

Light Trap Study to Determine Emergence and Peak of Adult Moths of Yellow Rice Stem Borer & Sex Ratio Study to Collect Male and Female Moths under Field Conditions

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Abstract:

Light trap study was carried out to observe the activity of adult moth of yellow rice stem borer. Moth activity of over-wintering generation started during the 4th week of March reaches to its first peak during the 2nd week of April and drastically decline up to the end of May. No moth was captured during June and July. Moth population again started during 2nd week of August to infest rice crop, reaches to its second peak during the 1st week of October. Moth population gradually decline from 2nd week of October to last week of November. No moth was captured in the last week of November, December, January and February. Female moths were more attracted to light trap. Sex ratio was observed as 1:4.32.

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Key words: Light trap, yellow rice stem borer, over-wintering, moth population, sex ratio.

Introduction

Rice is cultivated in 112 countries covering every continent and is consumed by 2500 million people in the developing countries. Insect pests damage rice crop at different stages of its growth. Insect pests are the major factors affecting the crop productivity. Around 15 to 20 insect species are known to be the pests of paramount importance and are regularly noticed in tropical Asia (Majid *et al.*, 2009). The average rice yield in Pakistan is considerably less when compared with other rice growing countries of the world, mainly due to the attack of yellow stem borer of rice. Talking about the damage of rice borers, in China, where approximately two third of the damage is caused by the rice stem borers and one third by the rice leaf folder (Sheng *et al.*, 2003). In Sri Lanka, LF affects roughly 20 per cent of the total paddy field (Nugaliyadde *et al.*, 1997). In Pakistan, the overall leaf infestation by *C. medinalis* was seen to be 25 % which reduced the grain yield up to 30% in major rice growing tracts of Punjab. However, at some locations the infestation was found to be 50% (Salim *et al.*, 1991). Besides other insect pests of rice, yellow rice Stem borer, *Scirpophaga incertulus* Wlk, Crambidae family, order Lepidoptera, is the most serious ones and responsible for significant losses (Shafique & Anwar, 1986). The yearly increase in the cost of pesticides has gone out of the reach of common farmer. Therefore there is a need to develop alternates for handling such economically important pests approach.

As an alternate approach insect traps are used to monitor or directly reduce insect populations. Insect traps are sometimes used in pest management programs instead of pesticides but are more often used to look at seasonal and

distributional patterns of pest occurrence. This information may then be used in other pest management approaches. The trap mechanism or bait can vary widely (Weinzier *et al.* 1991). Light traps attract certain insects; however, designs differ according to the behavior of the insects being studied. Light traps are used for ground foraging and flight insects such as beetles and weevils (Kronkright, 1991). The trap consists of three components: a clear plastic trap top to admit light for adult orientation into the trap, a deflector plate to reduce the escape of trapped adults, and a yellow colored trap base with an opening for adult entrance. The light traps (1 light trap/5 acre) would be suggestible to know the range of pest incidence as well as to kill the jassid population (Chu and Henneberry 1998). Light trap is used for killing adult moths to minimize the pest. It is used throughout the year therefore; it also helps to knowing the exact time of emergence of rice stem borers. In March, moths of the *S. incertulas* (Walker) emerge from the over-wintering larvae. The borers remain active from April to October.

In view of the economic significance of yellow rice stem borer, the present study was carried out to determine emergence and peaks of adult moths of yellow rice stem borer & evaluating the sex ratio for collection of male and female moths under field conditions at Rice Research Institute Dokri, Larkana, Sindh-Pakistan. The results of present study will be useful for management of rice stem borers for the farming community through light traps.

Materials and Methods

The present study was conducted to determine emergence and peak levels of adult moths of yellow stem borer and to evaluate their sex ratio during 2007 and was repeated during 2008 at experimental area of Rice Research Institute, Dokri, Sindh-

Pakistan. In this study we used Light traps to determine population fluctuation and sex ratio of yellow rice stem borer. Light traps were installed at the height of three feet above the ground level. A 100 w electric bulb was lit daily in the aluminum funnel of trap at the time of sun-set. Few drops of Thiodan 35EC insecticide were put in cotton and kept in the bottom of cylinder of trap for killing of the moths. No insecticides were applied in the experimental area. Kakde and Patel (2014) designed an experimental area which was kept free from insecticide spray throughout the crop season in order to record the season incidence of rice yellow stem borer. Light trap data was recorded daily throughout the year. Sex ratio was observed by putting the formula:

$$\text{Total females / total males} = \text{sex ratio (1586 / 367 = 4.32)}$$

Results

1. Emergence and Peak of Adult Moths of Yellow Rice Stem Borer

Number of adult moths of *S.incertulas* captured per day during 2007 were 0.16, 5.27, 1.06, 1.87, 6.90, 14.94 and 3.60; while during 2008 were 0.19, 4.77, 1.19, 1.52, 5.03, 14.00 and 3.03; whereas, average of both years was noted as 0.18, 5.02, 1.13, 1.70, 5.97, 14.47 and 3.32 in the months of March, April, May, August, September, October and November, respectively (Table 1). The data in table 1 further revealed that no any single moth was captured during the months of January, February, June, July and December for both of the years.

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Table-1 Moths captured per day to light trap during 2007 and 2008

Number of moths captured				
Moths	Trap/day-2007 Males+Females	Trap/day 2008 Males+Females	Total	Average
January	-	-	-	-
February	-	-	-	-
March	0.16	0.19	0.35	0.18
April	5.27	4.77	10.04	5.02
May	1.06	1.19	2.25	1.13
June	-	-	-	-
July	-	-	-	-
August	1.87	1.52	3.39	1.70
September	6.90	5.03	11.93	5.97
October	14.94	14.00	28.94	14.47
November	3.60	3.03	6.63	3.32
December	-	-	-	-

Males + females / days of month = trap / day. (1 + 4 = 5 / 31 = 0.16 trap/day)

2. Sex Ratio Study to Collect Male and Female Moths of Yellow Rice Stem Borer

To observe sex ratio of yellow rice stem borer, both captured male and female moths of *S. incertulas* through light traps were counted. Male moths captured during 2007 were as 1, 28, 6, 11, 38, 91 and 20; during 2008 as 1, 25, 7, 9, 27, 85 and 18; average both years was 1, 26.5, 6.5, 10, 32.5, 88 and 0.19 while; female moths captured during 2007 were as 4, 130, 27, 47, 176, 372 and 88; during 2008 as 5, 118, 30, 38, 129, 349 and 73; average of both of the years was 4.5, 124, 28.5, 42.5, 152.5, 360.5 and 80.5 in the months of March, April, May, August, September, October and November, respectively (Table 2). Total males throughout the year caught 195 and 172; females were 844 and 742 during 2007 and 2008, respectively (Fig. 1).

Table 2 Male and female moths captured to observe sex ratio

Months	Number of moths captured						Sex ratio
	Males 2007	Males 2008	Average	Females 2007	Females 2008	Average	
January	-	-	-	-	-	-	1:4.32
1 st week	-	-		-	-		
2 nd week	-	-		-	-		
3 rd week	-	-		-	-		

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4 th week	-	-		-	-		
February	-	-	-	-	-	-	
1 st week	-	-		-	-		
2 nd week	-	-		-	-		
3 rd week	-	-		-	-		
4 th week	-	-		-	-		
March	001	001	001	004	005	4.5	
1 st week	-	-		-	-		
2 nd week	-	-		-	-		
3 rd week	-	-		-	-		
4 th week	001	001		004	005		
April	028	025	26.5	130	118	124	
1 st week	009	007		036	031		
2 nd week	012	013		048	053		
3 rd week	005	003		029	020		
4 th week	002	002		17	14		
May	006	007	06.5	027	030	28.5	
1 st week	004	004		018	016		
2 nd week	001	002		005	008		
3 rd week	001	001		003	004		
4 th week	-	-		001	002		
June	-	-	-	-	-	-	
1 st week	-	-		-	-		
2 nd week	-	-		-	-		
3 rd week	-	-		-	-		
4 th week	-	-		-	-		
July	-	-	-	-	-	-	
1 st week	-	-		-	-		
2 nd week	-	-		-	-		
3 rd week	-	-		-	-		
4 th week	-	-		-	-		
August	011	009	010	047	038	42.5	
1 st week	-	-		-	-		
2 nd week	001	001		005	003		
3 rd week	004	003		010	010		
4 th week	006	005		032	025		
September	038	027	32.5	176	129	152.5	
1 st week	006	005		029	024		
2 nd week	007	005		040	026		
3 rd week	009	006		046	031		
4 th week	016	011		061	048		
October	091	085	088	372	349	360.5	
1 st week	041	038		168	151		
2 nd week	027	020		103	085		
3 rd week	015	016		066	067		
4 th week	008	011		035	046		
November	020	018	019	088	073	80.5	
1 st week	011	010		047	041		
02 nd week	006	006		025	019		
3 rd week	003	002		014	010		
4 th week	-	-		002	003		

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December	-	-	-	-	-	-	
1 st week	-	-		-	-		
2 nd week	-	-		-	-		
3 rd week	-	-		-	-		
4 th week	-	-		-	-		
	Total 195	Total 172	Av. 183.5	Total 844	Total 742	Av. 793	

$195 + 172 = 367$; $844 + 742 = 1586$; $1586 / 367 = 4.32$ (1:4.32 sex ratio).

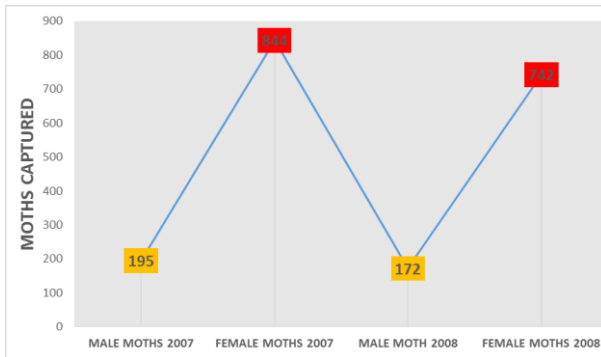


Fig. 1 Total male and female moths captured during 2007 and 2008

Discussion

The present study was conducted to determine emergence and peak of adult moths of yellow rice stem borer & their sex ratio at the experimental area of Rice Research Institute, Dokri, Sindh-Pakistan during 2007 and 2008. Average data collected during 2007 and 2008 showed that moth activity of overwintering generation from rice stubbles started during March (0.18 moths captured/day). Moth activity reached to its first peak (5.02) during April and drastically decline (1.13) up to the end of May. No moth was captured during June and July. Moth population again started during 2nd week of August to infest rice crop. Moth activity reached to its second peak (14.47) during October (highest moths were captured during 1st week of October). Moth population gradually declined from 2nd week of October to last week of November. No moth was captured in the last weeks of November, December, January and February

during both observed years, this indicating the entrance of larvae into state of diapause. The light trap study revealed that female moths were more attracted to light trap and trapped 844 and 742 while; males were 195 and 172 during 2007 and 2008, respectively. Kharat (2006) incidence of stem borer increased from August and it started declining from October. The present study agrees to Kumar and Sudhakar (2001) who observed peak activity of yellow stem borer in second fortnight of October. Kumar (2003) lesser moth collection was recorded the day after a heavy rain. Rai and Khan (2002) found peak occurrence of yellow stem borer during first fortnight of October. Our study partially agrees with Rehman *et al.*, (2002) there were two peaks of moth population during the May on rice nurseries and second in September in rice Crop. Saikia (2009) stem borer moth population increased from mid-August to mid-October. Sarkar and Gayen (1992) observed two major peaks of *S. incertulas* adults, one in October-November and another during February in West Bengal. Treaty *et al.*, (1999) observed two broods of *S. incertulas*, of which first was during the last week of September and another during 2nd week of November. Moreover, Gole (2012) found the incidence of *S. incertulas* from second week of August up to the harvesting of the crop. Justin and Preetha (2013) infestation of *S. incertulas* was found during August-September and December-February. Padhi and Saha (2004) also reported negative impact of maximum temperature, rainfall, relative humidity and wind velocity, while positively correlation with minimum temperature, evaporation and sunshine hours to the yellow stem borer moth population. Sankpal (2011) the activity of adult moths of yellow rice stem borer was observed from 3rd week of August to 2nd week of November showing peak levels during 2nd week of September at vegetative stage and 2nd week of November at reproductive stage.

Conclusion

The present study concluded that First moth was captured during 4th week of March. Moth activity reached to its first peak during April. Moth activity reached to its second peak during 1st week of October. Female moths were more attracted than the males to light trap. The sex ratio of the adult moths ranged from 1:4.32.

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