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## Studies on major insect pests of rice crop (*Oryza sativa*) at Balaghat district of Madhya Pradesh

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**Abstract**

A study was carried out on the major insect pest incidence on fine rice (short cylinder) most popular from private company in these areas, which covered 60-70 thousand hectare cultivated rice growing area at Balaghat district. The present studies were done in Kharif season 2017-2018. Fortnightly observation provided information about pest population in parallel relation with changes in metrological data. Survey was conducted on each stages of paddy reproduction, vegetative milking etc, so that the intensity of damage caused by insect pests during each stage can be figured out. It was concluded from the survey that crop is infested by major insects pests which decrease the yield of rice production.

**Keywords:** milking stage, short cylinder, reproductive stage

**Introduction**

Rice is the most important food crop in India and on research, and production priority for national food security. Rice (*Oryza sativa*) is a very important and major crop of Balaghat district. Rice contains protein name gluten (8.1%), Vitamins, minerals, fibers (2.2%) and lots of carbohydrates (77.1%) with a total of 349 calories. Rice crop is highly sensitive for several insect pests<sup>[12,16]</sup>. The major factors that have contributed towards changes in 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<sup>[11]</sup>. The number of insects pests recorded during this survey clearly shows the damage intensity caused by insects, this survey report will support for making the decision for management of major insects.

Insects are the most diverse group of animals living on earth. They are undoubtedly the most adaptable form of life as their number exceeds that of any other category. Among the major insect pests of rice are stem borers like yellow stem borer-YSB (*Scirpophaga incertulas*), belong to order Lepidoptera is the most destructive pest found all over the world. The presence of these insects in our field is easily identified by "dead heart" or "white ear" in hills at vegetative stage and panicle at reproductive stages respectively<sup>[17]</sup>. *Nilaparvata lugens* (Brown plant hopper) and *Nephotettix virescens* (Green leaf hopper) belonging to order Hemiptera were identified or characterized by "Hopper burn" and "yellow brown leaves" in the field are also major insects of rice<sup>[3]</sup>. As compared to other two BPH is more problematic or dangerous at Balaghat district. The *Cnaphalocrocis medinalis* (Leaf folder) belongs to order Lepidoptera also observed during both stages and feed inside the leaves make a fold. Gundhi bug (*Leptocoris oratorius*) is a serious pest of rice and it reduces yield up to 30%. Both adult and nymphs feed on grains at the milking stage. The population of bugs increases at the end of the rainy seasons<sup>[16]</sup>.

The adult of *Mythimna separata* (army worms) eats leaves of paddy and cut the stem. At the time of panicle emergence in rice it cut its panicle base and drops it down which causes major loss in yield. *Mythimna separata* attack at night and after finishing at one area it move towards another field for attack that's why called army worm. In the day time its hide in the crakes or behind the dry leaves. One more insect causes major loss in paddy field at Balaghat district its *Stenotarsonemus* (spinki smiley) panicle mites of rice belongs to order trombidiformes. Adult panicle rice mites are clear to straw-colored, oval, and very small. Immature panicle mites are clear to straw-colored and about half the size of adults.

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The complete life cycle can be completed in 7-21 days it totally depends upon weather condition. At the time of heavy rainfall, the percentage of mites increases [8]. All these insects cause major loss to paddy cultivation but at Balaghat district panicle mites, yellow stem borer and leaf folder shows major damage to paddy.

**Materials and Methods**

At CoA Balaghat, seven plots were selected to study the insect pests of paddy during Kharif season 2018. The plot size is (5x4 m) 20 sq meters with (RBD) randomized block design. The plots were named as P1, P2, P3, P4, P5, P6, & P7. Each plot was planted with the fine rice popular variety. Observation was noted in each phase vegetative, milking, and reproductive (Aug-Nov). The damage extent of paddy caused by these insect uses to correlate the population dynamics of insect pests in the field. Among the six insects of paddy damage extent caused by these insects is calculated only of

four. The panicle mite, army worms and gundhi bug damage was not calculated on the percentage basis.

$$\text{Percentage of yellow stem borer} = \frac{\text{No. of Deadheart or white ear in a hill}}{\text{total no of tiller in a hill}} \times 100$$

$$\text{Percentage of greenleafhopper} = \frac{\text{No. of yellow or brown leaves in a hill}}{\text{Total no. of leaves in a hill}} \times 100$$

$$\text{Percentage of brownplanthopper} = \frac{\text{No. of hopper burn symptom of hill}}{\text{Total no. of hills in one meter square}} \times 100$$

$$\text{Percentage of leaf folder} = \frac{\text{No. of folded leaves in one hill}}{\text{Total no. of leaves in one hill}} \times 100$$

**Analysis of Data**

The proper data on damage extent of paddy is taken and analyzed properly. Data was collected in each and every phase of paddy. The analyzed data was shown in the table and graphical representation.

**Table 1:** Pest of paddy at Balaghat district and its Scientific name, Order and Family.

S. No	Common Name	Scientific Name	Order: Family
1.	Yellow stem borer	<i>Scirpophaga incertulas</i>	Lepidoptera: Pyraustidae
2.	Leaf folder	<i>Cnaphalocrocis medinalis</i>	Lpidoptera: Crambidae
3.	Gundhi bug	<i>Leptocoris oratorius</i>	Hemiptera: Alydidae
4.	Green leaf hopper	<i>Nephotettix nigropictus</i>	Hemiptera: Cicadellidae
5.	Brown plant hopper	<i>Nilaparvata lugens</i>	Hemiptera: Delphacidae
6.	Armyworm (Rice ear cutting caterpillar )	<i>Mythimna separata</i>	Lepidoptera: Noctuidae
7.	Panicle mite	<i>Steneotarsonemus</i> (spinki smiley)	Trombidiformes: Tarsonemidae

**Results**

The present study revealed that the insects of paddy have specific effect on different varieties of rice in relation with changes in metrological condition. The major insect pests of rice show specific symptoms in the field through which we can identify the affected field. Each and every plot is observed very minutely and the damage plants and damage-causing insect were collected from the field and properly preserved. These pests or insects were identified with the help of [1, 10]. The data for damage extent caused by insect was calculated by specific formula (Anon. 2012). Yellow stem borer caused damage in paddy from the nursery stage to milking or grain formation stage. Damage caused by these

pests is easily identified by dead heart or white ear head [6]. The larva of stem borer enter from the lower side of plants and eats inner material and move towards upward side of plants. The leaves turn yellow to light brown and ultimately dry after some time. The adult male of *Scirpophagam incertulas* was smaller than female and whitish cream in color. While the female adult is light brown in color similar to husk color of paddy having one black spot on each side of wings. The female lay eggs on the leaves of paddy and covered it with hairy brown color thread like structure. Brown plant hopper is light brown in color with or without wings. It causes damage in both phases at larval and adult by sucking fluid from the plants stem.

**Table 2:** Major insect caused damage in paddy field calculated in percentage (YSB: yellow stem borer, LF: Leaf folder, BPH: Brown plant hopper, GLH: Green leaf hopper).

Observation date	Insects in paddy fields			
	YSB	LF	BPH	GLH
05/08/18	3.46(2.00)	2.35 (1.61)	1.68(1.46)	0.91(1.17)
15/08/18	3.38(1.98)	2.61 (1.78)	2.16(1.66)	1.12(1.28)
25/08/18	2.22(1.66)	2.41 (1.69)	1.50(1.40)	0.81(1.04)
05/09/18	3.45(1.99)	2.55(1.78)	1.48(1.52)	1.02(1.22)
15/09/18	3.50(2.01)	2.40 (2.80)	1.81(1.50)	1.10 (1.26)
25/09/18	3.10(1.91)	2.09(1.68)	1.81(1.51)	1.19 (1.30)
05/10/18	8.90(3.06)	2.35 (1.61)	1.43(1.39)	1.80 (1.51)
15/10/18	3.90(2.08)	2.45 (1.71)	1.68(1.46)	0.92(1.32)
25/10/18	4.91(2.60)	2.16(1.88)	1.23(1.24)	0.60 (1.06)
05/11/18	5.25(2.60)	2.98 (2.03)	1.10 (1.26)	0.78(1.12)
15/11/18	4.01(2.01)	2.35 (1.65)	0.92(1.32)	1.00(1.20)

**Table 3:** Meteorological data during study period 2018.

Month	Meteorological week	Temperature (°C)		Relative humidity (%)		Rainfall (mm day <sup>-1</sup> )
		Max.	Min.	Max.	Min.	
July, 2017	27	33.78	25.4	86.85	60	1.6
	28	31.1	25.0	93.95	86.28	199.2
	29	30.4	25.4	92.5	82	75.8
	30	28.6	25.0	88.71	76	51.4
	31	31.9	25.0	87.71	76.42	31.0
August, 2017	32	30.0	24.8	92.42	87.57	103.4
	33	30.0	25.3	94.28	79.42	101.2
	34	29.0	24.6	92.57	79.42	60.4
	35	28.3	24.1	95.87	85.57	275.0
September, 2017	36	29.2	29.9	91.71	72.57	30.2
	37	32.6	23.9	90	54.71	00
	38	31.0	25.1	91.57	67.85	33.4
	39	32.9	24.1	93.28	59.28	11.0
October, 2017	40	34.7	25.0	91.42	43.85	00
	41	32.4	23.8	87.14	52	00
	42	33.4	22.8	88.57	40.14	00
	43	32.9	21.3	86.42	48	00
	44	31.0	18.9	85.71	44.42	00
Average/Total		29.67	24.37	90.59	65.91	973.6

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 September to November. Panicle mites of rice were not seen through naked eyes in the field with the help of magnifying glass we can observe it. Panical mites causes damage on both reproductive and vegetative phases as it feeds on cell of rice leaves, stems and kernels and also indirectly vectoring or facilitating the establishment of pathogens [4]. Rice leaf folders occur in all rice field and are more abundant during rainy seasons. The *Cnaphalocrocis medinalis* 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. Presence of fecal matter or ovoid eggs was seen during tillering to flowering stage.

*Leptocorisa Oratorius* caused sucking of grain sap by the bug causes ill filled partially filled and chaffy grains and subsequent infection by fungi and bacteria result in grain discoloration. Leaves turn yellow and later rusted from tip downwards. Appearance of numerous brownish spots at the feeding sites causes shriveling of grains [18]. *Mythimna separata* army worm feeds on rice by cutting off leaves and young seedlings at the plant’s base. The adult army worm can survive better and lay more eggs when temperature is low. Each female can lay about 800-1000 eggs in its life time [14]. Army worms can feed mainly on the night time and during day time it’s in resting period.

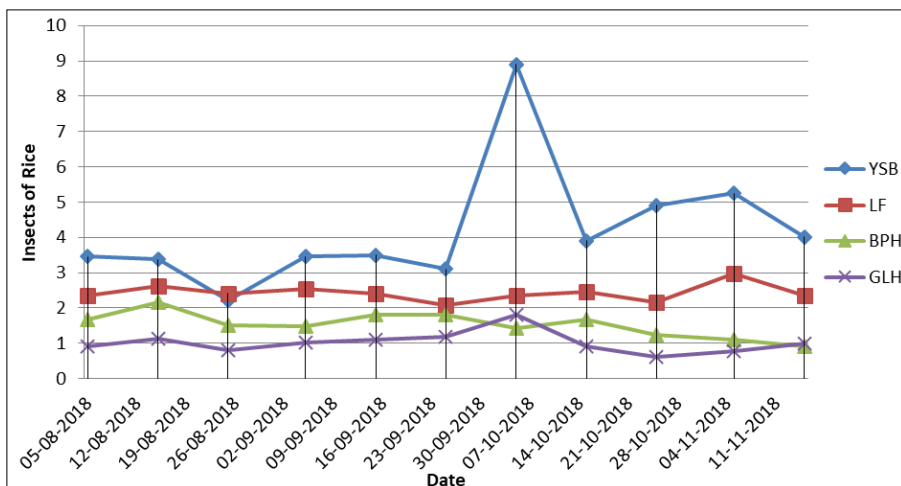
### Discussion and Conclusion

Many scientists worked on survey and observation of insects but no data on the rate of increasing insects with the growth of rice and its relation with metrological conditions. This observation put some light on stage wise insect infestation and its population increase or decrease with weather

parameter [16]. Yellow stem borer were observed in the mid to last of September (Table -2). The number also increases as the crop is moving towards vegetative phase. The attack of YSB is more after 45 days of transplantation. But the population of leaf folder increases at the time of reproductive phase mid of September (Table-3). The observation through light trap shows increase in population of green leaf hopper from mid of August to early October. Change in the population is seen in relation with changes in meteorological condition. The army worm number increases after drought followed by heavy rains [5]. It feeds on leaf tips and along leaf margins only the midribs of leaves remain [13, 15].

Feeding damage can results in a sterile grain syndrome which is described as a loose and brownish flag leaf sheath, a twisted panicle neck, impaired grain development with empty or partially filled grains with brown spots and panicle standing erect [7]. The infected plant shows a curved appearance, often referred to as “parrot-beak”. The damage plant reduces the photosynthetic capacity and its affect the fertility rate [2, 8].

At vegetative phase, crops can generally recover from damage but when leaf folders infest at reproductive phase the damage can be economically important [9, 17]. Gundhi bug (*Leptocorisa Oratorius*), the major insect pest in Balaghat district causes yield loss in paddy every year. The environmental condition plays important role in infestation of insect population. It had significant negative correlation with minimum temperature and evening relative humidity and rainfall and positive correlations with sunshine time and high temperature. The above study reveals that stem borers and leaf folder were not affected by rainfall but brown plant hopper shows positive relation with rainfall. At Balaghat district the major loss in paddy field is caused by stem borer, leaf folder and a very small insect panical mites. The study also shows the relation of insect pest population affected by weather conditions which help to plan a proper pest management technique for paddy field in this area. Further study required to confirm our findings.



**Fig 1:** Graph showing variation in insect pest population in paddy field (YSB: Yellow stem borer LF: Leaf folder, BPH: Brown plant hopper, GLH: Green leaf folder).



**Fig 2:** Insects of paddy field at Balaghat district :A :- Eggs of Yellow stem borer, B :- Larva of Yellow stem borer,C :- Adult of Yellow stem borer, D :- Larva of Leaf Folder, E :- Adult of Leaf Folder, F :- Brown Plant Hopper, G :- Gandhi Bug, H :- Green leaf hopper, I :- Larva of Army worm.

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