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Surendra SinghP.G Department of Zoology
College of Commerce, Arts and
Science, Patna, Bihar, India**Bindu Kumari**P.G Department of Zoology
College of Commerce, Arts and
Science, Patna, Bihar, India

Roving survey of major insect pests of rice crop (*Oryza sativa* L.) in different blocks of Patna district of Bihar state, India

Surendra Singh and Bindu Kumari

Abstract

Rice (*Oryza sativa* L.) is a staple food crop of Bihar, India and most part of the world. Rice is use in different kinds of food stuffs. Major insect pests reduce the productivity, yield and quality of rice grains. Major insect pest find out on the basis of damage 10% of paddy plant in different aspects. Continuous survey, after some years is a necessary for justification of pest status in paddy field. The present roving survey was conducted in kharif season (2014-15) in different Blocks of Patna District. In this research work, major insect pests were find out by the process of field survey of paddy in different Blocks. In this research survey, Bakhtiyarpur Block and Phulwarisharif Block of Patna District is most affected Block as compared to other Blocks of the District. In these Block, Green Leaf Hopper play major role of infestation upto 34.61 and 32.20 percent, respectively. After this YSB, BPH, GM, and LF infestation were takes place in decreasing order.

Keywords: Rice, major pest, survey, productivity, quality, damage

1. Introduction

Rice (*Oryza sativa*) is most important and staple food crop for more than two- third part of India, and 65 percent of the world population. This crop being grown in large area during kharif season in Indo-Gangetic plan region and its productivity satisfy the need of 1.25 billion populations in India. The crop play vital role in our national food security and its means of livelihood of millions of rural households. In India rice is grow of an area 43.76 m hectare with production of 104.5 M tones (2011-12).

Rice cultivated in all 38 district of Bihar, out 38 district only one district come under high productivity level, remaining others come under medium and low productivity level. Bihar state has a total geographical area of about 93.60 lakh hectares on which people it houses a population of 82.9 million exist. Results, generating a human population density of 880 persons per sq. km. Total Gross sown area in the State is 79.46 lakh hectares, while net sown area in State is 56.03 lakh hectares. About 80 percent of the total population of State living in rural areas, agriculture play a vital role in food security and primary feeder of rural economy, continues to operate not only on margins of land of State but also on the margins of human enterprise, productivity of rice being among the lowest in the country as compared other State. Without increasing returns to these margins of productivity, not much can be done realistically to develop the agricultural sector in Bihar. Thus, agriculture of Bihar State continues to define both the potentialities and constraints to development in economy of Bihar. Insect Pests Complex of Rice Ecosystem in Eastern Vidarbha of Maharashtra, India, analysis and evaluation was done by Jadhao and Khurad (2011) [4]. Rai *et al.* (2000) [12] reported yield losses of 90 percent in the scented cultivars, Pusa Basmati and Sugandha and 70 and 60 percent in Kanaka and Mahsoori, respectively under natural condition in Bihar, during *kharif*, 1998. Khan and Kushwaha (1991) [5] reported peak populations of WBPH between the last week of August and the third week of September, when the temperature, relative humidity and sunshine were 28.3-30.2 °C, 69-75 percent and 9.91- 10.70 hrs, respectively.

Vijaykumar (2002) [18] surveyed the insect pest and predatory fauna on irrigated rice of Tungabhadra Project Area of Karnataka state and observed that brown plant hopper, white backed plant hopper followed by leaf folder in isolated patches were the major insect pests. Horned caterpillar, skipper, stem borer, thrips, climbing cut worm and green leafhopper occurred as minor pests and the rice hispa, case worm and grass hopper as negligible pests.

Corresponding Author:**Surendra Singh**P.G Department of Zoology
College of Commerce, Arts and
Science, Patna, Bihar, India

Prasad Kumar (2003) [9] surveyed the major rice growing area of Uttara Kannada district during *kharif* season of 1994 to 1998 and reported that leaf folder (*Cnaphalocrocis medinalis* (Guenee) was the major pest (average damaged leaves ranged from 4.2-6.8%) during 1995 to1997. Higher incidence (15.0-

16.0%) of yellow stem borer (*Scirpophaga incertulas* Walker) was observed during 1995 and 1996 at Sirsi and Mundgod, respectively. Gall midge (*Orseolia oryzae*) (Wood Mason) incidence level ranged from 1.9 to 7%, in the coastal taluk's of the district.

Table 1: Meteorological Observation of Patna (2014)

Month	Humidity	Temperature		Rainfall (mm)	Sunshine Hrs/days	Rainy Days	Pan
		Max.	Min.				Evaporation(mm)
May	48.98	38.1	25.4	3.30	7.13	3	313.50
June	67.37	37.2	27.6	62.70	5.15	7	228.10
July	80.21	33.2	26.7	296.60	3.85	11	134.70
August	81.97	32.1	27.1	260.90	3.40	11	133.90
September	82.78	32.3	25.8	29.0	5.10	11	115.20
October	78.21	30.5	22.0	7.40	5.66	3	89.30
November	64.98	28.4	14.3	0.0	5.13	0	85.00
Annual	72.07	33.11	24.5	659.90	5.06	46	1099.70

Among various constrains of rice production, damage due to various type of insect pest, for control of insects pest is substantial and regular need of attention. Large scale cultivation of high yield varieties, monocropping, close planting, water regime, excessive use of nitrogenous fertilizer and misuse of agrochemicals have further aggregated pest incidence. Paddy crop damage severely by major insect pest which reduce the yield and production of rice at large scale. It also affects the quality of rice grains, nutrients value of rice. Different insect pest damage paddy by different mode which affect plant either directly or indirectly. Stem borer, bore the main shoot or tiller of paddy during larval stage and they are pupate in subtle in winter. Due to infestation of yellow stem borer central shoot of paddy is dry up in young plant which characterized by the "Dead heart". In other hand if the stem borer bore the central shoot during emergence of panicle or after emergence of panicle. Panicle along with tillers is dry up that are characterized by "white ear". Green Leaf Hopper is sucking types of insect that suck the sap of green leaf resulting conversion of green leaves into yellow brown leaves or leaf becomes white in colour, that region unable to synthesis food.

2. Materials and Methods

Paddy field of different Blocks of Patna District was used for the survey of major kinds of insect pests. Insect net was used for the collection different kinds of major insect pests in paddy field of different Blocks. The net was swiped over vegetation of paddy field and handle was turned by quick turn of wrist to fold cloth bag over to prevent the escape of insects. Aspirator is another type of a device which was used for

collection small insects into a vial in way that no any damage to specimens. Collected insect pests were killed immediately by use of killing bottle.

2.1 Killing Bottle preparation

Step. 1

Killing bottle preparation was done in a well ventilated room by use of potassium cyanide in first step of preparation. Placed a layer of potassium cyanide (1/4 inch thickness) at the bottom of the bottle. Covered with a layer of dry plaster of paris (1/2 inch thickness). Mixed plaster of paris with enough water so that it will pour off from the end of a spoon (if it is too wet the cyanide will expand itself too soon; if the dry the surface will be rough and unsatisfactory). Poured 1/2 inch layer of wet plaster of paris over the dry layer. Bottle was tap tightly on the table to eliminate any bubbles in the plaster and Smoothen the top. Leaved the lid off for a day to let the plaster was dry in well ventilated room, completely away from direct sunlight. Kept a circular piece of blotting paper on the top of the plaster and few strips of blotting-paper inside the bottle to keep it dry and avoid the condensation of water droplets on the side of the bottle.

Step. 2

In second steps ethyl acetate was used. 1/2 inch of wet plaster of paris to be poured in the bottom of the bottle allowed it to dry thoroughly (The dry process may be quickened by keeping bottle inside an oven). Saturated the plaster of paris layer with ethyl acetate. Recharged the bottle with the chemical again as and when it loses its effectiveness. After this preservation processes were done for further study.

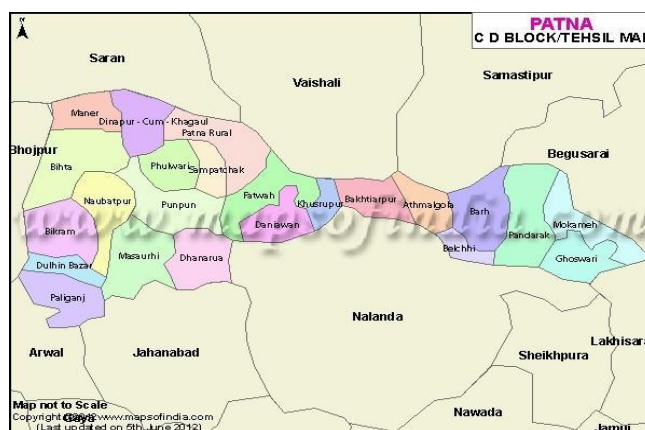


Fig 1: Different Blocks of Patna District in which Survey of major insect pests was conducted



Fig 1: Paddy field



Fig 2: Insect net

Formula which was used to calculate percentage damage Stem borer (*Scirpophaga incertulas*)

Counts were taken on the number of dead hearts/white ear and total number of tillers/panicle from 10 randomly selected hills. The percent incidences (dead heart/white ears) were calculated as follows.

$$\text{Percent incidence} = \frac{\text{Number of dead heart/white ears per hill}}{\text{Total numbers of tillers/panicle per hill}} \times 100$$

Green leafhopper (*Nephotettix virescense*)

The number of motile (adult and nymph) stages of green leafhopper which suck sap of leaves, count yellow/ brown leaves and total number of leaves on the 10 randomly selected hills was recorded. The percentage incidence calculated as follow.

$$\text{Percent damage} = \frac{\text{Total number of yellow/brown leaves per hill}}{\text{Total number of leaves in a tiller per hill}} \times 100$$

Leaf folder (*Cnaphalocrosis medinalis*)

The damage leaves and total leaves from 10 randomly selected hills were observed in each plot. The percentage of leaves damage was calculated as follows.

$$\text{Percent incidence} = \frac{\text{Numbers of damage leaves per hill}}{\text{Total numbers of leaves per hill}} \times 100$$

Brown plant hopper (*Nilaparvata lugens*)

Counts were taken on total number of yellow leaves of 10 randomly selected hills and total number of leaves in single hills. The percentage incidence was calculated as.

$$\text{Percent incidence} = \frac{\text{Total number of yellow leaves per hill}}{\text{Total number of leaves per hill}} \times 100$$

Gall midge (*Orseolia oryzae*) In case of gall midge total number of silver shoot in a hill and total number of tiller in a hill. Incidence per cent incidence/per cent silver shoot was recorded as follows.

$$\text{Percent incidence} = \frac{\text{Number of silver shoots per hill}}{\text{Total number of tillers per hill}} \times 100$$

3. Results and Discussion

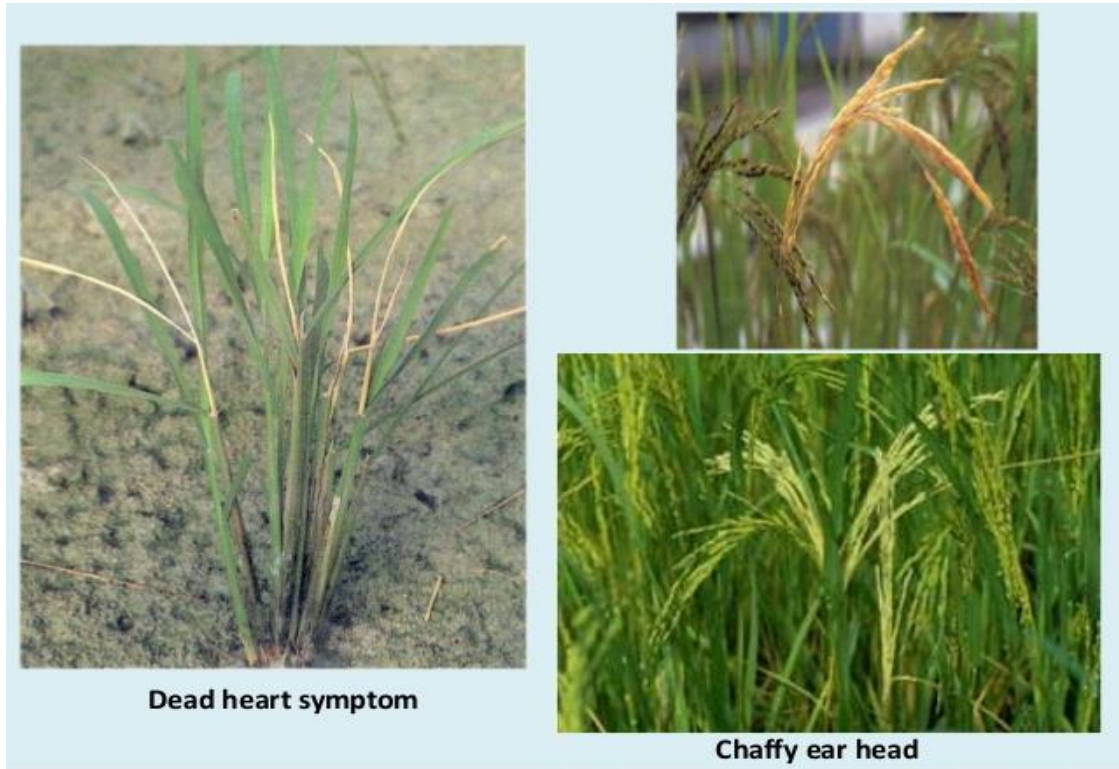
Major kinds of insect pests of paddy find out during course of survey on the basis of their damage symptoms which was find out above 10%. Identification of major insect pests along with their order and family was shown in table. 1.

Table 1: Major Kinds of insect pests of paddy

Sl. No.	Common Name	Scientific Name	Order: Family
1.	Yellow Stem Borer (BPH)	<i>Scirpophaga incertulas</i>	Lepidoptera: Pyralidae
2.	Green Leafhopper (GLH)	<i>Nephotettix virescense</i>	Hemiptera: Cicadellidae
3.	Brown Plant hopper (BPH)	<i>Nilaparvata lugens</i>	Hemiptera: Delphacidae
4.	Leaf folder (LF)	<i>Cnaphalocrosis medinalis</i>	Lepidoptera: Pyralidae
5.	Gall midge (GM)	<i>Orseolia oryzae</i>	Diptera: Cecidomyiidae

Table 2: Percentage Damage of Major kinds of Insect pests in different Block of Patna Districts

Blocks	GLH (%)	YSB (%)	BPH (%)	LF (%)	GM (%)	Variety
1. Phulwarisharif	32.20	20.15	21.87	18.75	10.71	BPT-5204
2. fatuha	16.12	11.76	17.24	14.28	12.50	BPT-5204
3. Bakhtiyar pur	13.88	18.75	34.61	14.28	15.38	MTU-7029
4. Pandark	19.23	15.38	16.00	13.63	15.38	BPT-5204
5. Danapur(Khagaul)	23.74	16.40	23.77	11.76	13.88	I.R.36



Yellow Stem Borer Damage



Green Leaf Hopper Damage



Leaf Folder Damage



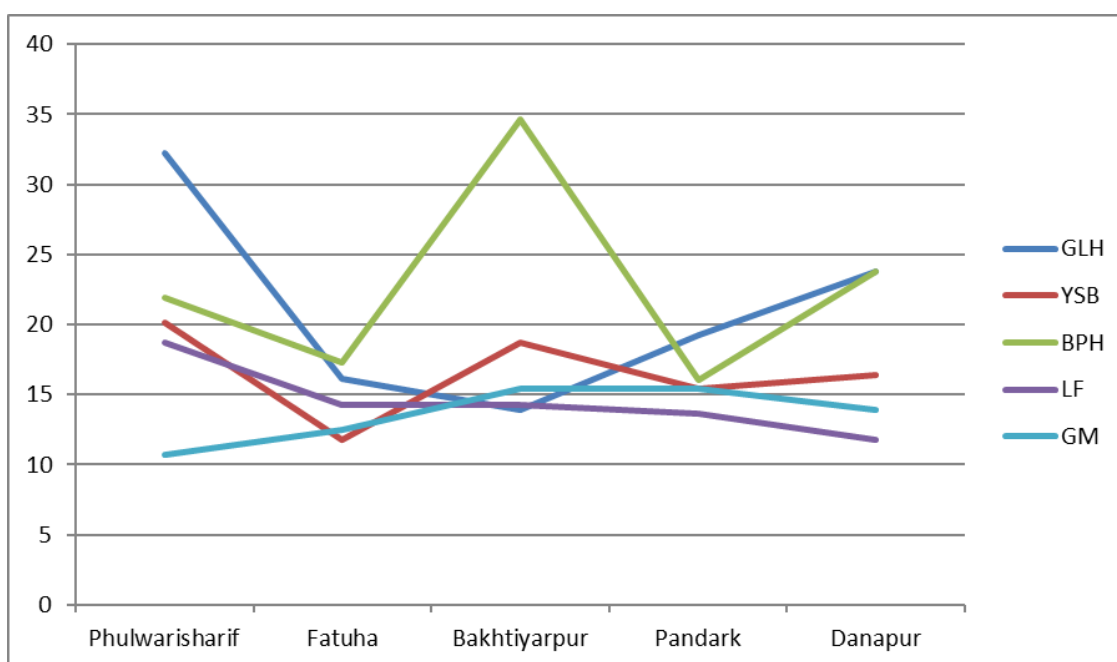
Brown Plant Hopper Damage



Gall Midge Damage

Brown Plant Hopper incidence greater in Bhakhtiyar Pur Block, upto highest 34.61 percent on MTU-7029 rice variety. Result, find out on the basis of number of leaves shows burning symptoms in a paddy hill, which was divided by total number of leaves in a paddy hill. After this, second most incidence of insect pest was found Green Leaf Hopper, upto 32.20 percent in Phulwarisharif Block on BPT-5204 rice variety. Results, yellow red brown colour of leaves were happened and plant undergoes stunted growth and development. These two pests were sucking type i.e sap sucker. Percentage incidence of these two sap sucker type of insect pest in other different Block shown in table. 2. Yellow Stem Borer insect pests were find out in all five Block of Patna district above the 10 percent, but in Phulwarisharif Block more incidence upto 20.15 percent find out as

compared to other blocks. Similarly, Leaf folder 18.75 percent highest in Phulwarisharif and lowest 11.76 in Danapur (Khagaul) Block. Gall midge incidence equal in Bhakhtiyar pur and Pandark Block i.e 15.38 percent and lowest in Phulwarisharif Block 10.71 percent. Earlier reported, severe outbreak of green leaf hopper in Cuddapah District of Andhra Pradesh, India during kharif season (Reddy and Naidu 1988). The finding of Reddy and Naidu support the present result of higher infestation of green leaf hopper during kharif season 2014 in Patna District of Bihar. Infestation of yellow stem borer and leaf folder was increase suddenly at mid October. Khan and Ramamurthy (2004), influence of weather factors on the activity of rice leaf folder *Cnaphlocrocis medanalisis* (Guenee) support the present finding.



Graphical representation of percentage incidence of major kinds of insect pest in different Block of Patna District

4. Conclusion

In this roving survey, it was find out that incidence of Brown plant hopper very high in Bakhtiyarpur Block of Patna District. This pest was destroyed up to 35 percent of paddy field in the Block. Gall midge incidence was less as compared with brown plant hopper in all Blocks of Patna District. Over all these all major insect pests damage paddy above the 10 percent. Hence, common management procedures apply for such kinds of major insect pests.

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