

# SEASONAL INCIDENCES OF STEM FLY ON SOYBEAN IN RELATION TO WEATHER PARAMETERS

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**Abstract**— Insect damages the soybean crop right from germination to till harvesting stage. Stem fly *Melanagromyza sojae* (Zehntner) causes 30 to 50 per cent reduction in grain yield. Number of infested plants due to *M. sojae* was recorded on soybean between 27<sup>th</sup> to 38<sup>th</sup> MW (12.70 to 27.2 per cent) and 30<sup>th</sup> to 40<sup>th</sup> MW from (10.90 to 25.70 per cent) during 2010-2011 and 2011-2012, respectively. Simple correlation and regression studies revealed that there was significant effect of different weather parameters on incidence of stem fly of soybean.

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**Keywords**— *Glycine max*, stem fly, *Melanagromyza sojae*, Seasonal incidence, Weather parameters.

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## I. INTRODUCTION

Soybean (*Glycine max*) is a wonder crop of twentieth century. It is an excellent source of protein and oil. It is a two-dimensional crop as it contains about 40 to 42% high quality protein and 20 to 22% oil. Gangrade (1976) reported over 99 insect species attacking soybean crop at Jabalpur. In Maharashtra, particularly in Marathwada, 19 species of insects have been identified attacking this crop (Mundhe, 1980). Gain and Kundu (1986) opined that stemfly *Melanagromyza sojae* was one of the important pests of soybean. The infestation varied with the date of sowing. The studies on population dynamics are envisaged to have insight into the predisposing ecological factors for occurrence of the pest. The climatic factors such as temperature, rainfall and humidity usually act in a density independent manner influencing insect to a greater or lesser extent. Understanding the weather changes over a period of time and adjusting the management practices towards achieving better harvest are challenges to the growth of agricultural sector as a whole. The climate sensitivity of agriculture is uncertain, as there is regional variation in rainfall, temperature, crops and cropping systems, soils and management practices. With changes in temperature and humidity levels, the populations of these insects may expand their geographic range hence investigation was carried out to study the percent infestation of stem fly of soybean in relation to weather parameters.

## II. MATERIAL & METHODS

Non replicated trial was conducted in *kharif* 2010-11 and 2011-12 with plot size of 10m x 10m in the field of Department of Agricultural Entomology, College of Agriculture, Marathwada Krishi Vidyapeeth, Parbhani (Maharashtra). The line sowing of MAUS 71 variety seed was done by maintaining 45cm distance between two rows and 5cm between two plants on 17.06.2010 and 11.07.2011. The experiment was

conducted in pesticide free conditions. The percent infestation of stem fly of soybean was studied in different meteorological weeks and correlated with various environmental factors. Simple correlation and regression coefficient were worked out. The influence of thermo-hygro parameters *viz.*, rainfall, number of rainy days, temperature (maximum and minimum), morning and evening relative humidity (RH-I and RH-II) on soybean pests was assessed and presented. Total number of plants and number of plants succumbed to stemfly infestation per meter row length at 3 places per plot on 7 and 10 days after sowing were recorded and expressed in per cent. As per Gomez and Gomez (1984), the data on per cent infestation were transformed into arc sin transformation values before statistical analysis.

## III. RESULT AND DISCUSSION

*M. sojae* infested soybean throughout the season, its infestation was initially low, reached its peak in the 8<sup>th</sup> to 12<sup>th</sup> MW during 2010-11 and 5<sup>th</sup> to 7<sup>th</sup> MW during 2011-12 after both season planting and declined towards the end of the season. Number of infested plants due to *M. sojae* was recorded on soybean between 27<sup>th</sup> to 38<sup>th</sup> MW (12.70 to 27.2 per cent) and 30<sup>th</sup> to 40<sup>th</sup> MW from (10.90 to 25.70 per cent) during 2010-2011 and 2011-2012, respectively. At the maximum level of infestation, rainfall, rainy days, maximum temperature, minimum temperature, before noon relative humidity, afternoon relative humidity were 51.4 and 16.4 mm, 5 days and 1 day, 29.0<sup>o</sup>C and 33.1<sup>o</sup>C, 22.3<sup>o</sup>C and 20.8<sup>o</sup>C, 94 and 84 per cent, 76 and 44 per cent, respectively during 2010-2011 and 2011-2012.

The above findings are confirmation with Adimani (1976) reported stem fly incidence on soybean commenced from third week after sowing and continued upto tenth week. Ali (1981) reported higher infestation of *Melanagromyza* sp. on soybean during *kharif* than rabi season. *M. sojae* infested soybean throughout the season, its infestation was initially

low, reached its peak in the 5<sup>th</sup> to 8<sup>th</sup> weeks after planting and declined towards the end of the season, noticed by Berg *et al.*, (1995). The infestation of stem fly was noticed from last week of August and from middle of September, the damage was above the ETL throughout the season with 31.40 per cent damaged plants in 3<sup>rd</sup> week of October, (Anonymous, 2010).

The data presented in Table 3 during 2010-11 showed that the percent infestation of *M. sojae* was positively and significantly correlated with minimum temperature ( $r=0.584^*$ ). The association of percent infestation of *M. sojae* with rainfall, rainy days, maximum temperature, morning and evening RH was non-significant. The data on correlation coefficient during 2011-12 showed (Table 4) that the correlation of percent infestation of *M. sojae* on soybean with evening relative humidity was positively significant, while it was non-significant with rainfall, rainy days, maximum and minimum temperature, morning RH. The simple regression studies during 2010-11 and 2011-12 for percent infestation of *M. sojae* were worked out along with the regression coefficient 'b' and constant 'a' and simple regression equation were set up. The regression equation during 2010-11 was  $Y = -699.9 + 4.104x$  which indicated that for every unit increase in minimum temperature percent infestation of *M. sojae* was increased by 4.104. During 2011-12, the regression equation was  $Y = -4.627 - 0.035x$  which indicated that for every unit decrease in relative humidity, *M. sojae* population decreased by 0.035. The above findings are in confirmation with Padiwal *et al.*, (2007) reported stemfly, *Melanagromyza sojae* Zehntner throughout the cropping season. The activity of the pest was initiated in the month of

August and reached its peak in the month of September and early October and showed negative correlation with the abiotic factors.

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**Table: 1 Percent plant infestation due to *Melanagromyza sojae* population in relation to weather parameters during kharif 2010-11.**

MW	Period	% plant infestation due to <i>M. sojae</i>	Rainfall (mm)	Rainy days	Maximum temp. (°C)	Minimum temp. (°C)	Morning RH (%)	Evening RH (%)
27	02-08 July	12.70	176.9	5.0	30.1	21.2	85	52
28	09-15 July	14.90	2.2	0.0	32.3	21.3	80	51
29	16-22 July	19.20	3.2	1.0	35.8	21.5	83	50
30	23-29 July	19.90	102.0	5.0	30.1	20.5	97	69
31	30-05 Aug	18.80	51.6	2.0	32.3	21.9	81	61
32	06-12 Aug	21.80	144.5	2.0	33.4	22.6	78	56
33	13-19 Aug	23.00	119.0	6.0	30.6	22.3	90	68
34	20-26 Aug	25.90	27.8	3.0	30.3	22.3	83	66
35	27-02 Sept	26.00	91.4	5.0	29.1	22.1	88	71
36	03-09 Sep	27.20	51.1	5.0	30.9	22.7	91	70
37	10-16 Sep	25.10	54.6	2.0	30.6	23.1	90	68
38	17-23 Sep	25.30	69.5	3.0	30.7	22.7	92	73
39	24-30 Sep	23.30	41.4	3.0	29.0	22.3	94	79
40	01-07 Oct.	23.00	1.4	0.0	31.8	22.3	88	61

**Table: 2 Percent infestation due to *Melanagromyza sojae* in relation to weather parameters during kharif 2011-12**

MW	Period	% plant infestation due to <i>M. sojae</i>	Rainfall (mm)	Rainy days	Maximum temp. ( $^{\circ}$ C)	Minimum temp. ( $^{\circ}$ C)	Morning RH (%)	Evening RH (%)
30	23-29 July	10.90	93.7	4.0	31.8	23.0	93	66
31	30-05 Aug	15.90	65.0	4.0	30.8	23.0	92	63
32	06-12 Aug	10.00	2.8	1.0	31.6	22.9	85	56
33	13-19 Aug	18.80	39.3	4.0	32.1	22.7	89	63
34	20-26 Aug	25.70	61.3	4.0	29.9	21.9	92	80
35	27-02 Sept	21.90	36.7	4.0	29.1	49.0	94	75
36	03-09 Sep	21.40	29.3	2.0	28.8	21.5	91	61
37	10-16 Sep	19.70	50.0	2.0	32.0	22.2	80	66
38	17-23 Sep	20.40	35.0	1.0	32.3	21.4	90	56
39	24-30 Sep	18.80	10.0	1.0	22.4	15.8	62	32
40	01-07 Oct.	20.20	0.0	0.0	0.0	0.0	0	0

**Table 3 Simple correlation and regression of weather parameters with *M sojae* infestation during 2010-11**

Sr. No.	Parameters	Intercept(a)	Slope(b)	'r' values
X <sub>1</sub>	Rainfall	208.3	0.085	0.102
X <sub>2</sub>	Rainy days	177.4	1.145	0.483
X <sub>3</sub>	Maximum temp.	572.3	-1.156	-0.329
X <sub>4</sub>	Minimum temp.	-699.9	4.104	0.584*
X <sub>5</sub>	Morning RH	-4.894	0.029	0.360
X <sub>6</sub>	Evening RH	-0.017	0.032	0.455

\* Significant at 5 % level

N=14

\*\* Significant at 1 % level

**Table 4: Simple correlation and regression of weather parameters with *M sojae* infestation during 2011-12**

Sr. No.	Parameters	Intercept(a)	Slope(b)	'r' values
X <sub>1</sub>	Rainfall	151.8	0.053	0.252
X <sub>2</sub>	Rainy days	140.7	1.280	0.326
X <sub>3</sub>	Maximum temp.	808.0	-2.026	-0.435
X <sub>4</sub>	Minimum temp.	545.2	-1.684	-0.219
X <sub>5</sub>	Morning RH	-1.915	-0.021	0.176
X <sub>6</sub>	Evening RH	-4.627	-0.035	0.674*

\* Significant at 5 % level

N=11

\*\* Significant at 1 % level

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