www.ThePharmaJournal.com

The Pharma Innovation

Inakarla Paramasiva
Department of Entomology,
Agricultural Research Station,
Nellore, Andhra Pradesh, India.

Ummanaboina Vineetha
Department of Agronomy,
Agricultural Research Station,
Nellore, Andhra Pradesh, India

Chintala Sreelakshmi
Department of Genetics and
Plant breeding, Agricultural
Research Station, Nellore,
Andhra Pradesh, India

Pachipala Rajasekhar
Department of Entomology,
Agricultural Research Station,
Nellore, Andhra Pradesh, India

Seasonal incidence and light trap catches of yellow stem borer, *Scirpophaga incertulas* (Walker) in relation to meteorological factors

Inakarla Paramasiva, Ummanaboina Vineetha, Chintala Sreelakshmi and Pachipala Rajasekhar

Abstract
An experiment was conducted during kharif season of 2014-15, at Agricultural Research Station, Nellore, Andhra Pradesh to evaluate the relation between light trap catches and seasonal incidence of yellow stem borer with weather factors viz., temperature (maximum and minimum), relative humidity (morning and evening), rainfall and sunshine hours. The peak light trap catches of yellow stem borer moths during kharif season was reported at 42nd standard week with 798 moths per week. In present study it was revealed that maximum temperature, morning relative humidity had significant positive correlation with yellow stem borer moth catches with correlation co-efficient r = 0.443 and 0.432 (*P*<0.01), respectively and while sunshine hours and rainfall showed significant negative correlation with yellow stem borer moth catches (r = 0.432, *P*<0.01 & r = 0.384, *P*<0.01, respectively). With regard to the field incidence, dead heart incidence was initiated from 45th meteorological standard week (SMW) i.e second week of November on TN 1 and BPT 5204 (1.3 and 2.0 % DH, respectively) with peak incidence at 48th standard week (67.4 and 63.2 % DH, respectively) i.e last week of November during kharif 2014.

Keywords: yellow stem borer, seasonal incidence, light trap catches, meteorological factors

Introduction
Rice (*Oryza sativa* L.) is the most important single food crop of the world importance and staple food for nearly half of the world population. Rice constitutes about 52 % of the total food grain production and 55 % of total cereal production. Rice is grown under diverse growing conditions such as irrigated, rainfed lowland, rainfed upland and flood prone ecosystems. India is the largest rice growing country, while China is the largest producer of rice. The rice crop is attacked by more than 100 species of insect and 20 of them cause serious economic loss (Pathok, 1977) [11]. Insects alone cause about 30-40% yield loss in rice every year by attacking almost all the aerial parts of the crop plants as well as root system in soil (Heinrich *et al*., 1979; Dhaliwal *et al*., 1984; Prakash and Rao, 2003) [5, 3, 12]. Rice is essentially a crop of warm, humid environment which is conductive for survival and proliferation of Lepidopteron insect pests like stem borer. Among different insect pests associated with rice, yellow stem borer (YSB), *Scirpophaga incertulas* (Walker) is widely distributed, dominant and monophagous pest of paddy through out India. Rice crop is most prone to stem borer infestation at the tillering and floweing stages and inflicted 18 to 40 % damage (Yadav *et al*., 2019; Anonymous, 2006; Pasulu *et al*., 2002) [16, 1, 10].

The seasonal effects of weather and ongoing changes in climatic conditions will directly lead to modifications in dispersal and development of insect species. The changes in surrounding temperature regimes certainly cause alterations in developmental rates, voltinism and survival of insects and subsequently act upon size, density and genetic composition of populations (Kennedy and storer, 2000; Bale *et al*., 2002) [7, 2]. The developmental success of insect pests also indirectly depends on climate, as environmental parameters impact on plant physiology. Weather factors like temperature, day length, rainfall and relative humidity are important components in forecasting and predicting the severity of insect-pests population. In this context knowledge of population dynamics of yellow stem borer in relation to the weather parameters are essential for developing sustainable crop protection strategies.

Materials and Methods
The present study was conducted at Agricultural Research Station (ANGRAU), Nellore,

Corresponding Author
Inakarla Paramasiva
Department of Entomology,
Agricultural Research Station,
Nellore, Andhra Pradesh, India.

Andhra Pradesh, India during kharif, 2014-15. Assessment of yellow stem borer (YSB), *Scirpophaga incertulas* (Walker) population was done by light trapping, 200-watt electric light source was used for the trapping of insects. Light trap was installed in ARS farm long ago, 6 m above the ground level with collection pan below the light source. The trap was operated from 18.00 to 6.00 hours. The light trap catches of yellow stem borer have been recorded daily through out the year. The daily observations of meteorological variables viz., temperature (maximum and minimum), rainfall and relative humidity were collected from Agro-meteorological observatory, Department of Agronomy at Agricultural Research Station, Nellore. These observations were compiled and averaged to weekly.

For recording seasonal incidence of yellow stem borer, the study was conducted at Agricultural Research Station (ANGRAU), Nellore, Andhra Pradesh, India during kharif, 2014. The total experimental plot size measured 20x20 m (400 m^2). The seedlings of 27 days old were transplanted in the experimental plot with spacing 20 cm between rows and 15 cm between plants. A susceptible rice variety Taichung Native 1 (TN1) and a popularly grown rice variety, BPT 5204 were used as test varieties for the experiment. All other cultural practices were followed as per the recommendations except plant protection measures against insect pest and diseases.

Observations on stem borer infestation was recorded in terms of dead heart counts on 50 random hills by counting the total number of tillers and number of dead hearts at weekly intervals starting from 15 days after transplantation. The per cent dead heart incidence was computed as follows.

$$\text{Per cent stem borer incidence} = \frac{\text{Number of dead hearts/hill}}{\text{Total number of tillers/hill}} \times 100$$

Results
Light trap catches of yellow stem borer
The stem borer population build up through trap collections are presented in Table. Initially, from 37th to 40th Standard week stem borer moth catches were moderate i.e from 36 to 39 moths per week. Then the moth catches were increased suddenly at 41 and 42 standard weeks with 740 and 798 moths, respectively. The peak catches of YSB during kharif season was reported at 42nd standard week (798 moths). High levels of moth catches per week was continued till 45th standard week. There after the number of moth catches were declined gradually and lowest was noted at 49th standard week.

Correlation between weather parameters and rice yellow stem borer
The correlation co-efficient analysis between weather parameters and light trap catches yellow stem borer moths revealed, significant positive correlation was recorded with

correlation co-efficient r = 0.443 (*P*<0.01) between yellow stem borer moth catches and maximum temperature, where as minimum temperature (r =0.295) had a non significant negative correlation with yellow stem borer catches. Morning relative humidity had a significant positive correlation with correlation co-efficient r = 0.432 (*P*<0.01) while evening relative humidity had non significant negative correlation (r = 0.18) with yellow stem borer moth catches. Sunshine hours and rainfall had significant negative correlation (r = 0.432, *P*<0.01 & r = 0.384, *P*<0.01, respectively) with yellow stem borer moth catches.

In present investigation it was revealed that maximum temperature, morning relative humidity, expressed significant positive correlation with yellow stem borer moth catches. Sharma *et al*., 2011 [15] also informed that maximum temperature and relative humidity had positive correlation with the yellow stem borer activity. Kumar *et al*., 2015 [8] reported that maximum temperature and morning relative humidity were positively correlated with YSB moth catches. In present study sunshine hours and rainfall showed significant negative correlation with YSB moth catches. In contrast Kumar *et al*., 2015 [8] reported that rainfall is positively correlated with YSB catches. He also reported that sunshine hours is negatively correlated with YSB moth catches. Contrary to the present observation Padhi and Saha (2004) [9] reported negative influence of maximum temperature, rainfall and relative humidity while positive influence with minimum temperature and sunshine hours to the YSB moth population.

Seasonal incidence of rice yellow stem borer
The incidence of yellow stem borer in terms of dead hearts (DH) were recorded at weekly intervals according to the standard weeks during kharif season i.e from September, 2014 to January, 2015. The data presented in Fig 1, revealed that the incidence of stem borer initiated from 45th meteorological standard week (SMW) i.e second week of November on TN 1 and BPT 5204 (1.3 and 2.0 % DH, respectively) with peak incidence at 48th standard week (67.4 and 63.2 % DH, respectively) i.e last week of November during kharif 2014. The incidence of YSB starts decline from 49th standard week to 51st standard week on TN 1 and BPT 5204 from 44.9 to 2.1 % and 24.55 to 1.3 % dead hearts, respectively. Present study also matches to the findings of Kumar and Sudhakar, 2001 reported that peak incidence of YSB at 2nd fortnight of October during kharif season. Rai *et al*., 2002 also revealed that peak occurrence of YSB during first fortnight of October, which may be due to the difference in climatic conditions. On the other hand present observation was contradicted by Justin and preetha, 2013, who reported *S. Incertulas* incidence in two spells during August-September and December-February at Thirupathsaram (Kanyakumari) where as Gole (2012) [4] stated that the incidence of YSB initiated from second week of August (32nd SMW) and continued up to the harvest of the crop.

**Table 1:** Seasonal occurrence of insect pests of Rice through light trap catches

Std week	Stem borer	Rain fall (mm)	Temperature(ºC)		Relative humidity (%)		Sun shine hours
			Max.	Min.	Morn.	Even.	
37	36	870	26.80	33.44	25.30	81.57	60.14
38	37	415	31.50	33.66	25.17	83.57	65.86
39	38	170	20.60	31.61	25.91	82.57	71.00
40	39	365	5.80	33.29	25.39	88.43	69.14
41	740	5.60	34.54	25.51	83.00	51.43	4.51
42	798	69.20	31.67	24.07	91.29	75.00	2.34
43	717	85.60	30.50	23.91	92.86	78.57	3.26
44	745	0.00	29.77	22.76	93.14	82.14	4.23
45	620	5.60	30.24	22.00	93.43	82.86	3.69
46	185	32.20	29.14	23.57	96.14	83.43	3.41
47	108	61.00	29.77	22.84	94.29	81.00	4.74
48	63	61.60	28.33	21.36	87.71	65.43	4.24
49	22	0.00	28.84	21.59	85.43	62.00	4.21
50	23	191.20	28.21	23.57	94.00	75.71	2.37
51	54	14.40	26.93	22.04	89.57	76.86	2.40
52	129	3.20	26.29	20.90	92.00	71.43	1.54

Table 2: Correlation studies between light trap catches of yellow stem borer and weather parameters during 2014-15.

Weather parameter	Correlation coefficients (r)
Maximum temperature (ºC)	0.44386**
Minimum Temperature (ºC)	-0.29590
Morning Relative humidity (%)	0.43210**
Evening Relative humidity (%)	-0.18086
Sunshine hours (hours)	-0.43274**
Rainfall (mm)	-0.38408*

*Correlation is significant at 1% level   ** Correlation is significant at 5 % level
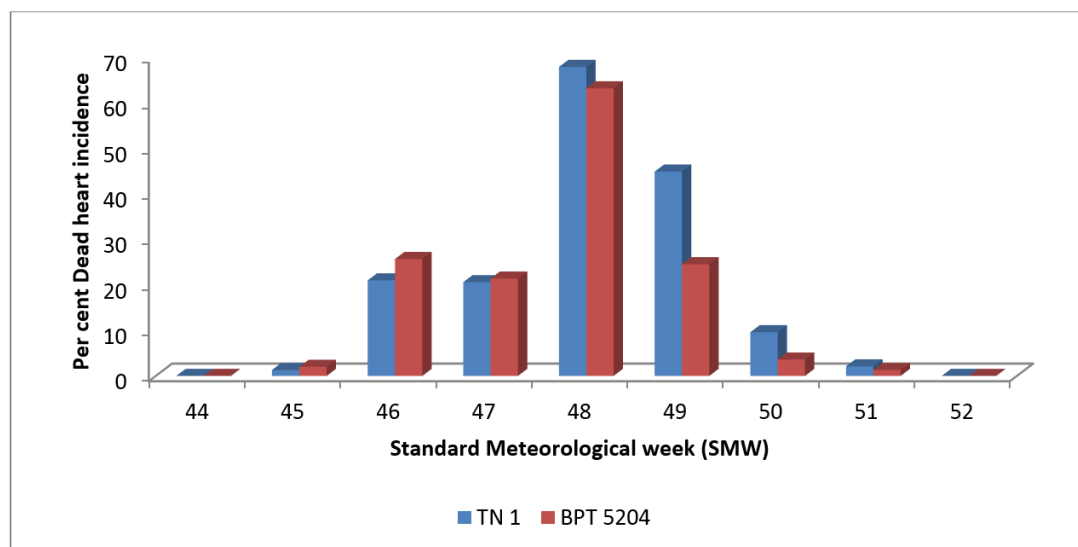
Fig 1: Seasonal incidence of yellow stem borer during kharif, 2014-15

References
1. Anonymous. Hand book of Agriculture, Indian Agricultural Research Institute, New Delhi, 2006, 817-844.
2. Bale J, Masters G, Hodkinson I, Awmack C, Inbezemer TM, Brown VK *et al*. Herbivore in global climate change research: direct effects of rising temperature on insect herbivores. Journal Global Change Biology. 2002;8(5):1-16.
3. Dhaliwal GS, Sahi HN, Malhi SS, Singh J, Boparai BS. Susceptibility of promising Basmati rice varieties to rice leaf folder and white backed plant hopper under different level of nitrogen. Indian Journal of Ecology. 1984;11(2):287-290.
4. Gole CA. Influence of planting method on major insect pest of rice and their management under middle Gujarat condition, M. Sc. (Agri.) thesis submitted to Anand Agricultural University, Anand (Gujarat), 2012.
5. Heinrichs EA, Sexena RC, Chellaih S. Development and implementation of insect pests management systems for rice in tropical Asia. ASPAC Bulletin 127. Taiwan: Food and fertilizer technology center, 1979.
6. Justin CGL, Preetha G. Seasonal incidence of rice yellow stem borer, *Scirpophaga incertulas* (Walker) in Tamil Nadu, Indian Journal of Entomology. 2013;75(2):109-112. 30.
7. Kennedy GG, Storer NP. Life systems of polyphagous arthropod pests in temporally unstable cropping systems.

Annual Rev. Entomol. 2000;45:467-493.
8. Kumar AD, Sudhakar TR. Incidence of yellow stem borer, *Scirpophaga incertulas* (Walker) on rice in relation to weather parameters, Pest Mangt. Econ. Zool. 2001;9(2):161-164.
9. Padhi G, Saha S. Influence of weather parameters on population fluctuations of yellow stem borer, *Scirpophaga incertulas* (Walker) in light trap catches. Environ. Eco. 2004;22(3):504-507.
10. Pasulu IC, Krishnaiah NV, Katti G, Varma NRG. IPM in rice, IPMnewletter, 2002, 45-55.
11. Pathok MD. Defense of the rice against insect pests. Ann. N. Y. Acad. Sci. 1977, 287-295.
12. Prakash A, Rao J. Insect pests of cereals and their management. Pub. By AZRA, CRRI, Cuttack, Orissa, 2003, PP. 167.8
13. Rai AK, Singh AK, Khan M. Influence of weather factors on light trap catches of yellow stem borer in kharif season, Indian J Ent. 2002;64(4):510-517.
14. Sankpal ND. Seasonal occurrence and management of major insect pests of paddy (*Oryza sativa* L.) under middle Gujarat conditions, M. Sc. (Agri.) thesis submitted to Anand Agricultural University, Anand (Gujarat), 2011.
15. Sharma MK, Asrat Atsedewoin, Sileshi Fanta. Forewarning models of the insects of paddy crop. International Journal of Biodiversity and Conservation. 2011;3(8):367-375.
16. Yadav A, Gupta PK, Kurulkar U. Incidence of insect-pests on rice, Int. J Curr. Microbiol. App. Sci. 2019;8(06):551-555.