BIODIVERSITY OF BENEFICIAL INSECT ASSOCIATED WITH COWPEA AT PANTNAGAR - UTTARAKHAND - INDIA

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ABSTRACT

The field experiment was conducted during Kharif season from August to October of 2010 and during Zaid season from March to June of 2011 at Breeder Seed Production Centre –Pantnagar-Uttarakhand-India. Observations on a diversity of beneficial insect in cowpea crop had a total of 33 insect species including 16 insect species visit on flowers, 13 predators and 4 parasitoids. Among the insect visitors/pollinators total of 16 species belonging to three orders, Lepidoptera (8), Hymenoptera (4) and Diptera (4). The various groups of predators belong to 5 orders, Coleoptera (6), Neuroptera (1), Hemiptera (1), Odonata (3) and Arachnida (2) were also observed, which preyed upon the insect pests of cowpea crop such as aphids, thrips, Jassids and some small flies. Some small insects were also found on the crop as well as on collected eggs or larvae, which were identified as insect parasitoid belonging to the order Hymenoptera including 4 species of the family Eulophidae, Eurtomymidae and Braconidae. They were observed to parasitize on the lepidopteran larvae and leaf miner. This study would be helpful to develop an integrated approach for controlling the insect pest and enhancing the activity of beneficial insect to obtain maximum yield.

Keywords: *Cowpea, predators, parasitoids, beneficial insect*

INTRODUCTION

Cowpea, *Vigna unguiculata* (Linn.) Walpers is one of important leguminous crop also known as crowderpea, black-eyed bean or Southern pea in English, while Chola or Choli, Chavli, Lobia in various vernacular languages in India. Cowpea is one of the most ancient crops known to man. Its origin and subsequent domestication is associated with pearl millet and Sorghum in Africa. It is now a broadly adapted and highly variable crop, cultivated around the world primarily for seeds but also as a vegetable (for leafy greens, green pods, fresh shelled green peas and shelled dried peas), a cover crop and for fodder. The largest production is in Africa, with Nigeria and Niger predominating, but Brazil, Haiti, India, Myanmar, Sri Lanka, Australia, The U.S., Bosnia and Herzegovina all have significant production (Vishnu, 2006). Worldwide production of cowpea is approximately 20 million acres. Cowpea originated in the Savannah region of West and central Africa and like many other crops with a long history of cultivation, they are subject to heavy losses or entire crop failure as a result of severe insect predation. As many as 21 insect pests of different groups have been recorded damaging the cowpea crop from germination to maturity. The avoidable losses in yield due to insect pests have been recorded in range of 66 to 100 percent in cowpea (Pandey *et al.*, 1991). Based on population build-up and percent incidence during the Kharif season in Hisar. *Stomoxys calcitrans* was also recorded for the first time as a larval parasitoid of *Chrysodeixis chalcites* and *Anticarsia irrorata* (Sankar *et al.*, 2005).

Information on biodiversity of beneficial insect of cowpea especially in Tarai region of Uttarakhand is totally lacking. Hence, the study of "Biodiversity of beneficial insect associated with cowpea at Pantnagar- Uttarakhand – India" was carried to generate the basic information which would be helpful to develop management strategies for suppressing pest population in cowpea.

MATERIALS AND METHODS

The experiments were conducted at Breeder Seed Production Centre, Govind Ballabh Pant University of Agriculture and Technology, Pantnagar-263145, District Udham Singh Nagar (Uttarakhand) India, during *Kharif* season from August to October of 2010 and during *Zaid* season from March to June of 2011 on different five cultivars of cowpea.

Experiment was carried out on five cultivars of Cowpea; PGCP -1 (Pant lobia 1), PGCP – 4 (Pant lobia 2), PGCP - 12, PGCP – 6 and PGCP - 14. One cultivar was considered as one treatment and each was replicated three times with plot size of 4m x 3m and 50 cm in row spacing.

R1	R2	R3
PGCP - 6	**PGCP – 12**	**PGCP - 1**
PGCP - 12	**PGCP – 14**	**PGCP - 4**
PGCP - 4	**PGCP - 1**	**PGCP - 6**
PGCP - 14	**PGCP – 6**	**PGCP - 12**
PGCP - 1	**PGCP - 4**	**PGCP - 14**

LAYOUT OF THE EXPERIMENT

Observations on a diversity of beneficial insect in cowpea crop: Regular surveys were carried out at weekly interval to record and identify beneficial insect at various stages (from vegetative to harvesting) in cowpea field. Collected beneficial insects were arranged systematically for identification.

RESULTS AND DISCUSSION

The beneficial insect including pollinators/ insect visitors, predators and parasitoids were collected from various stages of cowpea with the help of insect collecting net during the Kharif season of 2010 and the Zaid season of 2011. Among the insect visitors/pollinators, total of 16 species belonging to three orders, Lepidoptera (8), Hymenoptera (4) and Diptera (4) were observed to visit on the flowers of cowpea at Pantnagar which are enlisted in Table 1. Hymenoptera represented by three family viz Apidae, Xylocopidae and Ichneumonidae. Dipterans included the insect sp. belonging to the families Asilidae, Syrphidae and Techinidae. However, Lepidopteran butterflies represented by five families viz Nymphalidae, Pieridae, Lycaenidae, Hesperiidae and Papilionidae.

Table 1. Diversity of beneficial insects in cowpea crop during the Kharif season of 2010 and Zaid season of 2011 at Pantnagar

INSECT VISITORS/ POLLINATORS ON FLOWERS					
Sl. No	Common name	Scientific name	Order	Family	Activity period
1	Honey Bee	*Apis mellifera* L.	Hymenoptera	Apidae	Sep. (2010); May (2011)
2	Carpenter bee	*Xylocopa aestuans* (Linnaeus)		Xylocopidae	May (2011)
3		*Xylocopa* sp.			
4	Ichneumonid wasp	*Charops* sp.		Ichneumonidae	
5	Robber fly	*Efferia* sp.	Diptera	Asilidae	Sep. (2010); May (2011)
6	Dronefly	*Eristalis tenax* (Linnaeus)		Syrphidae	May (2011
7	Hoverfly	*Didea fasciata* (Macquart)		Syrphidae	
8	Tachinid fly	*Archytas* sp.		Tachinidae	
9	Painted Lady butterfly	*Vanessa* sp.	Lepidoptera	Nymphalidae	May (2011)
10	Blue Pansy butterfly	*Precis orithya* (Linnaeus)			
11	Cabbage white butterfly	*Pieris brassicae*		Pieridae	Sep. (2010); May (2011)
12	Large Copper butterfly	*Lycaena* sp.		Lycaenidae	May (2011)
13	Cute butterfly (skipper)	*Parnara* sp.		Hesperiidae	
14	Long-tailed blue butterfly	*Lampides boeticus* (Linnaeus)		Lycaenidae	
15	Swallowtail lemon butterfly	*Papilio demoleus* (Linnaeus)		Papilionidae	
16	Yellow Butterfly	*Colias erate* (Esper)		Pieridae	Sep. (2010)

PARASITOID					
Sl. No	Scientific name	Order	Family	Host	Activity period
1	*Tetrastichus* sp.	Hymenoptera	Eulophidae	Lepidopteran larvae	April (2011)
2	*Diglyphus harticola*			Leaf miner	
3	*Eurytoma* sp.		Eurtomymidae	Lepidopteran larvae	
4	*Cotesia* sp.		Braconidae	Leaf miner	

PREDATORS						
Sl. No	Common name	Scientific name	Order	Family	Host	Activity period
1	Ladybird beetle	*Verania vincta* Gorh	Coleoptera	Coccinellidae	Aphids, Jassids, Thrips	Aug.-Oct. (2010); Mar.-Jun. (2011)
2		*Coccinella Septempunctata (*Linnaeus)				
3		*Harmonoia octomacullata* (Fabricius)				
4		*Rodolia* sp.				
5		*Micraspis* sp				
6		*Menochilus sexmaculatus* Fab.				
7	Green Lacewing	*Chrysoperla carnea* (Stephens)	Neuroptera	Chrysopidae	Aphids, Thrips, Lepidopteran larvae	April-May (2011)
8	Red murder bug	*Rhynocoris iracundus* Poda	Hemiptera	Reduviidae	Lepidopteran larvae	May (2010)
9	Damselfly	*Ceriagrion fallax* R.	Odonata	Coenagriidae	Lepidopteran larvae, small moths	Aug.-Oct. (2010); Apr.-Jun. (2011)
10	Dragonfly	*Anax* sp.		Aeshnidae		
11		*Pantala flavescens* Fab.		Libellulidae		
12	Spiders	*Meta menardi* (Latreille)	Arachnida	Metidae	Aphids, Thrips small Flies	
13		*Agelenopsis* sp.		Agelenidae		

Apis mellifera L.

Meta menardi (Latreille)

Coccinella septempunctata (Linnaeus)

Efferia sp.

Lampides boeticus (Linnaeus)

Fig. 1: Beneficial insect observed on cowpea crop

The various groups of predators were also observed which preyed upon the insect pests of cowpea crop (Table 1). A total of 13 species belong to 5 orders, Coleoptera (6), Neuroptera (1), Hemiptera (1), Odonata (3) and Arachnida (2). The Ladybird beetle predators were first to appear in the field of cowpea to predate mostly upon aphids. Spiders were found predating upon aphids, thrips and some small flies. Similarly, red murder bug, Green lacewing, Damselfly and Dragonfly were also noticed casually preying upon aphids, thrips and other small insects. Some small insects were also found on the crop as well as on collected eggs or larvae, which

were identified as insect parasitoid belonging to the order Hymenoptera including 4 species of the families Eulophidae, Eurtomymidae and Braconidae. They were observed to parasitize on the lepidopteran larvae and leaf miner.

CONCLUSION

During the surveys a total of 33 insect species including 16 insect species visit on flowers, 13 predators and 4 parasitoids were observed in cowpea crop. Among the insect visitors/pollinators on the flowers of cowpea order Hymenoptera represented by three family *viz.* Apidae, Xylocopidae and Ichneumonidae. Dipterans included the insect species belonging to the families Asilidae, Syrphidae and Techinidae. However, Lepidopteran butterflies represented by five families *viz.* Nymphalidae, Pieridae, Lycaenidae, Hesperiidae and Papilionidae. The various groups of predators were also observed during the investigation which preyed upon the insect pests of cowpea crop. The Ladybird beetle was first to appear in the field of cowpea to predate mostly upon aphids. Spiders were found predating upon aphids, thrips and some small flies. Similarly, Red murder bug, Green Lacewing, Damselfly and Dragonfly were also noticed casually preying upon aphids, thrips and other small insects. Some small insects were also found on the crop as well as on collected eggs or larvae, which were identified as insect parasitoid belonging to the order Hymenoptera including 4 species of the families Eulophidae, Eurtomymidae and Braconidae. They were observed to parasitize on the lepidopteran larvae and leaf miner. On the basis of the results summarized above, it can be concluded that cowpea crop has a rich biodiversity of beneficial insects. This study would be helpful to develop an integrated approach for controlling the insect pest and enhancing the activity of beneficial insect to obtain maximum yield.

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TÓM TẮT

Sự phân bổ của thiên địch trên cây đậu trắng tại Pantnaga – Uttarakhand - Ấn Độ

Thí nghiệm "Sự phân bố của thiên địch trên cây đậu trắng tại Pantnagar –Uttarakhand - Ấn Độ" được thực hiện vào vụ Thu Đông năm 2010 và vụ Hè 2011 tại Trung tâm chọn tạo hạt giống, Pantnagar, Uttarakhand, Ấn Độ. Thiên địch trên cây đậu bao gồm 33 loài. Trong đó, 16 loài xuất hiện trên hoa, 13 loài ăn thịt và 4 loài ký sinh. Mười sáu loài xuất hiện trên hoa thuộc 3 bộ: Lepidoptera (8 loài), Hymenoptera (4 loài) và Diptera (4 loài). Nhóm ăn thịt gồm 13 loài thuộc 5 bộ: Coleoptera (6 loài), Neuroptera (1loài), Hemiptera (1loài), Odonata (3 loài) và Arachnida (2 loài). Chúng ăn các loài côn trùng gây hại trên cây đậu như là rầy mềm, bọ trĩ, rầy lá và một số côn trùng nhỏ có cánh. Kết quả phân lập và định danh một số loài sâu và trứng của côn trùng gây hại bị ong ký sinh thuộc bộ Hymenoptera có 4 họ Eulophidae, Eurtomymidae và Braconidae. Các loài ong này ký sinh trên sâu của bộ Lepidoptera và sâu vẽ bùa. Nghiên cứu sẽ giúp ích cho chiến lược quản lý dịch hại và tăng cường hoạt động của các loài thiên địch trên cây đậu nhằm đạt được năng xuất tối đa.