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INSECT PESTS OF GROUNDNUT (*Arachis hypogaea* L.), NATURE OF DAMAGE AND SUCCESSION WITH THE CROP STAGES

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Abstract

Thirty six species of insect pests were found to infest the different growth stages of groundnut crop at Gazipur, Bangladesh during the rabi seasons of 2008-09 and 2009-010. Among the recorded pest species, the hairy caterpillar, *Spilarctia obliqua* (Walker); common cutworm, *Spodoptera litura* F.; jassid, *Empoasca terminalis* Distant ; leaf miner, *Stomopteryx nerteria* M. and leaf roller, *Anersia ephippias* (Meyr.) were considered as the major pests, while the rests were of minor importance on the basis of their population densities/plant, nature and extent of damage and yield reductions. Most of the major and minor pests infested during the vegetative to pre-maturity stages (45-95 DAS) and the maximum infestation occurred during pod formation and pod filling stages (50-80 DAS) of the crop in both the years.

Keywords: Insect pests, groundnut, damage, succession, crop stages.

Introduction

Groundnut (*Arachis hypogaea* L.) is an important oilseed crop in Bangladesh on the basis of both in acreage and annual production (Biswas *et al*,. 2000; Mondal and Wahhab, 2001.) Its cultivation covered about 87,000 hectares and produced about 1,25,000 metric tons of seeds during 2011-12 (Krishi Diary, 2013). One of the major constraints to the successful groundnut production in Bangladesh is the damage caused by insect and mite pests. Studies reveal that 15 - 20 percent of the total oilseed production is lost directly or indirectly by the attack of insect and mite pests every year (Biswas and Das, 2011). In developing eco-friendly management strategies information on the pest complex, their status, incidence, and damage severity are of importance. The insect pests of groundnut in Bangladesh was recorded by several scientists (Alam, 1976; Hobbs, 1976; Kaul and Das, 1986; Begum, 1995; Biswas *et al.,* 2009) which are far from complete. No information on the building up of the pests in relation to other pests, crop growth stages or to different parameters of climate is available. A thorough understanding of these aspects of pest management can help in forecasting any outbreak of the pests and to develop an integrated pest management in groundnut (Jayanthi *et al.,* 1993). In order to develop economically feasible, ecologically sound, and socially acceptable pest management strategies, detailed information of a pest complex, the status and the sequence of appearance of the pest during

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the crop period, the losses and type of damages of the crop are of great importance (Bijjur and Verma, 1995). In Bangladesh, check list of insect pests of groundnut and their damage severity in this country are scanty. Therefore, the present study was undertaken to determine the insect pest complex of groundnut, status of the pests, the nature of damages, and the time of appearance of the pests in relation to the phenology of the crop.

Materials and Method

The experiment was conducted in the field and laboratory of the Oilseed Research Centre, (ORC), Bangladesh Agricultural Research Institute (BARI), Joydebpur, Gazipur, during rabi seasons of 2008-09 and 2009-010. The groundnut variety BARI Chinabadam-8 was used for this study. The experimental plots measured 5m × 4m. The seeds of groundnut were sown in the plot on the 1st week of December each year. There were four replications and the plots were selected following Randomized Complete Block Design. The row and the plants were spaced 40 cm and 10 cm apart, respectively. The recommended agronomic practices for raising the crop were maintained as described by Mondal and Wahhab (2001).

Observations on the population of different insect pests were recorded from germination to maturity stages (1-100 days after sowing = DAS) of the crop. Data on different species of insects were recorded from 10 randomly sampled of the plants in each plot. Sequential appearance of the insect pests, their nature and quantity of damage and feeding behaviors were carefully observed and recorded. Records were taken by visual observations on the standing crop during 07:00 - 10:00 AM and 04:00-06;00 PM at weekly intervals. Some insects were collected by hand nets and hand picking. The collected insects were preserved in the insect box and vial having 75% alcohol (Immature and soft bodied insects) for identification. Relative population of insect was counted as suggested by Pradhan (1964). The insects were identified following Maxwell-Lefroy (1909), Borror *et al*. (1976), Fletcher (1985), Nair (1986), Singh (1990), Jayanthi *et al*. (1993), Atwal and Dhaliwal (1997) and Biswas *et al.* (2009). The collected insects were also reared in the laboratory at an ambient temperature (24-34^0 C) in cages and preserved in the insect boxes. The insect were graded as major and minor on the basis of their population density per plant, nature and extent of crop damage and yield reduction of the crop. The time of severe attack was noted on the basis of degree of infestation observed in each week. The insect pests were also grouped as root feeders, stem feeders, leaf feeders, leaf roller, sap sucker and borer on the basis of their feeding behaviour.

Results and Discussion

Pest complex of groundnut

Thirty six species of insect pests belonging to 10 orders and 19 families were found to infest the groundnut at BARI farm, Joydebpur, Gazipur, Bangladesh during rabi 2009 and 2010 crop seasons (Table 1). Of these, only five, namely hairy caterpillar, *Spilarctia obliqua* (Walker); common cutworm, *Spodoptera litura* F.; jassid, *Empoasca terminalis* Distant; leaf miner, *Stomopteryx nerteria* M. and leaf roller, *Anersia ephippias* (Meyr.) were considered as the major pests, while the rests were of minor importance on the basis of their population densities per plant, nature and extent of damage, and yield reductions. The population density per plant of major and minor insects and their feeding behaviour on groundnut crop is presented in Table 2. The population density per plant of major insects, namely *S. obliqua, S. litura, E. terminalis, S. nerteria, and A. ephippias* ranged from 0.25 to 0.30, 0.30 to 0.35, 12 to 14, 1.00 to 1.20 and 1.00 to 1.20, respectively, in 2008 while the population density per plant of the above insects ranged from 0.32 to 0.36, 0.35 to 0.40, 15 to 18, 1.20 to 1.25, 1.20 to 1.25 and 1.20 to 1.25, respectively, in 2009. Most of the major and minor pests of groundnut were found in higher number per plant in 2010 than in 2009 (Table 2). The higher insect population may due to the higher temperature, lower relative humidity and rainfall recorded in 2010 than 2009 which provided suitable conditions for the population build-up of the insect pests.

Table 1. List of insect pests attacking groundnut with their common name, scientific name, family and order recorded at BARI farm, Gazipur, during 2009 and 2010 crop seasons.

Common name	*Scientific name*	Family	Order
Hairy caterpillar	*Spilarctia obliqua* (Walker)	Arctiidae	Lepidoptera
Common cutworm	*Spodoptera litura* F.	Noctuidae	Lepidoptera
Defoliator	*Spodoptera exegua* Hub.	Noctuidae	Lepidoptera
Jassids	*Empoasca terminalis* Dist.	Jassidae	Homoptera
Pod borer	*Helcoverpa armigera* Hub.	Noctuidae	Lepidoptera
Hairy Caterpillar	*Spilosoma nydia* Butl.	Arctiidae	Lepidoptera
Hairy Caterpillar	*Pericallia ricini* F.	Lymentridae	Lepidoptera
Shoot miner	*Stomopteryx nerteria* M.	Gelechiidae	Lepidoptera
Leafminer	*Stomopteryx pubsecirella* Meyr.	Gelechiidae	Lepidoptera
Termite	*Odontotermes redemani* Washman	Odontotermitidae	Isoptera
Termite	*Microtermes obesus* H.	Microtermitidae	Isoptera
Leaf roller	*Anarsia ephippias* (Meyr.)	Noctuidae	Lepidoptera

Table 1. Cont'd.

Common name	*Scientific name*	Family	Order
Black cutworm	*Agrotis ipsilon* (Hufn.)	Noctuidae	Lepidoptera
Semilooper	*Plusia orichalcea* F.	Noctuidae	Lepidoptera
Green grasshopper	*Atractomorpha crenulata* F.	Acrididae	Orthoptera
Lleaf beetle	*Cryptocephalus vittipennis* Suff.	Chrysomelidae	Coleoptera
White grub	*Oxycetuia versicolor* F.	Scarabaeidae	Coleoptera
Groundnut moth	*Scopula emissaria* W.	Noctuidae	Lepidoptera
Groundnut moth	*Plusia* sp.	Noctuidae	Lepidoptera
Grasshopper	*Atractomorpha psittacina* De Haan	Acrididae	Orthoptera
Cricket	*Atractomorpha psittacina* De Haan	Acrididae	Orthoptera
Black weevil	*Cyrtozemia cognata* Marshall	Curculionidae	Coleoptera
Leaf beetle	*Monolepta signata* Oliv.	Chrysomelidae	Coleoptera
Leaf hopper	*Cofana spectra* (Dist.)	Cicadellidae	Homoptera
Grasshopper	*Crotogonus trachypterus* (Blanch.)	Acrididae	Orthoptera
Aphid	*Aphis craccivora* (Koch)	Aphididae	Homoptera
Green stink bug	*Nezara viridula* Linn.	Pentatomidae	Hemiptera
Lygaeid bug	*Elasmolemus sordidus* Fab.	Lygaeidae	Heteroptera
Thrips	*Haplothrips indicus* (B.)	Thripidae	Thysanoptera
Ant	*Camponotus* spp.	Formicidae	Hymenoptera
Earwig	*Euborellia stali* D.	Forficulidae	Dermaptera
Flower thrips	*Megaluthrips usitatus*.	Thripidae	Thysanoptera
Flower thrips	*Frankliniella schultzei* .	Thripidae	Thysanoptera
Thrips	*Scirtothrips dorsalis* Dist.	Thripidae	Thysanoptera
Stemborer	*Sphenoptera perotetti*	Buprestidae	Coleoptera
Bug	*Dolicoris indicus* Stall	Pentatomidae	Heteroptera
Bug	*Piezodorus lybneri* Camelin	Pentatomidae	Heteroptera

Among the minor insects, pod borer, *Helicoverpa armigera*; hairy caterpillar, *S., nydia*; hairy caterpillar, *P. ricini*; semilooper, *P. orichalcea*; green grasshopper, *A. crenulata*; aphid, *A. craccivora*; green stink bug, *N. viridula*; thrips, *S. dorsalis*; termite, *M .obesus*; white grub, *O. versicolor*; and leaf miner, *S. emissaria* become occasionally important and cause serious damage to the groundnut crop. Lygaeid bug, *E. sordidus* is mainly postharvest pest, which infests the pods by sucking oil when the harvested crops are heaped on the threshing floor.

On the basis of feeding behaviour, 12 insects species were grouped as leaf eater, nine as sap sucker, five as root and stem cutter, four as leaf roller and eater, two as flower eater, two as stem borer, another two as leaf miner and remaining one as pod borer (Table 2).

Table 2. Insect pests of groundnut with their population density per plant and nature of damage at BARI Farm, Gazipur during 2009 and 2010 crop seasons.

Name of insects	Population/plant or leaf/flower		Feeding behavior/ nature of damage
	2009	2010	
S. obliqua	0.25-0.30	0.32-0.36	Leaf eater
S. litura	0.30-0.35	0.35-0.40	Leaf eater
S. exegua	0.08-0.10	0.10-0.12	Leaf eater
E. terminalis	12-14	15-18	Sap sucker
H. armigera	0.10-0.12	0.12-0.14	Stem & Pod borer
S. nydia.	0.08-0.10	0.10-0.11	Leaf eater
P. ricini	0.08-0.10	0.10-0.11	Leaf eater
S. nerteria .	1.00-1.20	1.20-1.25	Leaf miner
S. pubsecirella	0.30-0.40	0.32-0.35	Leaf miner
O. redemani	8.00-10.0	9.0-10.0	Root cutter & eater
A. ephippias	1.00-1.20	1.20-1.25	Leaf roller & eater
A. ipsilon	0.3-0.4/sqm	0.3-0.4/sqm	Stem cutter & eater
P. orichalcea	0.30-0.35	0.35-0.38	Leaf roller & eater
A. crenulata	0.20-0.24	0.25-0.28	Leaf eater
C. vittipennis	2.00-2.10	2.12-2.25	Leaf eater
O. versicolor	0.20-0.24	0.23-0.25	Root cutter & eater
S. emissaria	0.20-0.22	0.21-0.25	Leaf roller and eater
Plusia sp.	0.20-0.22	0.21-0.25	Leaf roller and eater
A. psittacina	0.10-0.12	0.11-0.14	Leaf eater
M. signata	2.30-2.50	2.50-2.60	Leaf eater
C. spectra	2.20-2.25	2.40-2.50	Sap sucker
C. trachypterus	1.00-1.20	1.10-1.20	Leaf eater
C. cognata	0.10-0.12	0.12-0.14	Leaf eater
A. craccivora	15-20	20-25	Sap sucker
N. viridula	0.30-0.32	0.32-0.35	Sap sucker
E. sordidus	0.10-0.12	0.10-0.12	Sap sucker
H. indicus	8.00-10.0	10.0-12.0	Sap sucker
Camponotus sp.	0.20-0.22	0.22-0.25	Root and stem feeder
E. stoli	0.10-0.12	0.12-0.14	Root , stem and pod eater
F. schultzei.	10.0-12.0	12.0-14.0	Flower eater
M. usitatus	4.00-5.00	5.0-6.0	Flower eater
S. dorsalis	6.00-8.0	7.0-8.0	Sap sucker
S. perotetti	0.10-0.12	0.12-0.14	Stem borer
D. indicus	0.20-0.22	0.22-0.25	Sap sucker
P. lybneri	0.20-0.22	0.22-0.24	Sap sucker

Nature of damage of the important pests

After sowing, ants damage the seeds of groundnut in the soil by boring and eating the kernel and taken away from the original sowing place. As a result, germination is hampered and infested seeds become rotten. The termite damages the seeds by boring the underground nuts and cutting the roots and eating the germinating roots and shoots resulting rot of the seeds and plants. The 1st and 2nd instar larvae of *S. obliqua* damaged the groundnut leaves and apex of the shoots and gregariously attack the same plants and leaves. Later on the 3rd and onward instars dispersed and moved from one plant to another and fed on the older leaves, stems, shoots, and flowers causing serious damage to the plant. *Spodoptera* is a common cutworm and defoliators. Both the young and full-grown larvae feed voraciously on leaves, tender shoots, and flowers. They completely defoliated the plant within a short time. Jassids (*E. terminalis*) suck the sap from the leaflets causing yellowing of leaflets, leaf curling, necrosis, and finally stunted the growth and gradually die. It also acts as a vector of a leaf curled, tomato spotted and other viruses. The larvae of leaf roller (*A. ephippias*) feed on shoots and web the top leaves. They make short holes in the leaves and web of the growing points. The larvae of shoot miner (*S. nerteria*) web leaves together and feed on them remaining within folds.

Succession of the pests

The succession of occurrence of the insect pests of groundnut with their crop phenology is presented in Fig 1. In 2009 and 2010, groundnut crop was first attacked by ant, *Camponotus* sp.; and termite, *Odontotermes redemani*; and earwig, *Euborellia stali* during seed germination stage. Then at seedling stage, leaf beetle, *Monolepta signata*; black weevil, *Cyrtozemia cognata*; black cutworm, *Agrotis ipsilon*; leafhopper, *Cofana spectra*; lygaeid bug, *Elamolemus sordidus*; jassids, *Empoasca terminais* were evident and their infestation continued up to pod formation stage of the crop during January to May of 2009 and 2010. After 2-3 weeks, aphids, *Aphis craccivora*; leaf roller, *Anarsia ephippias*; common cutworm, *S. litura* F. ; pod borer, *Helicoverpa armigera*; shoot miner, *Stomopteryx nerteria*; green grasshoppers, *Attractomorpha crenulata*; green stink bug, *Nezara viridula*; thrips, *Scirtothrips dorsalis*; flower thrips, *Frankliniella schultzei and Megaluthrips usitatus*; groundnut moth, *Scopula emisaria* and other pentatomid bugs, were frequently observed. It continued from flowering to maturity of the crop. They were recorded from February to May of both the years. Lygaeid bug, *Elasmolomus sordidus*, attacked the crop during pod premature stage till harvest and also in the threshing floor in the heap.

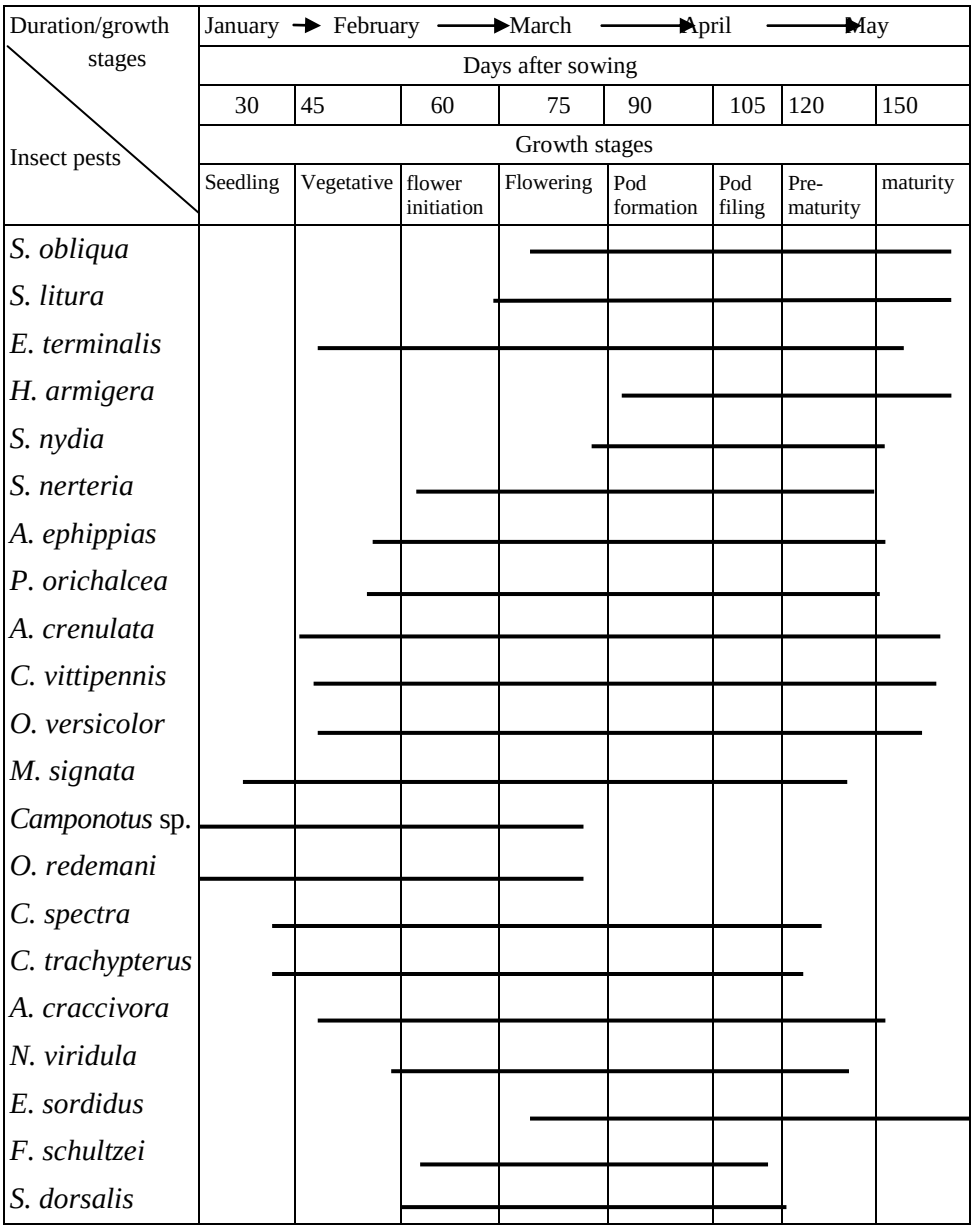

Fig. 1. Succession of appearance of important insect pests of groundnut in relation to crop stages during 2009 and 2010 at BARI, Gazipur. The duration of occurrence of each species on the crop is shown by horizontal lines.

In Bangladesh, the insect pests of groundnut were recorded by several scientists. Alam (1976), Islam *et al.* (1983), Kaul and Das (1986), Hobbs (1986), Ahmed *et al.* (1989), Begum (1995), Das (1998), recorded eleven insect pests of

groundnut viz., *S. obliqua*, *S. litura*, *O. versicolor*, *E. sordidus*, *S. nydia*, *A. ephipias*, *S. nerteria*, *S. emissaria*, *A. psittacina*, *Plusia* sp., and *H. indicus*, which were also recorded in the present observation. The insect pests in groundnut have also been recorded by Amin (1983), Ayyar (1984), Nair (1986), Singh (1990), Jayanthi *et al*. (1993) and Atwal and Dhaliwal (1997) from different regions of India. Kaul and Das (1986) recorded 12 species of insect pests attacking groundnut crop in Bangladesh. Of these, hairy caterpillar, leaf roller, *A. ephippias*), and leaf miner, *S. nerteria* were recorded as major pests. From the survey report of Islam *et al*. (1983) in the northern Bangladesh revealed that 25 species of insect pests have been recorded in different stages of groundnut crop in those area. Of these, 8 species were considered as serious pests. Biswas *et al*. (2009) recorded 25 species of insect pests attacking groundnut at Gazipur which were also included in the present record.

The succession of appearances of the insect pests on groundnut 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 the vegetative and flowering stages (35-55 DAS) and the maximum infestation occurred during pod formation and pod filling stages (50-80 DAS) of the crop in both the years. Comparatively high population density was observed in 2010 compared to 2009 which may be due to the differences in the environmental conditions and other biotic agents in the said years. Although most of the insects recorded from groundnut during the study period have been considered as minor, it is not unlikely that any one of the minor insects may attain the status of a major pest depending upon the environmental conditions and changing cropping pattern.

Conclusion

The research results accumulated here gives additional information on the insect pests of groundnut crop over the previous reports in Bangladesh. The present information on the status and diversity of the insect and mite pests of groundnut crops ecosystems in Bangladesh will help formulate the priority research strategies by researchers / academicians. The knowledge on biodiversity in groundnut crops ecosystems will also help the extension workers in deciding the judicious use of insecticides.

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