



## Abundance of predators in country bean field during summer season

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### Abstract

The study was conducted at the experimental field of Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur, Bangladesh during March to June 2009 in order to know the abundance of biological control agents (predators) in country bean ecosystem. During the study period the predators, black ant (Formicidae), lady bird beetle (Coccinellidae), Stink bug (Pentatomidae), Damsel fly (Coenagrionidae) and spider was found considerably. At the vegetative stage black ant (Formicidae) was highly abundant followed by lady bird beetle and spider. At the reproductive stage lady bird beetle, black ant and pentatomid bug found abundantly.

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## Introduction

The over-use and misuse of conventional insecticides cause resistance in pest species, pest resurgence, stimulation of the reproductive rate in certain pests, secondary pest outbreaks, mortality of beneficial insects and finally environmental pollution. So, alternative means of pest management deserve due consideration. Among the various alternatives available, biological control is the most promising one; with hundreds of outstanding successes are reported all over the world (Sathe *et al.*, 2003). Natural enemies / biological control agents are the most important factors to regulate the pest population for keeping the insect pests below economic injury level in country bean plant. The importance of naturally occurring biological control agents i.e., predaceous insects and spiders should be considered.

Sathe and Bhosale (2001) reported that, predators are the organisms, which directly attack, kill and eat one of the other species (prey of host). Typically, insect predators are characterized by a set of attributes that distinguish them from parasitoids, They are large relative to their prey and require more than one prey individual to complete development; they have free-living predatory immature stages; and many species of insect predators are predacious as both immature and adults (Hagen *et al.*, 1976). According to Sahayaraj (2004), the arthropod predators of insects include beetles, true bugs, preying mantids, lacewings, flies, midges and wasp. The lady bird beetles, tiger beetles, stink bug bug, spiders; dragon flies, damsel flies, black ants, preying mantid, ground beetles are important predaceous insects. The population growth of any pest species is effectively controlled by their natural enemies (Vorley, 1986). Lady bird beetle prey on a number of species of aphid on different host plants (Sakuratani, 1977; Winder *et al.*, 1994). The lady beetles are predacious both at larval and adult stages and feed on various crop pests such as aphids and other soft bodied insects like brown plant hopper, thrips etc (Rawat and Modi, 1969; Kring *et al.*, 1985 and Sumalde *et al.*, 1993). The stink bug (Pentatomidae: Hemiptera) is a predator of legume pod borer (*Helicoverpa armigera*) (Bhatnagar *et al.*, 1983) and Hairy caterpillar (Biswas,

2002; Biswas and Das, 2004). The preying mantid also predate on green semilooper, leaf eating caterpillar (Biswas and Das, 2004). The dragon fly (Aeshnidae: odonata) and damsel fly (Coenagrionidae: odonata) predate on whitefly, hooded hopper, leaf weevil and galerucid beetle (Biswas & Das, 2004). Recent trends in agriculture towards reduced pesticide use and ecological sustainability have led to increased interest in spiders as potential bio-control agents. Although the Chinese have augmented spider populations in field crops as a pest management strategy for centuries, much debate remains as to whether spiders will effectively control pest populations in U. S. agricultural ecosystems or not (Riechert, 1999; Greenstone & Sunderland, 1999). Spiders may be capable of fulfilling both pest reduction and pest stabilization (Sunderland, 1999). Some predators are specialized in their choice of prey while others are generalists. Some are extremely useful natural enemies of insect pests (Hoffman & Frodsham, 1993). Predaceous insects and spiders can be found in almost all agricultural and other habitats. The biological control of insect pest management play very significant role, which takes place in nature by different predaceous insects and spiders. Their abundance may vary in different crops and different growth stage of the crop. Therefore, the present study was undertaken to know the abundance of predaceous insects and spiders on country bean during summer season with a view to conserve and augment them to facilitate the biological control of insect pests.

## Materials and methods

The study on the abundance of predaceous insects & spiders in country bean field was conducted at the Research field of Entomology Department in Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur during the period from March to July 2009.

### *Monitoring the incidence of predaceous insects & spiders at vegetative stage*

For the purpose of studying the incidence of predaceous insects and spider, a close monitoring of field was done at every alternate day. Data collection at morning and afternoon was not conducted at the same date. The

incidence of natural enemies and pests was observed through visual search and sweep net wherever whichever was suitable in all plots and their number was noted. The specimens were brought to the laboratory for description and identification. For identification and confirmation some species were reared in the laboratory.

#### *Monitoring the incidence of predaceous insects and spider at reproductive stage*

For the purpose of studying the incidence of predaceous insects and spider at early reproductive Stage all plants in the plot were closely observed by visual search and sweep net at five days interval. Sometimes sweep net was used to capture the flying predaceous insects. Their number was recorded for calculating relative abundance. A total number of seven observations were conducted during this period.

#### *Data collection*

Data was collected from the experimental plots on the following parameters:

- > Predaceous insect species and spider found at vegetative stage.
- > Number of predaceous insects and spider at vegetative stage.
- > Predaceous insect species and spider found at reproductive stage.
- > Number of predaceous insects and spider at reproductive stage.
- > Relative abundance.

The collected data were properly analyzed by using Microsoft excel software for proper interpretation.

$$\text{Relative abundance (\%)} = \frac{\text{Number of specific insects}}{\text{Total number of insects}} \times 100$$

### **Results and discussion**

Predators (insects & spider) which were collected during experimental period from the country bean field and identified are presented in Table 1.

#### *Abundance of Predators at vegetative stage (afternoon)*

At the vegetative stage observation by visual search was done to record the prevalence and abundance of predators in the country bean field during summer

season at one day interval. It was conducted at afternoon and the number of predators was recorded to get relative abundance (Table 2). Different predators namely ladybird beetle, stinkbug, damsel fly, black ant, predatory grasshopper and preying mantid were found during the observation but lady bird beetle, stink bug, damsel fly, black ant and spider were recorded as they were in considerable number. Among them, black ant was found in highest number which was followed by lady bird beetle, spider, damsel fly and stink bug. More or less similarly Mahmudunnabi et al. (2009) recorded ladybird beetle, black ant, spider, predatory grasshopper and damsel fly as the predator in chick pea field. For the relative abundance of the predators, highest was found for black ant (83.25 %) which was followed by lady bird beetle (7.86 %), spider (5.32 %) and damsel fly (2.16 %) and the lowest abundant was stink bug (1.41 %). So, the relative abundance of predators were in order of black ant (83.25 %) > lady bird beetle (7.86 %) > spider (5.32 %) > damsel fly (2.16 %) > stink bug (1.41 %).

#### *Abundance of predators at vegetative stage (morning)*

The prevalence and abundance of predators in country bean field during summer season was also recorded by visual search at morning. The number of predaceous insects and spider was recorded from the whole country bean field at one day interval. Different predators namely black ant, ladybird beetle, stink bug, preying mantid, damsel fly, predatory grasshopper and spider were found during the observation but lady bird beetle, stink bug, damsel fly, black ant and spider were recorded as they were in considerable number. Among them, black ant was found in highest number which was followed by spider, lady bird beetle, damsel fly and stink bug. The prevalence of predators in morning was same to afternoon but their abundance was different. Among the predators black ant found highly abundant (83.99 %) which was followed by spider (6.69 %), lady bird beetle (5.59 %), damsel fly (2.00 %) and the lowest abundant was stink bug (1.73 %) (Table 3). So, the relative abundance of predators were found in order of black ant (83.99 %) > spider (6.69 %) > lady bird beetle (5.59 %) > damsel fly (2.00 %) > stink bug (1.73 %).

**Table 1.** Taxonomic status of predators found in country bean field during summer season 2009.

Common name	Scientific name	Family	Order
Lady bird beetle	<i>Coccinella repunda</i>	Coccinellidae	Cpleoptera
	<i>Coccinella septempunctata</i>		
	<i>Menochilus sexmachulatus</i>		
	<i>Coccinella transversalis</i>		
Stink bug	<i>Podisus connexivus</i>	Pentatomidae	Hemiptera
	<i>Supputius cincticeps</i>		
Black ant	<i>Camponotus compressus</i>	Formicidae	Hymenoptera
	<i>Solenopsis geminate</i>		
	<i>Pheidole sp.</i>		
Spider	<i>Rabidosa rabida</i>	Lycosidae	Araneae
	<i>Lycosa antelucana</i>		
	<i>Ummeliata insecticeps</i>	Linyphiidae	
	<i>Lepthyphantes tenuis</i>		
Damsel fly	<i>Agrionemis pygmaea</i>	Coenagrionidae	Odonata
	<i>Agrionemis rubescens</i>		

**Table 2.** Relative abundance (%) of predators at afternoon recorded at vegetative stage (18 DAT) in country bean field grown during summer season.

Name of the predaceous insects and spider	Number of predaceous insects and spider	Relative abundance (%)
Lady bird beetle	207	7.86
Stink bug	37	1.41
Black ant	2192	83.25
Spider	140	5.32
Damsel fly	57	2.16
Total	2633	

\*The number of predators is the totality of 7 observations at one day interval.

**Table 3.** Relative abundance (%) of predators at morning recorded at vegetative stage (19 DAT) in country bean field grown during summer season.

Name of the predaceous insects and spider	Number of predaceous insects and spider	Relative abundance (%)
Lady bird beetle	126	5.59
Stink bug	39	1.73
Black ant	1894	83.99
Spider	151	6.69
Damsel fly	45	2.00
Total	2255	

\*The numbers of predators are the totality of 7 observations at one day interval.

**Table 4.** Relative abundance (%) of predators at reproductive stage in country bean field grown during summer season.

Name of the predaceous insects and spider	Number of predaceous insects and spider	Relative abundance (%)
Lady bird beetle	2234	39.66
Stink bug	608	10.79
Black ant	2264	40.19
Spider	394	6.99
Damsel fly	133	2.36
Total	5633	

\*The numbers of predators are the totality of 7 observations at 5 days interval.

From the above discussion it can be concluded that the abundance of black ant, lady bird beetle and damsel fly found more at afternoon than morning but spider and stink bug found more at morning than afternoon.

#### *Abundance of predaceous insects and spiders at reproductive stage*

The prevalence and abundance of predaceous insects and spiders in country bean field at reproductive stage was observed and recorded. It was conducted at five days interval from the whole country bean field. Different predators were found during the observation but lady bird beetle, stink bug, damsel fly, black ant and spider were recorded as they were in considerable number. Among the predators, black ant was found in highest number which was followed by lady bird beetle, stink bug, spider and damsel fly. During the study period, the relative abundance of the predators was calculated as shown in Table 4. Among the predators black ant found highly abundant (40.19 %) which was followed by lady bird beetle (39.66 %), stink bug (10.79 %), spider (6.69 %) and the lowest abundant was damsel fly (2.36 %). So, the relative abundance of predators were found in order of black ant (40.19 %) > lady bird beetle (39.66 %) > stink bug (10.79 %) > spider (6.99 %) > damsel fly (2.36 %). The relative abundance of ladybird beetle and stink bug has increased at reproductive stage (39.66% & 10.79% respectively) than the vegetative stage (7.86% & 1.41% respectively). This is due to increased canopy structure at reproductive stage. The abundance and diversity of organisms increases when the canopy structure of the vegetation increases

(Ishii et al. 2004). Mahmudunnabi et al. (2009) found the relative abundance of ladybird beetle, black ant, damsel fly and spider as 27.05%, 25.00 %, 8.03% and 7.31% respectively.

#### References

- Bhatnagar VS, Lateef SS, Sithanatham S, Pawar CS, Reed W. 1983.** Research on *Heliothes* at ICRISAT. In: Proceedings of the international workshop on *Heliothis* management, 15-20 Nov. 1980, ICRISAT center, India, p.385-396.
- Biswas GC. 2002.** A newly recorded predatory stink bug in sesame field in Bangladesh. Bangladesh J. Agril. Res. **27(1)**, 127-130
- Biswas GC, Das GP. 2004.** Natural enemies of the insect pests of sesame and their succession. J. Asiat. Soc. Bangladesh, Sci. **30(2)**, 41-48
- Hagen KS, Viktorov GA, Yasumatsu K, Schuster MF. 1976.** Range, forage and grain crops. pp. 397-442.
- Kring TJ, Gustrap FE, Michels GJ. 1985.** Role of indigenous coccinellids in regulating green bugs (Homoptera: Aphididae) on Texas grain sorghum. J. Econ. Entomol. **78(1)**, 269-273.
- Rawat R, Modi BN. 1969.** Record of some predaceous coccinellid beetles on aphid and mite pert from Madhya Pradesh. Indian J. Agric. Sci. **39(1)**, 1057.

- Riechert S E. 1999.** The hows and whys of successful pest suppression by spiders: insights from case studies. *J. Arachnol.* **27**, 387-396.
- Sahayaraj K. 2004.** Indian Insect predators in Biological Control. Daya publishing house, Delhi. pp. 4-5.
- Sakuratani Y. 1977.** Spacial distribution pattern of the low density populations of aphids in the corn fields. *J. Appl. Ent. Zool.* **21**, 66-73.
- Sakuratani Y, Suguira Y, Ishida M, Kuwahara S, Sugimoto T. 1983.** Aggregative response of adults of *Coccinella Septempunctata bruckii* mulsant (Coccinellidae) to aphid population density. *Mem. Fac. Agric. Kinki University.* **16**. 49-54.
- Sathe TV, Bhosale YA. 2001.** Insect pest predators. Daya publishing house, Delhi. 124p.
- Sathe TV, Inamdar SA, Dawale RK. 2003.** Indian pest parasitoids. Daya publishing house, Delhi. pp.5-7.
- Sumalde AC, Calilung VJ, Canlas MLJ, Barile G. 1993.** Studies in the management of Thrips palmi attacking potato in the low land. *Inc. College, Laguna (Philippines).* p-32.
- Sunderland KD. 1999.** Mechanisms underlying the effects of spiders on pest populations. *J. Arachnol.* **27**, 308-316.
- Vorley WT. 1986.** The activity of parasitoids (Hymenoptera: Braconidae) of cereal aphids (Hemiptera: Aphididae) in winter and spring in southern England. *Bull. Ent. Res.* **76**, 491-504.
- Winder L, Hirst DJ, Carter N, Wratten SD, Sopp PI. 1994.** Estimating predation of the grain aphid *Sitobion avenae* by polyphagous predators. *J. Appl. Ecol.* **31**, 1-12.
- Zaman SMH.1992.** Irrigated crop production manual. Dept. of Agril. Ext., Amader Bangla Press, Azimpur, Dhaka. Pp.7-8
- Mahmudunnabi M, Miah MRU, Haque MA, Sarkar, MA, Dutta, NK. 2009.** Abundance of predaceous insects and spiders on different crops. *Bangladesh J. entomol.* **19(1)**, 51-59.
- Ishii HT, Tanabe S, Hiura T. 2004.** Exploring the relationship among canopy structure, stand productivity and biodiversity of temperate forest ecosystems. *Forest Sci.* **50**, 342-355.