

Short Communication

Effect of weather parameters on rice yellow stem borer *Scirpophagain certulas* (walker) population dynamics under shallow low land ecology

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Rice is Asia's most important and cheapest staple food crop which is likely to eradicate acute under nutrition. Food security is essentially a reflection of rice security in this region. One-third of the economy in this region is dependent on rice production, consumption and marketing. Rice is the staple food for more than 50 per cent of the population in Asia, and 70 per cent in South Asia. Additionally, more than half of the daily caloric intake in some countries comes from rice. Asia is the largest producer of rice contributing around 91 per cent of total world rice production (Varma, 2017). India holds the status of largest rice cultivated area (43.9 million ha) with the production of 112.9 million tonnes and productivity of 3.01 t ha⁻¹ during 2018 (Indiastat, 2019). During the last three decades, after the green revolution, a paradigm shift has occurred in the insect pest complex in rice ecosystems (Pandi *et al.*, 2016; Jena *et al.*, 2018). In recent years, rice production in the eastern part of India during *Rabi* season has been hampered by yellow stem borer, *Scirpophagain certulas* (walker) (Lepidoptera: Pyraustidae) infestation which lead to yield loss of about 10-60 per cent (Panda *et al.*, 1976; Jena *et al.*, 2018). Different weather parameters play a significant role for determining the population abundance and geographical distribution of major insect pests in rice (Singh *et al.*, 2012). All these weather parameters *viz.*, temperature, relative humidity, rainfall, wind speed, evaporation and sun shine hours *etc.* play a vital role in insect survival, reproduction and further spread. Therefore, a thorough understanding of interaction between weather parameters and YSB population dynamics is essential for standardizing management practices. Hence, the present investigation was undertaken to study the effect of different weather parameters on population dynamics of YSB, *S. incertulas* in shallow low land rice ecosystem.

The present study was carried out at experimental

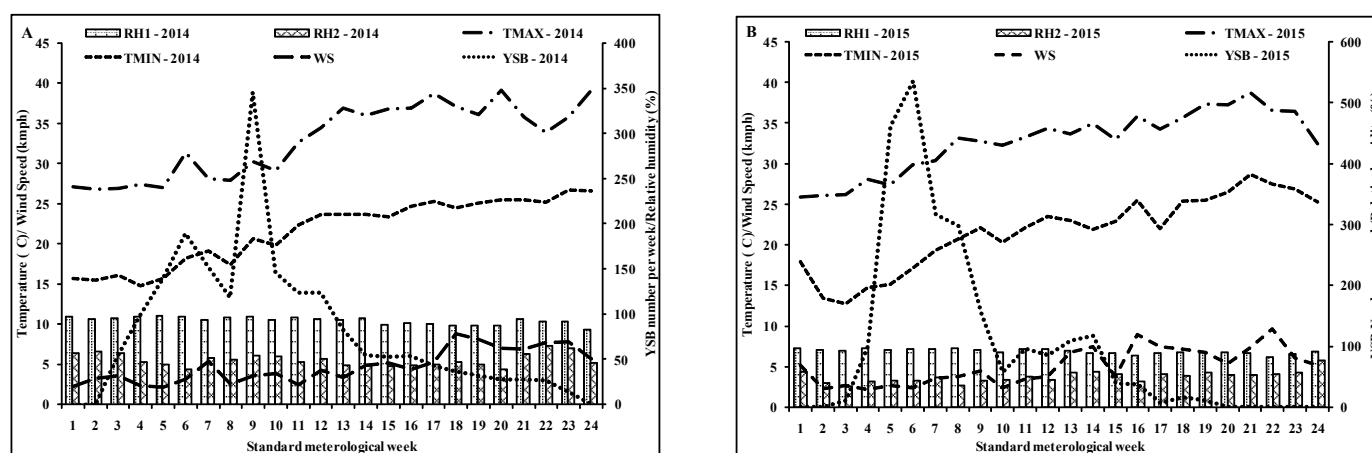
farm of ICAR-National Rice Research Institute, Cuttack, Odisha, India (20°45' N latitude, 85°932 E longitude and 36 m altitude) during the year 2015 and 2016 in randomized block design (RBD) with rice variety TN1, which was raised in accordance with recommended agronomic practices without insecticide application. Number of yellow stem borer (YSB) from each light trap was collected daily from 10 days after transplanting to harvesting stage and data were recorded at standard meteorological week (SMW). The data on weather parameters during the observation period was collected from meteorological observatory located in the institute. The weather parameters included are daily maximum temperature, minimum temperature, average temperature (°C), relative humidity at 7.00 am (RH-I) and 2.00 pm (RH-II), bright sun shine hour and wind velocity (km ph). Correlation was analyzed statistically using SPSS 16 statistical software in order to find out the effect of different weather parameters on the incidence of YSB on rice.

Correlation coefficient between YSB, *S. incertulas* population and weather parameters (Table 1) revealed that YSB population had significant positive correlation with relative humidity (0.515 and 0.489) and negative correlation with wind speed (-0.427 and -0.453) during the corresponding week for both the years 2015 and 2016; whereas lag week 1 data showed that maximum temperature (-0.476), minimum temperature (-0.455) and wind speed (-0.493) had significant negative correlation; while, morning relative humidity has significant positive correlation (0.488) during 2015. Similar result were observed during 2016 indicated that increased maximum temperature, minimum temperature and wind speed had depressing effect on YSB population; whereas morning relative humidity favoured YSB population. Figure 1 shows that infestation of YSB, *S. incertulas* started from 3rd standard meteorological week (SMW) during 2015 and the population gradually increased

Table 1: Correlations coefficient between weather parameters and incidence of YSB

Week	T _{Max} (°C)	T _{Min} (°C)	Rainfall l(mm)	RH-I (7AM) (%)	RH-II (2PM) (%)	Wind Speed (km ph)	Bright Sunshine (hrs)
2014							
Current Week	-0.371	-0.308	-0.177	0.515*	-0.118	-0.427*	0.158
Lag week 1	-0.476*	-0.455*	-0.133	0.448*	-0.169	-0.493*	0.164
Lag week 2	-0.515**	-0.425*	-0.014	0.320	-0.071	-0.262	-0.250
2015							
Current Week	-0.337	-0.421*	-0.229	0.489*	-0.378	-0.453*	0.050
Lag week 1	-0.430*	-0.485*	-0.159	0.567**	-0.391	-0.546**	0.104
Lag week 2	-0.474*	-0.531**	-0.234	0.466**	-0.525**	-0.562**	0.186

** - Correlation is significant at the 0.01 level; * - Correlation is significant at the 0.05 level.

**Fig 1:** Prevalence of YSB and weather parameters during *Rabi* 2014 (A) and 2015 (B)

during the successive weeks and reached maximum level at 9th SMW (345moths/week). During 2016, YSB appeared (Fig. 2) on 3rd SMW and the highest peak recorded at 6th SMW (536moths/week). Data clearly depicted that YSB population had two peaks during 2015; whereas only one peak during 2016 (Fig. 1 and 2), indicating weather plays a crucial role for YSB population increase. Our observations are in conformity with the studies of Shekar *et al.* (2018) and they revealed that population of YSB, *S. incertulas* showed negative correlation with minimum temperature, evening relative humidity and wind speed. Similar kind of results has been reported by Yang *et al.* (2009). Adiroubane and Raja (2010) reported that high incidence of YSB was observed during the month of March; where the mean temperature and relative humidity per cent was 27.6°C and 95.9. Similar trend was observed in the present study where high incidence of YSB population occurred when the prevailing mean temperature was 27.3 and 27.2°C, respectively during 2015 and 2016. Likewise, corresponding relative humidity per

cent was 95.6 and 95.3, respectively during 2015 and 2016.

In contrast, rainfall showed a non-significant negative correlation with YSB population during both the study years, whereas sunshine hours had non-significant positive correlation. The present findings are in concordance with Prasad and Tiwari (2010) who reported that *S. incertulas* moth catches showed non-significant correlation with weather parameters. Similarly, Justin and Preetha (2013) also correlated incidences of YSB with weather parameters and found a significant negative correlation with rainfall. YSB, *S. incertulas* population on rice disappeared from 24th and 20th SMW during 2015 and 2016, respectively due to unfavourable weather condition.

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