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## Seasonal incidence of major insect pests of soybean in girdle region central India

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### Abstract

Soybean [*Glycine max* (L.) Merrill] is a unique oilseed crop with high nutritional value, providing 43 percent protein and 20 percent edible oil. The crop is infested by more than 275 insect pests on different plant parts. Amongst these girdle beetles, *Obereopsis brevis* and stem fly *Melanagromyza sojae* (Zehnt.) are the prominent pests of the soybean crop. During *Kharif* 2017, stem fly *Melanagromyza sojae* (Zehnt.) and girdle beetle, *Obereopsis brevis* (Swed.) were recorded as major stem borers infesting on soybean crop. Observation on infestation of girdle beetle and stem fly were recorded weekly interval from germination to till harvesting of the crop.

Stem fly infested soybean crop throughout the crop season but initially its infestation was low and reached its peak in the last week of September 2017. The infestation of stem fly started in 1<sup>st</sup> week of August, 2017 at 28 DAG with 18 percent plant infestation and 1.35 percent stem tunneling. Plant infestation by the stem fly was continued up to harvest of the crop. Infestation abruptly increased and reached up to 78 percent in the last week of September with highest stem tunneling (48.40%). The stem fly infested almost every plant (90%) in first week of September 2017. The stem tunneling was caused by maggot of stem fly. It entered the stem through the leaf petiole and bored up and down wards. Reddish colour tunnel was observed in all the affected plants. The infestation of girdle beetle started in 2<sup>nd</sup> week of August, when crop was 35 days old with 3.08 percent plant infestation. The infestation caused by the adult of girdle beetle was initially low. However, number of infested plants were slowly increased and reached to 9.20 and 15 percent in 4<sup>th</sup> week of August and last week of September 2017. There was a further decrease in infestation in 2<sup>nd</sup> week of September, having 15.0 percent plant damage. Similar, a decreasing trend in plant infestation continued in the month of September.

**Keywords:** Soybean, *Glycine max* (L.), insect pest, incidence, girdle region

### 1. Introduction

Soybean [*Glycine max* (L.) Merrill] is a cash crop and has occupied an important place in agriculture and oil economy of the country. Soybean has occupied the first rank among oil crops in India since 2005 onwards. The area under soybean cultivation has increased from 8.12 millions hectare to 8.87 million hectare 2006-07 to 2016-17 and production from 7.96 million tonne to 9.46 million tonne, this indication increase of about 9.2% and 18.7% in area and production, respectively. Madhya Pradesh, contributes about 67% area and 56% production in the country and is called as "Soya state" [1, 2]. India, soybean has acquired a third position among the oil consumption after groundnut and mustard. During *Kharif* 2014 in India it was sown in 108.83 lakh hectare with production of 104.371 lakh million tonne and productivity was 959 kg/ha. In Madhya Pradesh during this year it was sown in 55.46 lakh hectare with production of 60.25 lakh million tonne and productivity of 1089 kg/ha. The major soybean producing states are Madhya Pradesh, Maharashtra, Rajasthan, Karnataka, Uttar Pradesh, Andhra Pradesh, Gujarat, Madhya Pradesh and Maharashtra together contribute about 97% to the total area and 96% production of soybean in the country. In Madhya Pradesh, soybean occupies an area of 5.61 million hectare with production of 6.02 million tonne and productivity of 1086 kg/ha [3].

The crop is infested by more than 275 insect pests on different plant parts of soybean throughout its growth stage and about a dozen of them have been reported causing serious damage to soybean from sowing to harvesting [16].

The grub of girdle beetle, *Obereopsis brevis*, (Swed) bores the main stem and branches resulting in stunting plant growth and sometime whole plant succumb to injury.

The stem fly, *Melanagromyza sojae* attacks the soybean throughout the growing season, but

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the most vulnerable period is within 3-4 weeks after germination. The maggot may reduce the grain yield up to 33 percent [18].

To tackle these pests' problems, it is therefore essential to monitor the seasonal abundance of these pests so as to understand the factors involved in its build up and suppression. This knowledge is essential for planning and affective management strategy.

## 2. Materials and Methods

The present studies on, "Seasonal incidence of major insect-pests of soybean in the Gird region at central India.", were conducted during the *Kharif* season 2017-18 in the experimental field of Department of Entomology, College of Agriculture, Gwalior. The experimental area is having uniform topography, gentle slope and adequate drainage.

### 2.1 Location and climate

Gwalior is situated in the Gird zone at the latitude of 26°13' North and longitude 76°14' east with an altitude of 211.52 meters from mean sea level, in Madhya Pradesh. This Region comes under semi-arid sub-tropical climate with extreme weather condition having hot and dry summer and cold winter. Generally monsoon sets in during the last week of June.

Annual rainfall ranges from 700 to 800 mm, most of which falls during last June to the middle of September. In this area winter rains are occasional and uncertain. The maximum temperature goes up to 45°C during summer and minimum as low at 5°C during winter.

As per the package of practices of soybean, variety RVS2001-04 was sown in an area of 100 sq m. with a plot size of 10 m x 10 m.

### 2.2 Observations to be recorded:

#### 2.2.1 Stem fly

Observation on stem fly was recorded on the randomly selected five plants at weekly interval from germination till harvesting of the crop. To record the tunneling caused by the maggot of stem fly the plants were uprooted and open vertically. Plant height and tunnel length was also being measured for calculating percent tunneling.

#### 2.2.2 Girdle beetle

To record the seasonal incidence of girdle beetle, observations on selected five plants was recorded at weekly interval

starting from the initiation of infestation till harvest of the crop. The pest's incidence was recorded by counting healthy and damaged plant by girdle beetle and the data would be calculated in percentage.

## 3. Results and Discussion

The present investigations were carried out to find out the seasonal incidence of insect pest of soybean and efficacy of insecticides against major insect pests of soybean. The obtained results are presented here.

During *kharif*, 2017, stem fly *Melanagromyza sojae* (Zehnt.) and girdle beetle, *Obereopsis brevis* (Swed.) were recorded as major stem borers infesting on soybean crop. Observation on infestation of girdle beetle and stem fly were recorded seven days after germination to till harvest of the crop. The distribution of these pests in relation to crop phenology is being described below

### 3.1 Stem fly, *Melanagromyza sojae* (Zehntner)

The studies on the seasonal incidence on soybean were conducted during *Kharif* –2017. Stem fly infested soybean crop throughout the crop season but initially it's infestation was low and reached its peak in the last week of September, 2017. The infestation of stem fly started in 1st week of August, 2017 at 28 DAG with 18 percent plant infestation and 1.35 percent stem tunneling. Plant infestation by the stem fly was continued up to harvest of the crop. Infestation abruptly increased and reached up to 78 percent in the last week of September with highest stem tunneling (48.40%). The fly infested almost every plant in the fourth week of September, 2017.

### 3.2 Girdle beetle, *Obereopsis brevis* (Swed.)

The infestation of girdle beetle started in 2<sup>nd</sup> week of August, when crop was 35 days old with 3.08 percent plant infestation. The infestation caused by the adult of girdle beetle was initially low. However, number of infested plants were slowly increased and reached to 9.20 and 15 percent in 2<sup>th</sup> week of August and 2<sup>nd</sup> week of September, 2017. There was a further decrease in infestation in 3<sup>rd</sup> week of September, having 11.50 percent plant damage. Similar, decreasing trend in plant infestation continued in month of September.

Plant infestation was also observed during 1<sup>st</sup> fortnight of October, but it was at negligible level. Thus the pest remained active for about two and half month, that is up to before harvest of the crop.

**Table 1:** Seasonal incidence of stem borer in soybean during *Kharif*, 2017-18

Date of Observations (Weekly)	Stem fly incidence		Girdle beetle incidence% Plant (inf./ mrl)
	% Plant (inf./mrl)	(%) Stem tunneling	
11.07.2017	0.00	0.00	0.00
18.07.2017	0.00	0.00	0.00
25.07.2017	00.00	0.00	0.00
01.08.2017	18.00	1.35	0.00
15. 08.2017	8.00	1.46	3.08
22.08.2017	38.00	6.17	4.29
29.09.2017	18.00	4.10	9.20
06.09.2017	48.00	5.10	15.00
13.09.2017	68.00	21.40	11.50
20.09.2017	78.00	32.50	8.23
27.09.2017	78.00	48.40	5.56
04.10.2017			0.23

During *Kharif*, 2017, Stem fly *Melanagromyza sojae* (Zehnt.) and girdle beetle, *Obereopsis brevis* (Swed.) were recorded as

major stem borer on soybean crop. Earlier [19] reported four species of girdle beetle on soybean crop at different states of

India. Whereas 16 - 18 insects and 1 mite, infesting soybean crop at different crop growth stage were recorded at Gwalior in different years by the workers. Out of these insects, Stem fly, *Melanagromyza sojae* (Zehntner) was recorded as major stem borer of soybean [4].

The infestation of stem fly started in 1<sup>st</sup> week of August, 2017 at 28 DAG with 18 percent plant infestation and 1.35 percent stem tunneling. Plant infestation by the stem fly was continued up to harvest of the crop. Plant infestation abruptly increased and reached up to 78 percent in the last week of September with highest stem tunneling (48.40%). The fly infested almost every plant in fourth week of September, 2017. The stem tunneling was caused by maggot of stem fly. Incidence of stem fly was adversely affected by high temperature, low relative humidity and low rainfall and weather variables were positively correlated with percentage stem tunneling [10].

Stem fly, *Melanagromyza sojae* infested 93.5 percent of soybean plants and the maggots tunneled 2.6 to 90.00 percent of stem length at time of harvest [18]. Similarly, in present investigation pest infested 80% of plant and maggot tunneled 48.50 percent tunnel at last week of September 2016.

*Melanagromyza sojae* caused extensive tunneling in the pith region of soybean stem culmination to death of seedling [21]. Infestation of stem fly was initially low and reached its peak during 5 to 8 Weeks after planting [5]. Soybean was attacked the seedling borer, *Melanagromyza sojae* Zenther as key pest during *kharif* [14].

Stem fly infestation started in 2<sup>nd</sup> week of August and continued upto second week of September and reached to 100 percent plants infestation with 23.3 percent stem tunneling [4]. Similar, observation was also noted during present investigation.

Earlier workers [17, 11, 6, 19, 20] also reported that the girdle beetle infested the crop throughout the rainy season in different parts of the country, particularly Uttar Pradesh, Madhya Pradesh, Himachal Pradesh and Western Himalayan Region. Girdle beetle damaged the soybean plants to the extent of 13.7 to 42.2 percent from August to October [17], whereas, incidence of the cerambycid *Obereopsis brevis* in soybean variety JS 72-44. First appeared on 1<sup>st</sup> week of August 1988 and activity continued until October [15]. It is concluded that the low infestation level (0.86-12.09%) during the period of activity may be due to the late planting of the soybean crop and low rainfall. Girdle beetle as a major pest of soybean and infestation was recorded in 0.7% plants when the crop was 21 days old and it gradually increased and reached up to 4.8% in the third week of September [4].

Girdle beetle, as a major insect pest of soybean in Marathwada. Maximum damage was recorded in Hingoli (10.50%) followed by Nanded (9.33%) and Beed (8.30%) and these districts are identified as hot spots [7].

Girdle beetle, (*Obereopsis brevis* (Swed) is a predominant borer. Adult female makes girdles in the petiole, petiole and even sometime on main stem of plants. It has been observed that girdle beetle causes higher reduction in yield in early crop stage and most vulnerable crop stage indentified in between 30 to 55 days, when girdler confined to petiole [8, 9].

Infection of girdle beetle on *kharif* season crop particularly black gram, cowpea, clusterbean, pigeonpea, Indian bean and soybean. Studies indicated that no incidence was observed on black gram, whereas maximum incidence and stem tunnelling were recorded in soybean [12]. Highest frequency of girdle beetle infestation on stem (24%), followed by petiole (21%),

petiole (13%), and branch (10%) during 2<sup>nd</sup> week of September. Similar trend of distribution of infestation continued up to 3<sup>rd</sup> week of September. This may be attributed to succulence of branches in comparison to stem [13].

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