Research Paper :

Study on seasional incidence of rice leaf folders (*Cnaphalocrocis medinalis* Guen. and *Pelopidas mathias* Fb.) of paddy and its correlation with weather parameters

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SUMMARY

In the study of seasional incidence larval population (0.50 larva/plant) and per cent damaged leaves (0.55) of rice leaf roller, *C. medinalis* initiated from 36th standard week and reached its peak level (3.12 larvae/plant and 3.20 per cent damaged leaves) during 43rd standard week in *Kharif*-2005 while the larval population (0.53 larva/plant) and per cent damaged leaves (0.72) of rice leaf roller initiated from 13th standard week and reached to its peak level (1.51 larvae/plant and 1.75 per cent damaged leaves) during 15th standard week in summer-2006. Similarly, the larval population (0.45 larva/plant) and per cent damaged leaves (0.75) of rice skipper, *P. mathias* initiated from 39th standard week in *Kharif*-2005 and reached to its peak level (2.03 larvae/plant and 2.10 per cent damaged leaves) during 41st standard week while the larval population (0.20 larva/plant) and per cent damaged leaves (0.28) of rice skipper initiated from 13th standard week and reached to its peak level (0.57 larvae/plant and 0.60 per cent damaged leaves) during 16th standard week in summer-2006. In *Kharif*-2005, maximum temperature (r = 0.726) and sunshine hours (r = 0.614) had significant positive correlation with larval population of rice leaf roller while wind velocity (r = -0.539) and rainy days (r = -0.518) had significant negative correlation with the larval population of rice leaf roller while the larval population of rice leaf roller in summer-2006 had significant negative correlation with average temperature (r = -0.705). The larval population of rice skipper in *Kharif*-2005 had significant positive correlation with maximum temperature (r = 0.589) and average temperature (r = 0.497) while the rice skipper larval population in summer-2006 exhibited significant negative correlation with average temperature (r = -0.658).

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Rice (*Oryza sativa* L.) is one of the staple foods of more than sixty per cent of the world's population and known as a king of cereals. The total area of the world under rice cultivation is 153.33 million hectares producing 588.56 million tonnes of grain with an average productivity of 3.37 MT/ha (Anonymous, 2004). The total area under rice cultivation in India was 44.6 million hectares with a production of 90 million tonnes (Sharma, 2005). India has the largest growing area (42.7 million hectares) with production of 86.30 metric tonnes in 2000-2001 and 78.64 MT in 2002-2003 (Anonymous, 2004). In Gujarat, rice occupied about 5 to 7 lakh ha area with a total production of 9 to 10.5 lakh tonnes (Vashi *et al.*, 2005).

Rice crop is attacked by a several hundred species of insect pests during its different stages of crop period.Among the leaf defoliators, leaf folders *viz.*,*C. medinalis* Guen. and *P. methias* Fb. are found to be occupying a major status in South Gujarat. Therefore, it is necessary to explore the economical and eco-friendly management strategy to manage the rice leaf folders *i.e.*,*C. medinalis* and *P. mathias*. Keeping this view in mind, it has been decided to investigate the seasonal incidence of rice leaf folders *C. medinalis* Guenee and *P. mathias* Fabricious in rice growing area of South Gujarat.

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MATERIALS AND METHODS

Present investigation on seasonal incidence of rice leaf folders, *Cnaphalocrocis medinalis* Guen. and *Pelopidas mathias* Fb. were carried out at NARP Farm, Navsari Agricultural University, Navsari, Gujarat during *Kharif* season of 2005 and summer season of 2006 having variety, Masuri. All the post sowing recommended agronomical practices were followed. However, experimental area was kept free from the insecticidal spray throughout the crop season in order to record the incidence of rice leaf folders .

Method of recording observations:

To know the incidence of rice leaf roller and rice skipper and on rice variety, Masuri, the observations were recorded as per standard week starting from 30 days after transplanting till harvest. The observations were taken by counting the number of damaged leaves and total number of leaves from randomly selected five spots consisting of five plants in each spot. The data thus obtained were converted to per cent infestation. Similarly, the larval populations were also counted as per standard week starting from 30 days after transplanting till harvest. The observations were taken by counting the total number of larvae from each of damaged leaves, comprising of five plants then the average population per plant was calculated.

In order to study the effect of weather parameters *viz.*, maximum temperature, minimum temperature, average temperature, maximum relative humidity, minimum relative humidity, average relative humidity, wind velocity, sunshine hours, rainfall and rainy days on population of rice leaf folders, (*C. medinalis* and *P. mathias*) the simple correlation coefficient was worked out (Appendix I and II). Weekly meteorological data recorded at the Meteorological Observatory, N.M. College of Agriculture, Navsari Agricultural University, Navsari, Gujarat were used for this purpose.

RESULTS AND DISCUSSION

The results obtained from the present investigation are summarized below :

Seasonal incidence of rice leaf folders, *C. medinalis* and *P. mathias* on paddy:

The data on leaf folders, *C. medinalis* during *Kharif* - 2005 presented in Table 1 reveal that the larval population (0.50 larva/plant) and per cent damaged leaves (0.55) of rice leaf roller initiated from 36th standard week reached to its peak level (3.12 larvae/plant and 3.20 per cent damaged leaves) during 43rd standard week. Then after, larval population (0.30 larva/plant) and per cent damaged leaves (0.85) was gradually declined and

Appendix I : Meteorological data recorded during the course of investigation (weekly mean) *Kharif* 2005

Month (2005)	Week No.	Temp.^{0}C			Relative humidity (%)			Wind velocity km/hr.	Sunshine hours/ day	Rain fall (mm)	Rainy days
		Max	Min	Aver.	Mor.	Eve.	Aver. RH				
July	31	28.8	26.2	27.5	93	88	90.5	8.9	1.9	225.0	6
Aug.	32	28.0	26.7	27.35	87	84	85.5	11.2	2.0	041.0	4
	33	29.7	26.1	27.9	88	73	80.5	7.1	7.5	019.0	3
	34	30.1	24.9	27.5	89	75	82	6.0	1.6	045.0	3
	35	30.3	25.4	27.85	91	72	81.5	3.4	5.3	013.2	2
Sept.	36	31.7	25.0	28.35	92	76	84	3.9	5.4	055.4	2
	37	28.9	25.6	27.25	93	86	89.5	6.5	2.3	86.7	6
	38	28.7	25.6	27.15	99	87	93	8.5	2.6	231.4	7
	39	29.5	24.5	27	90	74	82	6.0	5.0	014.7	1
Oct.	40	31.3	24.6	27.95	90	57	73.5	5.0	6.0	0.0	0
	41	36.2	22.9	29.55	90	36	63	3.8	9.4	0.0	0
	42	33.9	24.4	29.15	79	55	67	1.4	8.3	0.0	0
	43	33.3	20.8	27.05	88	42	65	5.0	9.2	0.0	0
	44	34.8	18.9	26.85	80	52	66	2.7	9.6	0.0	0
Nov.	45	33.1	10.0	21.55	69	31	50	3.4	9.6	0.0	0
	46	33.0	17.3	25.15	74	24	49	2.6	9.6	0.0	0
	47	33.9	18.1	26	61	26	43.5	5.0	9.8	0.0	0
	48	32.2	18.5	25.35	64	31	47.5	3.6	7.7	0.0	0

Appendix II : Meteorological data recorded during the course of investigation (weekly mean) summer - 2006

Month (2006)	Week No.	Temp.^{0}C			Relative humidity (%)			Wind velocity km/hr.	Sunshine hours/day
		Max	Min	Aver.	Mor.	Eve.	Aver. RH		
	10	30.1	19.1	24.6	83	50	66.5	4.7	7.9
March	11	31.7	19.7	25.7	87	41	64	4.7	8.6
	12	36.0	20.5	28.25	88	29	58.5	4.2	9.0
	13	35.9	20.8	20.8	79	33	56	5.0	9.0
	14	34.4	22.8	22.8	89	45	67	5.4	9.4
	15	33.2	23.2	23.2	92	55	73.5	5.8	9.5
April	16	35.2	24.2	24.2	88	48	68	5.5	9.8
	17	34.4	25.3	25.3	89	60	74.5	6.8	10.4
	18	34.6	26.2	26.2	88	61	74.5	7.1	10.5
	19	33.0	27.1	27.1	86	61	73.5	8.6	0.0
	20	33.6	28.1	28.1	87	64	75.5	9.2	0.0
May	21	33.6	29.0	29	87	74	80.5	12.8	0.0
	22	32.5	27.6	27.6	91	78	84.5	9.7	0.0

Table 1 : Seasonal incidence of rice leaf roller, *C. medinalis* and rice skipper, *P. mathias* on paddy during *Kharif*, 2005

Met. weeks	WAT	Date	Per cent damaged leaves caused by		Average no. of	
			Rice leaf roller	Rice skipper	Larvae of rice leaf roller per plant	Larvae of rice skipper per plant
31	5	01/08/05	0.0	0.0	0.0	0.0
32	6	08/08/05	0.0	0.0	0.0	0.0
33	7	15/08/05	0.0	0.0	0.0	0.0
34	8	22/08/05	0.0	0.0	0.0	0.0
35	9	29/08/05	0.0	0.0	0.0	0.0
36	10	05/09/05	0.55	0.0	0.50	0.0
37	11	12/09/05	1.50	0.0	0.73	0.0
38	12	19/09/05	1.67	0.0	0.87	0.0
39	13	26/09/05	1.73	0.75	0.94	0.45
40	14	03/10/05	1.89	1.30	1.32	1.08
41	15	10/10/05	2.30	2.10	2.90	2.03
42	16	17/10/05	2.60	1.75	3.06	1.86
43	17	24/10/05	3.20	1.20	3.12	1.10
44	18	01/11/05	2.80	0.75	3.00	0.43
45	19	08/11/05	2.15	0.0	2.43	0.0
46	20	15/11/05	1.05	0.0	1.12	0.0
47	21	22/11/05	0.85	0.0	0.30	0.0
48	22	29/11/05	0.0	0.0	0.0	0.0

Met. week - Meteorological standard week WAT - Week after transplanting

reached to a zero level at the maturity of crop. Similarly the data during summer – 2006 presented in Table 2 reveal that the larval population (0.53 larva/plant) and per cent damaged leaves (0.72) of rice leaf roller initiated from 13th standard week reached to its peak level (1.51 larvae/plant and 1.75 per cent damaged leaves) during 15th standard week. Then after, larval population (0.35 larva/plant) and per cent damaged leaves (0.50) was gradually declined and reached to a zero level at the maturity of crop.

The data on rice skipper, *P. mathias* during Kharif – 2005 presented in Table 1 reveal that the larval population (0.45 larva/plant) and per cent damaged leaves (0.75) of rice skipper initiated from 39th standard week and reached to its peak level (2.03 larvae/plant and 2.10 per cent damaged leaves) during 41st standard week. Then after, larval population (0.43 larva/plant) and per cent damaged leaves (0.75) was gradually declined and

Table 2 : Seasonal incidence of rice leaf roller, *C. medinalis* and rice skipper, *P. mathias* on paddy during summer, 2006

Met. weeks	WAT	Date	Per cent damaged leaves caused by		Average no. of	
			Rice leaf roller	Rice skipper	Larvae of rice leaf roller per plant	Larvae of rice skipper per plant
10	5	06/03/06	0.0	0.0	0.0	0.0
11	6	13/03/06	0.0	0.0	0.0	0.0
12	7	20/03/06	0.0	0.0	0.0	0.0
13	8	27/03/06	0.72	0.28	0.53	0.20
14	9	03/04/06	1.50	0.50	1.12	0.35
15	10	10/04/06	1.75	0.75	1.51	0.43
16	11	17/04/06	0.85	0.60	0.73	0.57
17	12	24/04/06	0.75	0.35	0.49	0.21
18	13	01/05/06	0.50	0.0	0.35	0.0
19	14	08/05/06	0.0	0.0	0.0	0.0
20	15	15/05/06	0.0	0.0	0.0	0.0
21	16	22/05/06	0.0	0.0	0.0	0.0
22	17	29/05/06	0.0	0.0	0.0	0.0

Met. week - Meteorological standard week WAT - Week after transplanting

reached to a zero level at the maturity of crop. Similarly, the data during Summer – 2006 presented in Table 2 reveal that the larval population (0.20 larva/plant) and per cent damaged leaves (0.28) of rice skipper initiated from 13th standard week and reached to its peak level (0.57 larvae/plant and 0.60 per cent damaged leaves) during 16th standard week. Then after, larval population (0.21 larva/plant) and per cent damaged leaves (0.35) was gradually declined and reached to a zero level at the maturity of crop.

Correlation matrix of the relationship between weather parameters with larval population and damage of rice leaf folders:

The results on rice leaf roller, *C. medinalis* during *Kharif*-2005 presented in Table 3 indicate that maximum temperature (r = 0.726) and sunshine hours (r = 0.614) had significant positive correlation with larval population of rice leaf roller while wind velocity (r = -0.539) and rainy days (r = -0.518) had significant negative correlation with the larval population of rice leaf roller. Minimum temperature (r = -0.399), average temperature (r = -0.005), morning relative humidity (r = -0.092), evening relative humidity (r = -0.454) and rainfall (r = -0.346) had non-significant negative correlation with the rice leaf roller population.

The results presented in Table 3 indicate that the leaf roller damage exhibited significant positive correlation with maximum temperature (r = 0.582) and sunshine hours (r = 0.507) while non-significance negative correlation was observed with minimum temperature (r = -0.334), average temperature (r = -

Table 3 : Correlation matrix of the relationship between weather parameters with larval population and damage of leaf folders on paddy during *Kharif* - 2005

Sr. No.	Weather parameters	RLR	R. ski.	Av. no. of RLR	Av. no. of R. ski.
1.	Maximum temperature ^{0}C	0.582*	0.588*	0.726*	0.589*
2.	Minimum temperature ^{0}C	-0.334	0.066	-0.399	0.078
3.	Average temperature ^{0}C	-0.021	0.482*	-0.005	0.497*
4.	Morning relative humidity (%)	-0.007	0.123	-0.092	0.104
5.	Evening relative humidity (%)	-0.353	-0.277	-0.454	-0.283
6.	Average relative humidity (%)	-0.253	-0.156	-0.353	-0.167
7.	Wind velocity (km/hr)	-0.428	-0.386	-0.539*	-0.391
8.	Sunshine hours	0.507*	0.403	0.614*	0.394
9.	Rainfall	-0.244	-0.357	-0.346	-0.333
10.	Rainy days	-0.407	-0.489*	-0.518*	-0.459

*Significant at 5 % level (r = + 0.467) RLR - Rice leaf roller R.ski. - Rice skipper

Table 4 : Correlation matrix of the relationship between weather parameters with larval population and damage of leaf folders on paddy during summer -2006

Sr. No.	Weather parameters	RLR	R. ski.	Av. no. of RLR	Av. no. of R. ski.
1.	Maximum temperature ^{0}C	0.322	0.313	0.292	0.365
2.	Minimum temperature ^{0}C	-0.160	-0.164	-0.161	-0.152
3.	Average temperature ^{0}C	-0.724*	-0.687*	-0.705*	-0.658*
4.	Morning relative humidity (%)	0.304	0.297	0.328	0.230
5.	Evening relative humidity (%)	-0.209	-0.219	-0.200	-0.247
6.	Average relative humidity (%)	-0.125	-0.136	-0.113	-0.175
7.	Wind velocity (km/hr)	-0.354	-0.354	-0.348	-0.358
8.	Sunshine Hours	0.577*	0.524	0.550	0.511

* indicates significance of value at P=0.05 level (r = + 0.551) RLR - Rice leaf roller R.ski. - Rice skipper

0.021), morning relative humidity (r = -0.007), evening relative humidity (r = -0.353), average relative humidity (r = -0.253), wind velocity (r= -0.428), rainfall (r = -0.244) and rainy days (r = -0.407).

Similarly, the correlation co-efficient during summer-2006 or relationship between larval population of rice leaf roller and weather parameters during summer-2006 are presented in Table 4. The results reveal that larval population of rice leaf roller had significant negative correlation with average temperature (r = -0.705) while non significant positive correlation with maximum temperature (r = 0.292), morning relative humidity (r = 0.328) and sunshine hours (r = 0.550) as well as non-significant negative correlation with minimum temperature (r = -0.161), evening relative humidity (r = -0.200), average relative humidity (r = -0.113) and wind velocity (r = -0.348).

The correlation matrix for relationship between rice leaf roller damage and weather parameters during summer-2006 are presented in Table 4. The correlation studies indicated that maximum temperature (r = 0.322) and morning relative humidity (r = 0.304) showed non-significant positive correlation with rice leaf roller damage, while minimum temperature (r = -0.160), evening relative humidity (r = -0.209), average relative humidity (r = -0.125), and wind velocity (r = -0.354) showed non-significant negative correlation with rice leaf roller damage. The sunshine hours (r = 0.577) had significant positive correlation with rice leaf roller damage while average temperature (r = -0.724) had significant negative correlation with rice leaf roller damage.

The correlation co-efficient of rice skipper, *P. mathias* during *Kharif* – 2005 for relationship between larval population of rice skipper and weather parameters during *Kharif*-2005 are presented in Table 3. The results reveal that the larval population of rice skipper had significant positive correlation with maximum temperature (r = 0.589) and average temperature (r = 0.497), while non-significant positive correlation with minimum temperature (r = 0.078), morning relative humidity (r = 0.104) and sunshine hours (r = 0.394). Evening relative humidity (r = -0.283), average relative humidity (r = -0.167), wind velocity (r = -0.391), rainfall (r = -0.333) and rainy days (r = -0.459) showed non-significant negative correlation with the larval population of rice skipper.

The results presented in Table 3 indicat that rice skipper damage exhibited significant positive correlation with maximum temperature (r = 0.588) and average temperature (r = 0.482), while significant negative correlation with rainy days (r = -0.489). Non-significant positive correlation was observed with minimum temperature (r = 0.066), morning relative humidity (r = 0.123) and sunshine hours (r = 0.403) as well as non significant negative correlation was observed with evening relative humidity (r = -0.277), average relative humidity (r = -0.156), wind velocity (r = -0.386) and rainfall (r = -0.357).

Similarly the results during summer - 2006 presented in Table 4 indicate that the rice skipper larval population exhibited non-significant positive correlation with maximum temperature (r = 0.365), morning relative humidity (r = 0.230) and sunshine hours (r = 0.511) while non-significant negative correlation with minimum temperature (r = -0.152), evening relative humidity (r= -0.247), average relative humidity (r =-0.175) and wind velocity(r = -0.358). Significant negative correlation was observed with average temperature (r = -0.658).

The correlation matrix for relationship between rice skipper damage and weather parameters during summer-2006 are presented in Table 4. The correlation studies indicated that maximum temperature (r = 0.313), morning relative humidity (r = 0.297) and sunshine hours (r =

0.524) showed non-significant positive correlation with rice skipper damage while minimum temperature (r = -0.164), evening relative humidity (r = -0.219), average relative humidity (r = -0.136) and wind velocity (r = -0.354) showed non-significant negative correlation with rice skipper damage. The rice skipper damage had significant negative correlation with average temperature (r = -0.687).

These results are in accordance with the findings of (Anonymous, 2002) wherein it was found that the average temperature (r = -0.439) and rainfall (r = -0.498) had negative correlation with leaf folder while minimum and maximum temperature, relative humidity and sunshine hours had positive correlation.

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