Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

J E Z S Journal of Entomology and Zoology Studies

E-ISSN: 2320-7078
P-ISSN: 2349-6800
www.entomoljournal.com
JEZS 2020; 8(4): 1906-1909

Received: 16-05-2020
Accepted: 18-06-2020

Kumbhar CR
Department of Entomology, Dr. Rajendra Prasad Central Agricultural University, Pusa Samastipur, Bihar, India

SPN Singh
Department of Entomology, Dr. Rajendra Prasad Central Agricultural University, Pusa Samastipur, Bihar, India

Corresponding Author:
Kumbhar CR
Department of Entomology, Dr. Rajendra Prasad Central Agricultural University, Pusa Samastipur, Bihar, India

Species compositions of rice stem borers in different rice cultivation system under north Bihar condition

Kumbhar CR and SPN Singh

Abstract
As the stem borers are harmful pest for rice crop it is very important to know the dominant species population to management of these pest. In order to determine the population dynamics of harmful stem borer to develop ecological and economical viable strategies, a field experiment was conducted at the Research Farm, RPCAU pusa and in the Laboratory, Department of Entomology, RPCAU, Pusa. Results pertaining to the species composition of four species of stem borer of rice viz. yellow stem borer (*Scirpophaga incertulas*) Walker, pink stem borer (*Sesamia inferens*) Walker, white stem borer (*Scirpophaga innotata*) Walker and dark headed striped borer (*Chilo polychrysus*) Meyrick were prevalent during the crop season. However, yellow stem borer was found to be dominant over other species of stem borer and showed consistency with higher population (92.70 to 93.50, 91.22 to 92.10, 94.00 to 95.17% and 89.10 to 90.00%) in the entire four cultivation system viz. transplanting, drum seeded, direct seeded and SRI (System of Rice Intensification) during Kharif, 2016 and 2017, respectively.

Keywords: composition, dark headed striped stem borer, pink stem borer, species, white stem borer species, yellow stem borer

1. Introduction
Rice (*Oryza sativa*) belonging to the family Graminae, is one of the most important food crops not only in India but the world too. India ranks first in area with 43.79 million hectare of land under rice cultivation and second after China in production of rice with a production of 112.91 million tonnes that shares 22.81 per cent of world rice production with average productivity of 2578 kg/ha. While in Bihar, rice is cultivated in around 3.28 million hectare that shares 11.68 per cent of rice growing area of India with a production of 14.97 million tonnes that shares 13.26 per cent of rice production of India but having lower productivity of 2926 kg/ha [1].

Rice is grown in both Kharif and Rabi season under diverse ecological and climatic conditions apart from socio-economic diversities of the state. Thirty three per cent of total rice land has irrigation facilities and rest is totally depending upon rainfall. Rainfed upland rice is usually grown in unfavorable soil and weather conditions and needs regular attention for obtaining good productivity. Insect pests menace is one among the many hurdles in reaching comprehensive rice grain productivity.

Over 1400 insect species attack standing and stored rice in the world [7], while Kalode and Pasalu (1986) reported that over 100 species of insect pests attack rice crop at various stages of its growth. All together 21 species of lepidopteran stem borers have been recorded as rice pests throughout the world. Of these, 8 species are known to occur in India [18, 15]. Of various lepidopteran insect pests attacking on rice, yellow stem borer, (*Scirpophaga incertulas*) Walker, white stem borer, (*Scirpophaga innotata*) Walker), dark headed borer, (*Chilo polychrysus*) Meyrick and pink stem borer, (*Sesamia inferens*) Walker are economically important. Among them yellow stem borer (YSB) is the most destructive and widely occurring insect pest of rice at all stages of the crop due to its monophagy to rice. Newly emerged larva enters into the stem for feeding on inner tissues at vegetative and reproductive stage of the crop. As a result of their feeding inside the stem around the nodes, central leaf whorl remains unfold, turn brownish, dry up and easily be pulled out, while lower leaves remain green and healthy. This condition is known as dead heart (DH). The affected tillers do not produce panicles. If infestation continues to the ripening stage of the crop then plants bear panicles without grains (chaffy ears). This condition is known as white earhead (WEH). Intensive use

high yielding varieties, sequential cropping and indiscriminate use of insecticides have resulted in various insect pest problems in rice crop. Among various depressing factors, biotic stress as insect pest infestation is the most crucial factor due to which rice production is unpredictable [1]. So that planting of rice in different cultivation systems *viz.* transplanting, drum seeded, direct seeded and SRI (System of Rice Intensification) resulting increase production with minimum pest damage. Keeping the above damaging nature of these stem borer in view, the present investigation is undertaken to study the different stem borer species composition in agro-climatic zone-I of North Bihar.

2. Materials and methods

In order to study the Population dynamics of pest species composition of stem borers of rice in North Bihar condition, a field trial was conducted at research farm, R.P.C.A.U., Pusa, Samastipur, Bihar during *Kharif*, 2016 and *Kharif*, 2017. Observations were recorded at weekly interval. Infested tillers (dead hearts and white earhead) was carefully uprooted and brought to the laboratory for its splitting and identification of larval species. The larvae were kept under observation for the confirmation of the species of stem borers of rice. The species were identified based on larval characters described by [12, 17, 8] as mentioned below:

Species	Head	Body	Prothoracic shield	Crochets
Scirpophaga incertulas (Yellowstem borer)	Yellowish brown	Creamy yellow 20-25 mm 1st abdominal segment white	Yellowish brown	Biordinal, sometimes almost uniordinal, arranged in an ellipse.
Scirpophaga inference (Pink stem borer)		Creamy yellow 20-25 mm	Yellowish brown, anterior margin tinged with dark colour	
Scirpophaga innotata (White stem borer)	Black to blackish brown	Dull white tinged with pink gray with longitudinal stripes 17- 22mm	Black to blackish brown	Almost triordinal arranged in a circle
Chilo polychrysus (Dark headed striped stem borer)	Reddish brown	Milky white tinged with pink or purple 30-35mm	Brown	Uniordinal arranged in a longitudinal band.

After the confirmation of species of stem borers, number of larvae were counted and computed in the form of percentage of each species of the stem borers at respective stages of the crop.

3. Results and discussion

The presented data in Table 1 showed that all the four species of stem borer of rice *viz.* yellow stem borer, (*Scirpophaga incertulas*) Walker, white stem borer, (*Scirpophaga innotata*) Walker), dark headed borer, (*Chilo polychrysus*) Meyrick and pink stem borer, (*Sesamia inferens*) Walker were prevalent during *Kharif*, 2016. Among the species, yellow stem borer was found to be dominant over other species of stem borer and showed consistently higher population at all the stages *viz.* tillering, maximum tillering and heading stage of the crop growth in all cultivation systems. It was also found that yellow stem borer recorded higher population (95.17%, 93.50%, 92.10% & 90.00%) in direct seeded, transplanting, drum seeded and SRI, respectively followed by pink stem borer (5.20%, 5.00%, 3.50% & 3.00) in SRI, drum seeded, direct seeded and transplanting, respectively. White stem borer (3.80%, 2.10%, 1.65% & 1.00%) in SRI, transplanting, drum seeded and direct seeded, respectively and dark headed striped borer (1.40%, 1.25%, 1.00% & 0.67%) in transplanting, drum seeded, SRI and direct seeded, respectively. From mean percentage composition of stem borers of rice, it is apparent that during *Kharif*, 2016 yellow stem borer was found dominant with higher population (92.69%) followed by pink stem borer (5.00%), white stem borer (4.00%) and dark headed striped borer (1.90%) in all cultivation systems. Similar pattern also found during Kharif 2017, yellow stem borer recorded higher population (94.00%, 92.70%, 91.22% & 89.10%) in direct seeded, transplanting, drum seeded and SRI, respectively followed by pink stem borer (5.00%, 4.60%, 3.00% & 2.90%) in SRI, drum seeded, direct seeded and transplanting, respectively, White stem borer (4.00%, 3.00%, 2.40% & 2.10%) in SRI, drum seeded, transplanting and direct seeded, respectively and dark headed striped borer (2.00%, 1.90%, 1.18% & 0.90%) in transplanting, SRI, drum seeded and direct seeded, respectively. From mean percentage composition of stem borers of rice, it is apparent that during *Kharif*, 2017 yellow stem borer was found dominant with higher population (91.76%) followed by pink stem borer (3.38%), white stem borer (2.88%) and dark headed striped borer (1.50%) in all cultivation systems.

The pooled data presented in Table 3 and Fig. 1 exhibited that all the four species of stem borers, among them yellow stem borer recorded higher population (94.59%, 93.10%, 91.66% & 89.55&) in direct seeded, transplanting, drum seeded and SRI, respectively followed by pink stem borer in SRI, drum seeded, direct seeded and transplanting, white stem borer in SRI, drum seeded, transplanting and direct seeded and dark headed striped borer in transplanting, SRI, drum seeded and direct seeded. From mean percentage composition of stem borers of rice, it is quite cleared that during *Kharif*, 2016 and 2017. Yellow stem borer was found dominant with higher population (92.22%) followed by pink stem borer (3.88%), white stem borer (2.54%) and dark headed striped borer (1.34%).

The present findings are in close agreement with the findings of [3] that yellow stem borer was the dominant species (89.50%), while pink stem borer, white stem borer and dark headed borer prevalent during the crop period at Pusa. Similar observations were also reported by [9, 16, 19, 2, 13, 17, 4, 10, 5] that yellow stem borer was predominating species throughout the crop season. 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 [14].

4. Conclusion

Present investigation was concluded that the among the species studied, yellow stem borer was found to be dominant over other species of stem borer and showed consistency with higher population in all the cultivation systems viz. transplanting, drum seeded, direct seeded and SRI (System Of Rice Intensification). From mean percentage composition of stem borers of rice, it is quite cleared that during *Kharif*, 2016 and 2017, Yellow stem borer was found dominant with higher population (92.22%) followed by pink stem borer (3.88%), white stem borer (2.54%) and dark headed striped borer (1.34%).

5. Acknowledgement
The authors are grateful to the and Head, Department of Entomology, and University Agricultural Farm- In- charge, Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur (Bihar), India for providing necessary facilities to conduct the experiment.

Table 1: Species composition of stem borers of rice in different rice cultivation systems during *Kharif*, 2016

Stem borer species	Percentage Composition (%) in cultivation systems				Mean
	Transplanting	Drum seeded	Direct seeded	SRI	
Yellow stem borer (*Scirpophaga incertulas*)	93.50	92.10	95.17	90.00	92.69
Pink stem borer (*Sesamia inferens*)	3.00	5.00	3.50	5.20	4.17
White stem borer (*Scirpophaga innotata*)	2.10	1.65	1.00	3.80	2.13
Dark headed striped borer (*Chilo polychrysus*)	1.40	1.25	0.67	1.00	1.08

Table 2: Species composition of stem borers of rice in different rice cultivation systems during *Kharif*, 2017

Stem borer species	Percentage Composition (%) in cultivation systems				Mean
	Transplanting	Drum seeded	Direct seeded	SRI	
Yellow stem borer (*Scirpophaga incertulas*)	92.70	91.22	94.00	89.10	91.76
Pink stem borer (*Sesamia inferens*)	2.90	2.60	3.00	5.00	3.38
White stem borer (*Scirpophaga innotata*)	2.40	3.00	2.10	4.00	2.88
Dark headed striped borer (*Chilo polychrysus*)	2.00	1.18	0.90	1.90	1.50

Table 3: Species composition of stem borers of rice in different rice cultivation systems (pooled mean of *Kharif*, 2016 and 2017)

Stem borer species	Percentage Composition (%) in cultivation systems				Mean
	Transplanting	Drum seeded	Direct seeded	SRI	
Yellow stem borer (*Scirpophaga incertulas*)	93.10	91.65	94.59	89.55	92.22
Pink stem borer (*Sesamia inferens*)	2.95	3.80	3.25	5.12	3.88
White stem borer (*Scirpophaga innotata*)	2.25	2.33	1.55	3.90	2.54
Dark headed striped borer (*Chilo polychrysus*)	1.70	1.22	0.79	1.45	1.34

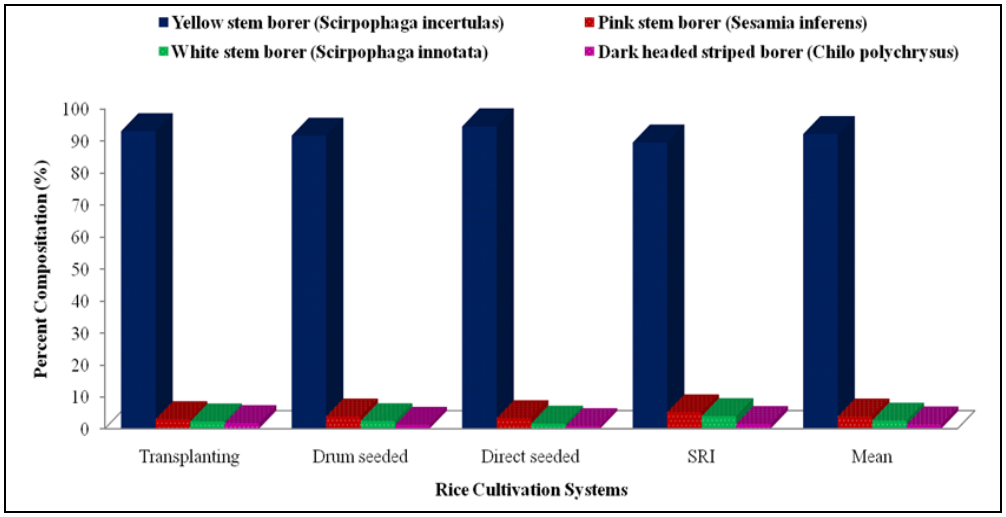

Fig 1: Species composition of stem borers of rice in different rice cultivation systems (pooled mean of *Kharif*, 2016 and 2017)

6. References

1. Atwal AS, Dhaliwal, GS. Agricultural Pests of South Asia and their Management. Kalyani Publishers, New Delhi, 2005, 181-182.
2. Catling HD, Islam Z. Pests of deep water rice and their management. Integrated Pest Management Reviews. 1999; 4:193-229.
3. DRR. DRR Annual Progress Report, Directorate of Rice Research, Rajendranagar, Hyderabad. 2008; 2:2.27-2.41, 2.64-2.72.
4. DRR. DRR Annual Progress Report, Directorate of Rice Research, Rajendranagar, Hyderabad. 2009; 2:2.19-2.35, 2.50-2.56, 2.57-2.60.
5. DRR. DRR Annual Progress Report, Directorate of Rice Research, Rajendranagar, Hyderabad. 2011; 2:2.21-2.35, 2.52-2.65.
6. Directorate of economic and statistics, 2018. http://agricoop.gov.in/sites/default/files/agristatglance 2018. pdf
7. Grist DH, Lever RJ. Pests of Rice, London: Longmans, Green, 1969.
8. Hattori I, Siwi S. Rice Stem Borers in Indonesia. JARQ. 1986; 2(1):25-30.
9. Husain M, Begum N. Seasonal stem borer (SB) population fluctuations in Mymensingh, Bangladesh. International Rice Research Newsletter. 1985; 10:22.
10. Joshi G, Ram L, Singh R. Population dynamics of paddy stem borers in relation to biotic and abiotic factors. Annals of Biology. 2009; 25(1):47-51.
11. Kalode MB, Pasalu IC. Pest management in rice. Indian

Farming. 1986; 9:31-34.
12. Kok LT, Varghese C. The four major lepidopterous rice stem borers in Malaya. Malaya Agriculture Journal. 1966; 45(3):275-288.
13. Lal R. Effect of fipronil on the incidence of stem borers in Basmati rice. Pesticide Research Journal. 2006; 18(2):146-149.
14. Pallavi D, Sharanabasappa, Megaladevi P. Relative abundance of yellow stem borer and pink stem borer on paddy, Journal of Entomology and Zoology Studies. 2018; 6(4):668-67.
15. Pathak MD. Insect Pests of Rice. International Rice Research Institute, Los Banos, Philippines, 1975, 68.
16. Pathak MD, Khan ZR. Insect Pests of Rice. International Rice Research Institute Publication, Philippines, 1994, 89.
17. Rai AK. Bionomics and losses due to stem borers in deep water rice. M.Sc. Thesis. Department of Entomology, RAU, Pusa, 1984.
18. Rao VP. Natural enemies of rice stem borer and allied species in various parts of the world and possibilities of their use in biological control of rice stem borers in Asia. Technical Bulletin on Common Insect Biological Control. 1965; 6:1-68.
19. Sharma DR, Gill PS, Dhaliwal GS. Extent of damage and pattern of emergence of over wintering larvae of rice stem borer in Punjab. Indian Journal of Entomology. 1996; 23(2):104-108.