Original Research Article

INCIDENCE, INFESTATION AND ROLE OF WEATHER FACTORS IN REGULATING THE POPULATION OF FLEA BEETLE (*ALTICA HEMENSIS)* ON SOYBEAN UNDER TEMPERATE CONDITIONS

ABSTRACT

Pulses have a strong history of nourishing human beings for centuries together. Soybean (G. max) being an important pulse crop, became vulnerable to a number of insect pests, viz., flea beetle (*A. hemensis*), pod borer (*H. armigera*), etc. Since in Kashmir through its intensive cultivation the acreage and production of the crop steadily increased, it is imperative to study the population buildup of the major insect-pests attacking soybean. The incidence of flea beetle, *Altica hemensis* commenced from 27th Standard meteorological week (SMW) with an average population level of 0.48 beetles per three leaves per plant reached its peak level of 1.75 beetles in 32nd SMW and then decreased and reached 0.24 beetles in 40th SMW. The percentage of flea beetle, *A. hemensis* infestation ranged from 8-40%, with highest infestation recorded in 33rd and 34th SMW respectively. The incidence of flea beetle revealed positive correlation with maximum temperature (r = 0.45), minimum temperature (r = 0.87), morning relative humidity (r = 0.39), evening relative humidity (r = 0.68) and negative correlation with rainfall (r = - 0.41) and sunshine hours (r = - 0.19). The regression analysis revealed that 88 per cent of flea beetle, *A. hemensis* population was influenced by weather parameters.

Keywords: *Altica hemensis*, infestation, incidence, relative humidity, temperature, rainfall, sunshine hours.

INTRODUCTION

Soybean (Glycine max L.) is one of the most important crops which is grown for oil and protein in both the rabi and kharif seasons. Seeds of soybean contain about 42% protein and 20% oil and provide 60% of the world supply of vegetable protein and 30% of the edible oil (Fehr, 1989). The crop has potential of mitigating rampant protein energy malnutrition as well as becoming ideal food of the country on account of a number of nutraceutical and functional compounds. It harbours more than 300 insects, amongst them only a few attain major pest status. They damage the crop from seedling stage to maturity and cause nearly 25% reduction of yield. *A. hemensis* results in the irregular patches of feeding damage and later a characteristic damage called skeletonization occurs whereby only hard parts of plant are left; insect will also damage flowers and small pods; pods may be damaged so badly that they drop from the plant.

MATERIALS AND METHODS

The studies were conducted with the soybean variety "Shalimar Soybean 1" which is a popular high yielding variety at FoA, Wadura Sopore following normal agronomical package of practices except pest control operations. For field studies on population build-up of Flea beetle of soybean was sown during 3rd week of May 2020 with plot size of 10 m x 7 m with row to row and plant to plant spacing of 45 x 5 cm. The experimental plot was left open for natural infestation of the insect pests. Data on flea beetle was recorded on randomly selected 25 plants for recording its population build up. These plants were inspected on three fully expanded leaves (basal, middle and terminal) at weekly intervals, and their number counted. The mean number of flea beetles was derived to get their number per leaf. The per cent plant infestation by the pest was worked out by counting the number of infested plants out of 25 plants used for determining the pest population by using formula:

$$\text{Plant infestation (\%)} = \frac{\text{Number of infested plants}}{\text{Total number of plants}} \times \mathbf{100}$$

RESULTS AND DISCUSSION

The studies on the incidence and infestation of flea beetle, *A. hemensis* on soybean with the weather parameters during *Kharif* 2020 are given in Table 1. The incidence of flea beetle, *A. hemensis* on soybean commenced from 1st week of July 2020, i.e. 27th Standard meteorological week (SMW) with an average population level of 0.48±0.08 flea beetle per three leaves per plant when the maximum and minimum temperatures were 32.5 and 14.1 ^{0}C, morning and evening relative humidities were 73.6 and 45.3 per cent, rainfall and sunshine were 0.70 mm and 66.10 hours/week, respectively. The flea beetle population gradually increased and reached its peak level of 1.75±0.06 flea beetle per three leaves per plant during 2nd week of August 2020 (32nd SMW) when the maximum and minimum temperatures were 33.9 and 17.8 ^{0}C, morning and evening relative humidities were 82.1 and 59.6 per cent, rainfall and sunshine were 0.40 mm and 59.00 hours/week, respectively. There after a declined trend was observed and population of flea beetle per three leaves per plant gradually decreased and reached 0.24±0.04 flea beetle per three leaves per plant during 1st week of October 2020 (40th SMW) when the maximum and minimum temperatures were 27.9 and 4.5 ^{0}C, morning and evening relative humidities were 80.1 and 36.0 per cent, rainfall and sunshine were 0.00 mm and 59.20 hours/week, respectively. The present findings on the incidence of flea beetles infesting soybean was also strengthened by Kumar and Nath (2003) who reported that insects infested pulses during the vegetative and reproductive stage of the crop. Our findings are also in line with Raghuvanshi et al. (2014) who reported the appearance of blue beetle in June and reaching its peak in August. Zuhaib et al (2022) observed incidence of H. armigera on soybean during kharif 2020 commenced from 29th standard meteorological week (SMW) (0.40± 0.10/ 3 leaves/ plant); and this reached its peak of 2.67± 0.17/ 3 leaves/ plant during 33rd SMW. Thereafter it declined to 0.60± 0.13/ 3 leaves/ plant during 40th SMW.

The infestation of flea beetle, *A. hemensis* on soybean commenced from 1st week of July 2020, i.e. 27th Standard meteorological week (SMW) with per cent infestation of 8.00 when the maximum and minimum temperatures were 32.5 and 14.1 ^{0}C, morning and evening relative humidities were 73.6 and 45.3%, rainfall and sunshine were 0.70 mm and 66.10 hours/week, respectively. The per cent infestation gradually increased and reached 40 per cent during 3rd week of August 2020 (33rd SMW) when the maximum and minimum temperatures were 35.0 and 18.1 ^{0}C, morning and evening relative humidities were 81.0 and 56.4%, rainfall and sunshine were 0.70 mm and 64.90 hours/week, respectively. There after a declined trend was observed and per cent infestation gradually decreased and reached 8 per cent during 1st week of October 2020 (40th SMW) when the maximum and minimum temperatures were 27.9 and 4.5 ^{0}C, morning and evening relative humidities were 80.1 and 36.0 per cent, rainfall and sunshine were 0.00 mm and 59.20 hours/week, respectively. Our findings are in line with Yadav et al. (2015) who observed 12.7 to 13.0 per cent infestation of girdle beetle during the month of August. Simillarly Mangang et al. (2017) reported 9.07 per cent infeststion of white spotted flea beetle beetle during the month of August.

The results revealed that the flea beetle, *A. hemensis* population exhibited positive, significant correlation with maximum temperature (r= 0.452), minimum temperature (r=0.874) and rainfall (r= 0.21). Whereas there was positive, significant correlation with minimum temperature (r=0.874) and evening relative humidity (r=0.686) and evening relative humidity (r=0.686). Sunshine was found to be negatively and non-significantly correlated (r = -0.19) with flea beetle population while rainfall was found to be negatively and significantly correlated (r = -0.19) with flea beetle population. The flea beetle, *A. hemensis* population exhibited positive, non-significant correlation with morning relative humidity (r= 0.39). Panwar *et al*. (2020) reported that girdle beetle population showed significantly positive correlation with maximum temperature (r = 0.89) and negative

correlation with rainfall (r = -0.44). Mangang et al. (2017) reported positive correlation of white spotted flea beetle with maximum temperature and evening relative humidity while as negative correlation with sunshine hours which also supported our present findings. The regression analysis revealed that the weather parameters showed significant effect on the population density of flea beetle from the regression equation the r value (0.88) suggests that all the weather parameters jointly contribute 88 percent variation in flea beetle, *A. hemensis* population, indicating higher dependency of population on weather parameters (Figure 1).

CONCLUSION

Flea beetle, *A. hemensis* population commenced from 27th Standard meteorological week (SMW) on soybean, *G. max* with average population as 0.48 ± 0.28 per plant, reaching its peak (1.75 ± 0.06 per plant) in the 32nd SMW after which it started declining and reached to minimum (0.24 ± 0.40 per plant) in 40th SMW. Infestation due to flea beetle started from 27th SMW on *Glycine max* with 8 per cent infestation, reaching its peak (40%) in the 33rd and 34th SMW after which it started declining and reached 8 per cent in 40th SMW. Population of flea beetle showed significant and positive correlation with maximum temperature, minimum temperature and evening relative humidity. It showed non-significant positive correlation with morning relative humidity. The rainfall and sunshine hours showed negative significant and negative non-significant correlations, respectively

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Table 1: Incidence and infestation of flea beetle (*Altica hemensis*) on soybean (*Glycine max* L.) during *Kharif* 2020

SMW	Temperature (□C)		Rainfall	RH (%)		Sunshine	*Incidence	Infestation
	Maximum	Minimum	(mm)	Morning	Evening	(Hours)	/ 3leaves/plant	(%)
27	32.5	14.1	0.7	73.6	45.3	66.1	0.48±0.08	8.00
28	31.9	14.8	0.0	74.6	51.1	67.5	0.83±0.10	16.00
29	31.1	15.1	1.2	80.3	64.0	44.2	1.00±0.10	20.00
30	32.3	15.3	0.4	83.0	55.0	60.7	1.13±0.09	28.00
31	33.0	15.9	1.0	83.1	63.9	58.7	1.33±0.09	28.00
32	33.9	17.8	0.4	82.1	59.6	59.0	1.75±0.06	36.00
33	35.0	18.1	0.7	81.0	56.4	64.9	1.45±0.07	40.00
34	32.0	16.9	1.1	82.9	51.3	48.2	1.32±0.07	40.00
35	24.2	15.7	9.8	90.9	76.0	24.3	1.13±0.05	36.00
36	27.8	15.1	3.3	90.6	63.4	46.0	0.99±0.08	28.00
37	30.4	10.5	0.0	86.7	50.6	63.6	0.77±0.07	20.00
38	31.2	7.5	0.0	82.9	39.7	64.0	0.52±0.04	12.00
39	27.8	7.4	0.0	73.3	45.3	53.8	0.40±0.05	12.00
40	27.9	4.5	0.0	80.1	36.0	59.2	0.24±0.04	8.00

*Each figure is mean of 25 plants
SMW: Standard Meteorological Week

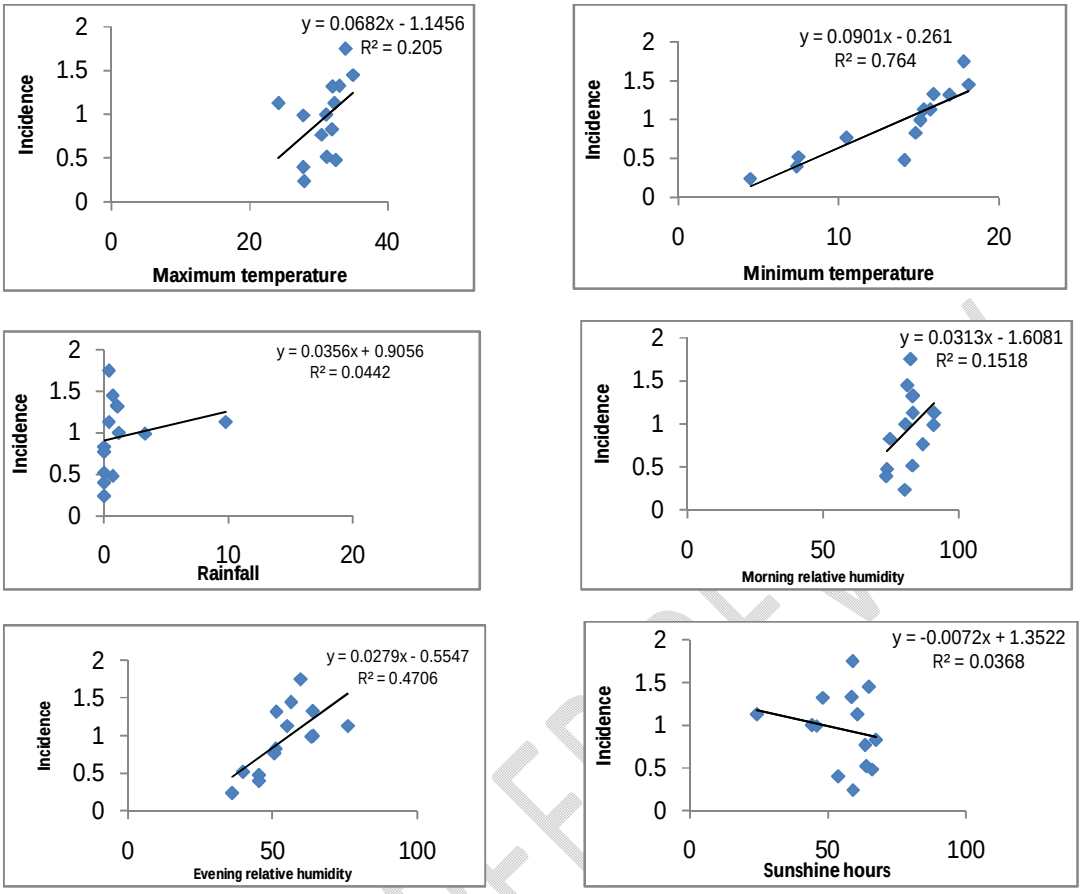

Figure 1. Regression studies of flea beetle (*Altica hemensis*) with weather parameters