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Relative abundance of yellow stem borer and pink stem borer on paddy

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Abstract

The present experiment on relative abundance of yellow stem borer and pink stem borer on paddy was conducted at ZAHRS, College of Agriculture, Shivamogga 2015. The results suggest that yellow stem borer was the most predominant species and pink stem borer was the second most predominant species observed during second week of October and also observed that pink stem borer infestation observed only in this season on paddy earlier there were no reports of pink stem borer in and around Shivamogga District.

Keywords: *Scirpophaga incertulas*, *Sesamia inferens*, abundance

1. Introduction

Rice, *Oryza sativa* L. is an important cereal crop of the world, known as king of cereals and forms the staple food crop for more than two third of the population of India and more than 65 percent of the world population [7].

India, the largest rice growing country in Asia, has an area of about 53.2 million hectares (31% total cultivated area) and produces around 106.29 m t of rice with productivity at 2850 kg ha [1]. The slogan "Rice is life" is the most important for India as this crop plays a vital role in our national food security and is a means of livelihood for millions of rural households.

In Karnataka, rice is cultivated in 27 districts with an area of 1.54 m ha with a total production of 4.18 m t and productivity of 2719 kg ha [1]. Rice is one of the important staple food crops of the Southern Transition Zone (STZ) grown in an area of almost three lakh hectares with a productivity of 2990 kg ha⁻¹ in STZ of Karnataka both under irrigated and rainfed upland situations [1].

The yellow stem borer (YSB), *S. incertulas* (Pyralidae; Lepidoptera) of rice is one of the major pest in all rice growing regions of Asia (Listinger, 1979) and in South East Asian region in general (Banerjee and Pramanik, 1967) and in India particular [3]. Unlike other rice stem borers, *S. incertulas* is well adapted to deep water rice environment [5]. The larvae of *S. incertulas* cause dead hearts during vegetative stage and white ear heads during reproductive stage. Even though rice plant can compensate if dead heart infestation does not exceed 10 percent, but not for white ear loss. It has been reported that the pest can infest 1 to 3 percent of white ears [12] causing a loss of about rupees 10 crores every year in India [2].

2. Materials Methods

Destructive sampling was made (100 plants showing dead heart/white ear per sampling) by collecting dead hearts or white ear heads during different crop growth stages like vegetative stage (21 to 56 days old crop), reproductive stage (63 to 77 days old crop) and ripening stage (84 and 119 days old crop). The larvae were counted and segregated from the dead heart/white ears which were having yellow stem borer *Scirpophaga incertulas* or pink stem borer *Sesamia inferens* or both and the percent share of each species was calculated and recorded number of larvae per dead heart or white ear at weekly intervals during *Kharif*.

The collected larvae were counted from each dead heart or white ear and were identified. For identification of species, the larvae were reared in the laboratory till the adult emergence and identification was done. Relative abundance of rice stem borers was calculated using the following formula [9], Based on the crochet arrangement also different species of larvae were categorised *i.e.*, in yellow stem borer proleg crochets are arranged in a single narrow ellipse, where as in pink stem borer the crochets arranged in a semicircle [10]

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$$\text{Relative abundance} = \frac{\text{Total number of individuals of each species}}{\text{Total number of individuals of all species}} \times 100$$

3. Results

The stem borer species observed during study were yellow stem borer *Scirpophaga incertulas* and pink stem borer *Sesamia inference*.

The larvae were counted and segregated the number of dead heart/white ear which were having each species and having both the species together in each dead heart or white ear and the percent share of each species was calculated and the results obtained are presented below. The infestation of larval population was started from 33rd standard meteorological week. The maximum total larval population was observed during 41st standard meteorological week (112 larvae from 100 infested plants showing white ear), minimum total larval population was observed during 33rd and 34th standard meteorological weeks (1, 3 larvae in 100 infested plants showing dead heart, respectively) (Table 1).

Further larval abundance of both yellow stem borer and pink stem borer was maximum in 41st standard meteorological week (61 and 51 larvae in 100 plants showing white ear respectively) and the percent share of yellow stem borer and pink stem borer was 54.46% and 45.53% and the occurrence of both the species was minimum during 33rd and 34th standard meteorological weeks (0 and 1, 2 and 1 respectively) with the percent share of 0.00 and 100, percent, 66.66 and 33.33 percent, respectively (Table 1).

However, more number of yellow stem borer larvae were found during 39th to 43rd standard meteorological week (32 to 61 larvae in 100 infested plants showing white ear) and more number of pink stem borer larva was found during 38th to 48th standard meteorological week (31 to 51 larvae in 100 infested plants showing dead heart /white ear). Yellow stem borer larvae were found highest during reproductive stage where as pink stem borer was higher during ripening phase.

From the investigation it was also noted that the larvae of both the species were existed in the single white ear *i.e.*,

during 41st standard meteorological week *viz.*, 2nd week of October, out of 100 white ears sampled, 16 white ears was observed to had both the species larvae together in different numbers and remaining white ears was having individual species larva alone in each white ear.

4. Discussion

The study on relative abundance of rice stem borer species was under taken during *Kharif* of 2015. The results obtained that the species *viz.*, yellow stem borer *Scirpophaga incertulas* (Walker) and pink stem borer *Sesamia inference* were observed. Yellow stem borer was the most predominant species observed during 41st standard meteorological week (61 yellow stem borer larvae in 100 plants showing white ears) *i.e.*, 2nd week of October and pink stem borer was the second most predominant species (51 pink stem borer larvae from 100 plants showing white ears).

The present findings are in agreement with the [4, 11, 8], who reported that among the rice stem borer species, *i.e.* Yellow stem borer (*Scirpophaga incertulas*), pink stem borer (*Sesamia inferens*) were recorded and also found that YSB was the most predominant species and PSB was the second most predominant species. The differences among the results might be due to the environmental condition or might be due to the population's pressure of other species.

The observation also revealed that among the different crop growth stages yellow stem borer larvae were found highest during reproductive stage where as pink stem borer was higher during ripening phase. These findings are in agreement with the findings of [6] who reported that YSB was dominant in heading stage of reproductive phase and the more abundance of pink stem borer was observed during grain ripening stage.

In Karnataka this is the first report on species composition where both the species are predominant causing equal damage during tillering and flowering stages of the crop growth. It is contradict with the findings of [6] who reported that in Mandya district yellow stem borer (89.0%) was highest where as pink stem borer (3.0%) was very less.

Table 1: Species abundance of rice stem borers during different crop growth stages (*Kharif* 2015)

Month	SMW	Crop growth stages	Total Number of Larvae in 100 plants showing Deadheart/White ear	YSB alone	PSB alone	Both		Total YSB	Total PSB	Percent share of YSB	Percent share of PSB
						YSB	PSB				
JULY	31	Vegetative Stage	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AUG	32		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	33		1.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00	100
	34		3.00	1.00	0.00	1.00	1.00	2.00	1.00	66.66	33.33
	35		13.00	8.00	5.00	0.00	0.00	8.00	5.00	61.53	38.46
	36		32.00	7.00	9.00	7.00	9.00	14.00	18.00	43.75	56.25
SEPT	37	Reproductive stage	37.00	12.00	7.00	9.00	9.00	21.00	16.00	56.75	43.24
	38		62.00	12.00	3.00	14.00	28.00	31.00	45.93	58.06	
	39		58.00	21.00	15.00	11.00	11.00	32.00	26.00	55.17	44.82
OCT	40		73.00	9.00	12.00	32.00	20.00	41.00	32.00	56.16	43.83
	41		112.00	16.00	20.00	45.00	31.00	61.00	51.00	54.46	45.53
	42		58.00	9.00	12.00	10.00	27.00	19.00	39.00	32.75	67.24
	43	Ripening Stage	43.00	11.00	13.00	11.00	8.00	22.00	21.00	51.16	48.83
	44		40.00	10.00	6.00	9.00	15.00	19.00	21.00	47.50	52.50
NOV	45		29.00	12.00	4.00	2.00	11.00	14.00	15.00	48.27	51.72
	46		28.00	10.00	8.00	1.00	9.00	11.00	17.00	39.28	60.71
	47		33.00	16.00	5.00	7.00	19.00	9.00	24.00	27.27	72.72

SMW-Standard meteorological week, YSB-Yellow stem borer, PSB-Pink stem borer, White ear was noticed after October month

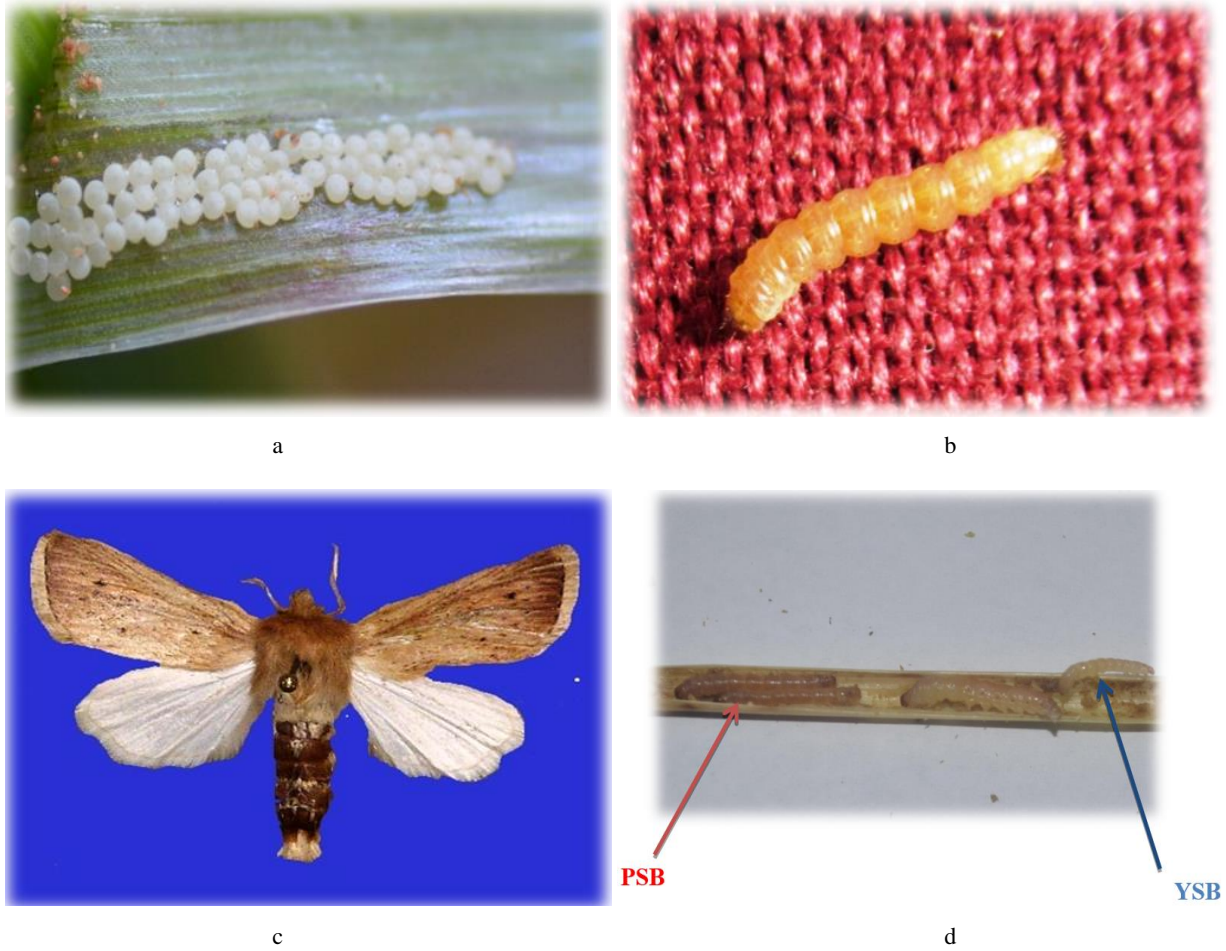


Fig 1: a. Egg mass of Pink stem borer, b. Pink stem borer larva, c. Pink stem borer adult, d. Both the species feeding on single white ear

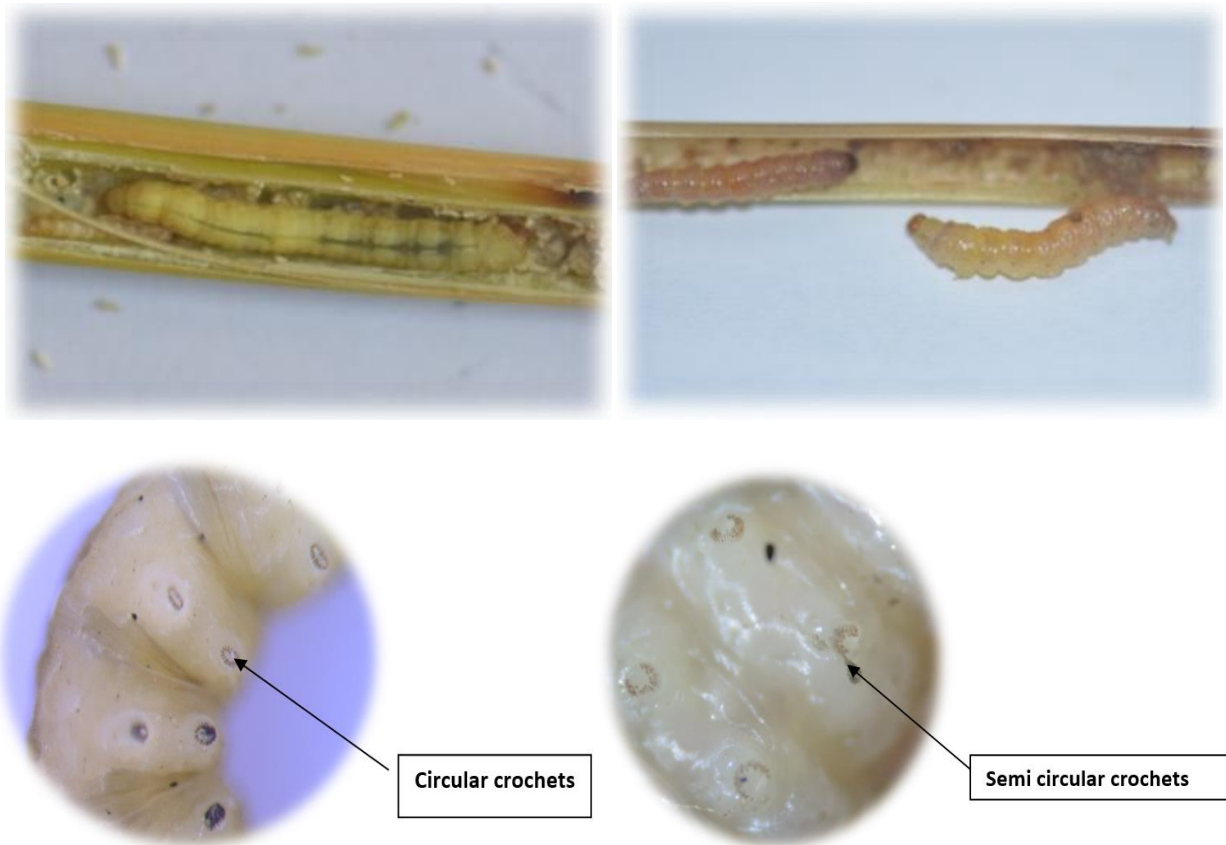


Fig 2: a. YSB larva - yellowish green, b. PSB larva - Pinkish, c. Circular crochets in YSB d. Semi circular crochets in PSB

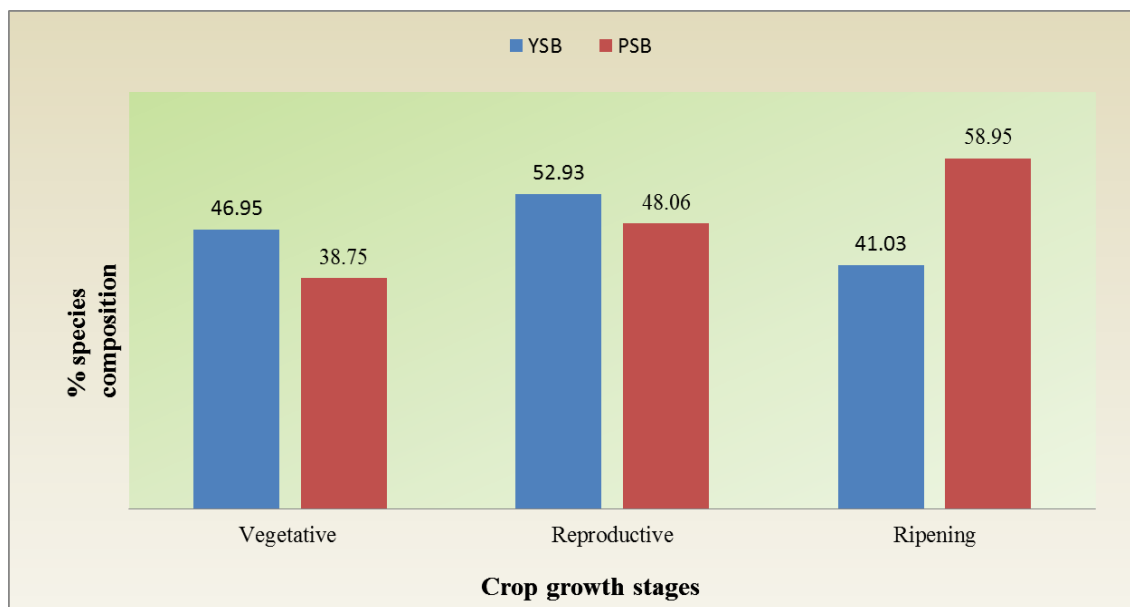


Fig 3: Species composition of stem borers on paddy during *Kharif* in Shivamogga, Karnataka, 2015

5. Conclusion

The experiment showed that incidence of two stem borer species i.e., *Scirpophaga incertulas* and Pink stem borer *Sesamia inferens* on paddy, though PSB was not observed on paddy in Shivamogga till now but it shared equal proportion with YSB in this season (*Kharif*, 2015)

6. Acknowledgments

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