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Monitoring of important predators associated with major insect pests of rice during *kharif* season 2017 at Pusa, Samastipur

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Abstract

The experiment was conducted during *kharif* season of 2017 at Pusa farm of Rajendra Prasad Central Agricultural University, Pusa (Samastipur), Bihar. Monitoring of important predators associated with major insect pests of rice during *kharif* season of 2017 indicated that among the predators relatively abundance of lady bird beetle was maximum 31.60 per cent. The important predators observed in the rice ecosystem of Pusa are spider, lady bird beetle, staphylinid beetle, green mirid bug, dragonfly and damselfly. Predatory spider, dragonfly and damselfly were found most active during the month of July while lady bird beetle, staphylinid beetle and green mirid bug were found most active in the month of August and September by sweeping net sampling and handpicking method. The highest count for most of the predators and parasitoids were observed in the month of August and September but spiders, dragonfly and damselfly were found most active during the month of July.

Keywords: Stem borer, leaf folder, plant hopper, predators

Introduction

Rice is one of the main crop of Bihar but its productivity is very poor since more than 60 per cent area under rice cultivation is concentrated in low productivity zone. Therefore the production and productivity of rice in Bihar is less than other states of the country. Warm and humid environment are conducive for survival and proliferation of insect pests in rice ecosystem. Therefore insect pests proved to be the major constraint in rice production.

Now a day's parasites and predators are being used for managing insect pests due to harmful effects of chemical pesticides. Natural enemies of rice insect pest include a wide range of predators and parasitoids that are important biological agents. Predators include a variety of spiders and insects such as carabid beetles, coccinellid beetles commonly known as lady bird beetles, aquatic and terrestrial predatory bugs and dragon flies^[5]. Predators as biocontrol agents, may be more important, because the majority of parasitoids are relatively host specific whereas, most predators are regarded as polyphagous. Amongst the predators of rice pests, spiders and coccinellids are important. Spiders alone constitute 80 percent of predatory fauna in the rice ecosystem^[12]. Agricultural entomologists have acknowledged the importance of spider species as major factor in regulating the pest population of the crops. Spiders as obligate suctorial carnivores often constitute a large part of the predatory arthropod fauna of rice agro ecosystem and prey on many insect pest^[2]. Several workers have reported predatory potential of spiders against rice pests in India and abroad^[7] and^[4]. Spiders are very effective against rice stem borer^[13]. It is amongst the major bioagent population for regulation of rice leaf folder and plant hopper^[10].

This study was conducted to know the important predators which were mostly present in the rice fields for controlling the major insect pests of rice such as yellow stem borer, leaf folder and plant hoppers.

Materials and Methods

The parasites and predators present in the rice crop ecosystem has immense role in regulating the insect pest present in the crop ecosystem. The observations of predator/parasite were recorded from the unsprayed experimental plots of Entomology unit by random sampling during *kharif* 2017. There are various sampling techniques for monitoring of parasites and predators such as sweeping net, hand picking and counting, visual counting per unit area, light trapping etc.

Here, sweeping net sampling and hand picking method were adopted at weekly intervals throughout the crop season for estimation of parasites and predators in the rice field.

Sweeping net sampling

This sampling technique is useful in catching of predator present in the crop ecosystem. A total of 25 samples were taken to observe the occurrence of important predators like spider, lady bird beetle, staphylinid beetle, green mirid bug, dragonfly and damselfly etc. Insects were collected by making ten successive double stroke sweeps on randomly selected site using sweeping net of 30 cm diameter with handle 75 cm long. One sample consists of ten sweeps at a place at weekly intervals. The predator population was collected after sampling and after due count the same were released in the paddy crop.

Handpicking method

Parasites and predators present on the leaf sheath, leaf blades were directly collected into glass tubes of 2.5 X 10 cm and tapping with cotton lid. Small insects were collected with the help of brush. These were then sorted and counted. Relative abundance of natural enemies was calculated using the following formula:

$$\text{Relative abundance (\%)} = \frac{\text{Total number of individuals of each species}}{\text{Total number of individuals of all species}} \times 100$$

Results and Discussion

The observations were recorded for predators such as, lady bird beetle, staphylinid beetle, green mirid bug, dragonfly and damselfly through sweeping net consisting of ten successive double stroke sweeps at each of the randomly selected spot and also through hand picking in rice field at weekly intervals as shown in the Table 1. Data revealed that maximum population of predatory spider was observed in the 29th standard week of July and afterwards it declined. The population of lady bird beetle was very low initially, afterwards the peak population of lady bird beetle was observed in the 33rd standard week of August and the second peak population in the 34th standard week of August. Staphylinid beetle was not found in the month of July. The highest count of staphylinid beetle was observed in the 39th standard week of October and the second peak was observed in the 35th standard week of September. The population of green mirid bug was low initially and reached to the peak in the 36th standard week of September. The population of dragonfly was highest in the 29th standard week of July and second peak was observed in the 32nd standard week of August. Initially, the population of damselfly was highest in the 30th standard week of July and the second peak was observed in the 31st standard week of August and there after it declined. Overall the relative abundance of lady bird beetle was observed maximum in the field with 31.69% followed by spiders with 18.64% and minimum of green mirid bug with 9.90% (Table 2). The incidence of lady bird beetle was observed maximum in the tillering stage of the crop which

was 308.24% followed by that of spiders 154.40% (Table 3). Hence we can say that lady bird beetles were the main predator found in the rice field. [9] Reported 23 insects including spiders preying on various stages of insect pests belonging to 7 orders and 18 families was prominently recorded. Among the 23 predators, dragonflies, *Crocothemis servilia* (Drury) and *Orthetrum sabina* (Drury), damselfly, *Agriocnemis femina*, lady bird beetles, *Micraspis discolor* and *Hormonia octamaculata*, rove beetle, *Paederus fuscipes* and ground beetle, *Ophionia indica* were found to be abundantly preying on immature and mature stages of major and minor insect pests. [8] reported the most common and dominant predators of rice ecosystem as spiders, coccinellids, staphylinids, mirids, damsel flies and dragon flies at Pantnagar. It is concluded in the Annual Progress Report of DRR [1] that spider, mirid bugs and staphylinid beetles constituted the major predators of general significance at Raipur, New Delhi, Warangal, Khudwani and Malan center of AICRIP. The present findings are also in agreement with the above findings. It may be stated that spider, lady bird beetle, staphylinid beetle, green mirid bug, dragonfly and damselfly are the important predators of rice ecosystem. Spider, dragonfly and damselfly were found most active during the month of July and staphylinid beetle, lady bird beetle and green mirid bug were most active in the month of August and September. Maximum number of natural enemies associated with the major insect pest of rice were observed in tillering stage of the crop. [6] Reported that the population of natural enemies like coccinellid, syrphids and spiders were host dependent. [3] Studied the populations of major pests associated with rice ecosystem were recorded at weekly intervals during *kharif* 2002, using sweep nets in Kangra Valley. The sweeps were made from one corner of the three blocks (330 m² each) to the other corner diagonally for half an hour, thus covering the field from four corners through the centre. The total number was counted for each sweeping interval and mean population per week of individual pest was calculated. Results revealed that the main insects included the stem borer (*Scirpophaga innotata*), leaf folder (*Cnaphalocrocis medinalis*) and rice hispa (*Diadisa armigera*), all of which appeared during the first week of July, with initial mean populations of 11.33, 1.00 and 1.67 respectively. Mean maximum population of these pests were observed as 42.66, 51.67 and 59.33 during August to September which coincided with the vegetative stage of the plant. [11] Conducted a survey during the crop seasons of 2000-2002 to determine the insect fauna associated with basmati rice, along with their nature of damage, seasonal incidence and economic importance, in Tarai region of Uttar Pradesh, India. A total of 28 insect species were recorded. The yellow stem borer, *Scirpophaga incertulas* (July-October), leaf-folder, *Cnaphalocrocis medinalis* (August-September) and brown plant hopper, *Nilaparvata lugens* (August-September) were found as major pests which was quite similar to the present findings.

Table 1: Predator population collected through sweeping net and handpicking at weekly intervals during *kharif* 2017

Month	Std. week	Temperature (°C)		Relative humidity (%)		Rainfall (mm)	Wind speed (Km / hr.)	Spider	Lady bird beetle	Staphylinid beetle	Green mirid bug	Dragonfly	Damsselfly
		Max.	Min.	Mor.	Even.								
Jul.	29	34.3	27.3	85	68	12.8	6.9	49	11	00	04	31	23
Jul.	30	32.1	26.2	86	75	31.4	8.7	43	21	00	09	23	32
Aug.	31	33.0	26.3	90	77	12.4	3.6	32	32	12	12	29	28
Aug.	32	32.8	26.5	93	79	116.3	5.2	35	44	09	19	30	16
Aug.	33	31.0	25.3	94	79	214.4	4.1	26	63	26	13	27	24
Aug.	34	33.2	26.8	87	71	41.8	4.7	24	60	23	22	24	21
Sept.	35	32.8	26.5	88	76	02.6	5.5	39	47	30	27	20	19
Sept.	36	33.9	26.3	88	65	11.2	3.3	40	52	18	31	13	25
Sept.	37	34.0	27.0	91	71	02.6	3.4	22	58	29	17	15	16
Sept.	38	33.5	26.1	88	70	30.0	6.0	24	51	27	16	16	13
Sept.	39	34.3	25.8	88	62	00.0	3.1	13	59	31	14	10	17
Oct.	40	33.2	25.0	87	70	00.0	3.6	10	58	29	10	09	12
Oct.	41	33.1	25.0	89	69	03.5	4.2	16	52	24	14	13	10
Oct.	42	33.4	22.8	88	63	00.0	3.5	13	48	27	19	08	14

Table 2: Relative abundance of predators of major insect pests of rice (%)

Name of insect	Total (no.)	Relative abundance (%)
Spider	386	18.64
Lady bird beetle	656	31.69
Staphylinid beetle	285	13.76
Green mirid bug	205	09.90
Dragonfly	268	12.94
Damsselfly	270	13.04

Table 3: The incidence of natural enemies at different growth stages of rice in per ten complete sweeps

Growth stage	Spider	Lady bird beetle	Staphylinid beetle	Green mirid bug	Dragonfly	Damsselfly
Seedling stage	128.10	113.15	62.79	37.30	63.51	63.75
Tillering stage	154.40	308.24	125.18	76.58	88.35	89.18
Heading stage	103.50	234.61	97.03	91.12	116.14	117.07

Conclusion

The important predators observed in sweeping net and hand picking collection were spiders, lady bird beetle, staphylinid beetle, green mirid bug, dragonfly and damsselfly. Spider, dragonfly and damsselfly were found most active during the 29th and 30th standard week of July whereas lady bird beetle, staphylinid beetle and green mirid bug were most active in the month of August and September. Among all the predators present in the field lady bird beetles was observed in maximum number. Rice stem borer, leaf folder and plant hopper were observed as major insect pest in sweeping net and hand picking collection in rice field.

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