

Biology of *Scirpophaga incertulus* (W.) A Major Pest of Rice in Eastern Vidarbha, Maharashtra

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ABSTRACT

The biology of yellow stem borer, *Scirpophaga incertulus* Walker was studied under laboratory conditions in the laboratory of S.N. Mor College, Tumsar, eastern Vidarbha of Maharashtra during Kharif season at prevailing room temperature (18-29°C) and relative humidity (57-70 %). 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 150 eggs/female. The incubation period was 6.5 days. The larval and pupal duration recorded was 27.5 and 8.0 days, respectively. The mean adult longevity was 2.5 days.

Key Words: Biology, rice, *Scirpophaga incertulus*.

Introduction

Among the several insect species recorded as pests of rice (Grist and Lever, 1969), rice stem borers are a key group of insect pests, infesting rice plants from seedling stage to maturity mostly belonging to the two lepidopteran families, Pyralidae and Noctuidae (Kapur, 1960 and Anonymous, 1966). *Scirpophaga incertulus* (Walker) is the dominant and the most destructive stem borer species in India (Walker., 1975 and Panda et al. 1976). It is often referred as a classical example of a monophagous species which is primarily distributed in the tropics but also occurs in temperate areas where the temperature remains constantly above 10°C and the annual precipitation is more than 1000 mm.

The damage is caused by caterpillars, which bore into the leaf sheath and destroy the growing tips by feeding the internal contents. This in turn disrupts the flow of water and nourishment to the plant, thereby causing drying of central shoot, which is referred to as "dead heart" (DHs) during vegetative stage. When the infestation occurs at the flowering stage, the ear heads become chaffy which are referred to as "white ear heads" (WHs). Since the biology of an insect pest differs from region-region and season-season so 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 this pest 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 and Banerjee & Pramanik, 1964) but almost no work have been done on this aspect in Maharashtra. Therefore, the present investigation is undertaken in order to study the biology of *S. incertulus* in the eastern Vidarbha of Maharashtra.

Materials and methods

The studies on the biology of yellow

stem borer, *Scirpophaga incertulus* (Walker) were carried out at prevailing room temperature (18-29°C) and relative humidity (57-70 %) at Department of Zoology, S.N. Mor College, Tumsar on HMT rice variety during kharif 2008. With a view to obtain the fresh adults, 15 days old seedlings with freshly laid egg masses were uprooted and transplanted in earthen pots each of 20 cm diameter. The potted plants were covered with muslin cloth hood to isolate the eggs masses from predators and parasites. A cardboard with a small hole in the middle was placed above the soil surface in the pot.

Through this hole 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 twice a day up to hatching. The newly hatched larvae were observed for their mode of penetration and dispersal. The developmental periods of eggs, larval stage, adult longevity, and morphological characteristics of each stage were noted.

In order to study the mating, pre-oviposition, oviposition period as well as the adult longevity newly emerged male and one female moths were released in the another muslin cloth covered potted rice plants, through a slit specially provided for this purpose. The pairs of moths were kept under constant observations for 24 hours. Nature of damage was also studied by observing mode of penetration of caterpillars in the stem.

Results and discussion

The results on the biology of *S. incertulus* studied under laboratory conditions have been summarized in Table 1. Life history of *S. incertulus* (W.) comprises four stages viz., egg, larva, pupa and adult (Fig. 1-5).

Table 1. 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	5-8	6.5
4.	Larval period	25-30	27.5
5.	Pupal period	6-10	8.0
6.	Adult longevity	2-3	2.5

Adult: Adults are nocturnal and phototaxis. The moths often exhibit sexual dimorphism. The male and female differ clearly in colour and size. The female moth is bigger (1.7cm) than the male and its forewings are bright yellowish brown with a distinct black spot in the center (Fig. 1).



Fig. 1- *S. incertulus*- Female moth

The abdomen is wide, and its tip is covered with tufts of yellowish hair. The male moth is pale whitish yellow and the abdomen is slender. Spots on the forewings are not conspicuous. The moths usually emerged at night. They were not active during the daytime, but found resting on 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 moths lay eggs early at night in small masses of about 50-80 eggs near the tip of the leaf blade. The moth deposits only one egg mass per night and the ovi-position took place for 1-2 days after

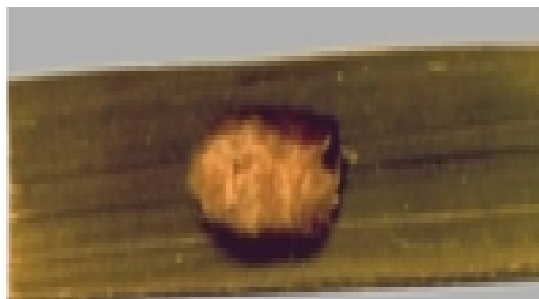


Fig. 2.- *S. incertulus*- Eggs mass

emergence. Ovi-position usually takes about 10-35 minutes. The moths are short-lived and die within 2-3 days post-oviposition. The fecundity of the moth varies from 100-150 eggs. The similar observations were also reported by Doke (1936).

Egg: Eggs are creamy white, flattened, oval and covered with brown anal tuft of hair of the female (Fig. 2). 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.

Larva:

Larvae measured about 1.5 mm long just after hatching. The body is pale yellow in colour with dark brown prothoracic shield and the orange head. Being negatively geotropic larvae crawl upward towards the



Fig. 3.- *S. incertulus*- Cater pillar larva

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 20 mm long, white or yellowish-white, and with a well-developed prothoracic shield (Fig. 3).



Fig. 4.- *S. incertulus*- Dead hearts (damage caused at early stage)

The larval period usually lasted for 25- 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



Fig. 5.- S. incertulus- White heads (damage caused at late stage)

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" (DH) and the affected tillers dry out without bearing panicles (Fig. 4).

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-earheads" (WHs) (Fig. 5).

Pupa:

Pupae remain inside 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 6-10 days. In kharif 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 CRR (1970) reported that after the harvest of paddy a large number of 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 *S. incertulus* population persisted in the rice ecosystem of Bhandara district throughout the year completing about 5-6 generations. Catling and Alam (1977) reported five overlapping generations of rice stem borer in each year.

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REFERENCE

- 1 Anonymous. (1966). Further studies on the insect pests on rice in Philippines. Rep. Int. Rice Res. Inst. Ent., 965 (Rev. Appl. Ent., (A) 56 (4): 844.
- 2 Banerjee, S. N. and Pramanik, L. M. (1964). The lepidopterous stalk borers of rice and their life cycles in the tropics. In "Major Insect Pests of the Rice Plant." Proc. Symp. Intern. Rice Res. Inst., Philippines, 103-25. (Johns Hopkins Press, Baltimore, 1967).
- 3 Catling, H. D. and Alam, S. (1977). Rice stem borers. In Literature review of insect pests and diseases of rice in Bangladesh. PP. 6-27.
- 4 Doke, N. (1936). Effect of temperature and humidity on the ecology of the rice stem borer. Japanese J. Appl. Zool., 8: 87-93.
- 5 Grist, D. H. and Lever, R. J. A. W. (1969). Pests of Rice, Longmans, Green and Co., Ltd., London and Harlow.
- 6 Islam, Z. and Catling, H. D. (1991). Biology and behaviour of rice yellow stem borer in deep water rice. Journal of plant protection in the tropics, 8 (2): 85-96.
- 7 Kapur, A. P. (1960). Taxonomy of the rice stem borers. In "Major insect pests of the Rice Plant. Proc. Symp. Intern. Rice Res. Inst., Philippines, 3-43. (Johns Hopkins Press, Baltimore, 1967).
- 8 Khan, M. Q. and Murthy, D. V. (1952). Some observations on the rice stem borer (*Schoenobius incertulus* Wlk.) in Hyderabad state. Indian J. Ent., 17: 175-182.
- 9 Panda, N., Somalo, A. P. Patra, N.C. and Reddy, T. G. (1976). Relative abundance of lepidopterous stalk borers of rice in Bhubaneswar. Indian J. Entomol., 38 (4) 301-304.
- 10 Pathak, M. D. (1967). Biology of some insect pests of rice. Ann. Rev. Entomol., 13: 257-294.
- 11 Soenardi, Ir. (1967). Insect pest of rice in Indonesia. In "Major Insect Pests of the Rice Plant". Proc. Symp. Intern. Rice Res. Inst., Philippines, 675-83. (Johns Hopkins Press, Baltimore, 1967).
- 12 Walker, H. G. (1975). Preliminary list of insects and mites recorded on paddy rice. Mimeograph. Food Agr. Organ. UN. (Rome 66 pp.).