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Studies On The Biology Of Yellow Stemborer, *Scirpophaga Incertulus* (W.) - A Major Rice Pest Of Central India

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Abstract

The biology of yellow stemborer, *Scirpophaga incertulus* (Walker) was studied under laboratory conditions in eastern Vidarbha of Maharashtra (India) during *Kharif* season at prevailing room temperature (22-32^{o}C) and relative humidity (58-72 %). The results revealed that the pre-oviposition and ovi-position period lasted on an average for 1.0 and 1.5 days, respectively. The fecundity was 124 eggs/female. The incubation period was 7.5 days. The larval and pupal duration recorded was 28.5 and 8.5 days, respectively. The mean adult longevity was 2 days.

Key Words: Biology, fecundity, rice, *Scirpophaga incertulus*, Yellow stemborer.

INTRODUCTION

Rice stemborers are a key group of insect pests infesting rice plants from seedling stage to maturity mostly belong to the two lepidopteran families, Pyralidae and Noctuidae (Kapur, 1960). Yellow stemborer, *Scirpophaga incertulus* (Walker) is the most dominant and the destructive stemborer species in India (Walker., 1975 and Panda *et al.*1976). It is often considered as a classical example of a monophagous pest species which is primarily distributed in the tropics but also occurs in temperate areas where the temperature remains constantly above 10 ^{o}C and the annual precipitation is more than 1000 mm.

The damage to the crop is caused by only caterpillar larvae, which bore into the leaf sheath and destroy the growing tips by feeding the internal contents of the stem. This in turn disrupts the flow of water and nourishment to the plant, thereby causing drying of central shoot, which is referred as 'dead heart' (DHs) during vegetative stage of rice crop. When the infestation occurs at the flowering stage, the ear heads become chaffy which are referred to as 'white ear heads' (WHs). As the biology of any insect pest differs from region-region and season-season, therefore the sufficient knowledge about the biology of an insect pest is necessary for adopting suitable control measures in a particular region and season. Although, biology of rice

stemborer was studied by various workers in different countries (Doke, 1936., Koyama, 1955., Soenardi, 1967., Pathak, 1967 and Islam & Catling, 1991,) and in some states of India (Khan *et al.,* 1952, Banerjee & Pramanik, 1964 and Ankit Kumar, *et al*., 2018) but no work has been done on biology of yellow stemborer in Maharashtra state of India. Therefore, the present study was undertaken to study the biology of YSB, *S. incertulus* in the eastern Vidarbha of Maharashtra.

MATERIALS AND METHODS

Biology of yellow stemborer, *Scirpophaga incertulus* (Walker) was carried out at prevailing room temperature of 22-32ºC and relative humidity of 58-72 % in the Zoology laboratory of S.N. Mor College, Tumsar Dist. Bhandara (MS) on Jai Shriram rice variety during *kharif* season. To obtain the fresh adults, 20 days old seedlings with freshly laid egg masses were uprooted and transplanted in earthen pots each of 25 cm diameter. To protect the eggs masses from predators and parasites, the potted plants were covered with muslin cloth hood. A cardboard having a small hole in the middle was placed above the soil surface in the pot through which the stem of the seedling was inserted. A cardboard surface was necessary at the base of the plants to locate dead larvae or adults those fall from the plants caged in these pots for specific studies. Observations were made once a day up to hatching. The newly hatched larvae were observed for their mode of penetration and dispersal. The incubation period of eggs, larval periods, adult longevity, and morphological characteristics of each developmental stages were recorded.

To study the mating, pre-oviposition, oviposition period as well as the adult longevity, newly emerged male and one female moth were released in another muslin cloth covered potted rice plants through a slit specially provided for this purpose. The moths were kept under constant observations. Nature of damage was also studied by observing mode of penetration of caterpillars in the stem.

RESULTS AND DISCUSSION

The observations on the biology of yellow stemborer, *S. incertulus* under laboratory conditions have been summarized in following table. Life cycle of *S. incertulus* (W.) includes four developmental stages viz., egg, caterpillar larva, pupa, and adult (Fig. 1, 2 and 3).

1. Adults

Adults (Fig.1) are nocturnal and phototaxis. The moths often show sexual dimorphism. The male and female moths differ clearly in colour and size. The female moth is larger (1.7cm) than the male and its forewings are bright yellowish brown with a distinct black spot in the center. The abdomen is wide, and its tip is covered with tufts of yellowish hair. The male moth is pale whitish yellow and its abdomen is slender. Spots on the forewings are not conspicuous**.** The moths usually emerged during night. They were not active during the daytime, but found seating on rice crop leaves. According to Pathak (1967) and Islam and Catling (1991) the adults of *S. incertulus* emerge during evening hours and continue till 9 pm. Mating generally occurred during night. The female moth deposits eggs early at night in small masses of about 50-80 eggs

upper side of the leaf. The moth deposits only one egg mass per night and the ovi-position took place for 1-2 days after emergence. Ovi-position usually took about 10-30 minutes. The moths are short-lived and died within 1.5-2.5 days post-oviposition. The fecundity of the moth varies from 98-145 eggs. The similar observations were also reported by Doke (1936).

2. Egg

The eggs (Fig. 2) are creamy white, flattened, oval and covered with brown anal tuft of hair of the female. The incubation period was found to be of 5-8 days. The eggs usually hatched during daytime. Generally, all the eggs within an egg mass hatched simultaneously.

3. Caterpillar Larva

The caterpillar larvae (Fig. 3) measured about 1.4 mm long just after hatching. The body is pale yellow in colour with dark brown prothoracic shield and the orange head. Being negatively geotropic, caterpillar larvae crawl upward towards the top of the plant where they stay only for short periods. They showed tendency to disperse. Some suspend themselves with a silken thread and spin and swing with the wind to reach the adjacent plants. Most of those remaining at the tip crawled down towards the base of the plant, feed on the leaves for a while and bored into the stem where they completed the larval period. The full-grown (sixth instar) larvae are about 18 mm long, white or yellowish-white, and with a well-developed prothoracic shield. The larval period usually lasted for 27 – 30 days. Before pupation, the larvae make an exit hole through which the adult moth later escapes.

The larvae start their attack by boring the inner portion of the leaf sheaths, which causes broad longitudinal yellowish white patches at the feeding sites. About a week after hatching, the larvae from the leaf sheaths bore into the stem and, staying in the pith, feed on the inner surface of the walls. Such feeding frequently results in a severing of the apical parts of the plant from the base. When this kind of damage occurs during the vegetative phase of the plant, the central leaf whorl does not unfold, turns brownish, and wilt off, although the lower leaves remain green and healthy. This condition is known as ‘dead heart’ (Fig. 4) and the affected tillers dry out without bearing panicles. After panicle initiation, severing of the growing plant parts from the base results in drying of panicles; they may not emerge at all and those that have already emerged do not produce grains. Such panicles are very conspicuous in the field and as being empty they remain erect and whitish. They are usually called ‘white-ear heads’ (Fig. 5).

4. Pupa

The pupae remain inside infected the stem or stubble, mostly in the lowest node of plant just above the water level in the field. They are pale at first and turn brown after some time. They are covered with whitish silken cocoons. The anterior end of the cocoon is tubular and attached to the exit holes. The pupal stage lasts usually for 7-10 days. In *khari*f season the mature larvae undergo diapause in rice stubbles after the harvest of rice in December. These larvae pupate and emerge as moths after the monsoon rains in June or July. Israel (1969) and CRRI (1970) reported that after the harvest of paddy, many larvae remained in the stubbles and confirmed that the borer population leftover in the stubbles is potentially high to reinfest the succeeding rice

crop. In the present study, yellow stemborer, *S. incertulus* population persisted in the rice ecosystem of eastern Maharashtra (India) throughout the year completing about 5-6 generations. Catling and Alam (1977) reported five overlapping generations of rice stem borer in each year.

Table. Biological parameters of yellow stem borer, *S. incertulus* (W.)

Sr. No.	Biological events	Period (Days)	
		Range	Mean
1.	Pre-oviposition period	1	1.0
2.	Ovi-position	1 - 2	1.5
3.	Incubation period	6 - 9	7.5
4.	Larval period	27 - 30	28.5
5.	Pupal period	7-10	8.5
6.	Adult longevity	1.5 – 2.5	2
7.	Fecundity	98 - 150	124

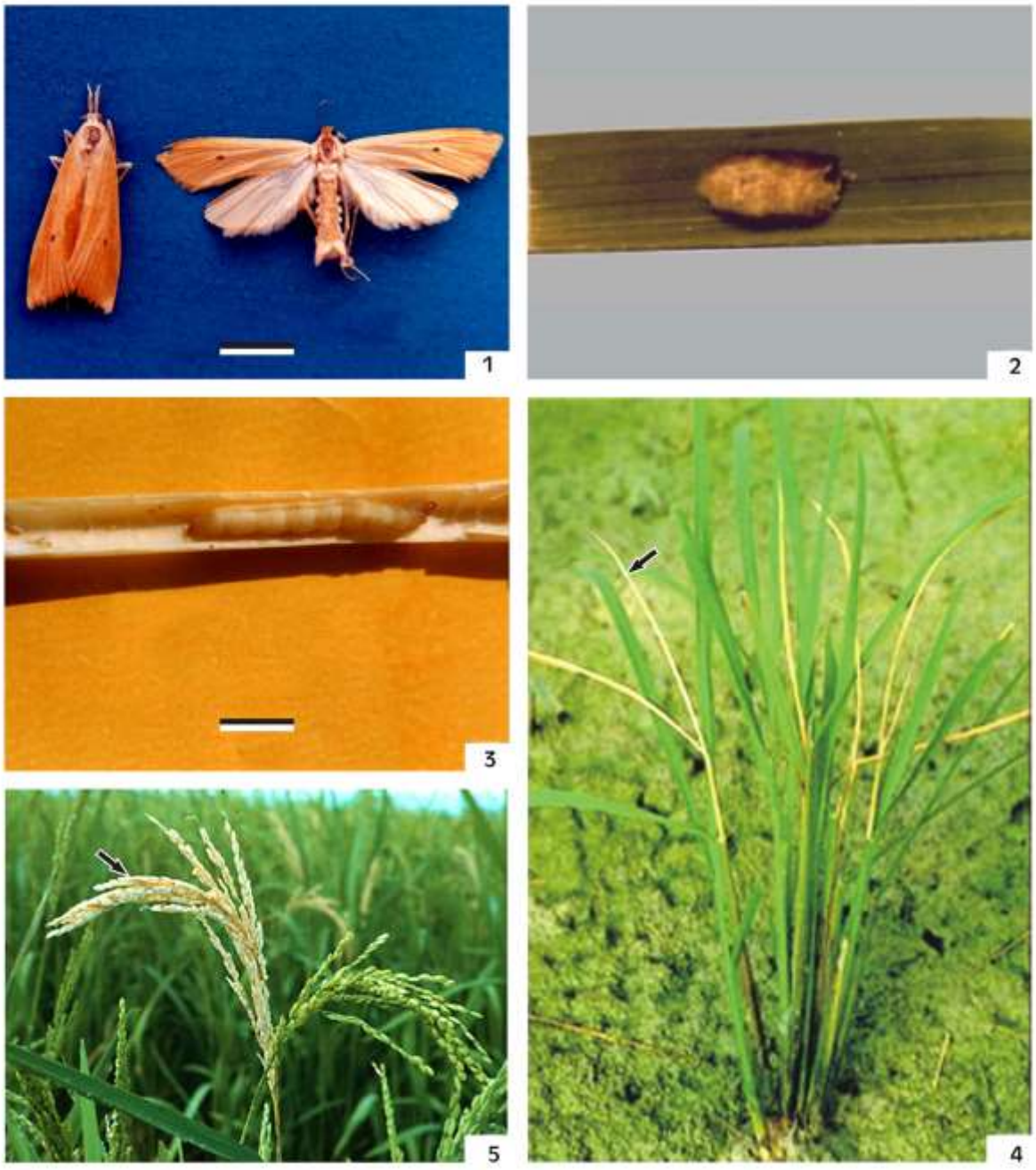

Fig. 1-5. Life cycle stages and damage caused by *S. incertulus*
Fig. 1. Female moth
Fig. 2. Eggs mass
Fig. 3. Cater pillar larva
Fig. 4. Dead hearts (damage caused at early stage)
Fig. 5. White-earheads (damage caused at late stage).

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