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Insects Associated with Mung Bean Crop: A Short Term Study in an Agro-ecosystem at Jhunjhunu District of Rajasthan

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Abstract - The mung bean (*Vigna radiata*), alternatively known as green gram, is a plant species in legume family. Being rich in quality protein, minerals and vitamins, they are an important ingredient in the diets of a large number of Indian population. The plants are able to fix nitrogen. A seed of mung bean is highly nutritious containing 24-28% protein, 1.0-1.5 fat, 3.5 -4.5-% ash and 59-65% carbohydrates on dry weight basis and provide 334-344 kcal energy. The protein is easily digestible and is widely cherished as sprouts. The haulms are used for fodder and the bean husks are useful as a feed concentrate. The crops are also grown for hay, green manure and cover crop. The mung bean is mainly cultivated in East Asia, Southeast Asia and the Indian subcontinent. It is used as an ingredient in both savory and sweet dishes.

In all, 52 insects belonging to 8 orders and 24 families were collected from the crop of which four were dominant, twenty four frequent and twenty four were rare forms. Maximum density of on mung bean crop was found in the month of September and diversity in the month of October while, the minimum density as well as diversity was noted in the month of July.

Keywords - Insects, diversity, density, mung beans, agro-ecosystem.

I. Introduction

India has an agriculture based economy. The task of farmers is to maintain the natural balance among elements in the agro-ecosystem, ensuring a good environment for the crop to grow well. Field observation is the key to make appropriate crop cultivation decisions. By observing the field and its surrounding environment thoroughly and regularly, farmers will know exactly what the conditions in the field are like. Hence, they do not have to be afraid of any unexpected problems, such as a pest outbreak or drought.

Arid zone of Rajasthan which covers 60% area of total Indian desert has the most serious problem of food production and plant protection directly or indirectly associated with it. Both our government and public in general are equally interested in meeting this problem successfully. In recent years, the losses caused by insect pests to the crops are high. The arid zone crops are the potential hosts of several insect species and some of them are at the pest status minimizing the yield.

The **mung bean** (*Vigna radiata*), alternatively known as green gram, is a plant species in legume family. Being rich in quality protein, minerals and vitamins, they are an important ingredient in the diets of a large number of Indian people. The plants are able to fix nitrogen as is found in all other legumes. A seed of mung bean is highly nutritious containing 24-28% protein, 1.0-1.5 fat, 3.5 -4.5-% ash and 59-65% carbohydrates on dry weight basis and provide 334-344 kcal energy. The protein is easily digestible and is widely cherished as sprouts. The haulms are used for fodder and the bean husks are useful as a feed concentrate. The crops are also grown for hay, green manure and cover crop. The mung bean is mainly cultivated in East Asia, Southeast Asia and the Indian subcontinent. It is used as an ingredient in both savory and sweet dishes.

The present study was undertaken to survey the insect fauna associated with this crop in an agro-ecosystem situated in the Indian desert in Jhunjhunu district of western Rajasthan.

II. Materials and method

The study area

The state of Rajasthan, the land with vivid topographical features and cultures, is the largest state of Indian republic occupying an area of 3,42,239 sq km.. Geographically, it is located between 23°3'-30°12' N and 69°30'-78°17' E. The state is divided into two unequal parts, the north-west 3/5th part constitutes a major portion of Indian desert having arid and semi-arid landscapes, while the eastern 2/5th part consist of fertile plains. The study area under study falls in the Indian desert in Jhunjhunu district situated in western Rajasthan. Jhunjhunu is located at 28°08'N&75°24' E and 28.13°N&75.4°E. The agro-ecosystem in the form of crop fields studied lies about 5km away from the city of Jhunjhunu, covering an area of 1000 x 500 m.

III. Methodology

The study concentrated on documenting the diversity and density of insect visitors to mung bean crop cultivated in the crop field employing an indigenously designed cage of size 1mx1mx1m of nylon mesh for insect collection which has earlier been used by Saigal (2002). The cage covered the 1m³ volume while holding the crop inside. The fauna trapped within the cage was mechanically picked up. Using cage the insects were collected between 7A.M to 11A.M, and again in the afternoon from 4 P.M. to 6 P.M. The insect visitors were surveyed and collected every week from July to October.

The insects collected by the above method were transferred to killing bottles, killed and preserved. The fauna were sorted out and identified following pertinent literature, help from the Section of Entomology, Department of Agriculture, Bikaner and Desert regional Station of the Zoological Survey of India, Jodhpur was also taken for identification and for confirmation. Besides, the reference collection in the Department of Zoology, Dungar College was consulted. The count of insect fauna collected using cage was averaged for each month and expressed as no/m³ or number/trap.

For the study, the field area was divided into five stations. The insects collected by the above method were transferred to killing bottles, killed and preserved. The fauna were sorted out and help from the Section of Entomology, Department of Agriculture, Bikaner and Desert regional Station of the Zoological Survey of India, Jodhpur was also taken for identification and for confirmation. Besides, the reference collection in the Department of Zoology, Dungar College was also consulted.

IV. Results and Discussion

The entomo-fauna collected from the crop of mung bean during the survey period has been presented in Table 1.

In all, 52 insects belonging to 8 orders and 24 families were collected from the crop of which four were dominant, twenty four frequent and twenty four were rare forms. Maximum density of on mung bean crop was found in the month of September and diversity in the month of October while, the minimum density as well as diversity was noted in the month of July.

Of the total ten coleopteran insect species observed, eight (*O.catta* *O. bonasus*, *Adoretus* sp., *Cicindella* sp. *Ochodius* sp., *P. nasutus*, *Mylocerus* sp. and *C. pictus*) were frequent. Among seventeen lepidopteran insects reckoned, two (*L. boeticus* and *Tephрина* sp.) were dominant, ten (*C. vestalis*, *C. fieldii*, *E. hecabe*, *D. chrysippus*, *E. insulana*, *M. seprata*, *T. orichalcea*, *A. ipsilon* *H. peltigera*, *H. fasciles*) were frequent and five (*E. cnejus*, *S. exigua*, *C. medinalis*, *E. zinckenella* and *U. pulchella*) were rare forms. Further, *E. hecabe*, *L. boeticus*, *H. peltigera*, *H. fasciles*, *E. zinckenella* and *Tephрина* sp. were noted throughout the cropping period. All the six hemipteran species documented namely, *N. viridula*, *B. hilaris*, *Oncocephalus* sp., *D. cingulatus*, *Aphanus* sp. and *Clavigrella* sp. were rare forms. Among seven hymenopteran insects reckoned on this crop, two (*D. affinis* and *Formica* sp.) were frequent and five (*A. cerana*, *A. mellifera*, *A. dorsata*, unidentified sp., A and unidentified sp. B) were rare forms. Besides, *A. cerana*, *D. affines*, and *Formica* sp. were regular visitors to the crop. Of the two dipteran species observed on this crop, *C. quinquefasciatus* was dominant and *M. domestica* was a frequent form. Both these insect species were noted as regular visitors to this crop. Among seven orthopteran insects, three (*Chrotogonus* sp. *O. chinensis* and *G. assimilis*) were frequent, and four (*S. gregaria*, *Eucenocephalus* sp., *A. domestica*, and *Ochirilidia* sp.) were rare forms. The two odonate insects which were reckoned on this crop were *A. femina* and *R. nursei*. Both were rare forms. Only one neuropteran documented was *C. carnea*, that too was a rare form.

Earlier, Bhardwaj et al. (2014) recorded insect visitors to inflorescence of coriander in an agro-ecosystem, while, Bhardwaj & Srivastava (2012) documented insects on cucurbit crops and reported various insect orders on them. Sima et al. (2014) in another study noted floral visitors on different crops from desert region, while, Bhardwaj et al. (2012) documented hymenopteran floral visitors. Similarly, entomo-fauna associated with Bajra crop have been documented by Sima & Srivastava (2012). A survey has also been conducted to compare the insect fauna collected employing two different methods of collection from the region (Sima & Srivastava, 2014).

Chrysodieixis sp. to attack, plants belonging to legume family. The present works gets support from the earlier work including these by (Swain, 1971 & Holloway, 1964) who noted a number of legumes including mung bean, cowpea etc. are damaged by *Lampides boeticus* has been reported earlier by Swain (1971). A hemipteran *Nezara viridula* also called green stinck bug causes damage to beans has been suggested by Butcher (1981), Hill (1975) and Swain (1971). *Heliothis armigera* and *Spodoptera litura* damage a wide range of crops including beans was noted by Hick (1980) and Hill (1975). *Mylocerus undecimpustulatus maculosus* was reported to be polyphagous pest of soybean by Singh & Singh (1997). According to Kumar & Nigam (1991) the pests attacking mung bean at seedling and

vegetative stages include *Caliothrips indicus*, *Megalurothrips distalis*, *Aphis craccivora*, *Empoasca kerri*, *Bemisia tabaci*, *Amsacta moorei*, *Myllocerus* sp., *Anarsia aphippias*, *Acrocerops phaseospora*, *A. caerela*, *Melanagromyza phaseoli*, *Madurasia obscurella*, *Luperodes* sp. and pests damaging the buds, flowers and the pods include *Euchrysops cnejus*, *Lampides boeticus*, *Catochrysops strabo*, *Heliothis armigera*, *Cydia hychora* and *Pachytychius mungonis*.

All these are in conformation with the present findings suggesting that many insects are associated with the mung bean crop depending upon the time, age of the crop and area of cultivation.

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Table 1. Entomo-faunal diversity and density (number/m³) on mung bean crop at the agro-ecosystem during the period of study

	Jul	Aug	Sep	Oct	Status
Order: Coleoptera					
Family: Scarabaeidae					
<i>Anomala bengalensis</i>	5	6	4	-	R
<i>Onthophagus catta</i>	9	8	7	1	F
<i>Onthophagus bonasus</i>	10	16	14	5	F
<i>Adoretus</i> sp.	5	11	12	7	F
<i>Ochodeus</i> sp.	8	7	2	10	F
<i>Peltonatus nasutus</i>	9	5	6	5	F
<i>Apogonia ferruginea</i>	30	24	28	22	D
Family: Curculionidae					
<i>Myllocerus</i> sp.	10	13	18	15	F
Family: Cicindelidae					
<i>Cicindella</i> sp.	17	20	23	26	F
Family: Meloidae					
<i>Cylindrothorax pictus</i>	13	13	15	17	F
Order: Lepidoptera					
Family: Pieridae					
<i>Colotis vestalis</i>	4	5	10	-	F
<i>Colias fieldii</i>	4	6	8	-	F
<i>Eurema hecabe</i>	12	14	18	22	F
Family: Lycaenidae					
<i>Lampides boeticus</i>	25	33	37	40	D
<i>Euchrysops cnejus</i>	-	-	1	-	R
Family: Danaidae					
<i>Danaus chrysippus</i>	-	7	10	-	F
Family: Noctuidae					
<i>Earias insulana</i>	11	13	8	-	F
<i>Mythimna separata</i>	6	5	6	8	F
<i>Agrotis ipsilon</i>	14	10	7	5	F
<i>Thysanoplusia orichalcea</i>	17	20	23	25	F
<i>Heliothis peltigera</i>	5	8	10	12	F
<i>Spodoptera exigua</i>	-	-	-	1	R
Family: Crambidae					
<i>Hymenia recurvalis</i>	16	19	21	23	F
<i>Cnaphalocrocis medinalis</i>	-	-	3	5	R
Family: Pyralidae					
<i>Etiella zinckenella</i>	4	2	3	5	R
Family: Arctidae					
<i>Utethesia pulchella</i>	-	2	4	6	R
Family: Geometridae					
<i>Tephрина</i> sp.	30	33	37	46	D
Order: Hemiptera					
Family: Pentatomidae					
<i>Nezara viridula</i>	1	2	3	4	R

	Jul	Aug	Sep	Oct	Status
<i>Bagrada hilaris</i>	2	1	4	3	R
<i>Oncocephalus</i> sp.	-	-	-	1	R
Family:Pyrrhocoridae					
<i>Dysdercus cingulatus</i>	-	1	-	-	R
Family:Lygaeidae					
<i>Aphanus</i> sp.	-	-	-	2	R
Family : Coreidae					
<i>Clavigrella</i> sp.	-	1	2	2	R
Order:Hymenoptera					
Family:Apidae					
<i>Apis cerana</i>	2	4	1	5	R
<i>Apis mellifera</i>	-	-	2	8	R
<i>Apis dorsata</i>	-	2	-	4	R
Family:Formicidae					
<i>Dolichoderus affinis</i>	2	3	5	6	F
<i>Formica</i> sp.	6	7	9	11	F
Unidentified speciesB	-	-	-	1	R
Unidentified speciesC	-	-	2	3	R
Order:Diptera					
Family:Muscidae					
<i>Musca domestica</i>	11	15	17	19	F
Family:Culicidae					
<i>Culex quinquefasciatus</i>	24	27	29	30	F
Order:Orthoptera					
Family:Acrididae					
<i>Chrotogonus</i> sp.	10	15	21	17	F
<i>Ochrilidia</i> sp.	-	2	3	5	R
<i>Schistocerca gregaria</i>	-	-	1	-	R
<i>Oxya chinensis</i>	12	14	25	30	F
Family:Tettigoniidae					
<i>Eucenocephalus</i> sp.	-	2	3	2	R
Family:Gryllidae					
<i>Acheta domesticus</i>	4	6	-	-	R
<i>Gryllus assimilis</i>	9	11	12	14	F
Order:Odonata					
Family:Coenagrionidae					
<i>Agriocnemis femina</i>	1	2	3	4	R
<i>Rhodischnura nursei</i>	-	-	-	2	R
Order:Neuroptera					
Family:Chrysopidae					
<i>Chrysopa carnea</i>	-	-	-	1	R

D-Dominant
D>100

F-Frequent
100>F>16

R-Rare
R□16