

Full Length Research Paper

Seasonal incidence of major insect- pests and their biocontrol agents of soybean crop (*Glycine max* L. Merrill)

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The major insect-pests observed attacking soybean variety JS 335 were girdle beetle, *Obereopsis brevis*; tobacco caterpillar, *Spodoptera litura*; green semilooper, *Chrysodeixis acuta*; whitefly, *Bemisia tabaci* and jassids, *Empoasca kerri*. The peak activity of girdle beetle (1.0 damaged plant per meter row) was observed during first week of October. Whereas the peak activity of caterpillar pests that is, *S. litura* (2.5 larvae per meter row) and *C. acuta* (0.7 larvae per meter row) was recorded during second fortnight of August and that of sucking pests that is, *B. tabaci* (3.2 whiteflies per plant) and *E. kerri* (3.4 jassids per plant) was recorded during last week of August and Second week of August, respectively. The biocontrol agent's three species of lady bird beetle, *Menochilus sexmaculata*, *Coccinella septumpunctata* and *Coccinella transversalis* and orb weaver spider, *Neoscona* sp. were found predated mainly upon whiteflies and jassids. Whereas, lynx spider, *Oxyopes* sp. and a predatory pentatomid bug, *Eocanthecona furcellata* was noticed sucking the body sap of lepidopterous larvae. The peak activity of lady bird beetle in second week of August and September with 0.4 grub and adult per plant, whereas the predatory pentatomid bug and spider is both last week of August with 1.1 and 1.2 bugs and spider per plant respectively.

Key words: Girdle beetle, caterpillar, sucking pests and soybean.

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 that over 99 insect species attacking soybean crop at Jabalpur. Vieira et al. (2011) observed that when *Bemisia tabaci* occurs in large populations, the plants weakened by the extraction of large amounts of sap.

Researchers in many parts of India have confirmed that seed yield and seed quality are being adversely affected by major insect pests viz. girdle beetle, tobacco caterpillar, green semilooper, jassids and white fly. Sum common insect pest complex infesting soybean crops are Green Semilooper, Tobacco Caterpillar, White fly, Girdle beetle etc. reported by Kumawat (2007). The predatory pentatomid bug *Eocanthecona furcellata* (Wolff) is

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Table 1. Insect-pests fauna observed on soybean variety JS-335 during *kharif*, 2012.

S/No.	Common Name	Systemic position	Damaging stage	Range of incidence	Status of peak activity
1	Girdle beetle	<i>Obereopsis brevis</i> (Coleoptera : Cerambycidae)	Grub	0.3 to 1.0 (Grubs / m. row)	First week of October
2	Tobacco caterpillar	<i>Spodoptera litura</i> (Lepidoptera : Noctuidae)	Caterpillar	0.3 to 2.5 (Caterpillars / m. row)	Third week of August
3	Green semilooper	<i>Chrysodeixis acuta</i> (Lepidoptera : Noctuidae)	Caterpillar	0.2 to 0.7 (Caterpillars / m. row)	Third week of August
3	White fly	<i>Bemisia tabaci</i> (Hemiptera : Aleyrodidae)	Nymph and Adult	0.1 to 3.2 (flies / plant)	Last week of August
4	Jassids	<i>Empoasca kerri</i> (Hemiptera : Cicadellidae)	Nymph and Adult	0.9 to 3.4 (Jassids / plant)	Second week of August

regarded as a potential biological control agent against lepidopteran pests in Southeast Asia reported by Nyunt (2008). Most true predators have relatively broad diets, some degree of preference is almost always present, Begon et al. (1996). There is evidence that generalist arthropod predators choose to eat certain prey to balance their amino-acid requirements and therefore may be affected by previous feeding (Greenstone, 1979). While most ecological studies on spiders as potential biocontrol agents in agroecosystems have focused on Lycosidae, Linyphiidae, and Araenidae, much less is known about Thomisidae (Dean et al., 1987; Agnew and Smith, 1989; Lang et al., 1999; Symondson et al., 2002; Vichitbandha and Wise, 2002; Romero and Vasconcello- Neto, 2003; Harwood et al., 2004). In Michigan, Gardiner et al. (2011) observed that the exotic coccinellids *Coccinella septempunctata* and *Harmonia axyridis* were the most abundant predators found in soybean field.

MATERIALS AND METHODS

Seasonal incidence of major insect pests and their biocontrol agents of soybean crop was recorded at 7 days interval from field during *kharif*, 2012 at Indira Gandhi Krishi Vishwavidyalaya; Raipur, Chhattisgarh (India). Soybean variety JS-335 was sown on 10th July 2012. In this experiment number of plants infested by girdle beetle and the number of caterpillar pests was counted from ten randomly selected one meter row-length. To record the observations on sucking pests, that is, whiteflies and jassids were recorded from randomly selected twenty plants. From each plant, insect count on five leaves was recorded; three from upper and two from middle part of the plant. Later, mean number of sucking pests per plant was calculated. Biocontrol agents (particularly lady bird beetle, spider and predatory pentatomid bug) population was recorded from randomly selected twenty plants. Later, mean number of biocontrol agents per plant was calculated.

RESULTS

The studies on the seasonal incidence of insect pests of soybean crop on variety JS-335 revealed that the occurrence of insect pest complex commenced from 25

days of sowing. Observation of pest incidence that is, population of each insect was recorded on soybean crop as per the procedure mentioned under "materials and methods." During the course of study, five insects species, viz., Girdle beetle, tobacco caterpillar, green semilooper, whiteflies and jassids were observed and causing damage at various growth stages of soybean crop. Among the biocontrol agents, three predators, namely, lady bird beetles, a predatory pentatomid bug and spiders were mainly observed preying on them (Tables 1, 2 and 3).

Pest succession studies

During the course of study, five insects species, viz., Girdle beetle, *Obereopsis brevis* tobacco caterpillar, *Spodoptera litura*, green semilooper, *Chrysodeixis acuta*, Jassids, *Empoasca kerri* and white flies, *Bemisia tabaci* were recorded as the major pests on soybean, variety JS- 335 causing damage at various stages of the crop. All these insects made their first appearance on the crop to a greater or lesser extent in the last week of July. The activity of girdle beetle increased gradually with peak density of the Cerambycid in the first week of October recoding 1.0 damaged plants per meter row with seasonal mean of 0.24 damaged plants. The density of lepidopterous caterpillars increased gradually with peak population of 3.2 larvae per meter row during the third week of August and seasonal mean of 1.33 larvae per meter row among the sucking pests, whitefly was observed in higher numbers than jassids. The peak density of sucking pests was observed during second week of August with 6.5 sucking pests/plant and seasonal mean of 3.94 white flies and jassids per plant.

Three species of lady bird beetle, *M. sexmuculata*, *Coccinella transversalis* and *C. septumpunctata* were recorded as the major bioagents of the sucking pests. They first appeared on the crop in the last week of July with 0.1 grub and adult per plant. They were observed feeding on nymphs and adults of jassids and whiteflies.

Table 2. Predatory fauna observed on soybean variety JS -335 during *kharif*, 2012.

S/ No.	Common name	Systemic position	Insect pests preyed	Range of incidence	Status of peak activity
1	Lady bird beetle-	a) <i>Menochilus sexmuculata</i> b) <i>Coccinella septumpunctata</i> c) <i>Coccinella transversalis</i> (Coleopteran : Coccinellidae)	Whiteflies and jassids Whiteflies and jassids Whiteflies and jassids	0.1 to 0.4 (Beetles/meter row)	Second week of August and September
2	Pentatomid bug	<i>Eocanthecona furcellata</i> (Hemiptera: Pentatomidae)	Lepidopterous caterpillars	0.3 to 1.1 (bugs/meter row)	Last week of August
3	Spiders (a) Lynx spider (b) Orb weaver spider	<i>Oxyopes satticus</i> (Araneae: Oxyopidae) <i>Neoscona sp.</i> (Araneae: Araneidae)	Lepidopterous caterpillars Whiteflies and Jassids	0.4 to 1.2 (Spiders/meter row)	Last week of August

Table 3. Seasonal incidence of major insect pests and natural enemies of soybean on variety JS-335 during *Kharif*, 2012.

Date of observation	Incidence per meter row length			Mean population/plant			No. of predators/ plant			
	No. of Girdle beetle damaged plants	No. of caterpillars			<i>B. tabaci</i>	<i>E. kerri</i>	Total	Coccinellid beetle	Pentatomid bug	Spiders
		<i>S. litura</i>	<i>C. acuta</i>	Total						
30.07.2012	0.0	0.3	0.0	0.3	0.1	0.0	0.1	0.1	0.0	0.0
06.08.2012	0.0	0.6	0.2	0.8	1.0	0.9	1.9	0.2	0.3	0.4
13.08.2012	0.0	1.5	0.4	1.9	3.1	3.4	6.5	0.4	0.8	0.6
20.08.2012	0.0	2.5	0.7	3.2	2.9	2.7	5.6	0.3	0.8	0.7
27.08.2012	0.0	2.1	0.5	2.6	3.2	3.0	6.2	0.3	1.1	1.2
03.09.2012	0.0	1.2	0.5	1.7	2.8	3.1	5.9	0.2	0.7	0.7
10.09.2012	0.3	1.0	0.2	1.2	2.7	2.0	4.7	0.4	0.6	0.7
17.09.2012	0.3	0.8	0.2	1.0	2.5	2.9	5.4	0.2	0.1	0.3
24.09.2012	0.2	0.6	0.0	0.6	2.0	1.0	3.0	0.0	0.4	0.4
01.10.2012	0.8	0.8	0.0	0.8	2.5	1.4	3.0	0.2	0.4	0.4
08.10.2012	1.0	0.6	0.0	0.6	0.8	0.2	1.0	0.1	0.3	0.7
Seasonal mean	0.24	1.09	0.25	1.33	2.15	1.87	3.94	0.22	0.50	0.55

Their activity continued till the first week of October and peak activity was observed in second week of August and September with 0.4 grub and adult per plant.

The Pentatomid bug, *E. furcellata* was observed to suck the body sap of caterpillar pests. It made its first appearance on the crop in the first week of August with 0.3 bugs per plant. Its density

increased gradually with the peak population of 1.1 bugs in the last week of August and a seasonal mean of 0.50 bugs.

Besides the lady bird beetle and pentatomid bug,

two predatory spiders, namely, lynx spider and orb weaver spider were found preying upon lepidopterous caterpillars and sucking pests, respectively. *Oxyopes* sp. is a hunting spider, whereas, *Neoscona* sp. is a web building spider. The spiders first appeared on the crop in the first week of August with mean population of 0.4 spiders per plant. It coincided with the appearance of host insects on the crop. They were active throughout the growth period of the crop, till the first week of October. Their population ranged from 0.4 to 1.2 spiders with a seasonal mean of 0.55 spiders per plant.

DISCUSSIONS

Based on pests succession studies on soybean variety JS-335, girdle beetle (*O. brevis*), caterpillar pests (*S. litura* and *C. acuta*) and sucking pests (*B. tabaci* and *E. kerri*) were observed as key pests inflicting substantial damage to the crop. The *S. litura* is the major insect pests of soybean as compared to other caterpillar pests.

In present investigation the peak activity of *S. litura*, *C. acuta*, *B. tabaci* and *E. kerri* was observed during, the third week of August, third week of August, last week of August and second week of August, respectively. Related observations were recorded by Netam (2010) and Kujur (2011). Thus, these observations are in conformity with the present findings.

Netam (2010) observed that density of lepidopterous caterpillars increased gradually with peak population of 5.0 larvae per meter row during the last week of August and seasonal mean of 3.22 larvae per meter row among the sucking pests, whitefly was observed in higher numbers than jassids. The peak density of sucking pests was observed during third week of September with 4.4 sucking pests/plant and seasonal mean of 3.62 white flies and jassids per plant. Preying upon the sucking insects, were two species of lady bird beetle, *Coccinella septempunctata* and *Menochilus sexmaculata* and two species of spiders, lynx spider and an unidentified golden preying spider. The latter was also a recorded preying on lepidopterous larvae.

Kujur (2011) reported that peak activity of girdle beetle was noticed during the second week of September with 3.1 number of girdle beetle damaged plants per meter row and a seasonal mean of 1.76. The defoliators, *S. litura* and *C. acuta* recorded their peak activity during last week of August (3.2 larvae per meter row) and during third week of August (1.2 larvae per meter row) with a seasonal mean of 1.58 and 0.40 larvae per meter row, respectively. Among sucking pests, the population of whitefly reached its peak of 3.1 whiteflies per plant during last week of September with a seasonal mean of 1.95 whiteflies per plant. Whereas, the jassid attained its peak density during last week of August (1.2 jassids per plant) with a seasonal mean of 0.90 jassid per plant. Among the predators, lady bird beetles – *M. sexmaculata* and *C.*

septempunctata and spider *Neoscona* sp. were observed preying on whiteflies and jassids; whereas, another spider *Oxyopes* sp. and a predatory pentatomid bug *Eocanthecona furcellata* were observed feeding on the lepidopterous larvae.

Singh and Singh (1987) studied the incidence and damage caused by the Noctuidae *Chrysodeixis acuta* to soybean pods and flowers in July-September 1984 in Madhya Pradesh, India. Larvae appeared during the 1st week of August and the maximum population was observed on 14th September.

Population densities of *Spodoptera litura* (Fab.) and *Spilosoma obliqua* Walker during the crop growth period were in maximum around the second half of October. However, density of *Plusia orichalcea* (Fab.) was higher during the later part of September or early October. Significant correlations were observed between population densities of some insect species as reported by Kumar et al. (1998). Paik et al. (2007) observed that *S. litura* occurred significantly in late August in soybean field. Patil (2002) observed *Obereopsis brevis* and *S. litura* as the key pests of soybean out of 48 phytophagous species observed attacking the crop. Van den berg and Shepard (1998) reported that the natural enemy population increased with increase in host density, although, there was no evidence of density dependence.

Conclusion

Girdle beetle, *O. brevis*, tobacco caterpillar, *S. litura*, green semilooper, *C. acuta*, whiteflies, *B. tabaci* and jassids, *E. kerri* were observed as the major pests on soybean variety JS-335. The peak activity of girdle beetle (1.0 damaged plants/m row) and lepidopterous larvae (3.2 larvae/m row) was recorded during first week of October and second fortnight of August. The sucking pests (6.5 insects/ plant) during second week of August. Among the predators, lady bird beetles, *M. sexmaculata*, *C. transversalis* and *C. septempunctata* and spider *Neoscona* sp. were observed preying on whiteflies and jassids; whereas, another spider *Oxyopes* sp. and a predatory pentatomid bug *Eocanthecona furcellata* were observed feeding on the lepidopterous larvae.

Conflict of Interest

The authors have not declared any conflict of interest.

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