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Population Dynamics of Groundnut Leafminer in Relation to Weather Parameters

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ABSTRACT

Groundnut leafminer, *Aproaerema modicella* Deventer (Gelechiidae : Lepidoptera) is one of the major pest attacking groundnut in both *kharif* and summer seasons. Among the various weather factors, maximum temperature showed positive significant influence on leafminer infestation during summer season. In rainy season, relative humidity and rainy days showed significant positive correlation, while maximum temperature and sunshine hours exhibited significant negative correlation with leafminer population. Multiple regression studies indicated that an increase in one per cent relative humidity resulted in decrease of leafminer by 0.141 larvae per plant in summer, while in rainy season R^2 value (0.912) indicated that seven weather parameters jointly contributed 91.2 per cent of the total variation in the density of leafminer population per plant.

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INTRODUCTION

Groundnut is the important oilseeds crop of semi-arid tropics in general and Saurashtra region of Gujarat in particulars. It is attacked by number of pests from germination to harvest. Among the various pests, groundnut leafminer, *Aproaerema modicella* Deventer (Gelechiidae : Lepidoptera) is one of the major pest. The climatic factors play an important role in the biology of any pest. It is rather difficult to find a direct cause and effects relationship between any single factor and pest activity, because the impact of weather elements on pest is usually confounded (Parker, 1946; Banerjee, 1972). However, temerature, rainfall, relative humidity, sunshine hours and wind speed are the chief weather parameters that largely direct the activity of a given species of insect. The present study deals with the population dynamics of groundnut leafminer in relation to these abiotic factors.

MATERIALS AND METHODS

Field experiments were conducted at Sagdividi Farm, Gujarat Agricultural University, Junagadh to determine the influence of abiotic factors on the population dynamics of *A. modicella* in GG 4 variety of groundnut during summer 1996 and *kharif* 1996. The crop was grown in an isolated plot size of 10 x 4.5 m^2 with 45 cm spacing in both the seasons. All the recommended agronomic practices were followed. The plots of this experiment were

TABLE 1

Meteorological data recorded during *kharif* 1996 at Junagadh.

Week after sowing	*Standard week No.*	*Temperature °C*		*Relative humidity (%)*	*Mean bright sunshine hours*	*Rain fall (mm)*	*Rainy days*	*Wind speed km/hr*
		Maximum X1	*Minimum X2*	*X3*	*X4*	*X5*	*X6*	*X7*
	1996	*1996*	*1996*	1996	*1996*	*1996*	*1996*	*1996*
1.	25	32.4	25.6	81.5	2.8	205.6	2	17.6
2.	26	34.8	26.1	71.0	7.1	0.5	0	15.7
3	27	35.3	26.3	69.0	6.8	1.0	0	13.4
4	28	32.1	25.4	87.0	2.9	21.6	4	7.0
5	29	30.8	25.5	94.0	1.2	188.2	5	6.1
6	30	28.9	24.8	92.0	0.3	90.2	4	8.4
7	31	29.5	25.2	88.5	2.0	25.4	3	8.5
8	32	29.0	24.8	87.5	0.5	6.6	1	8.6
9	33	28.9	24.1	89.0	1.0	19.0	3	5.9
10	34	29.7	23.9	87.0	3.8	20.8	3	9.2
11	35	30.2	23.7	84.5	2.0	18.6	2	4.9
12	36	31.2	23.8	78.0	3.1	0.5	0	4.7
13	37	32.7	23.7	74.5	4.7	0.4	0	4.8
14	38	33.3	23.0	70.0	7.0	0.0	0	6.1
15	39	34.7	23.1	64.5	8.6	0.0	0	5.6

kept unsprayed throughout the season. Ten quadrates each consisting of 10 plants were observed at weekly interval to record incidence of leaf- miner, starting from first week after sowing (WAS) till harvest of the crop. To determine the leafminer population; larval counts were made and mean incidence was worked out. Meteorological data for different standard weeks were obtained from the agro-meteorological observatory of Junagadh (Table 1 and 2). In order to study the influence of different meteorological parameters on leafminer incidence, correlation and regression analysis were carried out.

TABLE 2

Meteorological data recorded during summer 1996 at Junagadh.

Week after sowing	*Stanard week No.*	*Temperature °C*		*Relative humidity (%)*	*Mean bright sunshine hours*	*Wind speed km/hr*
		Maximum	*Minimum*			
		X1	*X2*	*X3*	*X4*	*X5*
1	5	31.3	8.7	42.0	9.5	6.2
2	6	32.6	13.3	41.5	9.3	5.6
3	7	31.8	12.9	44.5	9.5	6.6
4	8	33.9	17.9	53.0	8.9	6.7
5	9	33.5	15.5	39.5	9.9	7.4
6	10	38.2	19.1	42.5	10.2	6.1
7	11	38.9	22.5	40.0	8.3	8.8
8	12	36.8	21.4	40.0	10.5	8.7
9	13.	38.1	19.4	41.0	10.6	8.9
10	14	39.1	20.2	41.5	10.8	7.8
11	15	39.3	20.6	47.5	10.1	7.8
12	16	38.9	22.7	56.5	10.0	8.5
13	17	38.7	24.1	60.0	10.7	9.8
14	18	39.8	23.6	52.0	10.6	9.7
15	19	39.5	24.6	63.5	10.4	10.6

RESULTS AND DISCUSSION

The results (Table 3) revealed that *A. modicella* began to infest the groundnut from 2nd WAS (1st week of February) during summer season and remained active up to the harvest. The population growth range from 0.3 to 4.9 larvae per plant with a mean population of 2.51 larvae per plant. Two distint peaks were observed during summer

TABLE 3

Weekly observation on seasonal incidence of *A. modicella* on groundnut.

Week after sowing	Standard week No.	Population per plant Summer Date	1996	Standard week	Mean larval Date	1996
1	5	28-1	0.0	25	22-6	0.4
2	6	5-2	0.3	26	29-6	1.8
3	7	12-2	1.2	27	6-7	2.6
4	8	19-2	1.8	28	13-7	7.7
5	9	26-2	2.2	29	20-7	8.9
6	10	5-3	3.3	30	27-7	8.7
7	11	12-3	4.1	31	3-8	6.4
8	12	19-3	3.9	32	10-8	5.1
9	13	26-3	4.8	33	17-8	4.8
10	14	2-4	4.9	34	24-8	3.7
11	15	9-4	4.0	35	31-8	2.1
12	16	16-4	3.5	36	7-9	1.9
13	17	23-4	1.8	37	14-9	1.2
14	18	30-4	1.0	38	21-9	0.8
15	19	7-5	0.8	39	28-9	0.6
Mean			2.51			3.78

season. The first peak (4.1 larvae/plant) was recorded during 2nd week of March (7th WAS) and the second (4.9 larvae/plant) was observed during 1st week of April i.e. 10th WAS. The results of *kharif* season indicated that infestation of leafminer commenced from 1st WAS (3rd week of June) and its incidence continued in a variable density till harvest of the crop. The population varied from 0.4 to 8.9 larvae per plant with an average of 3.78 larvae per plant. The peak activity of 8.9 larvae/plant was observed during 3rd week of July (5th WAS). The activity of leafminer was higher in *kharif* as compared to summer season.

Upadhyay (1984) and Vyas (1989) also reported that leafminer infestation remained active on groundnut throughout the crop period during both *kharif* and summer season under Junagadh condition on GAUG - 10 groundnut variety.

Correlation studies between *A. modicella* and weather parameters

The results (Table 4) indicated that during summer season significantly positive correlation of leafminer was observed only with maximum temperature. But other weather parameters were non- significantly associated.

TABLE 4

Correlation coefficient between larval population of *A. modicella* and weather parameters.

Season	Year	Temperature °C		Relative humidity (%)	Mean bright sunshine hours	Rainfall (mm)	Rainy days	Wind speed km/hr
		Maximum	Minimum					
		X1	X2	X3	X4	X5	X6	X7
Summer	1996	0.566*	0.435	-0.324	0.224	—	—	0.200
Kharif	1996	-0.588*	0.375	0.806*	-0.678*	0.312	0.846*	-0.195

* Significant at 0.05 level (r = 0.512) (n = 15).

TABLE 5

Multiple regression analysis between larval population of *A. modicella* and weather parameters.

Season Year	A value	Temperature °C		Relative humidity (%)	Mean bright sunshine hours	Rainfall (mm)	Rainy days	Wind speed km/hr	R^2
		Maximum	Minimum						
		X1	X2	X3	X4	X5	X6	X7	
Summer 1996	-2.842	0.251	0.202	-0.141*	0.119	—	—	-0.284	0.695
Kharif 1996	-08.095	-1.291	2.876*	-0.216	0.431	0.002	1.205	-0.524*	0.912

* Significant at 0.05 level.

** Significant at 0.01 level.

In *kharif*, relative humidity and rainy days showed significant positive correlation, while maximum temperature and sunshine hours exhibited significant negative correlation with leafminer population. Similar trend was observed in *kharif* season by Upadhyay (1984) and Vyas (1989).

Multiple regression studies of *A. modicela* with weather parameters

The data presented in Table 5 indicated that only relative humidity showed significant negative efffect on leafminer population during summer season. It indicated that an increase in one per cent relative humidity resulted in decrease of leafminer population by 0.141 larvae per plant. The R^2 value of 0.695 revealed that five weather parameters jointly contributed 69.5 per cent of the total variation in the density of leafminer per plant in summer groundnut.

In *kharif* season, the partial regression coefficient of leafminer population on minimum temperature showed significant positive effect, whereas wind speed exhibited significant negative correlation. The R^2 value (0.912) indicated that seven weather parameters jointly contributed 91.2 per cent of the total variation in the density of leafminer population per plant in *kharif* groundnut. Vyas (1989) also observed highly significant positive effect with relative humidity, while significant negative effects with minimum temperature on leafminer population during *kharif*.

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