



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 seasons at Agricultural Research Station, N.A.U., Tanchha, Dist. Bharuch. During the *rabi* season, 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* season, flea beetles appeared from second week of August and remained till harvesting of crop. The peak activity was observed during first week of November. Flea beetle population was positively influenced by maximum temperature, wind velocity and sunshine; whereas, it was negatively influenced by minimum temperature, morning relative humidity, evening relative humidity, mean relative humidity and the number of rainy days.

Key words: sorghum, *rabi*, *kharif*, flea beetle, correlation, weather parameters

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 per cent of the semi arid tropical sorghum (Shivkumar and Virmani, 1982). Among the different pests infesting sorghum, the flea beetle was reported to be a minor pest of sorghum crop (Kadam and Patel, 1955). Though the 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. Adult beetles were observed to feed on sorghum leaves, which resulted in numerous small holes in the leaf lamina. The present investigation was carried out to record the incidence of the flea beetle on sorghum at Navsari with a view to ascertain its pest status during summer/ *rabi* seasons.

MATERIALS AND METHODS

The study on population of flea beetle and its 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 area during *rabi* and *kharif* seasons at

the Agricultural Research Station, N.A.U., Tanchha, Dist- Bharuch under rainfed condition. All the recommended agronomic practices were followed for raising the crop. Experimental area was kept free from insecticidal spray throughout the season. The crop area was divided into 20 quadrates and 5 plants were randomly selected from each quadrate. Observations for the flea beetle populations were recorded at weekly intervals on the five randomly selected plants from each quadrate. The observations were continued throughout the crop life span. Mean number of flea beetles was worked out per plant. In order to study the effect of weather parameters (maximum temperature, minimum temperature, average temperature, morning relative humidity, evening relative humidity, average relative humidity, sunshine hours, rainy days and rainfall) on population of the flea beetle, the coefficient of correlations and multiple/simple regression were worked out.

RESULTS AND DISCUSSION

Flea beetle population on *rabi* season sorghum crop: During *rabi* 2006-07 the flea beetle incidence on sorghum crop commenced from the 47th SMW (third week of November) with a mean of 2.55 flea beetles per plant and reached to a peak level (12.89 flea beetles

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/plant) on 1st SMW (first week of January). Then the flea beetle population gradually declined and was minimum on 6th SMW (first week of February), at the time of harvesting. During *rabi* 2007-08, flea beetles commenced during 46th SMW with a mean of 0.03 flea beetles per plant and gradually increased, reaching a peak level (3.32 flea beetles /plant) during 1st SMW (first week of January) and then declined at crop harvest (Table 1). A 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 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 beetles /plant) in second week of November, which increased and attained its first peak (6.11 flea beetles /plant) in third week of December; further, next week it decreased, again showed second peak in first week of January (8.11 flea beetles /plant); thereafter, the population gradually decreased at the end of season. In *rabi* 2007-08 population of flea beetle was recorded low as compared to that during *rabi* 2006-07.

Flea beetle population on kharif season sorghum crop:

During *kharif* 2007-08, population of flea beetle (Table 2) on sorghum commenced on 36th SMW (first week of September) with a mean of 0.03 flea beetles per plant. The number of flea beetles 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 beetles /plant) commenced from the 33rd SMW (third week of August). The flea beetle population increased gradually and reached to a peak (3.56 flea beetles /plant) during

40th SMW (first week of October). Population of flea beetle appeared earlier in 2008-09 than in the previous year. The pooled data of two years revealed that the flea beetle population initiated from the second week of August (Table 2 and Figure 2). The average number of flea beetles ranged from 0.06 to 8.25 flea beetles per plant during the second week of August to first week of November. The population commenced from 33rd SMW (second week of August (0.06 flea beetles /plant) and thereafter, the pest population gradually increased at crop maturity in the 45th SMW (8.25 flea beetles /plant).

To understand the role of different weather factors in causing population fluctuation of this pest, the coefficients of correlation were computed. The pooled results (Table 3) revealed that correlation between flea beetle and wind velocity was positive and significant; while, correlation with pest population and other weather factors were not significant in *rabi*. 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 worked out considering weather parameters that had significant

Table 1. Weekly mean population of flea beetle on *rabi* sorghum

S. No.	SMW	Date	WAS	Mean per plant		
				2006-07	2007-08	Pooled
1.	45	5-11 Nov	2	0	0	0
2.	46	12-18	3	0	0.03	0.02
3.	47	19-25	4	2.55	0.06	1.31
4.	48	26-2	5	5.59	0.3	2.95
5.	49	3-9 Dec	6	5.76	0.2	2.98
6.	50	10-16	7	9.5	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	8.07
11.	3	15-21	12	10.61	1.9	6.26
12.	4	22-28	13	8.56	1.5	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

Table 2. Weekly mean population of flea beetle on *kharif* sorghum

S. No.	SMW	Date	WAS	Mean per plant		
				2007-08	2008-09	Pooled
1	31	30-5 July	2	0	0	0
2.	32	6-12 Aug	3	0	0	0
3.	33	13-19	4	0	0.11	0.06
4.	34	20-26	5	0	0.68	0.34
5.	35	27-2	6	0	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
15.	45	5-11 Nov	16	16.44	0.06	8.25

MW = Standard meteorological week; WAS = Week after sowing

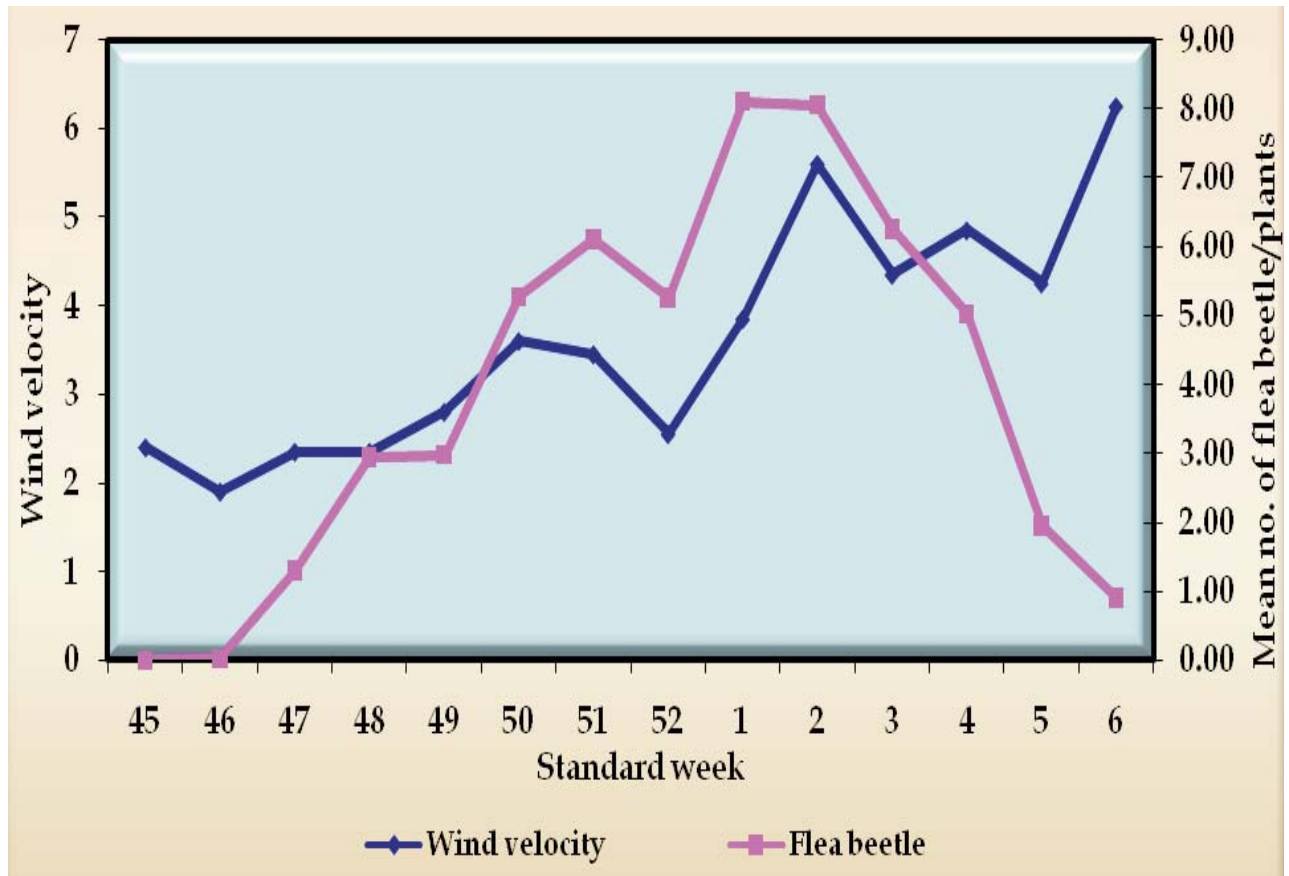


Fig. 1: Correlation of flea beetle on sorghum in relation to weather parameters during rabi season

Table 3. Coefficient of correlation values between flea beetle population and weather parameters during rabi season

Year	Weather Parameters										
	Temperature (°C)			Relative Humidity (%)			Sunshine (hrs)			Wind velocity	Evaporation
	Max.	Min.	Mean	Morn.	Even.	Mean	Sunshine (hrs)	Wind velocity	Evaporation		
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		

* Significant at 5 % level

Table 4. Coefficient of correlation values between flea beetle population and weather parameters during kharif season

Year	Weather Parameters												
	Temperature °C			Humidity %			Rainfall (mm)			Rainy days	Sunshine (hrs)	Wind velocity	Evaporation
	Max.	Min.	Mean	Morn.	Even.	Mean	Rainfall (mm)	Rainy days	Sunshine (hrs)	Wind velocity	Evaporation		
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		

* Significant at 5 % level

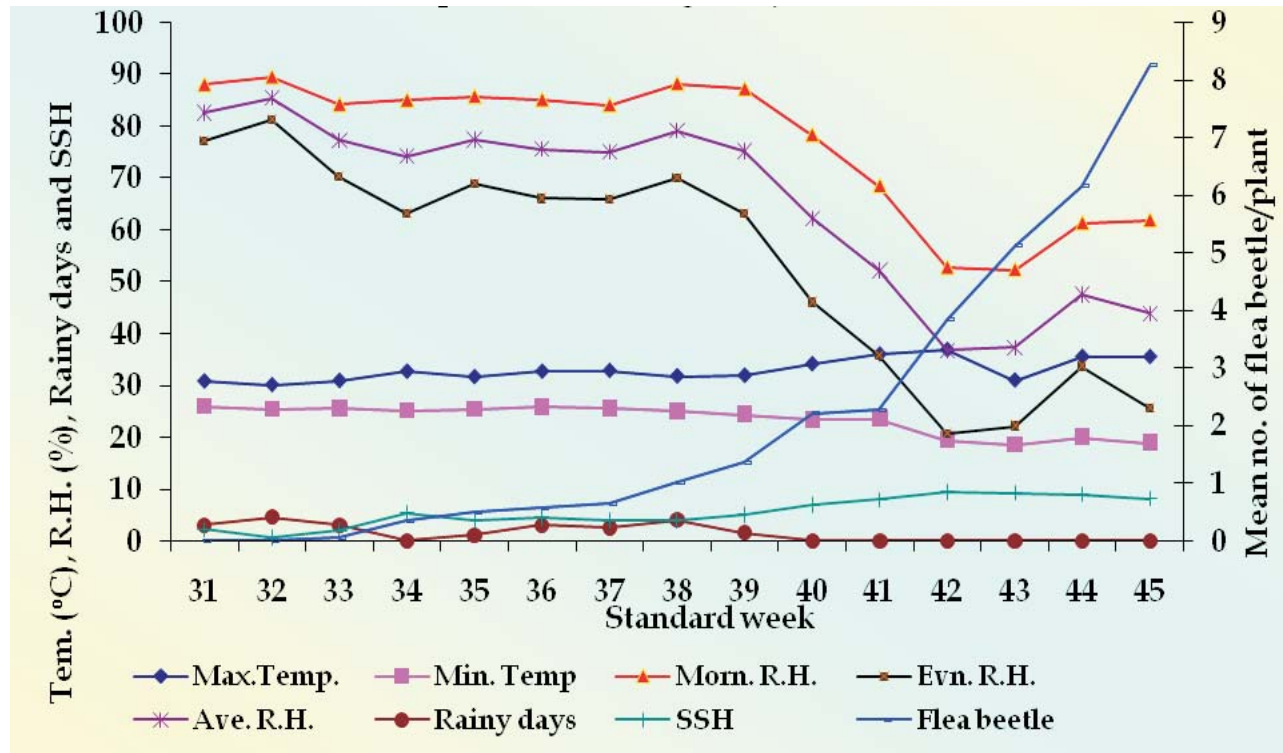


Fig. 2: Correlation of flea beetle on sorghum in relation to weather parameters during *kharif* season

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 variables 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. 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 seasons was low (33.38% in *rabi*, 30.80% in *kharif*).

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