

# Major insect pests of soybean - studies on population dynamics

## Abstract

The investigation was carried out during *kharif* 2010-2011 and 2011-2012 in order to know the population dynamics of insect pests of soybean. The population of *Gesoniagemma*, *Spodopteralitura*, *elicoverpaarmigera*, *Aproaeremamodicella*, *Obereopsis brevis* and *Melanagromyza sojajae* were ranged from 0-4, 0-2.2, 0-2.4, 0-0.3, 5.20-19.66, and 14.9-27.2 and it was 3.9-20.4, 6.8-26.2, 3.2-16.0, 0-5.5, 2.9-24.7 and 10-25.7 during 2011-12, respectively. In conclusion leaf miner (*A. modicella*), defoliators, stem fly (*M. sojajae*) and girdle beetle (*O. brevis*) were found to be major pests of soybean.

**Keywords:** Soybean, Insect pests, population dynamics, weather factors, semilooper, spodoptera, helicoverpa, leaf miner, stem pests

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## Introduction

The population dynamics of major defoliator and stem pests, infesting soybean in relation to weather parameters were 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. The experiment was conducted in pesticide free conditions. The population dynamics of pests of soybean was studied in different meteorological weeks. The population dynamics of leaf miner (*Aproaeremamodicella* Deventer), stem fly (*Melanagromyza sojajae*, Zehntner), girdle beetle (*Obereopsis Brevis* Swedenbord), and some defoliators was worked out by recording their observations weekly.

## Material and methods

Field experiments were conducted during *kharif* 2010-2011 and 2011-12, in the field of Department of Agricultural Entomology, College of Agriculture, Marathwada Krishi Vidyapeeth, Parbhani (Maharashtra). The line sowing of seed (MAUS-71) was done by maintaining 45cm distance between two rows and 5cm between two plants. The number of defoliating larvae/meter row length (mrl) was recorded at three places on weekly basis and leaf damage due to defoliators was worked out in terms of per cent defoliation. Number of larvae/plant in 10 plants, total number of leaflets and damage leaflets due to leaf miner was recorded and percentage was worked out. Total number of plants and number of plants succumbed to stem fly infestation/mrl at 3 places per plot on 7 and 10 days after sowing were recorded and expressed in per cent. Plant height and length of stem tunneled in 10 plants at physiological maturity was observed and expressed in percentage. One meter row length area was marked at five places and total number of plants and girdled plants by girdle beetle per mrl were recorded.

## Result and discussion

The population of *Gesoniagemma* (0.8 and 7.4/mrl) initiated in 29<sup>th</sup> and 30<sup>th</sup> MW with its peak (4.0 and 20.40 larvae per mrl) in 35<sup>th</sup> and 34<sup>th</sup> MW during 2010-11 and 2011-12, respectively Table 1 & Table 2. At the time of its peak incidence, the weather parameters *viz.*, rainfall, rainy days, maximum temperature, minimum temperature,

before noon relative humidity, afternoon relative humidity were 91.4 and 61.3mm, 5°C and 4.0 days, 30.6 and 29.9°C, 22.7°C and 21.9°C, 92 and 92 per cent, 73 and 80 per cent, respectively. The incidence of semilooper was below ETL throughout the *kharif* season and a maximum of 2.66 larvae/mrl was observed in last week of August. Population of green semi looper was high during *kharif* 2011-2012, the incidence started in 35<sup>th</sup> MW by recording 19.33 larvae/mrl and recorded a peak in next week with 28 larvae/mrl.<sup>1</sup> *Spodopteralitura* (Fabricius) incidence was low (0 to 2.2 larvae/mrl) due to heavy rainfall during 2010-2011 and from 6.80 to 26.2 larvae per mrl during 2011-2012. The highest level of population was observed in 36<sup>th</sup> and 34<sup>th</sup> MW when weather factors *viz.*, rainfall, rainy days, maximum temperature, minimum temperature, before noon relative humidity, afternoon relative humidity were 51.1 and 61.3 mm, 5.0 and 4.0 days, 29.0 and 29.9°C, 22.3°C and 21.9°C, 94 and 92 per cent, 76 and 80 per cent, respectively. More or less similar results were observed by Chechani et al.,<sup>2</sup> who noticed tobacco caterpillar during 34<sup>th</sup> meteorological week (20 to 26 August, 1997). They observed two distinct peaks, the first peak with a mean population of 1.53 larvae/plant in 36<sup>th</sup> meteorological week (3 to 9 September 1997) and the second peak with a mean population of 1.53 larvae/plant during 38<sup>th</sup> meteorological week (17 to 23 September 1997), when average temperature and relative humidity were 26.3°C and 26.65°C and 77 and 77.5 per cent, respectively. The pest population showed a positive correlation with temperature and relative humidity. Sreenivas et al.,<sup>3</sup> also reported peak incidence during 35<sup>th</sup> MW (27<sup>th</sup> August to 2<sup>nd</sup> September, 2002) in case of tobacco caterpillar, supporting the present results. The abundance of *Helicoverpaarmigera* (Hubner) was observed to be 2.40 and 16.0 larvae/mrl on soybean in 34<sup>th</sup> MW during both the seasons, when rainfall, rainy days, maximum temperature, minimum temperature, before noon relative humidity, afternoon relative humidity were 27.8 and 61.3mm, 3.0 and 4 days, 30.4 and 29.9°C, 23.1 and 21.9°C, 90 and 92 per cent, 68 and 80 per cent, respectively. The population of *Aproaeremamodicella* (Devender) was recorded on soybean between 27<sup>th</sup> to 35<sup>th</sup> (0 to 0.3 larvae per plant) and 30<sup>th</sup> to 37<sup>th</sup> meteorological weeks (0 to 5.5 larvae per plant) during 2010-2011 and 2011-2012, respectively. At the maximum level of larval population of *A. modicella*, rainfall, rainy days, maximum temperature, minimum temperature, before noon relative humidity, afternoon relative humidity were 91.4mm and 50mm, 5.0 days and

2.0 days, 30.6°C and 32.0°C, 22.7°C and 22.2°C, 92 per cent and 87 per cent, 73 and 66 per cent during 2010-2011 and 2011-2012, respectively. These results are in line with the results reported by Magar<sup>4</sup> who reported the highest population of *A. modicella* to the extent of 19.8 larvae per quadrat on soybean in 38<sup>th</sup> meteorological week when the maximum temperature, minimum temperature, before noon relative humidity, afternoon relative humidity, rainfall and number of rainy days were 27.85°C, 20.92°C, 77.00 per cent, 88.83 per cent, 40.73mm and 3 days, respectively. Behera et al.,<sup>5</sup> recorded

that the larval activity of leaf-miner started in third week of July and reached its peak during the first week of August, when the mean larval population ranged from 1.0 to 12.3 larvae per five plants. The population of leaf miner maintained from third week of August to third week of September with slight fluctuation of 1.4 to 2.1 larvae per five plants. Bidgire<sup>6</sup> recorded the first appearance of leaf miner (0.60 larvae/plant) in the last week of July (30<sup>th</sup> MW) on groundnut crop during *kharif* 1988.

**Table 1** Population dynamics of insect pests damaging soybean in relation to weather parameters during kharif 2010-11

MW	Period	No. of <i>G. gemma</i> larvae/mrl	No. of <i>S. litura</i> larvae/mrl	No. of <i>H. armigera</i> larvae/mrl	No. of <i>A. modicella</i> larvae/plant	% Infestation due to <i>O. brevis</i>	% Infestation due to <i>M. sojae</i>
27	02-08 July	0	0	0	0	5.2	12.7
28	09-15 July	0	0	0	0	7.9	14.9
29	16-22 July	0.8	0.8	0.2	0.1	10.8	19.2
30	23-29 July	1.4	0.6	0.2	0.3	12.4	19.9
31	30-05 Aug	1.8	0.6	0.4	0	12	18.8
32	06-12 Aug	2	0.2	1	0	15.7	21.8
33	13-19 Aug	0.8	0	1.6	0.2	17.9	23
34	20-26 Aug	1.8	0.2	2.4	0.2	18	25.9
35	27-02 Sept	4	0.8	1.8	0.3	18.2	26
36	03-09 Sep	2.8	2.2	1.2	0.2	18.4	27.2
37	10-16 Sep	2.2	1.8	3.1	0.1	18.6	25.1
38	17-23 Sep	1	0.8	0.1	0.2	19	25.3
39	24-30 Sep	0.8	0.6	0	0.1	19.6	23.3
40	01-07 Oct.	0.2	0.4	0	0.1	19.66	23

mrl, meter row length

**Table 2** Population dynamics of insect pests damaging soybean in relation to weather parameters during kharif 2011-12

MW	Period	No. of <i>G. gemma</i> larvae/mrl	No. of <i>S. litura</i> larvae/mrl	No. of <i>H. armigera</i> larvae/mrl	No. of <i>A. modicella</i> larvae/plant	% Infestation due to <i>O. brevis</i>	% Infestation due to <i>M. sojae</i>
30	23-29 July	7.4	15.9	4.9	0	2.9	10.9
31	30-05 Aug	12.9	11.3	5.7	1.7	8.2	15.9
32	06-12 Aug	5.6	9.9	3.2	1	3.3	10
33	13-19 Aug	7.8	14.9	10.2	4.1	5.9	18.8
34	20-26 Aug	20.4	26.2	16	4.3	15.8	25.7
35	27-02 Sept	17.9	19.8	12.1	3.7	16	21.9
36	03-09 Sep	15	18.8	7.9	4	14.9	21.4
37	10-16 Sep	19.9	20.4	9.9	5.5	20.7	19.7
38	17-23 Sep	10	19.7	10	4.3	20.1	20.4
39	24-30 Sep	8	16.5	5.8	3.3	22.2	18.8
40	01-07 Oct.	3.9	6.8	4.8	2.8	24.7	20.2

mrl, meter row length

The leaf miner population lasted up to second week of September (36<sup>th</sup> MW) and recorded maximum population (1.15 larvae/plant) in the middle of August. Sayyad<sup>7</sup> observed first incidence of leaf miner

(0.33 larvae per plant) in fourth week of July (29<sup>th</sup> MW). The highest population (2.83 larvae per plant) was observed in the third week of August (33<sup>rd</sup> MW). Later on population of leaf miners decreased slowly

and was 0.23 larvae per plant in third week of September (37<sup>th</sup> MW). Number of infested plants due to *Melanagromyza sojiae* (Zehntner) 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> and 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 16.4mm, 5 days and 1 day, 29.0°C and 33.1°C, 22.3°C and 20.8°C, 94 and 84 per cent, 76 and 44 per cent, respectively during 2010-2011 and 2011-2012. Ali<sup>8</sup> reported higher infestation of *Melanagromyza* sp. on soybean during *kharif* than rabi season. Verma et al.,<sup>9</sup> reported the infestation of *M. sojaeonurdbeanto* to an extent of 22 per cent in 3<sup>rd</sup> week of July to 70 per cent in 3<sup>rd</sup> week of August. The infestation of stemfly 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.<sup>1</sup> The maximum population of *Oberea brevis* (Sweden bord) (19.66 per cent and 24.7 per cent) was recorded on soybean in 33<sup>rd</sup> and 40<sup>th</sup> meteorological week during 2010-2011 and 2011-12, respectively, when rainfall, rainy days, maximum temperature, minimum temperature, before noon relative humidity, afternoon relative humidity were 1.4 and 16.4 mm, 0 and 1 days, 32.8°C and 33.1°C, 21.1°C and 20.8°C, 81 and 84 per cent, 48 and 44 per cent, respectively. Earlier results reported by Rai and Patel<sup>10</sup> revealed that *O. brevis* appeared on soybean when maximum temperature, minimum temperature and relative humidity were 27.60°C, 24.70°C and 84.50 per cent, respectively. Incidence of girdle beetle started in 1<sup>st</sup> week of August, increased gradually and reached to peak of 16.43 per cent during last week of October, crossing the ETL. During 2011 incidence of girdle beetle was more. It started in 32<sup>nd</sup> MW (0.83 per cent), increased gradually and reached to peak of 35.92 per cent in 40<sup>th</sup> and 41<sup>st</sup> MW.

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## Conflicts of interest

The authors declared there are no conflicts of interest.

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