

Original Research Article

<https://doi.org/10.20546/ijcmas.2020.909.269>

Insect Pests Associated with Rice Crop (*Oryza sativa*) at Cachar District of Assam

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ABSTRACT

Keywords

Rice, Vegetative stage, Reproductive stage, Fortnightly observation, *khari*f season

Article Info

Accepted:
17 August 2020
Available Online:
10 September 2020

A survey was conducted in different farmer's field to study the incidence of major insect pests of rice crop in Cachar district, Assam. The present study was done in *Khari*f season (August to November/December), 2019. Fortnightly observation was taken at vegetative and reproductive stages of paddy. During the present investigation, seven insect species *viz.*, *Cnaphalocrocis medinalis* (Guenee), *Scirpophaga incertulas* (Walker), *Mythimna separate* (walker), *Leptocorisa* spp, *Nilaparvata lugens* (Stal), *Nephotettix nigropictus* (Stal) and *Nephotettix virescence* (Distant) were recorded as major pests in paddy field. Among them, leaf folder (*C. medinalis*) and yellow stem borer (*S. incertulas*) were found as highly abundant and dominant pest species of rice cultivated in the study area.

Introduction

Rice (*Oryza* spp.) is the most important staple food for a large part of the world's population. It is cultivated in almost all the tropical, sub-tropical and temperate countries of the world. The major rice growing countries are India, China, Japan, Indonesia, Thailand, Burma, Philippines and Bangladesh. India is amongst the top most rice producers in the world, second only to China. Rice contributes more than 40 per cent of the country's total food grain production (Anonymous, 2018). According to the data released by the government of India, the annual production of

rice in India is 115.63 million ton during 2018 – 19 (Anonymous, 2019). However farmers face huge economic losses in paddy cultivation in every year. Reduction in the rice yield is due to many biotic and abiotic stresses such as, pests, diseases, soil fertility, rainfall, water logging and climatic conditions. Among the major yield limiting factors pests are said to be an important one. Pest causes 30 % production loss in India (Sachan *et al.*, 2006 and Dhaliwal *et al.*, 2010). Rice crop is attacked by more than 100 species of insects and 20 of them cause economic damage (Basit and Bhattacharya, 2001). Insect pests that can cause significant

yield losses are stem borers, leafhoppers, plant hoppers, gall midge, defoliators (mainly Lepidopterans), and grain-sucking bugs (Pathak and Khan, 1994). The yield loss estimates due to yellow stem borer, brown plant hopper and gall midge are 25-30, 10-70 and 15-60%, respectively. Leaf folder (10%) and other pests (25%) also cause yield losses (Krishnaiah and Varma, 2013). The major factors that have contributed towards changes the pest scenario are extensive cultivation of high yielding varieties, growing of varieties lacking resistance to major pests, intensified rice cultivation throughout the year providing constant niches for pest multiplication, imbalanced use of fertilizers, particularly application of high levels of nitrogen, non-judicious use of insecticides resulting in pest resistance to insecticides, and resurgence of pests and out breaks of minor pests. Assam is one of the constituent states in the North – Eastern Hill Region of India.

The economy of the state mainly depends upon agriculture. More than 90% population of Assam depend on rice for the caloric requirement. Due to good rainfall and constant humidity, this region is perfectly suitable for rice production. During 2015 - 2016 the state made a production of over 5.14 million tonnes (Anonymous, 2018). Rice is traditionally-grown throughout the year *viz.* sali or winter rice (June/July to November/December); ahu or autumn rice (March/April to June/July); and boro or summer rice (November/December to May/June). Sali or winter rice is dominant crop of the State. During sali season, transplanting is starting with the onset of monsoon (July – August).The weather condition is warm and humid. This climatic condition is beneficial for the development of various pests. It is a major problem in increasing rice production here. Considering these facts, the present experiment has been carried out to study the major insect pest

incidence on rice ecosystem during *kharif* season in Cachar district of Assam.

Materials and Methods

The survey was undertaken in different farmer’s field of cachar district, Assam during *kharif* season, 2019 to study the incidence of major insect pests in rice ecosystem. Fortnightly observation was taken from August to November /December in accordance to population dynamics of major insect pests and their damage extent. Observation was noted in vegetative and reproductive (Aug-Nov/Dec) stages of rice. Different species of insect pests were collected by hand picking and using insect collecting net. According to damage extent, major insect pests were identified through surveillance. The collected arthropods were sorted, counted and identified the morphological characters by consulting the published taxonomic keys and related literature. Percentage of damage extent of insect pests was computed by following formula proposed by (Rath *et al.*, 2015; Singh and Singh, 2017; Venkateswarlu *et al.*, 2018):

$$\text{Percent incidence of Yellow Stem Borer} = \frac{\text{Total no of dead hearts/white ears in 15 hills}}{\text{Total no of tillers (dead heart or white ears + healthy tillers) in 15 hills}} \times 100$$

$$\text{Percent incidence of Leaf folder} = \frac{\text{Total no.of folded leaves in 15 hills}}{\text{total no of leaves (folded+healthy) in 15 hill}} \times 100$$

$$\text{Percent incidence of Green Leaf hopper} = \frac{\text{Total no.of yellow/ brown leaves in 15 hills}}{\text{total no of leaves (yellow+healthy) in 15 hills}} \times 100$$

$$\text{Percent incidence of Brown Plant hopper} = \frac{\text{No.of hopper burn symptoms of hills}}{\text{total no of hills in one meter square}} \times 100$$

$$\text{Percent incidence of Gundhi bug} = \frac{\text{Total no.of damaged grain in 5 penicles}}{\text{Total no of grains (damage+healthy) in 5 penicles}} \times 100$$

$$\text{Percent incidence of army worm} = \frac{\text{damaged plants in one meter square}}{\text{Total no of plants (damage+healthy) in one meter square}} \times 100$$

borer enters from the lower side of plants and eats tender material and move towards upward side of plants. The leaves turn yellow to light brown and ultimately dry after some time.

Results and Discussion

In the present investigation, seven species of herbivores were identified as “major” pests, these were leaf folder (*C. medinalis*), stem borer (*S. incertulas*), armyworm (*M. separate*), gundhi bug (*Leptocoris* spp), brown plant hopper (*N. lugens*), green leaf hopper (*N. nigropictus* and *N. virescence*). These were observed frequently during each observation period right from early vegetative to till harvesting stage of rice (Table 1). Out of seven insect pests attacked the crop, leaf folder and stem borer were dominant in the field. The major insect pests of rice show specific symptoms in the field through which we can identify the affected field. The data for damage extent caused by insect was calculated by specific formula (Rath *et al.*, 2015; Singh and Singh, 2017; Venkateswarlu *et al.*, 2018).

Yellow stem borer (*Scirpophaga incertulas*)

The incidence of stem borer was first observed from 18 - 20 days after transplanting with damage extent 0.50 percent (Table 2). The infestation of yellow stem borer was high from middle of September to middle of October and then it decreased in field. The population increased gradually with the advancement of the crop age and reached the peak on first week of October, 2019 (12.11 per cent of damaged leave) when the crop was at reproductive stage. After 15 days from that period it was in moderate density in middle of October and then gradually decreased. Yellow stem borer caused damage in paddy from the nursery stage to reproductive stage. Damage caused by these pests is easily identified by “Dead heart” symptom at the vegetative stage of paddy while at reproductive stage by “white ear” formation. The larva of stem

Leaf folder (*Cnaphalocrocis medinalis*)

Leaf folder was initially noticed on last week of August at 30 – 35 DAT, with 4.35 percent damage of leave. Thereafter, the population continued to increase and reached its peak (10.75 percent) from middle of September to first week of October when crop was at reproductive stage. Subsequently, the population was observed to fluctuate and decreased gradually at end of December, 2019. The leaf folder population increases due to heavy use of fertilizers its encourage its multiplication rate while the humidity and rain fall also increase its population rate in paddy fields. When field appear scorched with many folded leaves its means the attack of leaf folder is sever. Incidence of first instar have found on tender leaves without folding them. The older larvae fasten the longitudinal margin of leaves together with a sticky substance and feed inside the folded leaves by scarping the green matter (Table 2).

Armyworm (*Mythimna separate*)

Army worm feeds on rice by cutting off leaves. Army worms can feed mainly on the night time and during day time it’s in resting period. First appearance of armyworm (0.25 per cent damage extent) was recorded on 16th August, 2019. The high population was present in field from last week to August to first week of October and maximum (10.50 per cent) was observed during 2nd week of September when crop was at vegetative stage. Subsequently, the activity of the pest was declined and lowest was found (0.75 per cent damage extent) in second week of October (Table 2).

Gundhi bug (*Leptocorisa* spp)

Gundhi bug was remain in field from second week of September to middle of October, 2019. The peak period of activity of gundhi bug (10.50 per cent of damage extent) was observed at 1st week of October at grain formation stage. At this stage due to infestation of bug, grains became chaffy with numerous brownish spots at the feeding sites causes shriveling of grains. Leaves turn yellow and later rusted from tip downwards.

Brown plant hopper (*Nilaparvata lugens*)

Attack of *Nilaparvata lugens* causes circular patches in the field which is called “hopper burn”. BPH also suck the fluid from plant sap from lower to upper side and release a sticky

fluid which causes fungal infection. The effect of this pest is more from last week of August to middle of September. It was remained in field from August to December and subsequently, the population declined towards the harvesting stage of paddy crop.

Green leaf hopper (*Nephotettix nigropictus* and *N. virescence*)

In middle of August, incidence of green leaf hopper was found which increased in last week of August. It was much active at vegetative phase of paddy growth and its incidence was gradually declined towards the harvesting stage of crop. Damage caused by these pests is easily identified by yellow and brown leaves symptom of paddy leaf.

Table.1 Major insect Pest of paddy in Cachar District of Assam

SL No	Common Name	Scientific name	Order: Family
1.	Yellow stem borer	<i>Scirpophaga incertulas</i> (Walker, 1863)	Lepidoptera: Pyrausdtidue
2.	Leaf folder	<i>Cnaphalocrocis medinalis</i> (Guenee, 1854)	Lpidoptera: Crambidae
3.	Gundhi bug	<i>Leptocorisa</i> spp	Hemiptera: Alydidae
4.	Armyworm (Rice ear cutting caterpillar)	<i>Mythimna separate</i> (walker)	Lepidoptera: Noctuidae
5.	Brown plant hopper	<i>Nilaparvata lugens</i> (Stal 1854)	Hemiptera: Delphacidae
6.	Green leaf hopper	<i>Nephotettix nigropictus</i> (Stal, 1870) and <i>N. virescence</i>	Hemiptera: Cicadellidae

Table.2 Major insect caused damage in paddy field (Percentage incidence) with damage extent

Observation date (Fortnightly)	Leaf folder	Yellow stem borer	Armyworm	Gundhi bug	Brown plant hopper	Green leaf hopper	
						<i>N. nigropictus</i>	<i>N. virescence</i>
16.08.2019	0.00	0.50	0.25	0.00	0.92	1.15	1.05
31.08.2019	4.35	3.30	7.25	0.00	11.25	10.45	9.95
16.09.2019	8.85	10.00	10.50	6.66	9.00	9.30	10.02
01.10.2019	10.75	12.11	8.75	10.50	6.17	7.05	7.25
16.10.2019	7.75	10.25	0.75	8.35	9.65	5.55	5.56
31.10.2019	3.05	1.05	0.00	0.00	2.20	2.02	1.85
16.11.2019	1.25	1.35	0.00	0.00	0.00	0.00	0.50

During the study period, it was observed that rice crop was infested by different insect pests viz. leaf folder (*C. medinalis*), yellow stem borer (*S. incertulas*), army worm (*M. separata*), brown plant hopper (*N. lugens*), green leaf hopper (*N. nigropictus* and *N. virescence*) and gundhi bug (*Leptocorisa* spp) in different farmer's field of Cachar district, Assam in *kharif* season, 2019. Among them, leaf folder and yellow stem borer were found as highly abundant and dominant pest species of rice cultivated in the study area and rest species were found moderately damaging the crop. The present findings were supported by the findings of Ghosh *et al.*, (2016) in Burdwan district, West Bengal and they reported that LF (*C. medinalis*) and YSB (*S. incertulas*) were the major and serious pests of rice plant. Similar findings were also reported by Saini *et al.*, (2015) who recorded twelve species of insect pests from basmati rice and among them, yellow stem borer and leaf folder were dominant pests of rice in Meerut. Earlier, many workers from different region of India recorded a number of insect pests from rice ecosystem. In India, more than 100 insect pests were reported from rice-crop and among them, stem borer, leaf folder, plant hopper, rice hispa, gundhi bug, rice hispa, case worm, gall midge are the most important ones (Pathak and Khan, 1994, Basit and Bhattacharyya, 2001). In a study, Islam *et al.*, (2004) previously reported that yellow stem borer (*S. incertulas*), leaf folder (*C. medinalis*), brown plant hopper (*N. lugens*), rice bug (*Leptocorisa* spp), rice hispa (*Nymphula depunctalis*), caseworm (*Dicladispa armigera*), thrips (*Stenchaetothrips biformis*) as potential pests of rice in different region of Assam. Punam *et al.*, (2019) observed that rice hispa, leaf folder, yellow stem borer, and bugs as major pest of paddy while studying the major pests of amon paddy in North Tripura district. In a survey, Singh and Singh, (2017) found that yellow stem borer (*S. incertulas*), green leaf

hopper (*N. nigropictus*), brown plant hopper (*N. lugens*), leaf folder (*C. medinalis*), gall midge (*O. oryzae*) as serious pests of paddy from Patna district of Bihar. Rath *et al.*, (2020) studied biodiversity of pests of rice in Odisha and observed that yellow stem borer (*S. incertulas*), leaf folder (*C. medinalis*), brown plant hopper (*N. lugens*), Swarming caterpillar (*Spodoptera Mauritia*), gall midge (*O. oryzae*), rice bug (*Leptocorisa* spp). Rice hispa (*N. depunctalis*), caseworm (*D. armigera*), as potential pests of rice. While studying the major pests of rice in Madhya Pradesh Bisen *et al.*, (2019) found that yellow stem borer were more in the mid to last of September, leaf folder increases at the time of reproductive phase in mid of September and the effect of brown plant hopper was more from September to November. In present work, leaf folder population was found more at the mid of September of reproductive phase of paddy which corroborates the finding of Prasad *et al.*, (2005) and Singh and Singh (2017) who also observed that yellow stem borer and green leaf hopper were considerably high during vegetative and reproductive stage of rice crop. The present finding are in agreement with the study made by Singh *et al.*, (1977) who reported that maximum attraction of *Nephotettix virescens* to light trap from mid August to early November. In a study, peak occurrence of green leaf hopper was observed during September and October (Gupta *et al.*, 1989). Present findings are in line with the findings of Singh and Singh (2015) who reported that green leaf hopper and brown plant hopper both are much active at vegetative phase of paddy growth and its incidence was found in only vegetative phase.

In conclusion the insect pests are one of the most important production constraints in rice crop. If we go for total control of pests, it is very essential to know the pest species, their time of occurrence and peak period of activity

in this ecosystem of that region. Therefore proper monitoring of pest species, is important to avoid economic loss of the crop. Hence, the present study was undertaken to know the major insect pests of rice ecosystem in cachar district, which will help to plan a proper pest management technique for paddy field in this area. However, more survey is needed to record other pest species and major diseases associated with rice crop in this region.

Acknowledgement

I am thankful to the respondent farmers of Cachar district of Assam, who provided valuable information, immense help and cooperation during entire course of the survey.

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How to cite this article:

Rupashree Das. 2020. Insect Pests Associated with Rice Crop (*Oryza sativa*) at Cachar District of Assam. *Int.J.Curr.Microbiol.App.Sci.* 9(09): 2157-2163.
doi: <https://doi.org/10.20546/ijcmas.2020.909.269>