
K6		
D1(full model)	Y= -460.98 +9.72 X1-2.95 X2+0.20 X3 +3.11 X4 -0.26 X5 +0.55 X6 -0.55 X7 +9.96 X8	0.92
D1 (Forward selection)	Y= -435.55 +8.20 Max. temp-0.24 RF +1.74 RD -0.30 SSH +8.12 WS	0.89
D2(full model)	Y= -582.85 +13.07 X1-4.95 X2+0.86 X3 +3.34 X4 -0.11 X5 -3.08 X6 -0.81 X7 +9.51X8	0.87
D2 (Forward selection)	Y= -337.74 +4.74 Max. temp+5.88 Min. temp+0.89 Eve RH +1.39 RD	0.73
D3(full model)	Y= -134.58 +3.48 X1-1.68 X2-0.24 X3 +1.38 X4 -0.12 X5 -0.49 X6 +0.49 X7 +3.33 X8	0.96
D3 (Forward selection)	Y= 45.48 -0.82 mor RH +0.54 Eve RH -0.06 RF	0.87

+0.51 Eve RH -0.07 RF and Y= 45.48 -0.82 mor RH +0.54 Eve RH -0.06 RF, respectively (Table-1.2).

Field Incidence of thrips on groundnut during Kharif 2011 at ARS, Kadiri

Field Incidence of thrips was recorded from 31st to 43rd standard weeks during kharif 2011 ARS, Kadiri in three dates of sowings (July I & II and August I fortnights) in two groundnut cultivars *i.e.*, Narayani and Kadiri-6 (K-6). The data indicated that, the damage was initiated from 31st, 32nd and 34th standard weeks in D1, D2 and D3 sown crops. Foliar damage was high in July first fortnight sown crop (D1) compared to July second (D2) and August first fortnight (D3) sown crops. The damage was high from 31st to 36th standard week in D1 sown crop, and it was ranged from 35.56 to 69.68, 36.79 to 71.02 per cent in Narayani and K-6. As the season advanced, the incidence was reduced from 37th standard week and reached a low by 40th standard week. Similar situation was observed in D2 and D3 sown groundnut cultivars Narayani and K-6 (Table -2).

Anonymous (1991) reported that incidence of thrips in groundnut was 5-10 per cent during September (36-39th standard week) at Kadiri. It is clearly indicated from the results of the present investigation that the thrips incidence is increasing enormously and causing severe damage on groundnut. Soujanya *et al.* (2010) also reported the peak incidence of thrips from 35th to 37th standard week of the year on Bt cotton.

Correlation studies of thrips incidence to weather parameters of Kharif, 2011 at ARS, Kadiri

Influence of various parameters like maximum temperature, minimum temperature, morning relative humidity, evening relative humidity, rainfall of ARS, Kadiri on foliar damage due to thrips was studied during kharif, 2011. Correlation studies indicated that, maximum temperature, minimum temperature, morning relative humidity showed negative influence on thrips incidence in terms of foliar damage, and evening relative humidity influenced positively (Table - 2.1). Whereas the influence of rainfall is not significant on all the three

Table 2. Population dynamics of thrips in groundnut in fixed plot at ARS Kadiri during Kharif, 2011.

Standard week	Period	Weather parameters					Rf (mm)	% Foliar damage by thrips							
		Max temp (°C)	Min temp (°C)	RH mor (%)	RH eve (%)	D1 (July II FN)		D2 (Aug I FN)		D3 Aug II FN)					
						Narayani		K6	Narayani	K6	Narayani	K6			
28	11-17 th July, 11	35	22	69	41	0									
29	18-24 th	35	22	67	39	3									
30	25-31	33	21	66	43	72									
31	1-7 th August, 11	34	22	71	47	2	35.56	36.79							
32	8-14 th Aug, 11	35	22	71	40	3	48.36	46.38	38.57						
33	15-21 st	33	21	70	43	80	50.30	52.36	40.41	33.98					
34	22-28 th	31	20	68	48	11	69.68	71.02	56.59	41.19				34.32	36.47
35	29 th Aug to 04 th Sep, 11	34	21	68	41	2	67.85	68.14	69.71	67.53				40.40	39.12
36	05-11 th	34	21	69	42	0	65.89	64.52	58.68	66.74				45.44	43.66
37	12-18 th	35	22	70	39	16	34.61	41.43	39.75	40.37				35.98	42.38
38	19-25 th	35	22	71	41	3	20.26	21.68	26.55	29.24				27.76	29.57
39	26 Sep to 2 nd Oct, 11	36	23	73	40	0	10.51	13.45	16.86	18.51				29.95	32.25
40	3-9 th	35	22	64	37	21	6.65	5.39	18.39	17.82				18.69	19.35
41	10-16 th	34	24	74	44	4			3.09	5.46				10.37	12.54
42	17-23 rd	35	23	69	42	0								7.29	6.92
43	24-30 th	31	22	74	59	44								5.32	5.89

dates sown groundnut cultivars either Narayani or K-6. Among the five weather parameters, maximum temperature (-0.72, -0.72) minimum temperature (-0.84, -0.83), showed significant negative influence on thrips incidence in D1 sown Narayani and Kadiri-6 groundnut cultivars, whereas the other three weather parameters did not show any significant influence. In case of D2 sown crop, influence of minimum temperature (-0.57) was significant but remaining weather parameters used in study did not influence significantly. Similar situation was observed on D3 sown crop (-0.65, -0.61).

Regression Analysis

Regression analysis of the thrips damage with weather parameters of kharif, 2011 at ARS, Kadiri by including all the five weather parameters in model resulted in 89 per cent ($R^2= 0.89$) influence on thrips damage in both the groundnut cultivars sown in D1 and regression equations developed were $Y= 264.50 +16.43 \text{ Max temp} -49.99 \text{ Min temp} +3.41 \text{ RH-I} +1.40 \text{ RH-II} -0.07 \text{ RF}$ and $Y= 291.02 +13.08 \text{ Max temp} -46.56 \text{ Min temp} +4.02 \text{ RH-I} +0.73 \text{ RH-II} -0.07 \text{ RF}$ in Narayani and K-6 respectively. In case of D2 sown Narayani and K-6, the influence of weather parameters on thrips incidence was 60 ($R^2= 0.60$) and 62 ($R^2= 0.62$) per cent, the regression models developed were $Y= 251.04 +1.36 \text{ Max temp} -17.77 \text{ Min temp} + 3.49 \text{ RH-I} -2.64 \text{ RH-II} -0.18 \text{ RF}$ and $Y= 434.13 -3.47 \text{ Max temp} -$

Table 2.1. Correlation studies of groundnut thrips in relation to weather parameters during Kharif, 2011 at ARS, Kadiri.

Weather parameter	D1 (July II FN)		D2 (Aug I FN)		(D3 Aug II FN)	
	Narayani	K6	Narayani	K6	Narayani	K6
Maximum temperature (X1)	-0.715**	-0.719**	-0.103	-0.030	0.140	0.160
Minimum temperature (X2)	-0.840**	-0.832**	-0.572*	-0.513	-0.648**	-0.606*
Morning RH (X3)	-0.078	-0.038	-0.136	-0.120	-0.332	-0.288
Evening RH (X4)	0.535	0.545	-0.050	-0.128	-0.427	-0.442
Rainfall (X5)	0.048	0.069	-0.034	-0.105	-0.441	-0.408
CD @0.05			0.552			
CD @0.01			0.629			

* sig at 5%

** sig at 1%

Date of sowing (D1):29-07-2011 Date of sowing (D2):10-08-2011 Date of sowing (D3):25-08-2011

Table 2.2. Regression analysis of groundnut thrips in relation to weather parameters during Kharif, 2011 at ARS, Kadiri.

Regression equation		R2
Narayani		
D1	Y= 264.50 +16.43 Max temp -49.99 Min temp +3.41 RH-I +1.40 RH-II -0.07 RF	0.89
	Y= 353.40 +12.08 Max temp -46.99 Min temp +4.16 RH-I	0.87
D2	Y= 251.04 +1.36 Max temp -17.77 Min temp + 3.49 RH-I -2.64 RH-II -0.18 RF	0.60
	Y= -6.07 + 8.02 Max temp -18.49 Min temp +2.53 RH-I	0.56
D3	Y= 205.44 -0.33 Max temp -15.05 Min temp +3.85 RH-I - 2.48 RH-II +0.04 RF	0.94
	Y= -17.51 +7.56 Max temp -16.91 Min temp +2.26 RH-I	0.84
K6		
D1	Y= 291.02 +13.08 Max temp -46.56 Min temp +4.02 RH-I +0.73 RH-II -0.07 RF	0.89
	Y= 330.18 +11.12 Max temp -45.28 Min temp +4.45 RH-I	0.88
D2	Y= 434.13 -3.47 Max temp -16.59 Min temp +4.30 RH-I -4.98 RH-II -0.28 RF	0.62
	Y= -35.40 +8.81 Max temp -18.15 Min temp +2.47 RH-I	0.54
D3	Y= 243.70 -2.19 Max temp -15.20 Min temp +4.87 RH-I -3.48 RH-II +0.22 RF	0.97
	Y= -38.93 +7.83 Max temp -17.01 Min temp +2.48 RH-I	0.81

16.59 Min temp +4.30 RH-I -4.98 RH-II -0.28 RF respectively. With regard to D3 sown Narayani and K-6 groundnut varieties, all the five weather parameters influenced thrips damage to the extent of 94 and 97 per cent and an equations developed were Y= 205.44 -0.33 Max temp -15.05 Min temp +3.85 RH-I - 2.48 RH-II +0.04 RF and Y= 243.70 -2.19 Max temp -15.20 Min temp +4.87 RH-I - 3.48 RH-II +0.22 RF, respectively (Table-2.2).

The data analyzed using forward selection regression indicating that three weather parameters namely maximum temperature, minimum temperature and morning relative humidity influenced the thrips damage in all the three dates' sown Narayani and K-6 groundnut cultivars. In D1 the influence of weather parameters was 87 and 88 per cent and regression models developed were Y= 353.40 +12.08 Max temp -46.99 Min temp

+4.16 RH I and $Y = 330.18 + 11.12 \text{ Max temp} - 45.28 \text{ Min temp} + 4.45 \text{ RH-I}$, respectively. In D2 sown Narayani and K-6 it was 56 and 54 per cent and the regression models developed were $Y = -6.07 + 8.02 \text{ Max temp} - 18.49 \text{ Min temp} + 2.53 \text{ RH-I}$ and $Y = -35.40 + 8.81 \text{ Max temp} - 18.15 \text{ Min temp} + 2.47 \text{ RH-I}$. Similarly, in D3 sowing the influence was 84 and 81 per cent and the equations were $Y = -17.51 + 7.56 \text{ Max temp} - 16.91 \text{ Min temp} + 2.26 \text{ RH I}$ and $Y = -38.93 + 7.83 \text{ Max temp} - 17.01 \text{ Min temp} + 2.48 \text{ RH-I}$, respectively (Table-2.2).

The results of the present investigations are in accordance with Nandagopal *et al.*, (2008) who studied the effect of abiotic factors temperature and relative humidity on *Caliothrips indicus* in groundnut at Junagadh and developed the prediction equation for population buildup of thrips in groundnut by stepwise regression technique. The coefficient of determination (R^2) between the thrips population and weather parameters was 0.47, which indicated that the combination of weather factors determined the population level up to 47%. The regression model developed for thrips (Y) = $-5.54 + 0.41 \text{ T. max} - 0.02 \text{ x Avg RH} - 0.62 \text{ x R.D} - 0.14 \text{ x S.S.H}$. The minimum deviation between the actual and predicted values during certain months indicating that abiotic factors can be of significant use in predicting population build up of this pest. Prasad *et al.* (2008) reported very low coefficient of determination (R^2) between the weather parameters during *rabi*, summer and *kharif* seasons was 11.97, 9.05 and 8.03%, respectively. Waiganjo *et al.*, (2008) also developed a model using regression analysis (step-wise selection model) and showed that minimum relative humidity was the only significant weather factor for predicting thrips infestation in the onion crop ($R^2 = 0.15$; $y = 60.342 - 0.1022x$).

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