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Seasonal incidence of yellow stem borer, *Scirpophaga incertulas* Walker infesting rice and its correlation with weather parameters

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Abstract

The present investigation was conducted to study the seasonal incidence of yellow stem borer, *Scirpophaga incertulas* Walker infesting rice and its correlation with weather parameters at MAE farm, Regional Agriculture Research Station, Karjat (M.S.), during *Kharif* 2019. Results revealed that initiation of yellow stem borer infestation was observed with (3.06%) dead heart, (1.72%) white ears head during the 31st SMW (30 July - 5 Aug) and 40th SMW (1 Oct - 7 Oct) respectively. The maximum dead heart was recorded with (6.31 ± 2.57%) infestation at 37th SMW (10 Sept- 16 Sept) and white ear head with (6.81 ± 2.38%) infestation during 42th SMW (15 Oct - 21 Oct). Among the all-weather parameters, yellow stem borer showed non-significant positive correlation with sunshine hours ($r=0.017$) while, other parameters showed non-significant negative correlation.

Keywords: Rice, *Scirpophaga incertulas*, dead heart, white ear head, incidence, correlation

Introduction

Rice (*Oryza sativa* L.) is second most prominent cereal crop serving as a staple food for major part of world's population (Devendra *et al.* 2018) [7]. Rice is grown in many region of world under diverse package of practices and climatic conditions. India rank 2nd after China in terms of world rice production and consumption (Sawai and Kothikar, 2019) [16]. Total area under the rice cultivation in india is about 43.774 million ha along with production 112.757 million tonnes and productivity 2576kg/ha during the year 2017-18 (Anonymous, 2018) [2]. Rice is cultivated in almost all the part of country from north to south and east to west. In Maharashtra, total area under rice cultivation is about 14.51 lakh ha with 27.30 lakh tones production and 1882 kg/ha productivity (Anonymous, 2018) [3]. From seedling to maturity, rice crop is affected by no. of various insect pests which causes the severe quantitative and qualitative loss in yield. More than 100 species of insect pests attack rice crop at various stages of its growth (Adiroubane and Raja, 2010) [1]. Out of which about 15 to 20 cause economic damage to the crop (Kalode, 2005) [10].

Among the various insect pests, the yellow stem borer, *Scirpophaga incertulas* Walker (Pyralidae: Lepidoptera) is monophagous and most damaging pest of rice (Satpathi *et al.* 2012) [15]. It produces the characteristics symptom of damage causing 'Dead heart' at vegetative stage and 'White ear' at reproductive stage (Kakde and Patel, 2014) [8]. Krishnaiah and Varma (2012) [12] reported about 11.2 to 40.1% and 27.6 to 71.7% yield loss cause due to dead heart and white ears, respectively. About 10-60% yield loss cause by the yellow stem borer (Chatterjee and Mondal, 2014) [5]. In rice, severe attack of yellow stem borer, causes problem of crop failure (Karthikeyan and Purushothaman, 2000) [11]. In development of sustainable crop protection strategies, knowledge of seasonal abundance, distribution of insect pest and effect of weather parameters (abiotic factors) on incidence of insect pest is necessary. Hence, present investigation was carried out to study the effect of weather parameters on incidence yellow stem borer infesting rice.

Materials and Methods

The field experiment was carried out at MAE Farm, Regional Agriculture Research Station, Karjat (M.S.), Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli during *Kharif*, 2019.

The experimental plot size measured 6m X 4.5m. The Karjat-3 variety of rice was transplanted in the experimental plot with spacing 20cm between row to row and 15cm between plant to plant. The normal agronomic practices were performed throughout the growing season of the crop. The observations of yellow rice stem borer, *Scirpophaga incertulas* Walker infesting rice was recorded at weekly interval (Standard Meteorological Week) in *Kharif* season. The observation was recorded on 10 randomly selected rice hills by counting damage done by yellow rice stem borer i.e. dead hearts (DH) during vegetative stage and white ear heads (WEH) during panicle initiation stage. To study the effect of weather parameters on stem borer population, Correlation analysis was carried out between the data recorded of stem borer population and weather parameters. The percent stem borer damage was calculated by using following formula:

$$\text{Per cent damage for Stem borer} = \frac{\text{No. of dead hearts/ White ear heads}}{\text{Total no. of tillers/ panicle per hill}} \times 100$$

Table 1: Weekly meteorological data and Seasonal incidence of yellow stem borer, *Scirpophaga incertulas* Walker infesting rice during *Kharif* 2019

SMW	Temperature (°C)		Relative humidity (%)		WS (km/hr)	BSS	Rainfall (mm)	Mean %	
	Tmax	Tmin	RH- 1	RH- 2				DH	WEH
30	29.1	23.9	93.7	91.4	5.3	0.7	737.2	0	0
31	27.7	23.6	90.3	92.6	6.2	0	978.8	3.06	0
32	28.2	24.9	89.9	89.7	7.2	0.1	253.6	4.78	0
33	30	24.6	92	76.3	4.3	2.2	54.9	4.97	0
34	30.2	24.2	92.6	77	3.1	5.6	72.7	5.91	0
35	30.1	24.4	89	81.9	3.9	4.3	128.9	5.75	0
36	28.4	23.7	91.9	90.1	5.3	0.4	546.5	5.21	0
37	28.1	23.5	94.6	89.1	3.5	0.3	345.7	6.31	0
38	29.2	23.3	91.3	85.3	2.6	3.1	182.4	5.72	0
39	31.3	23.8	91	77	3.3	4.7	104.2	4.21	0
40	32.2	23	91.9	70	2.5	6.7	77.4	1.01	1.72
41	33.3	22.8	93.4	60.4	2.2	6.7	90.4	0	3.61
42	31.9	21.7	86.4	74.3	1.8	5.7	33.7	0	6.81
43	30.6	23.2	91.1	71.1	2.1	0.7	92.2	0	5.92
SD (±)								2.57	2.38

SMW- Standard Meteorological Week

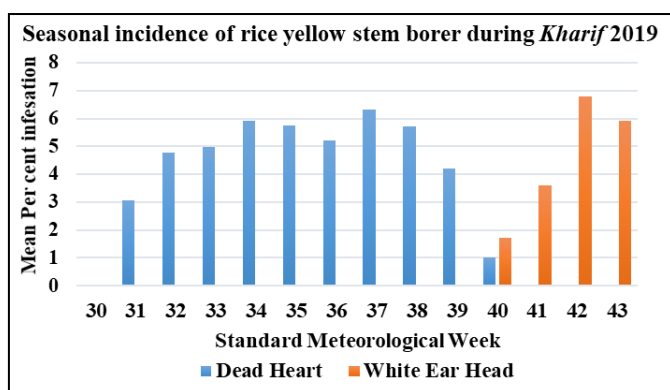


Fig 1: Seasonal incidence of rice yellow stem borer during *Kharif* 2019

During 42th SMW (15 Oct – 21 Oct) (Table 1, Fig 1). Present findings are in accordance with Mondal and Chakraborty (2017) [13] and also Baskaran *et al.* (2017) [4] reported that first appearance of dead heart (DH) was noted from 31st SMW. Moses *et al.* (2019) [14] recorded that maximum population of stem borer was observed in the 37th standard week of September. Chavan *et al.* (2013) [6] revealed that maximum,

Results and Discussion

The data obtained from the present investigation are summarized below:

Seasonal incidence of yellow stem borer, *Scirpophaga incertulas* Walker infesting rice

In the present study, during vegetative stage incidence of yellow stem borer *i.e.* percent dead heart (DH) was recorded and white ear heads (WEH) was found in reproductive stage till the harvesting of crop during *Kharif* 2019. The result revealed that, infestation of *S. incertulas* Walker was first observed with (3.06%) dead heart in the 31st SMW (30 July - 5 Aug). The peak infestation was observed with (6.31± 2.57%) dead heart at 37th SMW (10 Sept- 16 Sept). Then after 37th SMW, Percentage of dead heart declined. Minimum infestation (1.01%) dead heart was recorded in 40th SMW (10 Oct – 7 Oct). However, the initiation of white ears was observed from 40th SMW (10 Oct – 7 Oct) with lowest (1.72%) infestation. The maximum (6.81± 2.38%) white ear head was recorded

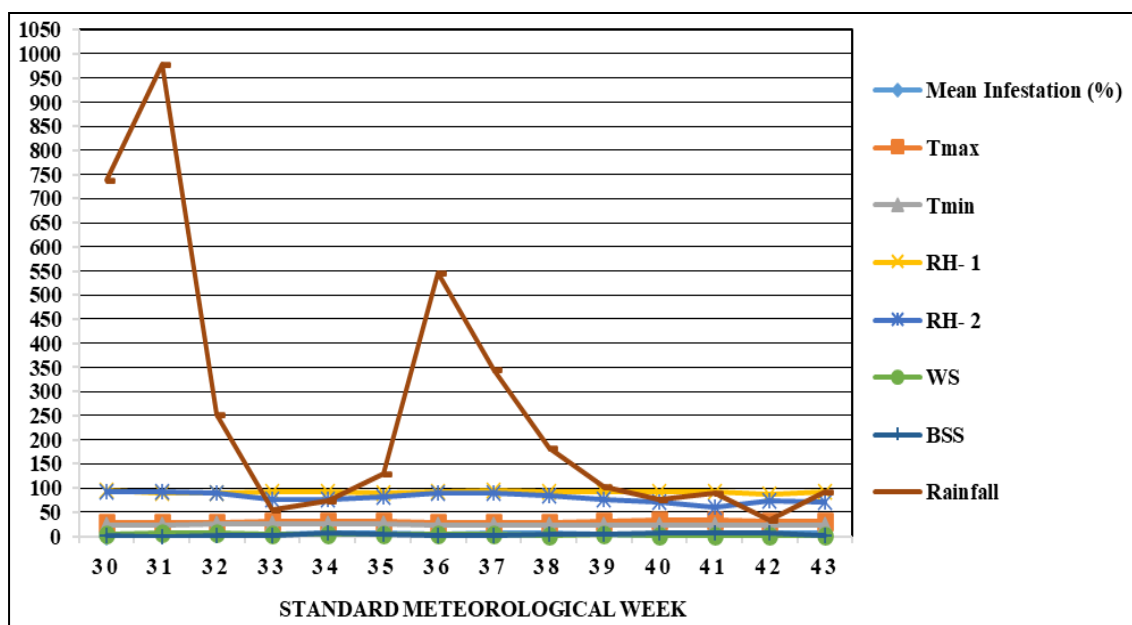
white ear head (WEH) damage was recorded during third week of October. Kalita *et al.* (2015) [9] reported that the maximum white ear heads was recorded in second fortnight of October.

Correlation between mean infestation of yellow stem borer and weather parameters

The correlation analysis revealed that incidence of yellow stem borer was non-significant positive correlation with sunshine hours ($r= 0.017$). Maximum temperature ($r= -0.059$), minimum temperature ($r= -0.088$), morning relative humidity ($r= -0.371$), evening relative humidity ($r= -0.084$), wind speed ($r= -0.309$) and rainfall ($r= -0.485$) showed non-significant negative correlation (Table 2, Fig 2). Similar findings were also reported by Devendra *et al.* (2018) [7] reported that sunshine hours showed non-significant positive impact on the incidence of yellow stem borer while non-significant negatively correlated with maximum temperature, minimum temperature, relative humidity and rainfall. Solanki *et al.* (2018) [17] revealed that incidence of stem borer showed negative correlation with maximum temperature, minimum temperature, and rainfall.

Table 2: Correlation coefficient of mean population of yellow stem borer infesting rice in relation to different weather parameters

Climatic parameters	Correlation coefficient (r)
Maximum temperature (Tmax)	-0.059
Minimum temperature (Tmin)	-0.088
Morning relative humidity (RH I)	-0.371
Evening relative humidity (RH II)	-0.084
Wind Speed	-0.309
Bright Sun Shine Hours (BSS)	0.017
Rainfall	-0.485

Significant at 5 per cent level $r = 0.532$ **Fig 2:** Correlation coefficient of mean population of yellow stem borer infesting rice in relation to different weather parameters

Conclusion

Based on the results of the present findings it can be concluded that yellow stem borer was observed during the entire crop season of paddy. The maximum infestation was observed with $(6.31 \pm 2.57\%)$ dead heart at 37th SMW (10 Sept- 16 Sept). The peak white ear head $(6.81 \pm 2.38\%)$ infestation was recorded during 42th SMW (15 Oct – 21 Oct). Among the weather parameters, sunshine hours showed a positive correlation with the incidence of yellow stem borer. These findings could be helpful for decision making and timely management of yellow stem borer in rice crop.

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