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# Population Dynamics Of Yellow Stem Borer Scirphophaga Incertulas (Walker) On Rice (Oryza Sativa): Using Sex Pheromone Trap At Shivamogga District, Karnataka.

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***Abstract:****The insect Scirpophga incertulas commonly known as yellow stem borer (YSB) of rice is distributed widely, covering almost all Asian countries, YSB usually occupied more than 90% of the borer population in the rice crop from seedling to maturity stage of the crop their infestation caused "Dead heart" at vegetative stage and "White ear" at reproductive stage respectively. Pheromone traps are the convenient tool to monitor adult male moth population of YSB in rice field. The present investigation was under taken at purle village, Shivamogga, Karnataka to monitor the population dynamics of YSB using sex pheromone trap during summer and kharif seasons 2017. The experimental result revealed that the YSB moth catches reaches its peak during 17$^{th}$ standard week (44.4 moths/week) during summer and 38$^{th}$ standard week (36.2moths /week) during kharif respectively.*

***Key words:*** *Sex pheromone trap, lures. Scirpophaga incertulas, Jyothi cultivar.*

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## I. Introduction

Rice (Oryza sativa) occupies the prominent place in Indian agriculture. It is the most important staple food crop of most of countries in developing world. About 90% of the world rice is produced and consumed in Asia (Anonymous 2004) being a staple food of 2.7 billion people in Asia alone (Kumar et al., 2009). Approximately 148 million hectares of land globally under rice cultivation with a production of 483 million tonnes (FAO, 2012).A number of insect pests infest of the rice crop. Among them extent of damage caused by stem borers varied form 80-90% (Sharma et al., 1996).The yellow stem borer Scirpophga incertulas (Pyralidae: Lepidoptern) of rice is one of the major destructive pest in all rice growing region of the Asia (Listinger, 1979) and is the dominant and is considered as prime devastor responsible for major causing yield loss of about 10-60%(Chatterjee and Mondal, 2014).The larvae of Scirpophga incertulas cause Dead heart (DH) during vegetative stage of the crop and White ear head during the reproductive stage of the crop respectively.

Pheromone traps (Sex pheromone traps) are the convenient tools to monitor adult male moth population of YSB in rice.Pheromone traps has been used for monitoring the male moth population of YSB with three reasons, the first is to detect the occurrence of the pest, the second is to identify occurrence of the pest and third is to estimate the actual field population density of the pest.

## II. Materials And Methods

The experiment was conducted at purle, Shivamogga district Karnataka, during summer and kharif seasons of 2017, in order to monitor the population dynamics of yellow stem borer using sex pheromone trap on rice variety Jyothi, for this purpose field preparation was done and all the recommended cultivation practices were followed during the period of investigation except plant protection measures. Geographically shivamogga is situated between $13^0$ 27' N latitude and $75^0$ 37'- $75^0$ 52'E longitude with an altitude of 650 meters MSL. The mean annual rainfall of Shivamogga was about 829 mm. The place lying in Southern Transitional Zone (Zone-7) and receives an average annual rainfall of 842.33 mm distributed well over the season.

**Study Area**


Sex pheromone traps were of polythene sleeve traps and it contained rubber septa (Lures) [(Z) - 11hexdecanal and (Z)-9 hex decanal]. Which is species specific of Scirpophga incertulas. It attracted and catched only male moth of insect pests (YSB).

Sex pheromone traps for yellow stem borer @ 5 traps in an area of 10 acres was installed during summer and kharif season of 2017.Traps were fixed to the supporting pole at a height of one foot above the plant canopy. The traps were installed when crop was transplanted to main field and traps were placed at a distance of > 75 feet apart. Cotton swab dipped in Diclorvas 76 EC was used inside the polythene bag to kill the insects getting traped. The number of male moth catched per trap / week was counted at weekly intervals till harvesting of the crop in both the seasons. Lures were changed once in two weeks. The mean values of male moth catched per traps at weekly intervals were worked out form the collected data and finally its correlation with meteorological parameter was documented. The weather parameters viz., maximum temperature, minimum temperature, relative humidity, rainfall, sunshine hours were obtained from the observatory unit situated at college of Agriculture, Shivamogga.

**The yellow stem borer trap catches during summer 2017**

The male yellow stem borer Scirpophaga incertulas moth trap catches baited with sex pheromone were initiated from 9th standard week (0.10 moths/week) and showed increasing trend up to 20th standard week (42.0 moths/week) The peak trap catches of moth observed during 17th standard week (44.4 moths/week). However, higher moth catches was recorded between the weeks of 12th to 20th standard weeks.

The correlation studies made between yellow stem borer catches and weather parameters showed that, maximum temperature (r=0.591*), minimum temperature(r=0.461*) and sunshine hours (r=0.533*) had significant positive correlation on moth trap catches while morning relative humidity (r=-0.449*) had significant negative influence on moth trap catches on the other hand total rainfall (r=0.165) shows non significant correlation on moth trap catches, while afternoon relative humidity shows (r= -0.291) had non significant negative correlation on moth trap catches.

**The yellow stem borer trap catches during kharif 2017.**

The male yellow stem borer Scirpophaga incertulas moth trap catches baited with sex pheromone were initiated from 30th standard week (0.30 moths/week) and showed increasing trend up to 38th standard week (36.2 moths/week). The peak trap catches of moth observed during 38th standard week (36.2 moths/week). However, higher moth catches was recorded between the weeks of 32th to 38th standard weeks.

The correlation studies made between yellow stem borer catches and weather parameters showed that, minimum temperature (r=0.813*) had significant positive correlation on moth trap catches, while maximum temperature (r= -0.705*), afternoon relative humidity (r= -0.768*) , sunshine hours (r= -0.528*) shows negative significant correlation with moth trap catches, while on other hand rainfall(r=0.080) shows non significant correlation on moth trap catches on other hand morning relative humidity (r= -0.197) shows negative non significant correlation on moth trap catches.

## III. Results and Discussion

Through understanding of the insect ecology forms a basis for effective pest management and conservation of natural enemies. A major part of insect ecology can be understood if the factors influencing its population are thoroughly investigated. Among these factors, weather parameters are the important and there is need to understand these influences, keeping this in view, The investigations was carried out to study the population dynamics of yellow stem borer Scirpophaga incertulas using sex pheromone trap on rice during summer and kharif 2017

**Summer 2017**

It is evident from the pooled data presented in (Table.1) that pest activity initiated from 9th standard week i.e., 4th week of February (0.10 moths/week) and the peak trap catches of moth recorded during 17th standard week i.e., 4th week of April (44.4 moths/week). The findings of present study are in close agreement with Ishaque and Rahman (1993) reported that peak catches of yellow stem borer moths were recorded during April-may in summer in Assam.

The present path analysis revealed that maximum temperature (r=0.591*), minimum temperature(r=0.461*) and sunshine hours (r=0.533*) had significant positive correlation on moth trap catches while morning relative humidity (r=-0.449*) had significant negative influence on moth trap catches on the other hand total rainfall (r=0.165) showed non significant correlation on moth trap catches, while afternoon relative humidity showd (r= -0.291) had non significant negative correlation on moth trap catches. The present findings are agreement with Somashekara and Javaregowda (2015) reported that there was a positive correlation with maximum temperature, minimum temperature and negative correlation with the total rainfall, morning relative humidity, and afternoon relative humidity in Agricultural research station Sirsi, similarly Adibourne and raja (2005) reported that there was a negative correlation with total rainfall during summer at Pandit Jawaharlal Nehru college and research institute Karaikal.

**Kharif 2017**

It is evident from the pooled data presented in (Table.2) that pest activity initiated from 30th standard week i.e. third week of July (0.30 moths/week) and the peak trap catches of moth observed during 38th standard week i.e. third week of September (36.2 moths/week). The findings of the present study is in agreement with Singh et al.,(2006) who reported that mean yellow stem borer catch per sex pheromone trap per week should two peaks during 3rd week of August and 2nd week of September. However varma et al., (2000) reported that three peak periods viz., July August and September yellow stem borer moth activity during kharif season, similar observations were also reported by Mishra et al., (2012) as yellow stem borer moth exhibiting their peak activity in the month of September onwards.

The correlation studies made between yellow stem borer catches and weather parameters showed that, minimum temperature (r=0.813*) had significant positive correlation on moth trap catches, while maximum temperature (r= -0.705*), afternoon relative humidity (r= -0.768*) , sunshine hours (r= -0.528*) shows negative significant correlation with moth trap catches, while on other hand rainfall(r=0.080) shows non significant correlation on moth trap catches on other hand morning relative humidity (r= -0.197) shows negative non significant correlation on moth trap catches. The findings of the present study are in close agreement with Padhi and Saha (2004) has investigated that maximum temperature, rainfall, relative humidity were negatively correlated with yellow stem borer moth catches while, Razvi (1991) reported that minimum temperature sunshine hours were positively correlated with yellow stem borer moth population at Agricultural University, Andhra Pradesh.

**Tables**

**Table. 1 The yellow stem borer trap catches during Summer 2017**

| Season | Month | SMW | Stages of the Crop | *Moth catches per week |
|---|---|---|---|---|
| Summer | FEB | 9 | Vegetative Stage | 0.1 |
| | MAR | 10 | | 0.5 |
| | | 11 | | 16.6 |
| | | 12 | | 25.6 |
| | | 13 | | 18.0 |
| | APR | 14 | | 30.8 |
| | | 15 | | 39.4 |
| | | 16 | Reproductive Stage | 42.0 |
| | | 17 | | 44.4 |
| | MAY | 18 | | 36.6 |
| | | 19 | | 43.8 |
| | | 20 | Ripening Stage | 42.0 |
| | | 21 | | 28.0 |
| | | 22 | | 9.8 |
| | JUN | 23 | | 18.8 |
| | | 24 | | 10.2 |
| | | 25 | | 7.2 |
| | | 26 | | 0.00 |
| | JULY | 27 | | 0.5 |
| | | 28 | | 0 |
| **Mean** | | | | **20.7** |

**Correlation coefficient (r) between weather parameters and Rice yellow stem borer trap catches during Summer 2017 in Purle**

| | Correlation coefficient ('r' value) | | | | | |
|---|---|---|---|---|---|---|
| Weather parameters | Total rainfall (mm) ($X_1$) | Temperature ($^0$C) | | Relative humidity (%) | | Sunshine hours |
| | | Maximum ($X_2$) | Minimum ($X_3$) | I ($X_4$) | II ($X_5$) | |
| Summer | | | | | | |
| Values | 0.165 | 0.591* | 0.461 | -0.449* | -0.291 | 0.533* |

* indicate significant of values at P=0.0

**Table. 2 The yellow stem borer trap catches during Kharif 2017**

| Season | Month | SMW | Stage of the crop | *Moth catches per week |
|---|---|---|---|---|
| Kharif | | 29 | Vegetative stage | 0.00 |
| | | 30 | | 0.30 |
| | | 31 | | 2.00 |
| | AUG | 32 | | 5.50 |
| | | 33 | | 5.00 |
| | | 34 | | 8.50 |
| | | 35 | | 26.50 |
| | SEPT | 36 | | 21.60 |
| | | 37 | | 29.0 |
| | | 38 | Reproductive stage | 36.2 |

| | | | | |
|---|---|---|---|---|
| | | 39 | | 28.40 |
| | | 40 | | 15.4 |
| | OCT | 41 | | 16.0 |
| | | 42 | | 20.0 |
| | | 43 | **Ripening stage** | 15.0 |
| | | 44 | | 20.0 |
| **Mean** | | | | **15.58** |

**Correlation coefficient (r) between weather parameters and Rice yellow stem borer trap catches during Kharif 2017 in Purle**

| | **Correlation coefficient ('r' value)** | | | | | |
|---|---|---|---|---|---|---|
| **Weather parameters** | **Total rainfall (mm) ($X_1$)** | **Temperature ($^0$C)** | | **Relative humidity (%)** | | **Sunshine hours** |
| | | **Maximum ($X_2$)** | **Minimum ($X_3$)** | **I ($X_4$)** | **II ($X_5$)** | |
| **Kharif** | | | | | | |
| **Values** | 0.080 | -0.705* | 0.813* | -0.197 | -0.768* | -0.528 |

* indicate significant of values at P=0.05

**Table. 3 Mean weekly weather parameters during Summer, 2017**

| | **Weather parameters** | | | | | |
|---|---|---|---|---|---|---|
| **Standard Week** | **RF(mm)** | **Max.Temp ($^O$C)** | **Min.Temp( $^O$C)** | **RH-I( %)** | **RH-II (%)** | **B.S.S. (hrs)** |
| 9 | 0 | 35.7 | 17.9 | 71.1 | 28.7 | 8.8 |
| 10 | 0 | 35.7 | 18.1 | 74.4 | 30.9 | 9.3 |
| 11 | 1.8 | 35.3 | 18.1 | 68.7 | 37.1 | 8.4 |
| 12 | 5 | 37.2 | 20.7 | 75.0 | 30.3 | 8.4 |
| 13 | 0 | 38.3 | 21.2 | 75.3 | 28.3 | 8.3 |
| 14 | 0 | 37.9 | 22.4 | 72.1 | 32.9 | 8.0 |
| 15 | 4.6 | 38.2 | 23.1 | 73.6 | 40.0 | 7.8 |
| 16 | 0 | 37.5 | 23.4 | 71.7 | 43.1 | 9.6 |
| 17 | 49 | 37.7 | 21.3 | 66.4 | 48.4 | 9.3 |
| 18 | 29 | 32.2 | 21.6 | 73.5 | 40.5 | 9.3 |
| 19 | 47.8 | 35.6 | 22.2 | 77.9 | 54.4 | 7.5 |
| 20 | 9.4 | 34.5 | 22.9 | 80.1 | 63.1 | 6.8 |
| 21 | 16.4 | 33.6 | 23.9 | 88.7 | 66.3 | 4.3 |
| 22 | 0 | 33.5 | 22.9 | 78.4 | 55.4 | 6.8 |
| 23 | 24.8 | 30.7 | 22.3 | 86.6 | 75.9 | 2.6 |
| 24 | 67.2 | 28.5 | 22.4 | 91.9 | 82.7 | 1.7 |
| 25 | 8.4 | 29.8 | 22.0 | 87.4 | 75.0 | 2.7 |
| 26 | 24.4 | 28.6 | 21.7 | 85.0 | 79.6 | 1.6 |
| 27 | 17.2 | 29.3 | 21.8 | 87.3 | 76.4 | 2.0 |
| 28 | 19 | 29.0 | 21.3 | 87.1 | 76.9 | 1.8 |

**Table. 4 Mean weekly weather parameters during Kharif, 2017**

| | **Weather parameters** | | | | | |
|---|---|---|---|---|---|---|
| **Standard Week** | **RF(mm)** | **Max.Temp ($^O$C)** | **Min.Temp( $^O$C)** | **RH-I( %)** | **RH-II (%)** | **B.S.S. (hrs)** |
| 29 | 78.2 | 27.5 | 21.6 | 90.3 | 82.4 | 2.2 |
| 30 | 10.8 | 29.4 | 21.7 | 86.1 | 81.0 | 4.8 |
| 31 | 28 | 30.2 | 21.8 | 86.0 | 73.7 | 5.6 |
| 32 | 31.8 | 30.0 | 21.9 | 90.9 | 80.4 | 4.0 |
| 33 | 34.4 | 29.5 | 21.5 | 86.9 | 73.4 | 4.3 |
| 34 | 17.6 | 28.9 | 21.9 | 90.1 | 82.0 | 4.8 |
| 35 | 44.2 | 29.1 | 21.8 | 92.2 | 84.6 | 4.0 |
| 36 | 70 | 31.7 | 22.5 | 89.4 | 73.3 | 4.9 |
| 37 | 45.4 | 31.9 | 22.7 | 88.4 | 77.1 | 6.4 |
| 38 | 7.2 | 28.7 | 20.7 | 86.6 | 76.6 | 5.1 |
| 39 | 64 | 29.5 | 21.4 | 89.1 | 82.1 | 3.1 |
| 40 | 62.8 | 30.6 | 22.0 | 86.4 | 80.6 | 4.5 |
| 41 | 17.6 | 32.0 | 22.1 | 91.3 | 81.9 | 5.2 |
| 42 | 0 | 31.0 | 20.8 | 89.0 | 69.9 | 3.9 |
| 43 | 4.2 | 32.1 | 19.3 | 88.4 | 61.9 | 7.4 |
| 44 | 0 | 30.8 | 17.5 | 69.3 | 60.1 | 8.8 |

## IV. Reference


[1]. Adiroubane, D and K.R. Raja, (2006). Influence of Weather Parameters on the occurrence of Rice Yellow Stem Borer, Scirpophaga incertulus (Walker).**Journal of Rice Research**., 3(1): 6-7

[2]. Anonymous (2004).**State wise rice productivity analysis**. Chhattisgarh sankhyiki published by govt of Chhattisgarh.pp 51-53.

[3]. Chatterjee, S and P. Mondal, (2014). Management of rice yellow stem borer Scirpophaga incertulas (Walker) using some biorational insecticides. **Journal of biopest**., 7(supp) :143-47

[4]. Isahaque, N. M. M. and A. Rahman, (1983), Seasonal abundance of rice stem borer, Tryporyza incertulas (walker) in Assam. **Pesticides, 17**(1): 25-27

[5]. Kumar SAV, Locque .R and P A, Sebastian,.(2009) "A new species of the ant spider genus suffasia (Araneae;zidariidae) from western ghats , India with a key to species of genus" zootaxa vol.2203,pp.59-64

[6]. Listinger, J.A., (1979), Major insect-pests of rainfed wetland rice in tropical Asia. **International. Rice Research. Newsletter**.,**16** (3):25-26

[7]. Mishra, M.K., Sharma, R.C., Singh, R.B. and R.P.Singh, (2012). Monitoring of yellow stem borer, Scirpophaga incertulas (Walker) in rice through light and pheromone traps**. Agricultural. & Biological Research.** 28 (2):135-139

[8]. Padhi, G. and S, Saha, (2004). Influence of weather parameters on population fluctuation of rice yellow stem borer Scirpophoga incertulas (Walker) in light trap catches. **Environmental and Ecology**. 22 (3):

[9]. Razvi, S.A. (1991). **Bio-ecology and management of rice yellow stem borer, Scirpophaga incertulas (Walker)** (Lepidoptera: Pyralidae). Ph.D. Thesis, Andhra Pradesh Agricultural University, Hyderabad, (INDIA)

[10]. Sharma, D. R., Singh, D. P., Singh. J. and G. S. Dhaliwal, (1996), Extent of damage and pattern of emergence from overwintering larvae of rice stem borer in Punjab. **Indian Journal. of Ecology**., **23**(2):104-108

[11]. Somashekara, H. and Javaregowda., 2015, Population build up of paddy yellow stem borer (Scirpophaga incertulus Walker) in relation to different weather parameters Karnataka. **Journal of Agriculutral Science**, **28**(2): 282-283

[12]. Singh, R., Mahal, M.S. and V.K. Kajal, (2006). Influence of pheromone traps in management of yellow stem borer, Scirpophaga incertulas (Walker) on basmati rice. **Journal of Insect Science**. 19 (1): 22-26.

[13]. Varma, N.R.G., Krishnaiah, K., Pasalu, I.C. and P.R.M. Rao (2004).Influence of field size in management of yellow stem borer (YSB), Scirpophaga incertulas(Walker) through pheromone mediated mass trapping in rice. **Indian Journal of Plant Protection**.,32 (1):39-41


**Figures.**

**Fig. 1 Sex pheromone trap**

**Fig .2 Sex pheromone traps installed in the rice field**

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