

Seasonal Incidence of Flea Beetle, *Chaetochnema indica* Klse. on Sorghum

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Abstract

Studies on population dynamics of flea beetle, *Chaetochnema indica* Klse. infesting sorghum was made during *rabi* 2006-07, 2007-08 and *kharif* 2007-08, 2008-09 season at Agricultural Research Station, N.A.U., Tanchha, Dist. Bharuch. In *rabi* incidence of flea beetles began from second week of November and continued up to first week of February with a peak activity in first week of January, while in *kharif* flea beetles appeared from second week of August and remained till harvesting of crop. The peak activity found during first week of November. Flea beetle population positively influenced by maximum temperature, wind velocity and sunshine hours, whereas it was negatively influenced by minimum temperature, morning relative humidity, evening relative humidity, average relative humidity and rainy days.

Keywords: sorghum, *rabi*, *kharif*, flea beetle, correlation, weather parameters

1. Introduction

Sorghum [*Sorghum bicolor* (L) Moench] ranks fourth among the top five grains of the world in order of its importance. India is the largest producer of sorghum in the world contributing 34% of the semi arid tropical sorghum (Shivkumar and Virmani, 1982). Among different pest infesting sorghum, a flea beetle was reported to be a minor pest of sorghum crop (Kadam and Patel, 1955). Though, flea beetle, *Chaetochnema indica* Klse was considered to be a minor pest, it appeared in serious and epidemic form on *rabi* sorghum during September-November 1986 in Maharashtra State. Adult beetles were feeding on sorghum leaves, which resulted in numerous small holes in the leaf lamina. Hence, the present investigation was carried out which also helps in forecasting the pest incidence and to incorporate the same in integrated pest management programme gainfully

2. Materials and Methods

The study on population fluctuation of flea beetle and correlation with weather parameters was carried out for two consecutive years (*rabi* 2006-07, 2007-08 and *kharif* 2007-08, 2008-09) on sorghum variety GJ 38, which was grown in 400 m² areas during *rabi* and *kharif* seasons at Agricultural Research Station, N.A.U., Tanchha, Dist- Bharuch under rainfed condition. The crop area was divided into 20 quadrates and 5 plants were randomly selected from each quadrate. An observation on population of flea beetle was recorded at

weekly interval from five randomly selected plants from each quadrate. The observations were continued throughout the crop life span. Mean number of flea beetle was worked out per plant. All the recommended agronomic practices were followed for raising the crop. Experimental area was kept free from insecticidal spray throughout the season. In order to study the effect of weather parameters *viz.*, maximum temperature, minimum temperature, average temperature, morning relative humidity, evening relative humidity, average relative humidity, sunshine hours, rainy days and rainfall on population of various insect pests, correlation coefficient and multiple or simple regression were worked out.

3. Results and Discussion

3.1. *Rabi*

During *rabi* 2006-07 aphids, flea beetle incidence (Table 1) on sorghum crop commenced with 2.55 flea beetles per plant from 47th SMW (third week of November) and reached to a peak level (12.89 flea beetle plant⁻¹) on 1st SMW (first week of January). Then the flea beetle population gradually decline and found minimum on 6th SMW (first week of February) i.e. at the time of harvesting. During *rabi* 2007-08, flea beetles commenced with 0.03 flea beetles per plant during 46th SMW and gradually increased and reached a peak level (3.32 flea beetle plant⁻¹) during 1th SMW (first week of January) and then decline till harvesting of crop. A close perusal of pooled data (2006-07 and 2007-08) showed that incidence of this pest (Table 1 and Figure 1) on crop commenced during second week



Table 1 : Population of flea beetle, *Chaetochnema indica* on Rabi sorghum

Sr. No.	Met. Week	Date	WAS	Mean flea beetle population plant ⁻¹		
				2006-07	2007-08	Pooled
1.	45	5-11 Nov	2	0.00	0.00	0.00
2.	46	12-18	3	0.00	0.03	0.02
3.	47	19-25	4	2.55	0.06	1.31
4.	48	26-2	5	5.59	0.30	2.95
5.	49	3-9 Dec	6	5.76	0.20	2.98
6.	50	10-16	7	9.50	1.05	5.28
7.	51	17-23	8	10.25	1.96	6.11
8.	52	24-31	9	8.05	2.47	5.26
9.	1	1-7 Jan	10	12.89	3.32	8.11
10.	2	8-14	11	12.13	4.00	8.07
11.	3	15-21	12	10.61	1.90	6.26
12.	4	22-28	13	8.56	1.50	5.03
13.	5	29-4	14	3.24	0.65	1.95
14.	6	5-11 Feb	15	1.54	0.27	0.91

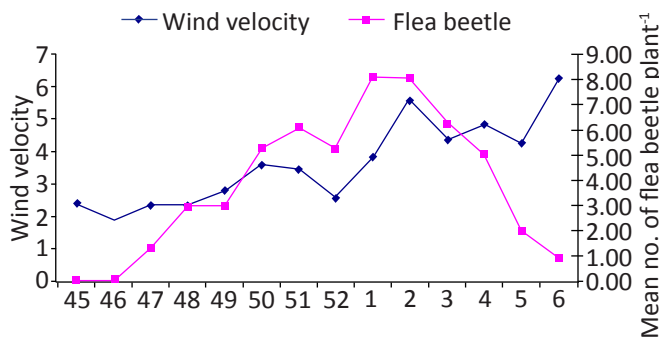


Figure 1: Correlation of flea beetle on sorghum in relation to weather parameters during *rabi* seasons

of November (46th SMW) and remained till harvesting of crop. During this period population showed fluctuation exhibiting two peaks of its activity. The pest commenced (0.02 flea beetle plant⁻¹) in second week of November, which increased and attained its first peak (6.11 flea beetle plant⁻¹) in third week of December. Next week it decreased, again showed second peak in first week of January (8.11 flea beetle plant⁻¹). Then population gradually decreased up to end of season. In *rabi* 2007-08 population of flea beetle was recorded low as compared to *rabi* 2006-07.

3.2. Kharif

During *kharif* 2007-08, population of flea beetle (Table 2) on sorghum commenced with 0.03 flea beetles per plant on 36th SMW (first week of September). The number of flea beetle per

plant increased gradually and reached to a peak level on 45th SMW (first week of November) *i.e.* at the time of harvesting. In 2008-09, the incidence of flea beetle (0.11 flea beetle plant⁻¹) was commenced from the 33rd SMW (third week of August). The flea beetle population increased gradually and reached to a peak (3.56 flea beetle plant⁻¹) during 40th SMW (first week of October). Population of flea beetle appear earlier in 2008-09. The pooled data of two years revealed that the flea beetle population was initiated from the second week

Table 2 : Population of flea beetle, *Chaetochnema indica* on Rabi sorghum

Sr. No.	Met. Week	Date	WAS	Mean flea beetle population plant ⁻¹		
				2007-08	2008-09	Pooled
1.	31	30-5 July	2	0.00	0.00	0.00
2.	32	6-12 Aug	3	0.00	0.00	0.00
3.	33	13-19	4	0.00	0.11	0.06
4.	34	20-26	5	0.00	0.68	0.34
5.	35	27-2	6	0.00	0.98	0.49
6.	36	3-9 Sep	7	0.03	1.12	0.58
7.	37	10-16	8	0.03	1.24	0.64
8.	38	17-23	9	0.01	2.03	1.02
9.	39	24-30	10	0.12	2.58	1.35
10.	40	1-7 Oct	11	0.85	3.56	2.21
11.	41	8-14	12	1.57	2.96	2.27
12.	42	15-21	13	5.24	2.43	3.84
13.	43	22-28	14	9.32	0.91	5.12
14.	44	29-4	15	12.11	0.21	6.16
	45	5-11 Nov	16	16.44	0.06	8.25

MW: Standard meteorological week; WAS: Week after sowing

of August (Table 2 and Figure 2). The average number of flea beetle ranged between 0.06 to 8.25 flea beetles per plant during the second week of August to first week of November

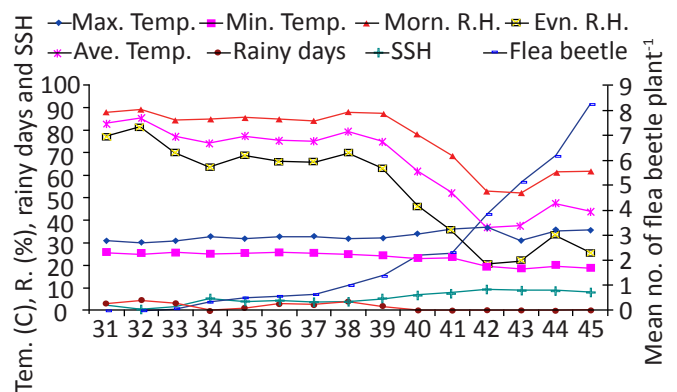


Figure 2: Correlation of flea beetle on sorghum in relation to weather parameters during *kharif* season

i.e., harvesting of crop. The population commenced from 33rd SMW (second week of August, 0.06 flea beetle plant⁻¹) and thereafter, the pest population gradually increase till harvesting of crop i.e., 45th SMW (8.25 flea beetle plant⁻¹).

To understand the role of different weather factors in causing the fluctuation of the population of this pest, correlation study was carried out. The pooled results (Table 3) revealed that correlation between flea beetle and wind velocity is positive and significant, while correlation with pest population and other weather factors were found non significant in *rabi* indicating there was no correlation between them. The regression equation was worked out by taking flea beetle

population (Y) as a dependent variable and meteorological parameters as independent variables. The following equation was fitted for *rabi*.

$$Y = -1.0221 + 1.3553 WV \quad (R^2 = 0.3338)$$

The pooled results of *kharif* (Table 4) revealed that maximum temperature and sunshine hours showed significant positive correlation, while minimum temperature, morning, evening, average relative humidity and rainy days show significant negative correlation indicating that increase in magnitude of these weather parameters resulted in reduction of the population. A stepwise regression analysis was work out considering weather parameters which had significant

Table 3: Correlation coefficient between *Chaetochnema indica* and weather parameter during *rabi* season

Year	weather parameter								
	Temperature °C			Humidity %			Sunshine hours	Wind velocity	Evaporation
	Max.	Min.	Mean	Morn.	Even.	Mean			
2006-07	-0.823	-0.930	-0.936	-0.157	-0.457	-0.328	0.189	0.550*	0.153
2007-08	-0.182	-0.239	-0.218	0.456	0.356	0.442	0.019	0.236	0.145
Pooled	-0.099	-0.206	-0.162	0.261	0.187	0.247	0.016	0.577*	0.329

Table 4: Correlation coefficient between *Chaetochnema indica* and weather parameter during *kharif* season

Year	weather parameter										
	Temperature °C			Humidity %			Rainfall	Rainy days	Sunshine hours	Wind velocity	Evaporation
	Max.	Min.	Mean	Morn.	Even.	Mean					
2007-08	0.705*	-0.750*	-0.376	-0.688*	-0.695*	-0.703*	-0.480	-0.517*	0.581*	-0.353	0.282
2008-09	0.390	0.115	-0.400	-0.030	-0.172	-0.118	-0.369	-0.370	0.300	-0.471	-0.057
Pooled	0.481*	-0.445*	-0.009	-0.470*	-0.478*	-0.480*	-0.341	-0.398*	0.427*	-0.267	0.222

correlation with the population of this pest. The regression equation fitted to the data taking the flea beetle population(Y) as a dependent variable and meteorological parameters as independent variable The following equation was fitted for *kharif*.

$$Y = -2.1608 + 0.5723 \text{ Max TEMP} - 0.4446 \text{ Min TEMP} + 0.0003 \text{ MRH} - 0.0039 \text{ ERH} + 0.0055 \text{ ARH} - 0.3133 \text{ RD} - 0.4300 \text{ SSH} \quad (R^2 = 0.3080).$$

The above results indicated that flea beetle population was not influenced by any weather parameters except wind velocity in *rabi* season. However, in *kharif* season it was positively influenced by maximum temperature and sunshine hours, whereas it was negatively influenced by minimum temperature, morning relative humidity, evening relative humidity, average relative humidity and rainy days. The impact of weather parameters on flea beetle in both the season was very low (33.38 % in *rabi*, 30.80% in *kharif*).

4. Conclusion

In *rabi* incidence of flea beetles began from second week of

November and continued up to first week of February with a peak activity in first week of January, while in *kharif* flea beetles appeared from second week of August and remained till harvesting of crop while, the peak activity found during first week of November. Flea beetle population positively influenced by maximum temperature, wind velocity and sunshine hours, whereas it was negatively influenced by minimum temperature, morning relative humidity, evening relative humidity, average relative humidity and rainy days.

5. References

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