

Soybean Pests, Their Nature of Damage and Abundance with Various Environmental Factors

¹M.A. Rahman and ²M.H. Ali, M.S.A. Mamun, M. M.Ferdous, K. Jahan

¹Department of Agronomy and Agricultural Extension, Rajshahi University, Bangladesh.

²Department of Entomology, Bangladesh Agricultural University, Mymensingh, Bangladesh.

Abstract: Many insects feed on soybean and can threaten yield and or quality. However, the frequency and severity of pest damage vary considerably between the growth stages. The growth stage had a direct and positive relationship with the environment. So field scouting helps to determine control measures are implemented only when pest levels of which crop damage could result in losses greater than the cost of the treatment. Therefore, it is important to visit plant regularly and make control decisions on established economic threshold or action levels. Integrated pest management (IPM) concept assumes that pests can be tolerated to some degree unless they cause economic loss.

Key words: soybean, natural enemies, environmental factors and IPM.

INTRODUCTION

Soybean, *Glycine max* (L) is one of the most important leguminous oil seed crops of great economic value, occupying an important position in the world trade as it is important in the soil by fixing atmospheric nitrogen through *Rhizobium* bacteria that lives in their root nodules. Stewart 2009^[6] stated that in a season the plants can fix upto 94 kg/ha nitrogen in the soil. About 73.444 million hectare of land in the world is under soybean cultivation and annual production is approximately 1,61,993 million tons, FAO 2000^[2]. The people of Bangladesh are now adapted to use soybean oil. In our country soybean could not become popular as a staple food items both as whole seed or split "dal" is one of the leading oil seed crops of the world. As good source of protein, unsaturated fatty acids, mineral like Ca and P including vitamin A, B, C and D, soybean can meet up different nutritional needs, Rahman 1982^[4] The soybean seed contain about 42-45% Protein 20-20% of edible oil, provide around 60% of the world supply of vegetative protein and 30% of edible oil, Fehr 2009^[3].

Soybean is very much susceptible to insect attack from seedling to mature stage. All parts of the plant including plant leaves, stems and pods are subjected to attack by different species of insect in Bangladesh, tropical regions insects tend to gain importance in proportion to the expansion of the crop's hectare. Insect population of Economic important includes different species and others which are observed in the soybean field causing serious damage to soybean crops by

direct feeding as well as by transmitting various diseases, Daugerty 2009^[1].

With this aim in view, the present study has been undertaken with the following objectives: (i) To know the abundance of different insect species and their natural enemies in soybean. (ii) To identify the pest complex attacking (iii) To know the nature of damage of different insect pests at different growth stages of the plant, (iv) To observe the relationship of soybean pests in relation to environmental factors.

MATERIALS AND METHODS

The experiment was conducted in Genetics and Plant Breeding Farm and also in the laboratories of the Department of Entomology, Bangladesh Agricultural University (BAU), Various insect pests at different growth stages of soybean plant in relation to environmental factors were studied addition with their nature of damage.

The soil of the plot was sandy loam fine texture, having pH 6.45 under the agro ecological zone of Brahmaputra Floodplain, UNDP and FAO 1988^[7]. Land was prepared by ploughing, corss- ploughing, and fertilizer were applied in the field with Urea, TSP, MOP, Gypsum and Zinc sulphate at the rate of 50 Kg/ha, 120 Kg/ha, 110 Kg/ha, 30 Kg/ha and 8 Kg/ha, The variety of soybean PB-1 was grown in the experimental fields. Seeds were sown in line in continuous rows keeping row to row distance as 25 cm and seed to seed keeping the space at 5 cm sowing of seed. Intercultural operation viz. gap filling, weeding

etc. were done as needed. Irrigation and insecticide was not applied in the experimental fields. The number of insects infesting soybean and their natural enemies, weekly sampling was started from seedling to maturing stage and the insects attacking soybean plants were recorded. The equipments were used during collection and preservation of sample used i. Sweeping net, ii. Plastic container, iii. Poly bag, iv. Brush, v. Petridish, vi. Pencil, vii. Scale, viii. Forceps, ix, Alcohol, x. Formalin solution (70%) xi. Bamboo stick and xii. Paper sheet etc.

The sampling was carried out in two different techniques namely absolute counting and sweeping with net at different stages of soybean plants. Sampling on insect pests and there natural enemies was done twice a day in the experimental field. From the vegetative to maturity stages, 25 numbers of plants were marked as a sampling area with jute stick in each plot. At the pod formation, pod filling, maturity stages, insect pests and natural enemies enumerated by both absolute counting and using sweeping net, which was placed 10 times over the plants moving two spaces forward along the diagonally and the sampling was done three times, two times diagonally and one time around this and the insect pests and natural enemies were collected in the plastic containers and taken to the laboratory for identification.

After killing the insects were separated species wise and preserved in small vials filled with formalin (40% formaldehyde) solution. Pest species attacking soybean plants was made from vegetative to maturity stages of plant. The pests were examined and counted carefully in the plants from top to bottom and also in soil surface. Sweeping net was used when necessary. This investigation was done once in every week from seedling to maturity stages and populations of each species of natural enemies were recorded to determine their relative abundance. They were separated species wise and preserved in small vials filled with formalin (40% formaldehyde) solution. Pest species attacking soybean plants was made from vegetative to maturity stages of plant. The pests were examined and counted carefully in the plants from top to bottom and also in soil surface. Sweeping net was used when necessary. This investigation was done once in every week from seedling to maturity stages and populations of each species of natural enemies were recorded to determine their relative abundance.

The mean differences were adjusted by Duncan's New Multiple Range Test (DMRT) and Least Significant Difference (LSD) test at 5% and 1% level.

RESULTS AND DISCUSSION

Thirteen species of insect pests and 3 species of

natural enemies were recorded in the experimental field. The insect pests and natural enemies recorded are given (Table 1). During the study period it was observed that this insect attack in pod initiation and maturity stage. The population density of different insect species were counted in soybean field at different growth stages has been shown (Fig. 1).

Natural enemies species were observed. Among these natural enemies the lady bird beetle was most abundant in soybean field. The grown up of all larvae feed voraciously on the entire leaves, leaving only the main veins. A spot of dead tissue at the point of the insect's entry and a large exit aperture are clearly visible on damaged crops. They also attack only reproductive phase but not attack in vegetative stage. The whole leaf of susceptible soybean varieties can desiccate and shed. The pest reduced seed yield and oil content during pod filling stage, but not during pod elongation or pod ripening. (Fig.2).

Population of soybean decreased significantly with the increased of temperature and humidity, rainfall and wind speed. It has been reported to cause 90% soybean seeding loss under favourable climatic conditions. (Fig 3).

Correlation: Every soybean pests were correlated with environmental factors shown (Table2). The insect showed positively correlated with temperature, humidity and wind speed.

Cutworm: The cutworm is a polyphagous insect. The cutworm was decreased significantly with the increased of temperature and humidity.

Soybean Semilooper: Soybean semilooper feed on leaves of soybean plant from vegetative to maturity stage. The soybean semilooper was decreased significantly with the increased of temperature and humidity.

Soybean Hairy Catter Piller and Jassid: Soybean hairy catter piller and Jassid is the most harmful foliage feeding polyphagous insect. It was significant and negative correlated with sunshine

Soybean Leaf Roller: Soybean leaf roller larvae fold and roll the leaves from tip to down wards and web together. It was decreased significantly with the increased of temperature, humidity and wind speed.

Soybean pod borer: Soybean pod borer feed directly on pods. It showed significant and Soybean pod borer attacked only reproductive phase but not attack in vegetative stage

Table 1: Insect pests and natural enemies recorded in the soybean field

Common name	Family	Order
A. Insect pest		
Soybean semi looper	Noctuidae	Lepidoptera
Soybean hairy caterpillar	Arctiidae	Lepidoptera
Soybean leaf roller	Pyralidae	Lepidoptera
Soybean fly	Agromyzidae	Diptera
Jassid	Cicadellidae	Homoptera
Soybean pod borer	Pyralidae	Lepidoptera
Spotted leaf hopper	Chrysomelidae	Coleoptera
Stink bug	Pentatomidae	Hemiptera
Black leaf beetle	Chrysomelidae	Coleoptera
Short homed grass hopper	Acrididae	Orthoptera
Green leaf hoppers	Cicadellidae	Homoptera
Brown plant hopper	Delphacidae	Hemiptera
Cutworm	Noctuidae	Lepidoptera
B. Natural enemies		
Lady bird beetle	Coccinellidae	Coleoptera
Carabid beetle	Carabidae	Coleoptera
Spider	Lycosidae	Araneae

Table 2: Total number of soybean pests correlated with various environmental factors

Items	Temp.	Humidity	Rainfall	Wind Speed	Sunshine
Cut worm	-0.6415*	-0.6175*	-0.2226 NS NS	-0.4912 NSNS	0.3772 NS NS
Soybean semilooper	-0.5814 NSNS	-0.6123*	0.0499 NSNS	-0.4121 NSNS	0.6019*
S.hairy caterpillar	-0.3399 NS	-0.4759 NS	0.2054 NSNS	-0.2745 NSNS	0.6522*
S. lafe roller	-0.9471**	-0.9416**	-0.5259 NSNS	-0.8713**	0.3765 NSNS
S. pod borer	0.6228*	-0.6014*	0.4285 NSNS	0.6729*	0.0135 NSNS
Spotted leaf beetle	-0.5943 NSNS	-0.5979 NSNS	-0.0992 NSNS	-0.4495 NSNS	0.3793 NSNS
Black leaf beetle	-0.9442**	-0.9218**	-0.4964 NSNS	-0.8406**	0.3695 NSNS
Green leaf hopper	0.6255*	0.5997 NSNS	0.8797**	0.6639*	0.4166 NSNS
Green stink bug	0.4621 NS	0.2634 NS	0.4076 NS	0.5016 NS	0.2663 NS
S.stemfly	-0.9023**	-0.8586**	-0.5006 NSNS	-0.8965**	0.4220 NSNS
Sting bug	0.4051 NS	0.2021 NS	0.2049 NS	0.4074 NS	-0.1221 NS
Jassid	-0.5614 NS	-0.4849 NS	0.0854 NS	-0.3175 NS	0.7139**
Short horn grass hopper	-0.7293**	-0.7502**	-0.3425 NS	-0.5957 NS	0.3986 NS

** 1% level of significant = *5% level of significant NS means non- significant

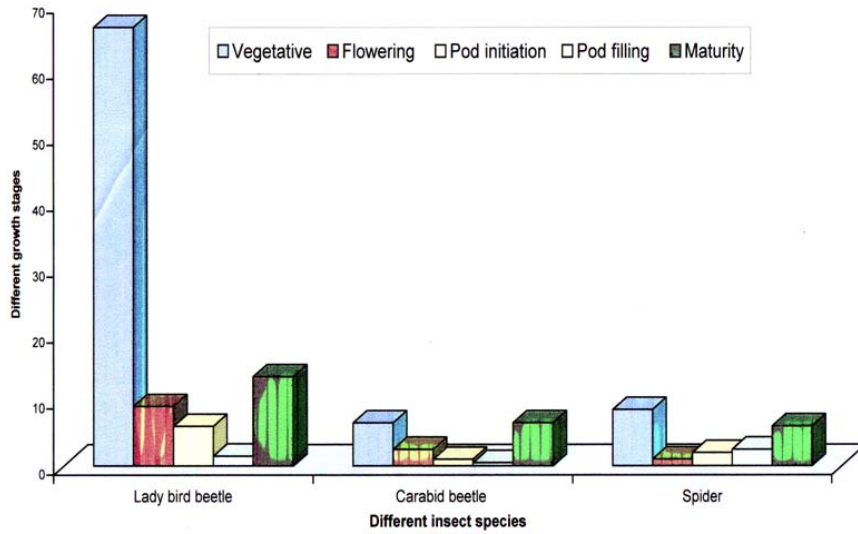


Fig. 1: Showing the variation of three species of natural enemies at different growth stages.

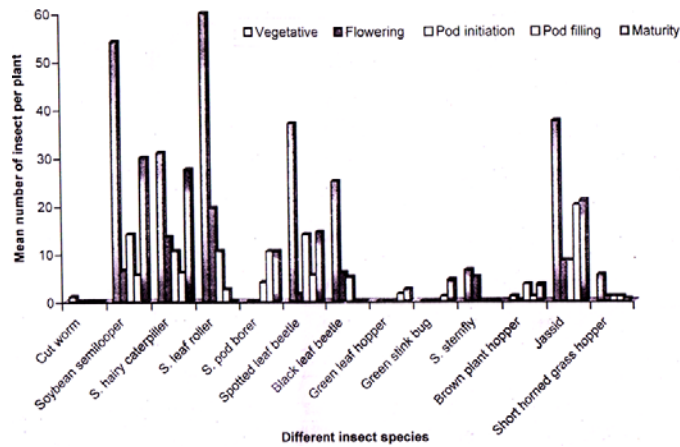


Fig. 2: Severity of damage of different insect species at different growth stages of soybean.

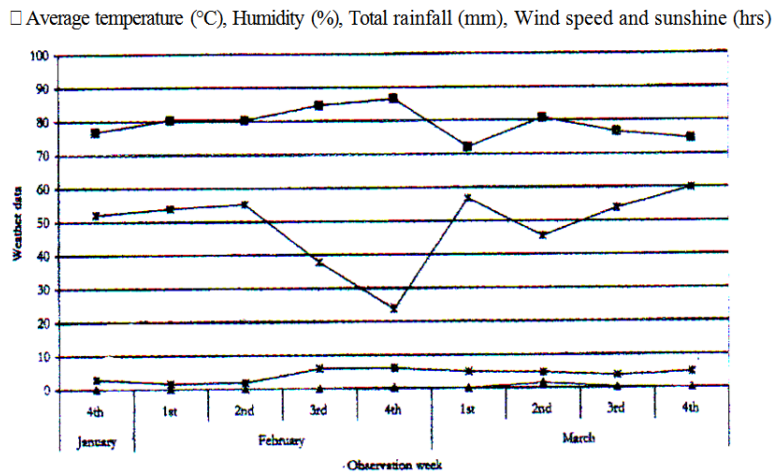


Fig. 3: Weekly variations of air temperature ($^{\circ}$ C), humidity (%) total rainfall (mm), wind speed and sunshine (hrs) in the experimental field during the study period.

Spotted leaf beetle, Green stink bug and Stink bug:

Spotted leaf beetle, Green stink bug and Stink bug were not significant with temperature, humidity, rainfall, sunshine and wind speed.

Black Leaf Beetle: Black leaf beetle attacked all the stages of soybean but more in vegetative stage. The insect decreased significantly with the increased of temperature and humidity.

Green Leaf Hopper: Green leaf hopper showed that the population increased with the increased of temperature, rainfall and wind speed

Soybean Stem Fly: Soybean stem fly which killed young seedling and the stem of soybean. The insect significant and negatively correlated with temperature, humidity and wind speed.

Short Horned Grasshopper: Short horned grasshopper was decreased significantly with the increased of temperature and humidity.

Conclusion: To observe the abundance of insect pests along with their natural enemies in relation to various environmental factors. At the vegetative and flowering stages, number of insects and natural enemies were counted by observing them directly from the top portion of the plants as well as the basal portion as far as possible and the numbers were recorded. Early, mid and late maturing soybean varieties were artificially infested with larvae at seedling and the later development and productivity of the plants were stated that primary leaf damage by larvae delayed the forthcoming vegetative growth but not the blooming which was initiated by the change in day length. Infestation during initial podding of late- sown plants resulted in yield losses of about 80%, whereas infestation at an advanced stage, normal- sown plants, resulted in satisfactory seed development but a

reduction in seed size by about 40%. The insects damaged pod surface injury, pod clipping, defoliation and stem surface feeding occurred simultaneously. Nature and extent of damage caused by the most abundant insects were also identified during the study period. Singh and Singh 1989^[5] carried out an experiment in the rainy season of natural enemies fed on second and third- instar nymphs on an average of 1.13 and 1.86 larvae/day, whereas fourth and fifth-instar nymphs fed on 2.26 and 7.06 larvae/day, respectively.

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