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## Survey and fortnightly observation to find out major insect pests of rice crop (*Oryza sativa*) in Patna district of Bihar

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### Abstract

Survey was conducted on major insect pests incidence on BPT-5204 rice ecosystem which covered 70 % cultivated rice growing area in Phulwarisharif Block of Patna District of Bihar State, India. The present studies were done in kharif season (2013-14) of Phulwarisharif Block of Patna District. Major insect pests of rice were inducing major problem in rice production in Patna District. The survey was conducted at both vegetative and reproductive stages of paddy. Fortnightly observations of major insect pests were done in relation to population dynamics and percentage damage extents in different Plots at vegetative and reproductive phase of paddy. Fortnightly observation provides information about pest population in relation to metrological changes. The crop is infested by major insect pests which play a significant role in limiting BPT-5204 rice production

**Keywords:** Survey, fortnightly observation, Phulwarisharif, kharif, extent, vegetative

### 1. Introduction

Rice (*Oryza sativa*) is staple crop of Bihar, India and some part of the world. Rice is a major cereal crop of Patna district of Bihar State. It is a rich source of Carbohydrates (75 %) and Proteins (7 %). Rice contains gluten protein, which is responsible for softness of rice after cooking. It is also known as “Oryzinin”. Besides, carbohydrate and proteins rice contains lipids, vitamins and minerals. The paddy crop is highly sensitive and potential host for several insect pests (Prasad *et al.*, 2005). Two major factors are responsible for low yield of BPT-5204 i.e. major insect pests attack and adverse conditions of environment. Insect-pests attack the rice crop from the time of nursery bed is prepared until harvest. Rice field is an artificial managed ecosystem for small duration of time in which a large diversity of flora, fauna and microbial species provides a wide range of services for human well-being (MEA 2005) [2]. A number of insect pests were recorded from the paddy field of Patna district but some of them were highly destructive. Those insect pests were considering as major insect pest that damage either 10% or more than 10%. Fortnightly observation is necessary for study of damaging nature major insect pests in relation to their population dynamics. Fortnightly observation provide as clear cut information about population dynamics of insect pest in paddy field, which provide support for making decision for management of major pests. Fortnightly observation of insects and their destructive phase, reveal that they are either major pests or minor pests.

*Scirpophaga incertulas* (Walker) is a monophagous pest of paddy that belongs to order Lepidoptera and family *Pyralidae*. This pest is most destructive pest and found almost all region of world. Symptoms of this pest is characterised by “dead heart” in hill at vegetative stage and “white ear” in panicle at reproductive stage. The last instar of larvae created an out let hole and pupate in silken cocoon inside the larval tunnel in the base of plant (Sarwar 2012a; 2012b) [3]. When infestation occur at flowering stage, the ear head become chaffy (Jadho and Khurad 2012) [4]. The population of *N. virescens* dominant in Tropic area including Sri Lanka (Fernado, 1967) [5], Philippines (Nasu, 1967) [6] and India, Burma, China, Taiwan, Malaysia (Ghauri, 1971) [7]. *Nephotettix virescens* and *Nilaparvata lugens* are sucking pest of rice that belong to order Hemiptera and family *Cicadellidae* and *Delphacidae* respectively, damage symptoms of *Nephotettix virescens* characterized by “yellow/ brown leaves” while *Nilaparvata lugens* characterized by “Hopper burn”. Higher population of leaf folder (*Cnaphalocrocis medinalis*) was found higher in kharif season during 1995-1997 by Prasad Kumar (2003) [1].

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The young larvae of leaf folder feeds on tender leaves without folding them while older larvae feed inside older folded leaves. Leaf folder belongs to order Lepidoptera and family *Pyralidae*. Gall midge (*Orseolia oryzae*) belongs to the order Diptera and family *Cecidomyiidae*, damage symptom of this pest is characterized by “onion leaf” and “silver shoot”.

**2. Material and Method**

**2.1 Field site and survey materials**

The five plots were used for survey of insect pest in Phulwarisharif block of Patna district. This block located to the adjacent to the Capital of Bihar. This area comes under, monitoring area of Indian Council of Agriculture Research (ICAR) Institute for Eastern India. The roving survey was conducted in Kharif season (2013-2014) for collection of insect pest. Insect net was used as collecting device. All plots like P<sub>1</sub>, P<sub>2</sub>, P<sub>3</sub>, P<sub>4</sub> and P<sub>5</sub> that were taken for survey, planted with rice variety BPT -5204. Fortnightly observation was taken from August to December in accordance to population

dynamics of major insect pests and their damage extent. Population dynamics of insect pests were represented as damage extent of paddy.

**2.2 Identification of major insect pest and their damage extent**

Damage extent of paddy that provides clear cut information about insect pest that come under major insect pest. According to damage extent, major insect pests were identified through surveillance. After identification of major insect pest, collection of insect pest were done. The collected specimens were brought to the laboratory for specimen preservation and mounting. Most of the pestiferous major insects were identified at the specific level by using keys (Barrion and Litsinger, 1994) [9], photographs available (Pathak and Khan, 1994) [10], and by taking the help of the subject experts. Here the previous followed characteristics by major insect pests was used and their damage extent find out through following formula proposed by Anon. (2012)

$$\text{Percent incidence of Yellow Stem Borer} = \frac{\text{number of dead heart / white ear in a hill}}{\text{total number of tiller in a hill}} \times 100$$

$$\text{Percent incidence of Green Leaf hopper} = \frac{\text{Number of Yellow / Brown leaves in a hill}}{\text{Total number of leaves in a hill}} \times 100$$

$$\text{Percent incidence of Brown Planthopper} = \frac{\text{Number of Hopper burn symptom of hills}}{\text{Total number of hills in one meter square}} \times 100$$

$$\text{Percent incidence of Leaf folder} = \frac{\text{Number of folded leaves in one hill}}{\text{Total number of leaves in one hill}} \times 100$$

$$\text{Percent incidence of Gall midge} = \frac{\text{Number of onion / silvershoot tiller in one hill}}{\text{Total number of tiller in one hill}} \times 100$$

**2.3 Analysis of data**

The data were recorded on damage extents of paddy by various major insect pests. Fortnightly observations of insect pest population dynamics in relation to their damage extents were represented. Data were found out according to damage characteristics of major insect pest.

**3. Results**

**3.1 Diversity of major insect pests**

Major insect pests were found in all selected plots and it was found that the major insect pest produces their specific character of damage. Yellow Stem Borer produces “Dead

heart” symptom at the vegetative stage of paddy while at reproductive stage by “white ear”. Green leaf hopper produces yellow/ brown leaves where as brown plant hopper produces “Hopper burn” symptom. 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. The scarped leaves become membranous, turned white and finally wither. The heavily infested crop has streaks on the leaves and appear whitish from a distance. Gall midge produces “silver shoot” or “onion leaf” symptoms.

**Table 1:** Major insect Pest of paddy in Patna District of Bihar State

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

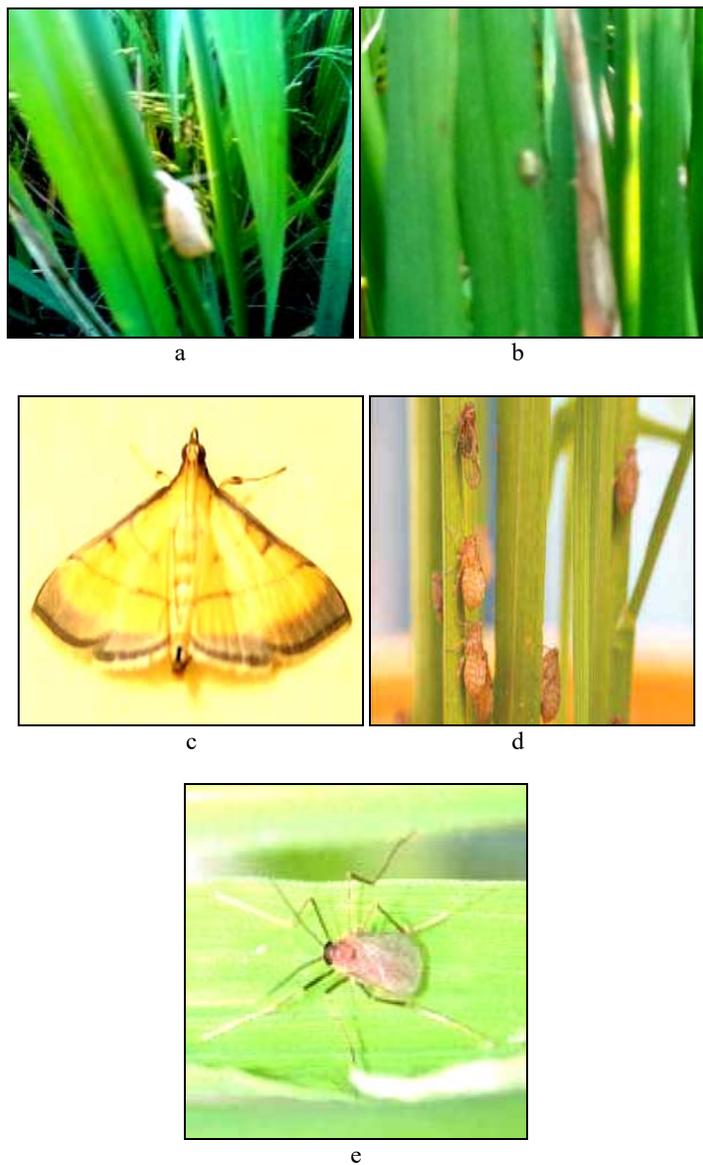


Fig: a-e-Survey of major insect pests, a. *Scirpophaga incertulas*, b. *Nephotettix virescens*, c. *Nilaparvata lugens*, d. *Cnaphalocrosis medinalis*, e. *Orseolia oryzae*

Table 2: Fortnightly observation of major insect pest (Percentage incidence) with damage extent

Fortnightly Observation	Vegetative Phase					Reproductive Phase					Selected Plots
	YSB	GLH	BPH	LF	GM	YSB	GLH	BPH	LF	GM	
15.08.2013	0.00	4.76	6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	P <sub>1</sub> P <sub>2</sub> P <sub>3</sub> P <sub>4</sub> P <sub>5</sub>
30.08.2013	0.00	8.33	12.0	4.65	0.00	0.00	0.00	0.00	0.00	0.00	
15.09.2013	11.11	11.90	16.0	9.52	6.66	0.00	0.00	0.00	7.31	11.0	
30.09.2013	14.28	10.52	10.0	11.9	12.5	6.66	5.71	0.00	11.4	0.00	
15.10.2013	11.17	8.57	0.00	7.14	0.00	12.5	0.00	0.00	8.33	0.00	
30.10.2013	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
15.11.2013	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

YSB-Yellow Stem Borer, GLH-Green Leafhopper, BPH-Brown Plant hopper, LF-Leaf folder, GM-Gall midge

### 3.2 Observation of data

In middle of August incidence of Green leaf hopper and Brown plant hopper was found which increased in last August. The infestation of Yellow Stem borer was high at last September, and then it decreases in all selected plots. Green leafhopper was more destructive during mid September to last September after that their number undergoes decreased. Observation of other major insect pests incidence shown in Table 2.

### 4. Discussion

The present survey and fortnightly observation were done on Yellow Stem Borer, Green Leaf hopper, Brown Plant hopper, Leaf folder and Gall midge on BPT-5204 variety of paddy. The present observation corroborates the finding of Prasad *et al.*, 2005. Among these insect pests Yellow Stem Borer and Green Leaf hopper were considerably high during vegetative and reproductive stage. As such there is no published survey information on major insect pest of rice in Patna District including Phulwarisharif Block. Report of Bathnagar and

Saxena (1999) <sup>[12]</sup> provide support for the present finding. Various scientists have worked on survey and fortnightly observation of insect pests, but one thing was not clear that how many insect pest of paddy act as major insect pests and how the population dynamics of insect pests has been increasing or decreasing according to time scale. In this Research work population dynamics of insect pests was calculated with respect to different time scale which provides information about life table of insect pest in paddy field and relation to meteorological changes. Population dynamics of different insect pests were varied at vegetative and reproductive stage of paddy plant in terms of damage. Naganagouda *et al.* (1999) <sup>[13]</sup> reported the peak light trap of Yellow Stem Borer in the first fortnight of May, but in present study it was found between mid and last September of vegetative phase. Higher population of leaf folder (*Cnaphalocrocis medinalis*) was found higher in kharif season during 1995-1997 (Prasad Kumar, 2003) <sup>[1]</sup>. In present work leaf folder population was found more at the mid of September of reproductive phase of paddy. The present finding corroborate the Report of maximum attraction of *Nephotettix virescens* to light trap from mid August to early November (Singh *et al.*, 1977), outbreak of GLH during wet season (Ready and Naidu 1988) and observed peak occurrence of hopper during September and October (Gupta *et al.*, 1989). Survey and Surveillance of major insect pest of rice (Singh S and Singh B.K 2015) <sup>[17]</sup> support the present finding. In this finding *Nephotettix virescens* incidence induces yellow or brown colour of leaves while *Nilaparvata lugens* incidence characterised by “Hopper burn” symptom of hill. *Nephotettix virescens* and *Nilaparvata lugens* both are much active at vegetative phase of paddy growth and its incidence was found in only vegetative phase. *Orseolia oryzae* were found most active during reproductive stage of paddy when tiller formation has been started. Gall midge were characterised by “onion leaf or silver shoot” symptom.

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