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#### Sable GS

Department of Agricultural  
Entomology, Vasant Rao Naik  
Marathwada Krishi Vidyapeeth,  
Parbhani, Maharashtra, India

#### More DG

Department of Agricultural  
Entomology, Vasant Rao Naik  
Marathwada Krishi Vidyapeeth,  
Parbhani, Maharashtra, India

#### Munemanik RM

Department of Agricultural  
Entomology, Vasant Rao Naik  
Marathwada Krishi Vidyapeeth,  
Parbhani, Maharashtra, India

#### Wahekar GR

Department of Agricultural  
Entomology, Vasant Rao Naik  
Marathwada Krishi Vidyapeeth,  
Parbhani, Maharashtra, India

#### Correspondence

##### Sable GS

Department of Agricultural  
Entomology, Vasant Rao Naik  
Marathwada Krishi Vidyapeeth,  
Parbhani, Maharashtra, India

## Seasonal incidence of pests of soybean (*Glycine max* (L.) Merrill) influenced by different sowing dates

Sable GS, More DG, Munemanik RM and Wahekar GR

#### Abstract

Field experiment was conducted at the Farm of All India Coordinated Research Project on Soybean, Vasant Rao Naik Marathwada Krishi Vidyapeeth, Parbhani during *kharif*-2015 to study pest incidence of soybean as influenced by sowing dates, to work out the correlation of pest incidence with weather parameters and to study the effect of sowing dates and pest incidence on soybean yield.

During the season of *kharif* 2015, girdle beetle and stemfly were observed as major pests. Incidence of defoliators viz., *H. armigera*, *S. litura* and semiloopers was found moderate to low while low to high incidence of jassids and whitefly was observed. Population of grey weevil, *Myloccerus* sp. was also observed. Among natural enemies, spiders were found predominantly. Girdle beetle infestation on the crop sown on 15<sup>th</sup> and 30<sup>th</sup> June showed positive significant correlation with rainfall and morning relative humidity whereas, it showed significant negative correlation with minimum temperature, bright sunshine hours and wind velocity while the crop sown on 15<sup>th</sup> July, 30<sup>th</sup> July and 15<sup>th</sup> August showed significant positive correlation with maximum temperature while minimum temperature has negative significant correlation.

Semiloopers showed negative significant correlation with evaporation when the crop was sown on 15<sup>th</sup> June. It also showed positive correlation with minimum temperature when the crop was sown on 15<sup>th</sup> July and 15<sup>th</sup> August.

The population of jassids on the soybean crop sown on 15<sup>th</sup> June showed significant positive correlation with morning and evening RH while with maximum and minimum temperature, evaporation and bright sunshine hours, it showed significant negative correlation. Jassid population showed significant positive correlation with evaporation when the crop was sown on 30<sup>th</sup> July. Whitefly also showed significant positive correlation with morning RH while it showed negative significant correlation with maximum temperature and bright sunshine hours.

**Keywords:** Soybean, major pests, seasonal incidence, weather factors

#### Introduction

Soybean (*Glycine max* (L.) Merrill) belongs to family Leguminaceae. Soybean is reported to be originated in Eastern Asia and was used as food long before the existence of written record. The first known record however, indicates that soybean emerged as domesticated crop around the eleventh century in China (Nagata, 1960) and was introduced in India in 1870-80 (Andole, 1984). Soybean is important from nutritional point of view. Soybean contains 43.2 percent protein, 19.5 percent fat and 20.9 percent carbohydrate. It is also rich in soluble phosphate and sulphate (Bower, 1939). It also contains a good amount of potassium and vitamin E. Soybean protein is mainly rich in amino acids like leucine, methionine and threonine.

During the late sixties and early seventies, the soybean crop was considered to be safest crop as regard the insect pest attack. Now the situation is changed drastically and as many as 275 insect species have been recorded attacking soybean crop in India (Singh and Singh, 1989a). Whereas in Maharashtra, particularly in Marathwada region 19 insect species have been identified attacking this crop (Munde, 1982). Among the pest species, leaf miner, girdle beetle, stemfly, semilooper, sucking pests (jassid, whitefly, aphid) and defoliators are the most important.

Every year insect- pests cause 20 to 25 percent average losses in soybean yield (Sharma and Shukla, 1997). Insect feeds on soybean crop right from germination to harvest stage. Singh and Singh (1990) reported the incidence and damage by *M. sojae* on soybean and recorded 30.26 percent yield loss. Kundu *et al.*, (1995) reported 18.6 percent to 40.1 percent yield losses in soybean due to stemfly (*Melanagromyza sojae*). In India, stemfly infestation is as high as 85-90 percent. Ansari and Sharma (2000) observed 19.5 percent to 30.72 percent girdle beetle

infestation while Shetgar and Thombre (1984) recorded 100 percent damage to plant population and 75 percent damage to leaflets.

### Materials and methods

Field experiment was conducted at the farm of All India Coordinated Research Project on Soybean, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani (Maharashtra), during *kharif* 2015 to study the seasonal incidence of insect pests of soybean influenced by different sowing dates. The experiment was laid out with five dates of sowings and MAUS 162 varieties in factorial RBD. Crop was sown during 15<sup>th</sup> June, 30<sup>th</sup> June, 15<sup>th</sup> July, 30<sup>th</sup> July and 15<sup>th</sup> August. Line sowing of seed was done by keeping 45 cm distance between two rows and 5 cm between two plants.

### Method of recording observations

#### Defoliators

- Number of larvae (spp. wise)/MRL (meter row length)
- Observations were recorded at three places and mean was recorded in per meter

**Girdle beetle:** One meter rows were marked at three (03) places and number of total plants and girdled plants were recorded. From this, percent plants infested by girdle beetle were worked out.

#### Stemfly

- Seedling mortality: Total number of plants and number of plants succumbed to stemfly infestation/MRL at 3 places per plot on 7-10 DAG were recorded. Mean of percent seedling mortality was worked out.
- Stem tunneling: At physiological maturity, plant height and stem tunneled in 10 plants/plot were measured and percent stem tunneling was worked out.

**Sucking pests (whitefly and jassids):** No. of insects (nymphs and adults) on 3 leaves / plant (upper, middle and lower Leaf) in ten randomly selected plants were recorded and mean was worked out.

### Results and Discussion

#### Pest incidence on soybean crop sown on 15<sup>th</sup> June 2015

Infestation of girdle beetle *O. brevis* commenced from about 20 days after germination and recorded 1.71 percent infested plants during 28<sup>th</sup> Meteorological Week (hereafter MW). Thereafter the girdle beetle infestation increased gradually and reached to 9.70 percent in 31<sup>st</sup> MW (30 July to 5 August). Among the different species of semilooper, only *Gesonia gema* was found damaging the soybean crop during the season and it never crossed the economic threshold level of 3 larvae/MRL in an entire season. The incidence of *G. gema* started in 27<sup>th</sup> MW (2-8 July) by recording 0.33 larvae/ MRL during 27<sup>th</sup> MW. Thereafter, the population increased very slowly due to very high temperature during June and July and recorded a peak of 1.17 larvae/ MRL during 32<sup>nd</sup> MW (6-12 August). During the season *kharif* 2015, tobacco leaf eating caterpillar was observed only as minor pest and a highest of only 0.42 larvae/MRL were observed during 32<sup>nd</sup> MW (6-12 August).

The incidence of jassid was noticed from. 28<sup>th</sup> MW (09-15 July) by recording 0.28 jassids/3leaves/ plant and showed a increasing trend as the crop stage advances up to maturity of the crop due to rise in temperature in the month of July and

August. A peak of 2.25 jassids/3leaves/plant were observed in 34<sup>th</sup> MW (20-26 August). The incidence of whiteflies was noticed from. 28<sup>th</sup> MW (9-15 July) by recording 0.45 whiteflies/3leaves/plant and showed increasing trend in population up to the harvest. It reached to a peak of 3.40 whiteflies/3 leaves/plant during 33<sup>rd</sup> MW (13-19 August)

#### Pest incidence on soybean crop sown on 30<sup>th</sup> June 2015

Infestation of girdle beetle *O. brevis* commenced from about 25 days after germination by recording 1.86 percent infested plants during 31<sup>st</sup> MW. Overall the incidence of semilooper, *G. gema* was observed very low. The larvae first noticed in 30<sup>th</sup> MW (23-29 July) (about one month after germination of the crop) and recorded 0.17 larvae/ MRL during 30<sup>th</sup> MW. Very low or negligible population of tobacco leaf eating caterpillar, *S. litura* was observed throughout the season of *kharif* 2015. Though its first appearance was noted in 29<sup>th</sup> MW (16 to 22 July) with 0.08 larvae/MRL, it was not observed in next three weeks. In 33<sup>rd</sup> MW (13-19 August) it recorded 0.25 larvae/MRL and in the last week of August it reported the seasons highest of 0.58 larvae/MRL.

Jassids were present in the field right from seven days after germination up to harvest and their population ranged in between 0.35 to 1.90 jassids/3 leaves/plant. The incidence was first observed during 28<sup>th</sup> MW(9-15 July) by recording 0.35 jassids /3 leaves/plant), thereafter their population increased gradually up to mid August and reached to a peak of 1.90 jassids /3 leaves/plant during 33<sup>rd</sup> MW (13-19 August). The population showed a gradual decreasing trend in population up to harvest and in 38<sup>th</sup> MW (17-23 September) it recorded 0.38 jassids/3 leaves/plant.

The whiteflies were observed throughout the season on soybean crop sown at 30<sup>th</sup> June 2015. It population varied in between 0.98 to 3.55 whitflies/3 leaves/plant. The incidence was first observed during 28<sup>th</sup> MW i.e. about seven days after germination of the crop by recording 0.98 whiteflies/3 leaves/plant.

#### Pest incidence on soybean crop sown on 15<sup>th</sup> July 2015

Infestation of girdle beetle *O. brevis* commenced from about 15-20 days after germination of the soybean crop sown on 15<sup>th</sup> July 2015 and recorded 0.44 percent infested plants during 32<sup>th</sup> MW (6-12 August). In next three weeks the infestation increased steadily and reached to 9.05 percent.

The incidence of *G. gema* started at 20 days after germination and recorded 0.42 larvae/MRL during 32<sup>th</sup> MW (6-12 August). In next two weeks the population reached to a peak of 0.92 larvae/MRL during 34<sup>th</sup> MW (20-26 August)

Larvae of tobacco leaf eating caterpillar were observed in only two observation weeks i.e. 35<sup>th</sup> MW (27 August-2 September) and 36<sup>th</sup> MW (3-9 September) where it recorded only 0.25 and 0.42 larvae/MRL, respectively.

Jassid incidence was observed throughout the crop season and the population ranged in between 0.03 to 1.58. First incidence of jassid was noticed in 31<sup>st</sup> MW (30 July-05 Aug) by recording 0.05 jassids/ 3 leaves/plant.

Whiteflies were observed from seven days after germination up to the harvest of the crop. First incidence was noticed in 31<sup>st</sup> MW (30 July-05 August) where it reported 0.13 whiteflies/ 3leaves/ plant

#### Pest incidence on soybean crop sown on 30<sup>th</sup> July 2015

Infestation of girdle beetle *O. brevis* commenced from 34<sup>th</sup> MW (20-26 August) and recorded 0.76 percent infested

plants. In next week the infestation reached to 4.76 percent. The incidence of *G. gema* started at 20 days after germination and recorded 0.08 larvae/ MRL during 35<sup>th</sup> MW (27 August-02 September). The population showed increasing trend thereafter up to 38<sup>th</sup> MW (17-23 September). Very negligible population of tobacco leaf eating caterpillar was observed throughout the season on the soybean crop sown on 30 July 2015. Its first appearance was noted in 37<sup>th</sup> MW (10-16 September) when 0.08 larvae/MRL were reported. Peak population of 0.17 larvae/MRL was noted in 39<sup>th</sup> MW (24-30 September). The overall jassids population ranged in between 0.28 to 0.93 jassids/3 leaves/plant. Though the population was observed throughout the season, the population observed was very low and it remained below 1.0 jassids/ 3leaves/plant. Peak population of 0.93 jassid /3leaves/plant was noted during 35<sup>th</sup> MW (27 August-2 September).

The incidence of whiteflies was noticed from. 34<sup>th</sup> MW (20-26 August) up to harvesting of the crop i.e. 43<sup>rd</sup> MW (22-28 October). The incidence was first observed during 34<sup>th</sup> MW (20-26 August) by recording 0.63 whiteflies/3leaves/plant and reached to a peak of 1.78 whiteflies/3leaves/plant during 37<sup>th</sup> MW (10-16 September)

### **Pest incidence on soybean crop sown on 15<sup>th</sup> August 2015**

Infestation of girdle beetle *O. brevis* commenced from 36<sup>th</sup> MW (3-9 September) by recording 1.52 percent infested plants. In next week the infestation reached to 7.90 percent. Thereafter, the infestation increased gradually up to the end of the crop. The girdle beetle infestation crossed the economic threshold level (15% infested plants) during 41<sup>st</sup> MW (8-14 October) by recording 15.12 percent infestation.

Semilooper incidence was noticed from last week of August up to first week of October. The incidence of *G. gema* observed just seven days after germination of the soybean crop sown on 15<sup>th</sup> August 2015 and recorded 0.25 larvae/ MRL during 35<sup>th</sup> MW (27 August-2 September). The peak of 0.33 larvae/ MRL was recorded during 40<sup>th</sup> MW (1-7 October) negligible population of tobacco leaf eating caterpillar *S. litura* was observed on the crop. The larvae were recorded only in two weeks i.e. 41<sup>st</sup> and 42<sup>nd</sup> MW and their population observed was only 0.08 and 0.17 larvae/MRL, respectively.

Jassids were also observed throughout the season. Highest population of 0.90 jassids/3 leaves/plant was observed in 37<sup>th</sup> MW (10-16 September). With slight fluctuations in the number the jassids population remained at same level up to the end of the crop. Same trend as that of jassids was observed with respect to whitefly population and it is seen damaging the crop throughout the season. Also, its infestation started just seven days after germination of the crop by recording 0.9 whiteflies/ 3leaves/ plant and with slight changes in number the population was seen up to the harvest of the crop with a peak of 1.03 whiteflies/3 leaves/plant during 39<sup>th</sup> MW (24-30 September)

### **Comparison of incidence of major pests of soybean sown on different sowing dates**

#### **1. Girdle beetle**

Girdle beetle was the major pest observed throughout the *kharif* 2015 season causing damage to the crop. Joshi (1998) also mentioned the damaging nature of girdle beetle. When the girdle beetle infestation observed on the soybean crop sown at different dates at the interval of fifteen days starting from 15<sup>th</sup> June to 15<sup>th</sup> August is compared, it is observed that

when the crop was sown on first two sowing dates i.e. 15<sup>th</sup> and 30<sup>th</sup> June, more than 50% plants were infested by the girdle beetle. Even though the girdle beetle infestation was more on the crop sown on 15<sup>th</sup> and 30<sup>th</sup> June. This might be due to the fact that Parbhani has become hot spot for girdle beetle and the hibernating grubs of the last season come out of the resting stage and completes the pupal stage and adult emergence took place as soon as about 125 mm rains were received in the month of June. The emerged adults continue to damage the crop sown on these two dates. However, the dry spell occurred in the month of July restrict their infestation to some extent, due to which comparatively less infestation was observed on the crop sown on 15<sup>th</sup> July, 30<sup>th</sup> July and 15<sup>th</sup> August. Raj and Patel (1990) concluded his study on girdle beetle conducted during 1988 with the remarks that the low level (0.86 to 12.09%) of girdle beetle infestation during the period of activity might be due to late planting of the soybean crop and low rainfall, supporting the findings of present investigation.

The results corroborate the findings of Chechani *et al.*, (1999) who observed girdle beetle infestation after 30 days of sowing which continued up to 75 days and that of Jena and Kulia (1997) who reported girdle beetle activity from 35 days after sowing and continued up to 80 days after sowing. Findings of present investigation are on line with the findings of Yeotikar *et al.*, (2015) who reported that the girdle beetle, *Obereopsis brevis* infestation started in 30<sup>th</sup> MW (1.36%) and reached to 61.22% at harvest. Kundu and Trimohan (1986) noticed high incidence of 24.87 percent in crop sown on July 1, 1985 which was reduced to 3.29 percent in crop on August 1, 1985, supporting the findings of present investigation were also July sown crop recorded more girdle beetle incidence than the August sown crop.

#### **2. Semilooper, *G. gema***

Overall, the population of semilooper observed was very low and it never crossed the economic threshold level of 3 larvae/MRL. But, when the population observed on the soybean crop sown on different dates was compared, it is noticed that for first three sowing dates i.e. 15<sup>th</sup> June, 30<sup>th</sup> June and 15<sup>th</sup> July, more or less same semilooper population was observed but the peak population observed was towards decreasing trend i.e. 1.17, 1.0 and 0.92 larvae/MRL, in 32<sup>nd</sup> (6-12 August), 33<sup>rd</sup> (13-19 August) and 34<sup>th</sup> MW (20-26 August), respectively. Singh and Singh (1987) reported highest population of green semilooper on 1<sup>st</sup> September with 14.67 larvae/10 plants. However, in the present investigation, highest semilooper population was observed in the month of August. Also in present study, the semiloopers were observed damaging the crop for comparatively less period i.e. for crop sown on 15<sup>th</sup> June, the larvae were observed on crop for eight (08) observation weeks while they are found in six (06) observation weeks when the crop was sown on 30<sup>th</sup> July and 15<sup>th</sup> August.

#### **3. Jassids and whitefly**

Jassid and whiteflies were seen on the soybean crop right from 28<sup>th</sup> MW (9-15 July) to 45<sup>th</sup> MW (5-11 November). Chechani and Joshi (2000) carried out investigation on the incidence of foliage pests of soybean and revealed that jassids (*Amrasca spp*) and whitefly were present in soybean throughout the season supporting the findings of present study. When jassids and whitefly population observed on soybean crop sown at different sowing dates is compared, it is

found that more population of jassids and whiteflies was observed on the crop sown on 15<sup>th</sup> and 30<sup>th</sup> June (jassid's peak of 2.25 and 1.90/3 leaves/ plant and whitefly's peak of 3.40 and 3.55/3 leaves/ plant). As the sowing date advances, jassid and whitefly population showed decreasing trend. During the season, about 125 mm rains were received in the month of June which helped the crop growth. However, the dry spell in July hampered the growth of the crop sown from 15<sup>th</sup> July onwards. The succulent plants of first two sowing date might be the reason of more jassids and whitefly population. Bhattacharjee (1986) reported that whitefly, *B. tabaci* infestation in soybean took place right from unifoliate stage of the plant and continued as long as they remain green. The findings of present study, where whitefly incidence was noticed just seven days after germination of the crop, are in conformity with above findings. Bhattacharjee (1986) also mentioned that the whitefly thrived well where both temperature and humidity were quite high and rainfall retarded its activities as its wings get chocked with rain and made it inactive. The increased temperature and dry spells experienced during the present study also helped for multiplication of both the sucking pests.

#### 4. Stemfly, *Melanagromyza sojae* (Zentener)

The data revealed that no seedling mortality due to stemfly *M. sojae* was observed at 7-10 days after germination in any of the sowing date from 15<sup>th</sup> June to 15<sup>th</sup> August indicating that the stemfly infestation is starting at later stage of the crop. This finding was in collaboration with the finding of Chechani *et al.*, (2002) who reported that the infestation of stemfly commenced 30 days after sowing, supporting the present findings. However, differences were observed with respect to the stem tunneled by stemfly which is recorded at physiological maturity.

The crop sown on 15<sup>th</sup> June 2015 recorded a stem tunneling of 16.83 percent. The tunneling percentage goes on increasing as the sowing date advances up to mid July and in the crop sown on 30<sup>th</sup> June it reported 18.20 percent stem tunneling while a highest of 22.42 percent stem tunneling was recorded in the crop sown on 15<sup>th</sup> July.

#### References

1. Andole VC. Soybean it's cultivation, uses and values in dietetics, 1984, 29
2. Bhattacharjee HS. Management of major pests in India, Pesticides. 1986; 20(5):19.
3. Bower JB. Soybean: its value in dietetics cultivation and uses, 1939, 159.
4. Chechani VK, Joshi FL, Meena VR, Sharma US. Assessment of losses caused by insect pests of soybean (*Glycine max* (L) Merrill). Indian. J Appl. Ento. 1999; 13:65-69.
5. Chechani VK, Joshi FL, Sharma US, Ishar AK. Seasonal incidence and control of girdle beetle *O. brevis* Swed. (Coleoptera: Lamiidae) on soybean. Indian J Appl. Ento. 2000; 14:63-64.
6. Chechani VK, Joshi FL, Sharma US, Ameta OP. Incidence and chemical control of stem fly *Melanagromyza sojae* (Zehntner) on soybean. Indian J Appl. Ent. 2002; 14:9-12.
7. Jena BC, Kuila B. Seasonal incidence of leaf miner *Approaerema modicella* in groundnut and its chemical control. Indian J Ent. 1997; 59(1):27-33.
8. Mundhe DR. Insect pest complex on soybean (*Glycine*

- max*) in Marathwada region J Maharashtra Agric. Univ. 1982; 5(3):259-261.
9. Nagata T. Sci. Respts. Ser. Agr. Hyogo. Univ. Agric. 1960; 4:101-104.
10. Raj RK, Patel RK. Girdle beetle, *O. brevis* its incidence in *kharif* soybean Orissa J Agril. Res. 1990; 3(2):163-195.
11. Sharma AN, Shukla AK. Effect of insect and disease control of soybean (*Glycine max* (L) Merrill) yield in Madhya Pradesh. J Oilseed Res. 1997; 14:324-326.
12. Shetgar SS, Thombre UT. Occurrence of natural enemies of soybean leaf miner and relative susceptibility of some soybean leaf miner and relative susceptibility of some soybean varieties to its attack. J Maharashtra Agric. Univ. 1984; 9(2):218-219.
13. Singh OP, Singh KJ. Insect pest of soybean and their management. Indian Farming. 1990; 39(10):9-14.
14. Sharma AN, Shukla AK. Effect of insect and disease control of soybean (*Glycine max* (L) Merrill) yield in Madhya Pradesh. J Oilseed Res. 1997; 14:324-326.
15. Shetgar SS, Thombre UT. Occurrence of natural enemies of soybean leaf miner and relative susceptibility of some soybean leaf miner and relative susceptibility of some soybean varieties to its attack. J Maharashtra Agric. Univ. 1984; 9(2):218-219.
16. Yeotikar SG, More DG, Gaikwad BB, Chavan RD. Seasonal incidence of major insect pests of soybean. J ent. Res. 2015; 39(4):341-346.
17. Yeotikar SG, More DG, Gaikwad BB, Chavan RD. Correlation and regression between weather parameters and major insect pests of soybean. J Ent. Res. 2015; 39(3):227-230.