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# Yield loss assessment due to infestation of *Scirpophaga incertulas* of BPT 5204 rice variety in Patna district of Bihar, India

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## Abstract
The present studies were done in the BPT-5204 paddy field of Phulwarisharif Block of Patna District of Bihar. A fresh nursery field prepare for the sowing paddy seed for germination of paddy seedling. There was eradicated all types of grass like host plant for insect pest near the experimental site which was used for nursery germination. In this research work, it was investigated that nursery of paddy field infected by eggs of *Scirpophaga incertulas*. It was find out that eggs were laid down on the blade side of nursery leaves. These eggs were carrying on in the paddy field during course of nursery plantation. It was find out that infected nursery show low strength during plantation in paddy field. Yield loss happen due to infestation in nursery field as well as in planted paddy field. A main symptom of this insect pest is dead heart of main shoot at vegetative growth and white ear or chaffy panicles at the ear head stage and reproductive stage of paddy.

**Keywords:** Yield, nursery, *Scirpophaga incertulas*, infestation, rice, plantation, symptoms

## 1. Introduction
Rice (*Oryza sativa* L.) is a second most very important food crop of India and most part of the world. Rice is use for making various types of food stuffs like Pulaw, Biryani, Rishofo and different kind of Biryani. Softness of rice grain depends upon the protein "Oryzinin". Insect pest of rice crop play negative role in the total growth and development of paddy plants. Yellow Stem Borer (*Scirpophaga incertulas*) is major types of insect pest of which produce higher yield loss during high infestation. This pest belongs to Order Lepidoptera and family *Pyralidae*. This pest common in all the Asian countries. In India it is widespread in all paddy growing areas like Bihar, West Bengal, Orissa, Uttar Pradesh, Punjab, and Andhra Pradesh. The adults have a wing expanse of 25-45 mm and yellowish white with orange yellow front wings. The female moths have a prominent tuft of brownish yellow in colour silken hair at the tip of their abdomen. The female moth bigger than the male moth and has a centrally situated black spot on each fore- wings. The caterpillar when full-grown, grown measure about 20 mm and are dirty white or greenish yellow, having brown head and pronotum. Incidence of yellow stem borer on paddy was reported throughout the country with varied level of severity and yield losses ranged from 3 to 65 percent (Ghose et al 1960) [5]. The extent of 5 to 25 percent (Edwin Binjhan, Copland 1924). Rai *et al*. (2000) [15] reported yield losses of 90 per cent in the scented cultivars, Pusa Basmati and Sugandha and 70 and 60 per cent in Kanaka and Mahsoori, respectively under natural condition in Bihar, during *kharif*, 1998. The rice stem borer, *Scirpophaga incertulas* (Walker) is one of the most important pests of rice. In India, the yield losses ranged from 3 to 65 per cent (Ghose *et al*., 1960) [5]. Nigam and Verma (1985) recorded the loss caused by rice ear head bug in Uttar
Pradesh. 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. Rice stem borer, *Scirpophaga incertulas* (Walker) is one of the most serious pests of rice that occur in all the rice growing tracts of the Asian mainland and Japan (Narayana, 1953).

## 2. Material and Method

### 2.1 Surveillance of Nursery

In Surveillance of nursery of paddy plant eggs are lay by female moth on underside of leaves in 2-5 cluster of 60-100 eggs each, which creamy white and leathery in morphology. The eggs of yellow stem borer covered with yellowish brown hair of the female tuft. They hatch in 6-7 days and tiny black headed caterpillars are soon bore into the stem from growing point to downwards. Caterpillar grows in 6 states and is full-fed in 16-27 days. It construct hole inside boring stem where they undergoes pupation, it completed within 9-12 days and emerge as moth.

### 2.2 Life Cycle

The life cycle is completed in 31-46 days. There are two broods in Bihar, another brood found at vegetative stage of paddy, male and female mate together. Female lays eggs on underside of leaves in cluster of 2-5 of 60-100 eggs in each. Eggs are hatch in 6-7 days and newly caterpillar, which black headed that travelled from tip of leaves to central stem of leaves, where they are feed on tender growing shoot of paddy. Caterpillar bore tender stem and created tunnel inside stem where they are undergoes pupation. After complete pupation moth emerge within 7-8 days. Due to bore in tender stem, shoot dry up that characterized by "dead heart" Due to borer nature of caterpillar transport of sap materials are does not reach towards apex region. Result, metabolic system of paddy plant disturbs.

### 2.3 Yield loss assessment

Yield loss assessment was calculated on the basis of damage symptoms of paddy tiller which was characterized by "dead heart" symptoms and "white ear/chaffy" symptoms of panicle of paddy. Sampling of 5 meter square area in which numbers of dead heart symptoms and white ear/chaffy panicles were calculated in different Block of Patna District. Percentage yield loss due to stem borer was calculated as

$$\text{Damage percentage} = \frac{\text{Number of Dead heart/ white ear or chaffy panicles in 5 m2 of Area}}{\text{Total number of hills in 5 m2 of Area}} \text{ X } 100$$

## 3. Results and Discussion

Yellow stem borer Egg mass of yellow stem borer was found on lower side of leaf blades of seedling and leaves or stem of transplanted paddy which have buff coloured. Egg masses varied in size and number of per egg masses also varied. This stage of stem borer was not found as destructive. Under surveillance of larvae, it was found more destructive stage. Newly hatch larvae were start scarping epidermis layer of leaves and start movement towards leaf base, parallel to the mid rib. From the base of leaves it was enter in tiller and feed on soft tissue resulting symptom of "dead heart" or "dead tiller" (drying of central shoot). Dead heart or dead tiller can easily pull from the base during vegetative stage. Symptom of dead heart or dead tiller was only detected at the vegetative stage. Tiny holes were also seen on the stem and tiller. Frass or faecal matters were found out inside the damage stem or tiller. At reproductive stage it was find out that larvae feed on tiller of panicle, resulting symptoms of "white ear" or "white head". Due to symptoms of white ear it was find out those panicles becomes chaffy i.e unfilled grain or partially filled grain. After harvesting of paddy larval stage pupate in stubble. This stage was not destructive in nature Yield loss assessment of yellow stem borer due to damage was shown in table. 1 which indicates that nursery infestation was not find out by insect pests because of egg stage of stem borer. Highly, destructive stage of this pest was larval stage which was shown in Fig. 1(C). High infestation was find out in bakhtiyarpur Block of Patna District up to 31.57 percent at vegetative stage of paddy plant and lowest infestation find out in Danapur Block of Patna District up to 16.66 percent at vegetative stage of paddy. Due to infestation at this stage "dead heart" symptoms in paddy hill was find out. High infestations at reproductive stage find out in Phulwarisharif Block up to 19.04 percent and lowest in Sampatchak Block up to 13.33 percent at reproductive stage, which was characterized by "white ear" of panicles.

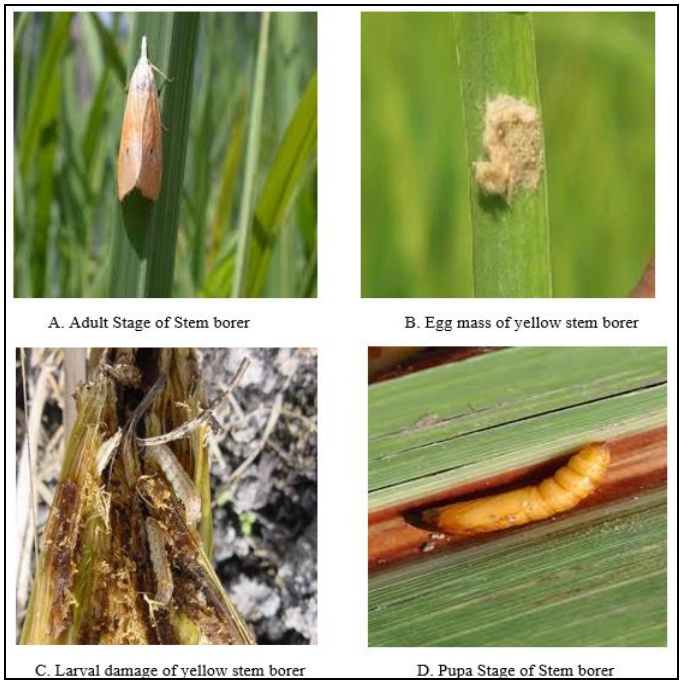


**Fig 1:** Different Stages of yellow stem borer

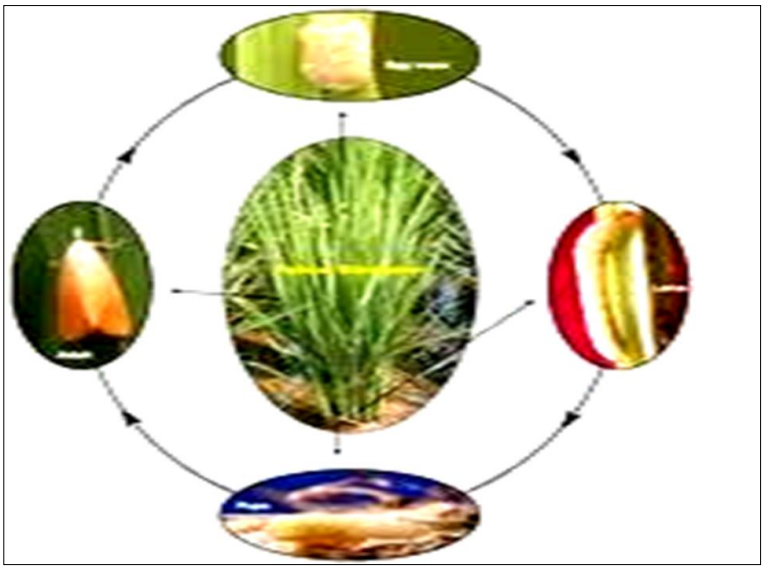

**Fig 2:** Life Cycle of *S.incertulas*

**Table 1:** Percentage damage of YSB on BPT-5204 rice variety in different Block Patna District

| Sl. No. | Name of the Block | Nursery stage Damage % | Vegetative stage Damage % | Reproductive stage Damage % | Rice variety |
|---|---|---|---|---|---|
| 1. | Phulwarisharif | 0.00 | 18.75 | 19.04 | BPT-5204 |
| 2. | Danapur | 0.012 | 16.66 | 17.64 | |
| 3. | Sampatchak | 0.030 | 17.64 | 13.33 | |
| 4. | Fatuha | 0.00 | 24.00 | 14.28 | |
| 5. | Bakhtiyarpur | 0.00 | 31.57 | 17.07 | |

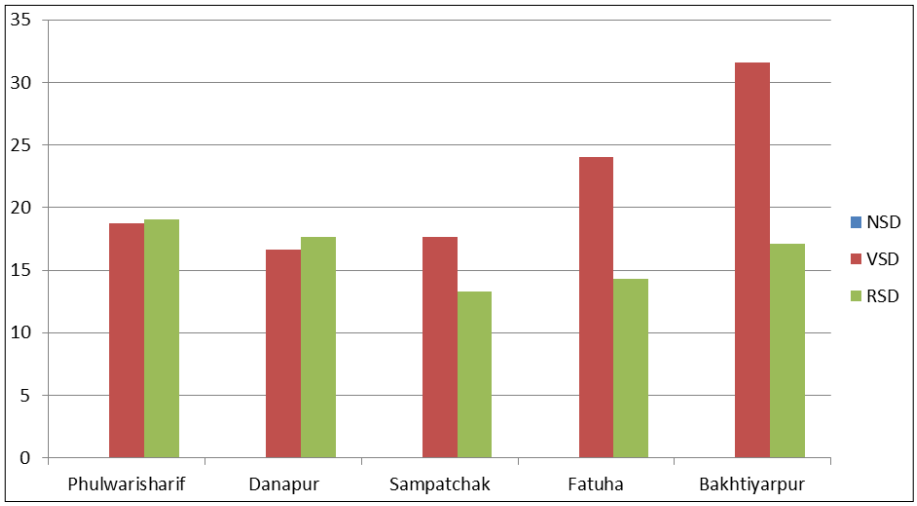


**Fig 3:** NSD-Nursery Stage Damage, VSD-Vegetative Stage Damage, RSD-Reproductive Stage Damage

## 4. Conclusion

Major damage and yield loss happen at the vegetative and reproductive stage of paddy. Main destructive stage of *Scirpophaga incertulas* was larval stage which was damage up to 31.57 percent at vegetative stage in Bhakhtiyarpur Block of Patna district of Bihar State. Due to damage percentage yield loss happen up to 30-35 percent per acre.

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