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STUDY ON THE LIFE CYCLE OF SITOPHILUS ORYZAE ON RICE CULTIVAR PUSA 2-21 IN LABORATORY CONDITION

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Abstract

Sitophilus oryzae is a major stored grain pest infesting many grains in storage but rice is its main target of attack. It has been seen that the life cycle of insect depends upon many factors such as ambient temperature, humidity, water content of the grain etc. But the ease with which the life cycle is completed also depends on the type / variety of rice on which the insect is thriving. So it is desirable to study the life cycle on different cultivars of rice. Understanding of life cycle helps in management of pest in a better way.

Key words: Sitophilus oryzae, life cycle, rice, pest

INTRODUCTION

It has been estimated that pests devour about 6.5% of total grains stored in India (Raju, 1984). Even though ultramodern storage facilities are available, farmers in rural India due to their ignorance and lack of extension facilities in the hinterland, still depend upon traditional techniques of storage of food grains, thereby making their grains prone to the infestations of pests during storage (Aslam *et al*.2004). Devising methods of storage and assessing the susceptibility of a particular cultivar to a pest requires the study of the life cycle of the pest in different conditions of temperature and relative humidity. A number of workers have delved into the life cycle of Sitophilus oryzae (Wille 1923; Bheemanna 1986; Barbuiya *et al.*, 2002) but results do not show uniformity as far as the time taken in completion of life cycle (Wille, 1923), the features of different developmental stages encountered (Barbuiya *et al.* 2002) and the generations completed per year (Bheemanna 1986) are concerned. It was not only the type of food grain but the prevailing agro-climatic which has left their imprint on various aspects of growth and development of the infesting pest.

In the Tirhut area of Bihar a number of rice varieties are cultivated of which Pusa 2-21 is an important one. It is subjected to large scale damage by *Sitophilus orizae* during warehousing particularly during storage by small farmers who do not afford highly sophisticated storage facilities.
The present work intends to study the life cycle of *Sitophilus oryzae* with special reference to observation on time taken to complete different development stages in the local agro-climatic region.

Materials & Methods.

Studies on the biology and life cycle of *Sitophilus orizae* on local rice grain Pusa 2-21 were conducted for the period of 92 days, i.e., from 15th June to 15th September of 2015.

Laboratory conditions: The entire study was conducted in the laboratory of the University Department of Zoology, B R A Bihar University Muzaffarpur. During experiment the average temperature (minimum & maximum) varied from 22.18ºc to 32.8ºc and the range of relative humidity was recorded between 68% to 85%.

Collection of samples:
Rice sampling**:** For this study fresh rice grains were purchased from the local market of Muzaffarpur called Gola bazar. The grains were dried under sunlight and stored in air tight jars. Only un-infested intact grains were selected.
Insect sampling: The adult rice weevils were collected from infested rice grains. The infested rice grains were purchased from the local retail market of Muzaffarpur, popularly called Andigola market. The culture was maintained in glass bottle of 2.5 liter capacity containing rice grains. For proper aeration mouth of bottle was covered with piece of cotton cloth. Clean and fresh grains were given to ensure proper growth of the weevil. Pure culture of the weevil was prepared by infesting properly cleaned pre- weighted insect free rice grains with freshly emerged single mating pair. The culture was maintained in the plastic jars each of which contained 30 rice grains.
The temperature of plastic vial is measured with the help of digital probe thermometer and accordingly recorded. Micrometer and slide caliper were used for morphometric observations.

Result & discussion
Ten male and female insects with food grains were placed in ten separate vials each containing fifty grams of rice grains and their lifespan was observed in each of them at room temperature and humidity. Damaged grains were replaced every day by fresh grains, the former were carefully observed under microscope to isolate grains having eggs. The egg of *S.orayzae* measures 0.71±0.04 mm in length. The average length of adult male and female was 3.1 ± 0.6 mm and 2.9 ±0.6mm respectively. Whereas the adult female, with continuous food supply survives for 81 to105 days, the adult male remains alive for 57-63 days.

The S. oryzae larvae were fed individually inside a specimen tube of 7.00 cm x 2.00 cm size with seven gram rice grains in each. Ten grains per day were dissected out to observe different larval stages. The process was continued till the appearance of pupal stage begun in the dissection. The time taken between hatching and pupation was length of larval period. Larval stage lasted for 21-27 days. The average length of the larva was 2.9 ±0.2 mm.

The larvae thus emerged earlier were continuously fed upon and they pupated. The length of time consumed between pupation and emergence of adult indicated the pupation period which varied between 7-8 days with a mean of 7.5 plus-minus 0.84 days. Total length of life cycle starting from egg to adult ranges between 35-49 days with mean of 41.2 ± 5.79 days.

Ovipositional studies: Newly emerged pairs of weevil were allowed to grow in specimen tube (7.5 cm x 2.5 cm) and ten replication of such tubes were maintained. Mating commenced after 4-6 days and oviposition followed.
Incubation period: Rice grains on which eggs were laid were further maintained in a glass vial to study the incubation period. Twenty grains were dissected daily to ascertain the hatching. As per the experiment conducted, the incubation period turned out to be 6-7 days on rice.
While the result of present study conformed some of the observations made by earlier workers in this regard, it was in contrast to some others. It is consonance with the observations of Barbuiya et . al (2002) who found an incubation period of 5 to 7 days on rice.

Table 1: Variations in temperature & humidity of Practical room during the study period.

Room Climate		Months.		
		June15- July 14 (30 days).	July15- Aug. 14 (30 days).	Aug.15-Sep.15 (302days)
Temperature (°C)	Maximum	32.08	31.92	32.73
	Minimum	22.53	22.83	22.05
	Range	32.08-22.53	31.92-22.83	32.73-22.05
	Average	27.32	27.41	27.77
Humidity (RH%)	Maximum	86.33	85.52	83.4
	Minimum	68.39	69.58	71.48
	Range	86.33-68.39	85.52-69.58	83.40-71.48
	Average	77.44	77.74	77.95

Table 2. Description Of Different Growth Stages Of *S. orizae*.

Growth stages		Mean (mm)	Standard devation (mm)	Range (mm)
Adult	Male	3.1	3.1 ± 0.6	2.5-3.7
	Female	2.9	2.9 ± 0.6	2.3-3.5
Egg		0.71	0.71 ± 0.03	0.68-0.70
Larva		2.9	2.9 ± 0.2	2.6 - 3.1
Pupa		2.4	2.4 ± 0.1	2.3 - 2.5

An incubation period of 5 days was observed on maize grains by Yevoor (2003), at 14 to 34 degree C temperature and 55 to 88 % relative humidity (RH). But Wille (1923) contradicted present study by the observation that during summer the egg stage of *Calandra oryzae* (L.) on husked rice lasts for six to nine days. While Okuni (1924) had observed 5 to 20 days of pupal period, Wille (1923) has recorded 7 to 11 days of pupal period. Wille (1923) reported variable duration of life cycle with 45 days in summer but taking as long as five months in cool weather of autumn and winter for completion of one generation. While it takes 42 days to complete the full life cycle as per the present observation, contrary to this, Okuni (1924) reported eight generations of *S. oryzae* in a year with the adult average longevity for 160 days. The duration of incubation period in the present observation is far above the observation of Okuni (1924) who had noted that the incubation period under normal condition extends up to three to four days. Newman (1927) from Australia had registered three to five days of egg stage and had recorded 20 to 30 days of larval period of rice weevil.

Fig. Adult *Sitophilus* species.

Fig: Egg.

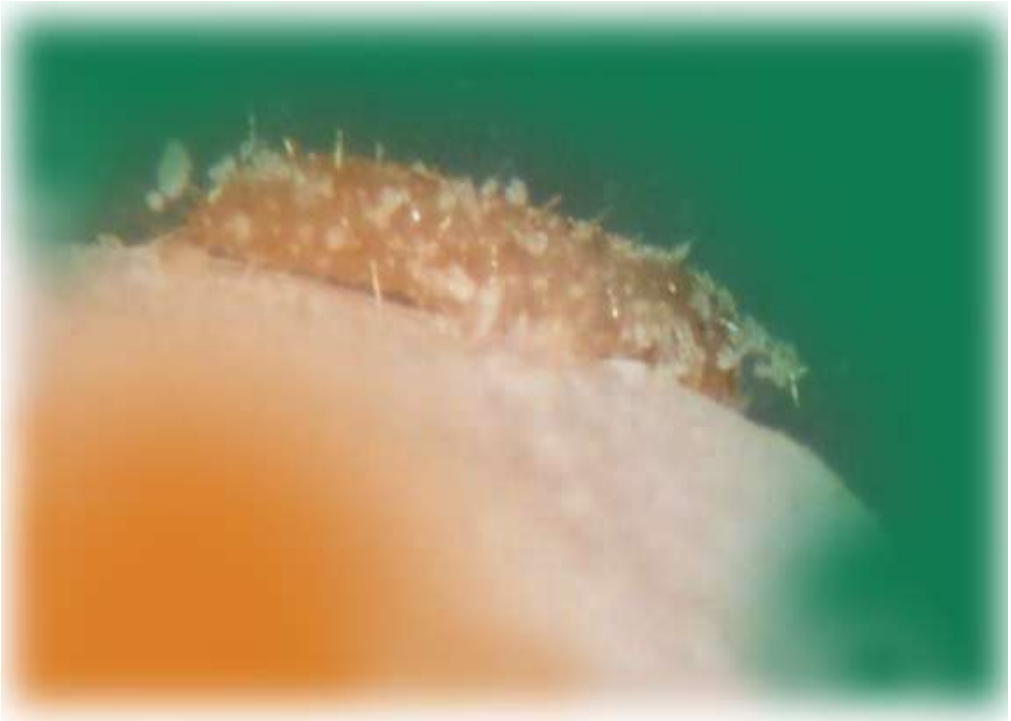

Fig: Larval stage

Fig: Pupa.

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