

INSECT PESTS OF SOYBEAN (*GLYCINE MAX L.*), THEIR NATURE OF DAMAGE AND SUCCESSION WITH THE CROP STAGES

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Abstract

Thirty nine species of insect pests were found to infest soybean crop at their different growth stages in Noakhali region of Bangladesh during January to May, 2010 and 2011. Among the recorded pest species, six species namely, hairy caterpillar, *Spilarctia obliqua* (Walker); leaf roller, *Lamprosema indicata* F; common cutworm, *Spodoptera litura* F; pod borer, *Helicoverpa armigera* (Hubner); stem fly, *Ophiomyia phaseoli* (Tryon) and white fly; *Bemisia tabaci* Genn. were considered as the major pests while the rests were of minor importance on the basis of population densities per plant, nature and extent of damages, and yield reductions. Most of the major and minor pests appeared in the crop during vegetative to flowering stages (30-50 Days after sowing) and the maximum insect population and their infestation occurred during flowering and pod formation stages of the crop throughout the study period.

Key words: Insect pests, Soybean, *Glycine max*, Damage, Succession, Crop stages

Introduction

Soybean (*Glycine max* L.) is one of the most important crops which is grown for oil and protein in both the rabi and kharif seasons. Seeds of soybean contain about 42% protein and 20% oil and provide 60% of the world supply of vegetable protein and 30% of the edible oil (Fehr 1989). In Bangladesh this crop is comparatively new but soybean oil is very much popular as edible oil. However, recently the crop gained popularity in the poultry industry and its cultivation expands day by day. In the Greater Noakhali region (Noakhali and Laxmipur districts) soybean is the major oilseed crop and is extensively cultivated. Cultivation of soybean covered about 55,000 hectares of land and produced about 90,000 metric tones of seeds during the period 2009-2010 in Bangladesh (Anonymous 2011). One of the major constraints to the successful soybean production in Bangladesh is the damage caused due to insect pests. Research experiences reveal that 15 - 20 percent of the total soybean production is lost directly or indirectly by the attack of insect pests every year (Biswas 2008).

In order to evolve economically feasible, ecologically sound and socially acceptable pest management strategies, detailed information on the pest complex, their status and sequence of appearance during the crop period, losses and type of damage are of great importance (Jayanthi *et al.* 1993). In Bangladesh, check lists of insect pests of soybean and their succession in relation to crop stages are scanty. Only the list of some insect

pests of soybean in Bangladesh was recorded (Sardar and Debnath 1984, Kaul and Das 1986, Ali 1988, Begum 1995, Biswas *et al.* 2001 and Biswas 2008). Therefore, the present research work was undertaken to record the insect pests of soybean, their nature of damage, incidence, infestation and time of appearance with the crop stages.

Materials and Methods

The research work was conducted in the field of Subarna Char, at Noakhali and in the laboratory of Oilseed Research Centre, BARI, Gazipur during rabi 2009-2010 and 2010-2011 crop seasons. The survey was conducted from one hectare land soybean field cultivated by the farmers with the supervision of scientists of Oilseed Research Centre, BARI, Joydebpur, Gazipur. The experimental plot measured 10 m X 10 m. The seeds of soybean were sown in the plots on 4th week of December of 2009 and 2010. There were four replications and plots were selected following a Randomize Complete Block Design. The rows and plants were spaced 30 cm and 10 cm apart, respectively. The recommended agronomic practices for raising the crop were maintained following the work of Mondal and Wahhab (2001).

Observation on species of insect pests with their population per plant was recorded from seedling to matured stage of the crop from 10 randomly selected samples of the plants in each plot. The time of appearance of the pests were observed and recorded. The nature of damage and feeding behaviour of the insects were carefully observed and their photographs were taken in the crop fields and in the laboratory. The recordings of data were included visual observations, hand tens, and hand picking of insects from the standing crops during 7:00-10:00 a.m and 4:00-6:00 p.m at weekly intervals. Some insects were also collected by aspirators for laboratory studies. The collected insects were preserved in the insect box and vial having 75% alcohol for identification. Relative population of insect was counted as suggested by Biswas *et al.* (2001). The collected insects were also reared in the laboratory at an ambient temperature (24-34^o C) in cages and preserved in the insect boxes. The insects (specimens) were preliminarily identified following Maxwell- Lefroy (1909), Borror *et al.* (1975), Fletcher (1985), Nair (1986), Singh (1990) and Biswas (2008). The insects were graded as major and minor on the basis of their population density per plant, nature and extent of damage of the crop and the yield reduction. The insect pests were also grouped as stem feeders, leaf feeders, leaf roller, sap sucker and borer on the basis of their feeding behaviour.

Results and Discussion

Pest complex of soybean: Thirty nine species of insect pests belonging to seven orders and 22 families were found to infest at the different growth stages of soybean crop in Noakhali region, Bangladesh during rabi seasons of two consecutive years 2009-10 and 2010-11 (Table 1). Of these, only six species namely, hairy caterpillar, *Spilarctia obliqua* (Walker); leaf roller, *Lamprosema indicata* F.; common cutworm, *Spodoptera litura* F.;

Table 1. Insect pests recorded from soybean crop ecosystems at Noakhali region, Bangladesh during 2009-10 and 2010-11 crop seasons.

SL no.	Common Name	Scientific Name	Order	Family	Feeding behaviour
01.	Hairy caterpillar	<i>Spilarctia obliqua</i> (Walker)	Lepidoptera	Arctiidae	Leaf eater
02.	Hairy caterpillar	<i>Anarsia ephippias</i> (Mullar)	Lepidoptera	Arctiidae	Leaf eater
03.	Common cutworm	<i>Spodoptera litura</i> Fab.	Lepidoptera	Noctuidae	Leaf eater & cutter
04.	Common cutworm	<i>Spodoptera exigua</i> Fab.	Lepidoptera	Noctuidae	Leaf eater & cutter
05.	Leaf roller	<i>Lamprosema indicata</i> F.	Lepidoptera	Pyralidae	Leaf roller & eater
06.	Stem fly	<i>Ophiomyia phaseoli</i> (Tryon.)	Diptera	Agromyzidae	Stem borer
07.	Shoot fly	<i>Melanagromyza obtuse</i> Mach	Diptera	Agromyzidae	Shoot borer
08.	White fly	<i>Bemisia tabaci</i> Genn.	Diptera	Aleyrodidae	Sap sucker
09.	Pod borer	<i>Helicoverpa armigera</i> (Hub)	Lepidoptera	Noctuidae	Pod eater
10.	Black cutworm	<i>Agrotis ipsilon</i> (Hufn.)	Lepidoptera	Noctuidae	Stemcutter
11.	Leaf miner	<i>Stomopteryx</i> spp.	Lepidoptera	Gelechiidae	Miner & eater
12.	Semilooper	<i>Plusia orichalcea</i> (Fab.)	Lepidoptera	Noctuidae	Leaf eater
13.	Green grasshopper	<i>Attractomorpha crenulata</i> F.	Orthoptera	Acrididae	Leaf eater
14.	Longhorn grass hopper	<i>Phaneroptera gracilli</i> Bur.	Orthoptera	Tettigonidae	Leaf eater
15.	Green stink bug	<i>Nezara viridula</i> L.	Heteroptera	Pentatomidae	Sap sucker
16.	Stink bug	<i>Chrysocoris stollii</i> F.	Heteroptera	Pentatomidae	Sap sucker
17.	Green stink bug	<i>Dolycoris indicus</i> Stal.	Heteroptera	Pentatomidae	Sap sucker
18.	Pod bug	<i>Eusarcocoris</i> sp.	Heteroptera	Pentatomidae	Sap sucker
19.	Stink bug	<i>Coptosoma cribrarium</i> F.	Heteroptera	Plataspidae	Sap sucker
20.	Coreid bug	<i>Leptocoris</i> spp.	Heteroptera	Coreidae	Sap sucker
21.	Coreid bug	<i>Riptortus pedestris</i> F.	Heteroptera	Coreidae	Sap sucker
22.	Red cotton bug	<i>Dysdercus cingulatus</i> F.	Heteroptera	Pyrrhocoridae	Sap sucker
23.	Aphid	<i>Aphis craccivora</i> (Koch)	Homoptera	Aphididae	Sap sucker
24.	Leaf hopper	<i>Aphannus sordidus</i> F.	Homoptera	Jassidae	Sap sucker
25.	Jassid	<i>Empoasca</i> sp.	Homoptera	Jassidae	Sap sucker
26.	Jassid	<i>Amrasca biguttula</i> (Ishida)	Homoptera	Jassidae	Sap sucker
27.	Mealy bug	<i>Pseudococcus corymbatulus</i>	Homoptera	Coccidae	Sap sucker
28.	Mealy bug	<i>Pseudococcus filamentosus</i>	Homoptera	Coccidae	Sap sucker
29.	Brown hopper	<i>Nilaparvata lugens</i>	Homoptera	Jassidae	Sap sucker
30.	Thrips	<i>Frankliniella schultzei</i>	Thysanoptera	Thripidae	Sap sucker
31.	Black weevil	<i>Cyrtozemia cognate</i> Marsal	Coleoptera	Culculionidae	Leaf eater
32.	Grey weevil	<i>Mylocerus discolor</i> Boh.	Coleoptera	Culculionidae	Leaf eater
33.	Weevil	<i>Tenymecus indicus</i> Fst.	Coleoptera	Culculionidae	Leaf eater
34.	Weevil	<i>Chaetocnema</i> sp.	Coleoptera	Halticidae	Leaf eater
35.	Pumkin beetle	<i>Aulacophora</i> sp.	Coleoptera	Chysomelidae	Leaf eater
36.	Leaf beetle	<i>Oulema</i> sp.	Coleoptera	Chysomelidae	Leaf eater
37.	Leaf beetle	<i>Monolepta signata</i> Olv.	Coleoptera	Chysomelidae	Leaf eater
38.	Epilachna beetle	<i>Epilachna 12-punctata</i>	Coleoptera	Chysomelidae	Leaf eater
39.	Girdle beetle	<i>Oberia brevis</i> S.	Coleoptera	Chysomelidae	Leaf eater

pod borer, *Helicoverpa armigera* (Hubner); stem fly, *Ophiomyia phaseoli* (Tryon) and white fly, *Bemisia tabaci* Genn. were considered as the major pests while the rests were of minor importance on the basis of population densities per plant, nature and extent of damages and yield reductions. The population density per plant of major and minor insects and their rate of infestation on soybean plant is presented in Table 2. The population density per plant of major insects namely, *S.obliqua*, *L. indicata*, *S. litura*, *H. armigera*, *O. phaseoli* and *B.tabaci* ranged from 0.50-0.60, 2.00-2.50, 1.50-1.80, 0.35-0.40, 0.40-0.50 and 4.00-5.00, respectively in 2010 while it ranged from 0.45-0.55, 1.50-2.00, 1.20-1.50, 0.30-3.50, 0.30-0.40 and 3.00-3.50, respectively in 2011. Similarly, percent plant infestation by the major insects namely, *S.obliqua*, *L. indicata*, *S. litura*, *H. armigera*, *O. phaseoli* and *B. tabaci* ranged from 70-80, 95-100, 90-100, 35-40, 40-45, 96-100, respectively in 2010 while it ranged from 60-70, 95-100, 80-90, 30-35, 35-40 and 95-100, respectively in 2011. Most of the number of major and minor pests per plant of soybean with their infestation rate was found higher in 2010 than in 2011 (Table 2). About 100 percent plant was infested by leaf roller, white fly, leaf hopper and leaf beetle throughout the study period. The higher insect population and their infestation in 2010 may be due to higher temperature, lower relative humidity and rainfall in 2010 than 2011 which provided suitable conditions for the population build-up of the insect pests.

Among the minor pests, green stink bug (*Nezara viridula* L.), semilooper (*Plusia orichalcea* Fab.), Black cutworm (*Agrotis ipsilon* (Hufn.), leaf miner (*Stomopteryx* spp.), green grasshopper (*Attractomorpha crenulata* F.), pod bug (*Eusarcocoris* sp.) and aphid (*Aphis craccivora*) became occasionally important and caused serious damage to the soybean crop. Aphid, jassid and whitefly are also important as vectors for transmission of viral (YMV) diseases (Biswas 2008).

On the basis of feeding behaviour, 17 species were grouped as sap sucker, 15 as leaf eater, 2 as leaf roller and eater, and the remaining five such as, *Helicoverpa armigera*, as pod borer and eater, *Stomopteryx* sp. as leaf miner, *Agrotis* sp. as stem cutter, *Ophiomyia phaseoli* and *Melanagromyza obtusa* as stem or shoot borers.

Nature of damage of the important pests: The 1st and 2nd instar larvae of *S. obliqua* damaged the soybean leaves and shoots and gregariously occurred in the same plants and leaves. Later on, 3rd and onward instars dispersed and moved from one plant to another and fed on the older leaves, stems, shoots, flowers and pods causing serious damage to the plants. The yellowish green larvae of leaf roller rolled the leaves of soybean plants and several may be webbed together and feed inside. Damaged leaves became silvery-brown papery. About 2-3 larvae remained in a single folded leaf. The pale green larvae of *S. litura* damaged the leaves and shoots by feeding voraciously. Infested leaves bore irregular holes, growth of the plant was arrested, flower and pod formation was hindered. Very small larvae of the pest bore into the stem through the petiole. They feed on cortex and pith of the stem causing tunneling of the stems and died. The green larvae of *H.*

armigera feed on leaves and tender shoots firstly; later on they bore pods and feed inside. The green stink bugs suck sap from the tender shoots, leaves and pods resulting distorted leaves and pods.

Succession of the pests: The succession of the major insect pests of soybean crop during 2010 and 2011 at Noakhali region is presented in Fig.1. Soybean crop was first attacked by leaf beetle, *Monolepta signata*, black beetle, *Cyrtomezia cognata*, epilachna beetle, *Epilachna 12 Punctata*, *E. 28 punctata*, pumpkin beetle, *Aulacophorai* sp., black cutworm, *Agrotis ipsilon*, leaf hopper, *Aphannus sordidus*, jassids, *Empoasca* spp. at the seedling stage and their infestation continued up to pod formation stage of the crop during January 2010 and 2011. After 2-3 weeks, leaf roller, *Lamprosema indicata* F. common cutworm, *Spodoptera litura* F. hairy caterpillar, *S. obliqua*, pod borer, *Helicoverpa armigera* Hubner, green stink bug, *Nezara viridula* L., rice bug and other pentatomid bugs were frequently observed from flowering to maturity of the crop and recorded on February to April 2010 and 2011. The bugs were also important which suck sap from the tender part of the stems, leaves and pods. The white fly and aphids were noticed from vegetative to pre-maturity of the crop and act as vectors of yellow mosaic virus (YMV) and leaf curled viruses that were seriously affected plant growth and yield of soybean crop in both the years. Stem fly was observed from seedling to pod formation stage of the crop while pod borer damage was recorded at the flowering and pod pre-maturity stage in both the years (Fig. 1).

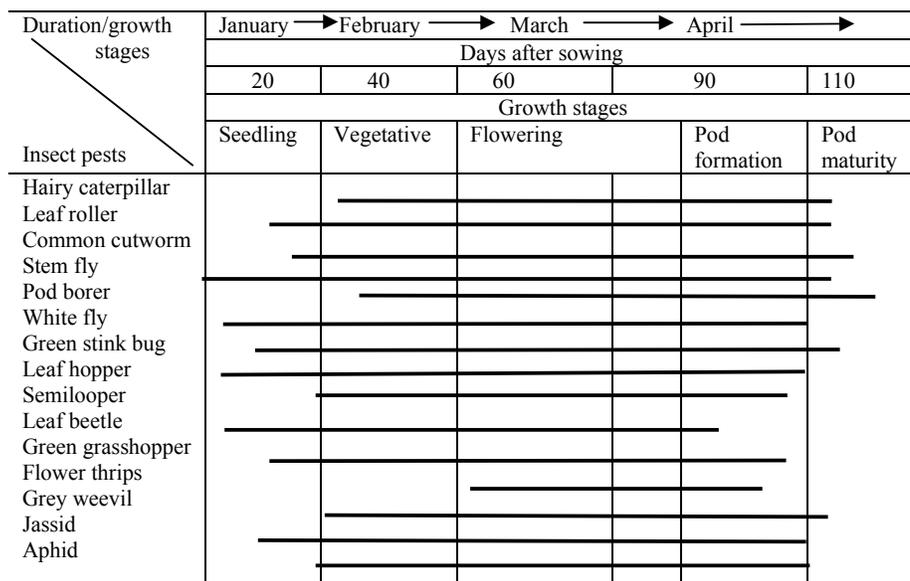


Fig. 1. Succession of important insect pests of soybean in relation to crop stages during 2010 and 2011 at Noakhali.

- The duration of occurrence of each species on the crop is shown by horizontal lines.

The most damaging insects were hairy caterpillar, leaf roller, common cutworm, pod borer and stem flies those were found to damage during vegetative, flowering and pod formation stages (30-65 DAS) of the crop. The yield loss caused by these pests has been estimated more than 25% in Bangladesh. In the soybean field infestation of insect pests like stem flies, bugs, aphids and white fly were frequently observed. Stem flies (*Ophiomyia phaseoli* and *Melanagromyza sojae*) were the major pests of soybean and about 30% loss occurred due to attack of these pests in this country. About 25-30% pod was damaged by pod borer at the pod formation to prematurely of the crop. About 100 % soybean plant and 70% leaf were infested by leaf roller and common cutworm and hairy caterpillar (Table 2).

Table 2. Population density per plant and percent infestation of some important insect pests of soybean crop during 2010 and 2011 at Noakhali region.

Name of insects	No. of insect /plant		Plant infestation%		Stage of severe infestation
	2010	2011	2010	2011	
Hairy caterpillar	0.50-0.60	0.45-0.55	70-80	60-70	F-P
Leaf roller	2.00-2.50	1.50-2.00	95-100	95-100	V-F
Common cutworm	1.50-1.80	1.20-1.50	90-100	80-90	V-F
Stem fly	0.40-0.50	0.30-0.40	40-45	35-40	S-V
Pod borer	0.35-0.40	0.30-0.35	35-40	30-35	F-M
White fly	4.00-5.00	3.00-3.50	95-100	95-100	V-P
Green stink bug	0.60-0.80	0.50-0.80	70-75	65-70	V-P
Leaf hopper	3.50-4.50	3.00-4.00	95-100	95-100	V-P
Semilooper	0.30-0.40	0.25-0.30	40-50	35-40	V-P
Leaf beetle	2.50-3.50	2.00-3.00	96-100	95-100	S-F
Green grasshopper	0.30-0.40	0.25-0.30	40-45	35-40	V-M
Flower thrips	5.00-6.00	4.00-5.50	96-100	95-100	F
Grey weevil	0.25-0.30	2.00-0.25	25-30	20-25	V-P
Jassid	2.50-3.50	2.00-3.00	96-100	95-100	V-P
Aphid	4.50-5.50	4.00-4.50	60-70	50-60	V-P

Data were recorded on average of 30 soybean plants.

V- Vegetative, S-Seedling, F-Flowering, P-Pod formation, M-Maturity.

The insect pests of soybean were recorded in Bangladesh by several scientists. Alam (1976) listed only four species of insect pests attacking the soybean. Of these, leaf roller (*L. indicata* F.) and mealy bug (*Pseudococcus corymbatus*) were important. Sardar and Debnath (1984) recorded 15 species of insects of soybean crop in Bangladesh. Of these, bean bug, leaf roller, hooded hopper caused serious damage. Kaul and Das (1986)

recorded 14 species of insect pests attacking soybean in Bangladesh. Of these, hairy caterpillar, cutworm, leaf roller (*L. indicata* F.) and bug (*N. viridula* L.) were recorded as major pests. From the survey report of Ali (1988) in the northern Bangladesh, it is revealed that 47 species of insect pests had been recorded in different stages of soybean crop in that area. Of these, 12 species were considered as serious pests. Begum (1995) listed 9 species of insects in soybean, Das (1998) recorded two major pests namely, hairy caterpillar and stem fly. Biswas (2008) recorded 35 species of insect pests attacking soybean at Gazipur all of which were also recorded in this study. Biswas *et al.* (2001) reported that leaf roller (*L. indicata*) and hairy caterpillar (*S. obliqua*) were the major pests of soybean and about 80% plant and about 60% leaf were infested by the attack of these pests.

The succession of appearances of the insect pests on soybean showed that the population of different pest species occurred in an overlapping manner and the crop was under the continuous attack of one or more pests. Most of the major and minor pests appeared in the crop during vegetative to flowering stages (30-50 Days after sowing) and the maximum infestation occurred during flowering and pod formation stages of the crop in both the years. Although most of the insects recorded from soybean crop during the study period have been considered as minor, it is not unlikely that any one of the minor pests may attain the status of a major pest depending upon the environmental conditions and changing cropping pattern.

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