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Effect of Temperature and Lunar Phase in Light Trap Catches of Yellow Rice Stem Borer *Scirpophaga incertulas* Wik.

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Abstract

A gradual increase in moth population along with the raising of temperature resulted in the highest number of moths captured (516/trap), when the temperature was 100-105^{0}F. However, the number of moths drastically reduced when the temperature crossed this limit. Significantly higher numbers of moths were captured during the last quarter of the lunar phase in the light trap fitted with mercury bulb of 60,100,125 and 200w respectively. The moth catches in the light trap indicated that significantly higher number were captured during new moon (first week) in the trap fitted with 200w mercury bulb and number of moths decreased as the strength of the light source decreased during all the four lunar phases.

Keywords: Lunar phase, Light trap catches, *Scirpophaga incertulas* stem borer.

Introduction

Rice feeds more people than any other food crop in the world. More than one hundred insect species attack rice. Of these stem borers are major pests (Hattori, 1971; Pathak *et al.*, 1971; Ooi; 1976). They attack the crop from seedling to maturity stage. Four species of borers, *Scirpophaga incertulas* walk, *Scirpophaga innotata* walk. *Sesamia inferens* walk and *Chilo suppressalis* walk. are widely distributed through out the rice growing areas of Sindh, Pakistan (Ahmad, 1985, Naqvi, 1975). The level of infestation changes from year to year in different areas. Gentry (1965) estimated 90% crop losses in near east including Pakistan, while Javed and Ahmed (1974) and Afzal *et al.* (1977) have observed the loss of the entire crop in some years in parts of lower Sindh. Stem borer (larva) is internal feeder and remains inside the stem or between the stem and leaf sheath and thus remains protected against parasites, predators, environmental stresses and cantact pesticidal sprays. Although certain systemic insecticides effectively prevent damage yet the control is temporary and expensive. Satisfactory alternatives of insecticides such as pheromones and cultural control measures have not been developed. Therefore, the present studies were conducted to determine the effect of transplanting dates on the infestation of stem borers in different rice genotypes.

Balasubramanian *et al.* (1982) carried out field observation in Tamil Nadu, India to investigate the relationship between various climatic factors and the incidence of the *S. incertulas* (Wlk) on rice crop. A significant positive corrrelation was found between pest incidence and morning relative humidity, evening relative humidity, total rainfall and total number of rainy days. A significant negative correlation was observed between pest incidence and hours of sunshine and maximum temperature.

Mahar and Hakro (1979) reported that the emerging moths from stubbles usually appear from first or second week of March with peak emergence reaching from mid April to the end of June. However, during May and June moth population was found to be very low.

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Material and Method

Studies on the effect of temperature and lunar phase for yellow rice stem borer in light traps were conducted at outskirts of Larkana city. 60, 100. 125 and 200W mercury bulbs were used in the trap. The light trap was placed approximately three feet above the ground level. Nogas 100EC was used to kill the moths. Three drops were introduced to cotton puff and kept in the bottom of cylinder of the trap. The observation on the insect activity, temperature effect and lunar phase was recorded daily for one year. The number of moths collected inside the cylinder of the light trap was counted.

Results

The affect of maximum temperature (^{0}F) on trap catches of *Scirpophaga incertulas* Walker (Table.1) indicated that mean number of adults captured varied significantly with the temperature. The number of moths captured was minimum at 75-80 ^{0}F (4/trap) and it increased with the rise in the prevailing temperature. A gradual increase in moth population along with the rising temperature resulted in highest number of moths captured (516/trap) when the temperature was 100-105 ^{0}F. However, the number of moths drastically reduced when the temperature crossed this limit.

The influence of lunar phase on light trap catches of yellow stem borer moths (Table-2) indicated that the response of adult moths to light trap varied significantly with the light source in the trap and lunar phase. Significantly higher number of moths were captured during the last quarter of the lunar phase in all the light traps fitted with the mercury bulbs of 60, 100, 125 and 200W strengths respectively. The moth catches in the light traps indicated that significantly higher number were captured during new moon (First week) in the trap fitted with 200W mercury bulb and moths number decreased as the strength of the light source decreased during all the four lunar phases. It is evident from the data presented in Table-2 that number of moths captured during the full moon period was significantly low in all light raps.

Table 1: Effect of maximum temperature (^{0}F) on trap catches of *Scirpophaga incertulas* Wlk.

Temperature (^{0}F).	Number of moths captured/ trap / night.
75-80	04
80-85	32
85-90	78
90-95	119
95-100	325
100-105	516

Table 2: Influence of lunar phase on light trap catches of yellow stem borer moths.

Trap with Mercury bulb (W).	Number of moths captured			
	New moon	First quarter	Full moon	Last quarter
60	B 18.25 c	C 12.16 c	C 9.78 c	A 39.25 c
100	B 21.72 c	C 14.74 c	C 11.25 c	A 41.82 c
125	B 32.75 b	C21.75 b	C 19.25 b	A 69.72 b
200	B 48.25 a	C 26.59 a	C 25.16 a	A 85.92 a

Superscripts on right and left side of the mean values show inter and intra column variations.

Distribution

The maximum temperature (°F) on trap catches of yellow rice stem borer *Scirpophaga incertulas* Walker indicated that mean number of adults captured varied significantly with the temperature. The number of moths captured was minimum at 75-80 °F (4/trap) and it increased with the rise in the prevailing temperature. A gradual increase in moth population along with the rising temperature resulted in the highest number of moth captured (116/trap) when the temperature was 100-105 °F However, the number of moths captured drastically reduced when the temperature crossed this limit. Balasubramanian *et al.* (1982) reported that multiple regression analysis revealed that an increase in minimum temperature of 1 °C would result in a 0.4% decrease in damage by *S. incertulas*. Hussain and Beg (1985) studied seasonal population fluctuation of stem borer on rice in Bangladesh. In July-October, the pyralid, *Scirpophga incertulas* constituted 60-97% of the stem borer population. Koyama (1955) reported that the flight as well as the oviposition behavior of *Tryporyza incertulas* which was confined in a glass tube began to flap its wings when the water temperature reached 29 °C, and its activity again decreared when the temperature was about 30 °C. Mahar and Hakro (1979) reported that the yellow stem borer moths ceased to emerge during third week of November and again resumed their activity from second and third week of March. Their emergence continued up to the second week of May, with its peak during second week of April. During this period, as the rice plants are not present in the field, those moths were subjected to death, the moth emergence again resumed during second week of July and continued up to third week of November, with their peak during July, last week of August or first week of September and first week of October.

The influence of lunar phase on light trap catches of yellow stem borer moths indicated that the response of adult moths to light trap varied significantly with the light source and lunar phase. Significantly higher number of moths were captured during the last quarter of the lunar phase in all the light traps fitted with the mercury bulbs of 60, 100, 125 and 200w strengths respectively. The moth catches in light traps indicated that significantly higher number were captured during new moon (First week) in the trap fitted with 200w mercury bulb and moths number decreased as the strength of light source decreased during all the four lunar phases. It is evident from the data presented in Table–2 that number of moths captured during the full moon period was significantly the least in all the light traps. Koshima and Kono (1942) observed that catch of moths in the light trap was remarkably small on nights with a bright moon, during cool weather and on rainy and windy nights. Loevinsohn and Bandong (1991) examined the relationship between catches of *Scirpophaga incertulas* in light trap and population in the adjacent fields. Peak percentage" "Dead hearts" was recorded 24-27 days after the full moon. The average concentration of egg masses were greater between days 20 and 23 than the total for all other periods combined. The results suggested the counting for damage by *S. incertulas* should be carried out mainly in the two weeks after full moon and also that catches in small kerosene lamp light traps reflect patterns in the development of nearby field populations, lending support to the use of these traps in the wide area for monitoring of rice pests. Ramakrishnan and Venugopal (1991) reported that a 200w incandescent bulb attracted the most adults and a 40W bulb the least. A 125w mercury vapor lamp was intermediate .

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