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ORIGINAL ARTICLE

Studies on Preoviposition, Oviposition, Fecundity and Incubation Period of Rice Weevil *Sitophilus oryzae* on Sorghum

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ABSTRACT

Near about 70% of the world's population depends upon productivity of crops. Sorghum (Sorghum bicolor), popularly called as Jowar, is one of the most important food and fodder crop in India and occupies third place in area and production. Its grains used by human beings as well as straw for cattles. The study belongs to sorghum pest Sitophilus oryzae with regard to its preoviposition, oviposition, fecundity and incubation period studies to manage control strategies.

***Key words**: Preoviposition, Oviposition, Fecundity, Incubation Period, Sitophilus oryzae*

INTRODUCTION

The area under Sorghum has gradually declined from 18 million ha in 1960 to 10 million ha in 2002. The Sorghum is grown in two major seasons, viz. Kharif (June – July to September – October) and Raw (September – October to February – March). The decline in area is mostly in Kharif and at present area of both Kharif and rabies more or less equal. Sorghum Storage of Sorghum is main problem because a lot of Stored grain pests attack to our storage houses. In 1979 Rai and Singh collected loss datas of storage houses they reported that damage of grains is about 10% which is directly influenced with the population of insect pests. It has been observed that if stored grains once infested by insect pest, it is impossible to get rid of them easily because their grabs remain penetrate in grains and the pest population multiply in geometrical progression. Similarly chemical factors responsible for resistance have also been established in some cases, Protein, Sugar, Starch, Oil and Minerals are important components for insect resistance (Pandey and Pandey, 1978 and Sudhakar and Pandey, 1982). For saving the food grains in storage from insect pests it is therefore, needed the systemic research approach to determine the sources of Physico-chemical resistance techniques, so that the resistant factor can be utilized in breeding programme to protect the grains by insect infestation.

Further, the research approach will help for maintaining the quality of food grain. In the light of heavy losses caused by *Sitophilus oryzae* to Sorghum in storage, *Sitophilus oryzae* has been found as one of the major pest of Sorghum grain, which causes serious damage though various pesticides have proved to give effective control of various stored pest but different hazardous problem produce.

MATERIALS AND METHODS

Among different varieties Sorghum, the variety CSV8R was used for mass culture of *Sitophilus oryzae* was selected as the culture variety, because it is known to be susceptible of *Sitophilus oryzae* and other beetles (Prakash, A. 1981) and stored in glass bottles (5 litre capacity) after sterilization and cleaning, whenever, needed for culture grains were taken out from these bottles and conditioned in desicator having a relative humidity of 70% maintained by using KOH solution (Solaman, 1951). The grains were loosely filled in small muslin bags and kept inside the desicator for 2-3 weeks for counting, so that the grains acquire a moisture content level of 13-14%, which is most conductive for *Sitophilus oryzae*. The nuclear culture of *Sitophilus oryzae* was obtained from the pure culture which maintain in the Deptt. of Zoology Ganjdundawara for several generation about 80 grabs of *Sitophilus oryzae* were taken as initial inoculation and rebased in glass jar (115.5

x 10.5) which were half filled with the conditioned grains with culture variety. The glass jars were kept inside a B.O.D. incubator maintaining constant temperature 35± 1°C and 60 ± 2% relative humidity. The incubated grabs of *Sitophilus oryzae* were allowed to develop into adults on the grains inside the Jar. Adult insects after emerging from a jar were used to start new cultures in fresh jars. Such process was repeated with succession of jar to have a continuous and adequate supply of the test insect for experimental on varietal screening.

APPARATUS :

Glassjars, specimen tubes, B.O.D. chamber, incubator, forcepts, needles, Petridishes, binocular microscope, camel hair brush, muslin cloth, corks and rubber rings, dry and wet bulb thermometer were used during the course of investigations.

VARIETIES OF SORGHUM:

Sorghum varieties were selected from those rebased for common cultivation for different zones of the country. The Sorghum grains of Seventeen different varieties were obtained from the Deptt. of Genetics and plant breeding, R.B.S. College, Agra. Five groups have to be used in the study; five A/B lines (296A, 296B, 2219B, AKMS14A, AKMS14B), Five R lines (CS3541, MR750, RS29, AKR 150, SPY 86), Five commercially rebased varieties (CSV8R, SPY462, CSV15), Swati and DJ6514, one germplasm occasional (IS2146 and one local Nizamabad. The Sorghum grains of selected varieties were cleaned and kept in sterilized glass bottle for varietal experiment grains samples were taken out and kept in small muslin cloth bags, placed inside desicator having 65-70% Relative humidity, for conditioning as in case of the culture variety. After 2-4 weeks of conditioning the grains, as the moisture rays 13-15% the strains were used for susceptibility tests rays 13-15% the grain were used for susceptibility tests.

GROWTH AND DEVELOPMENT OF *S. oryzae*:

The various experiments were carried out under controlled condition at 35 ± 1°C temperature and 60 ± 2% relative humidity during the course investigation. Mating, Pre-oviposition and oviposition perio for observing the mating, preoviposition, 5 pair of freshly emerged male and female isolated from the stock culture were introduced in to tubes (10 x 4cm) containing 25gm conditioned grains of each selected variety at random. Each tube covered with perforated polythene paper and tighed with rubber band to prevent the scope of bottle. All the tube were placed in decicators at 60 ± 2% relative humidity and 35 ± 1°C temperature. The experimental replicated thrice eggs were isolated with the help of camel hair brash and their number counted with the help of bull lens. Observation of mating, preovioposition and oviposition period recorded from each tube of Sorghum variety.

RESULTS AND DISCUSSION

The mating of adult *Sitophilus oryzae* has been observed which indicated that *S. oryzae* after emergence were found, to start copulate and egg laying is among the grains. These eggs were deposited towards the surface from varieties. Pre oviposition period was minimum on variety 2219B (1.00day), while maximum in 296B (1.85 days). The pre oviposition period in MR 750, DJ803, IS 2146, CSV8R, CSV15, RS29, Swati, SPY462, RS29, SPY86, Nizamabad, AKMS14B, AKMS14A was 1.01., 1.02, 1.34, 1.40, 1.42, 1.44, 1.45, 1.47, 1.52, 1.57, 1.61, 1.63 and 1.69 days respectively. The oviposition period 2.05 to 3.08 days have been minimum in 2219B and maximum in variety AKMS14A. The oviposition period of the pest did not differ significantly in different Sorghum varieties (Table 1 & Fig. 1). It is obvious from the results that minimum number of eggs were deposited on variety AKMS14B (68.59), which was at per eith 296B (72.46), AKMS14A (72.59), Nizamabad (76.42), Rs29 (76.46), Swati (75.52), CS3541 (77.39), SPY- 86 (79.21). The maximum number of eggs laid on variety 2219B (97.36 followed by MR 750 (94.85) and DJ6514 (94.86) but it different to the rest of varieties. Remaining varieties CSV8R, CSV 15 and SPY 462 found to be non significant amount themselves. The varieties SPY 462, 296A, DJ6514 showed intermediary, behavior influencing the fecundity of pest in which the number of eggs varied from 91.31 to 94.36. Significantly minimum incubation period was recorded is variety 2219B (59.3 days) which was followed by MR 750, 296A, DJ6514, AKR 150, SPY 462, IS2146 being 5.98, 6.23, 6.52, 6.67, 6.83, 7.39 days respectively. However, it was maximum on variety AKMS14A (9.90days).

Table 1: Pre oviposition and oviposition period of *Sitophilus oryzae*

Variety	Pre-oviposition period (days)	Oviposition period (days)
296A	1.42	2.34
296B	1.85	3.03
2219B	1.00	2.05
AKMS14A	1.69	3.08
AKMs14B	1.63	2.73
CS3541	1.52	2.64
MR750	1.01	2.46
RS29	1.47	2.63
AKR150	1.44	2.50
SPY86	1.57	2.70
CSV86	1.38	2.44
SPY462	1.45	2.25
CSV 15	1.40	2.06
Swati	1.54	2.66
DJ6514	1.02	2.44
IS2146	1.34	2.46
Nizamabad	1.61	2.53

Fig. 1: Pre oviposition and oviposition period of *Sitophilus oryzae*

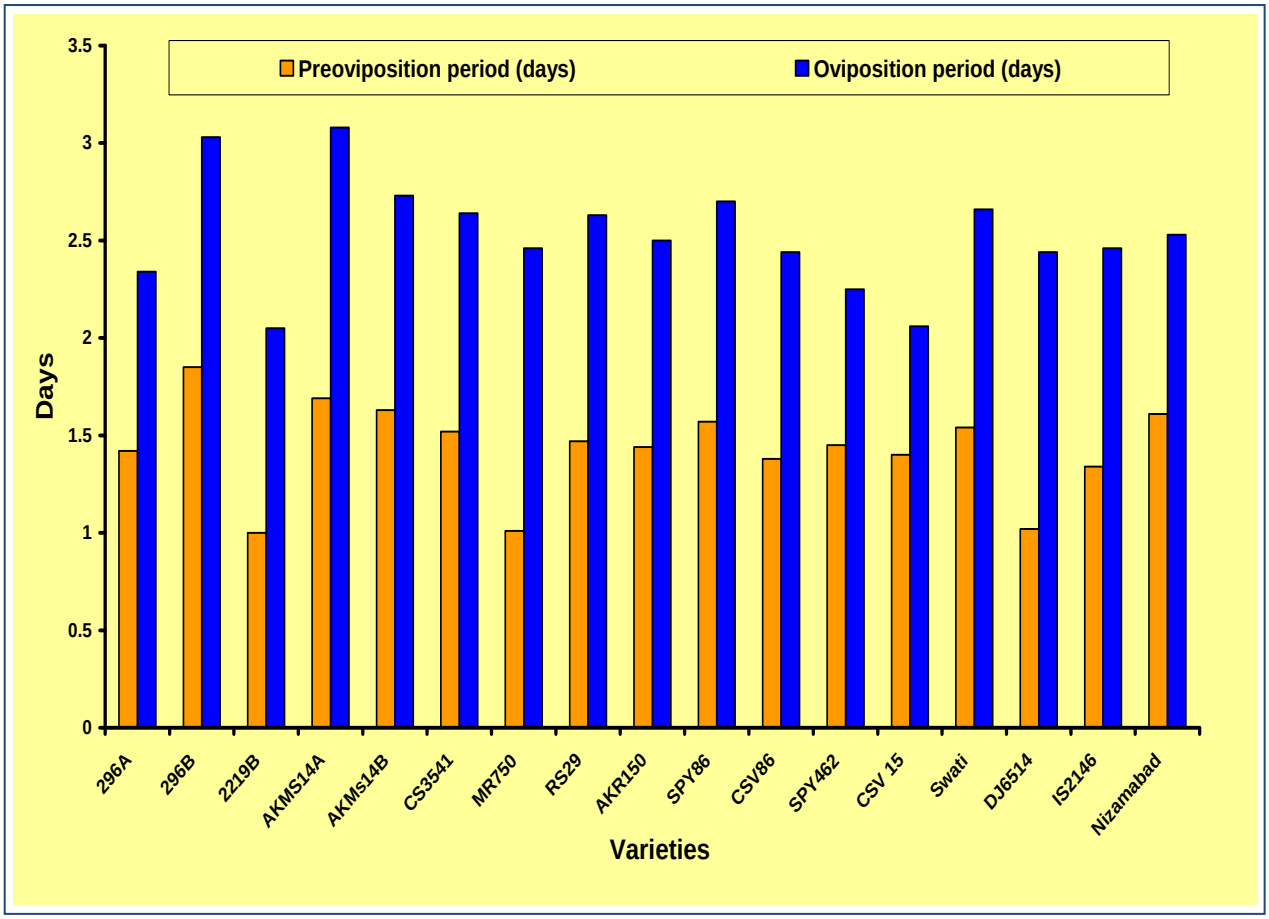
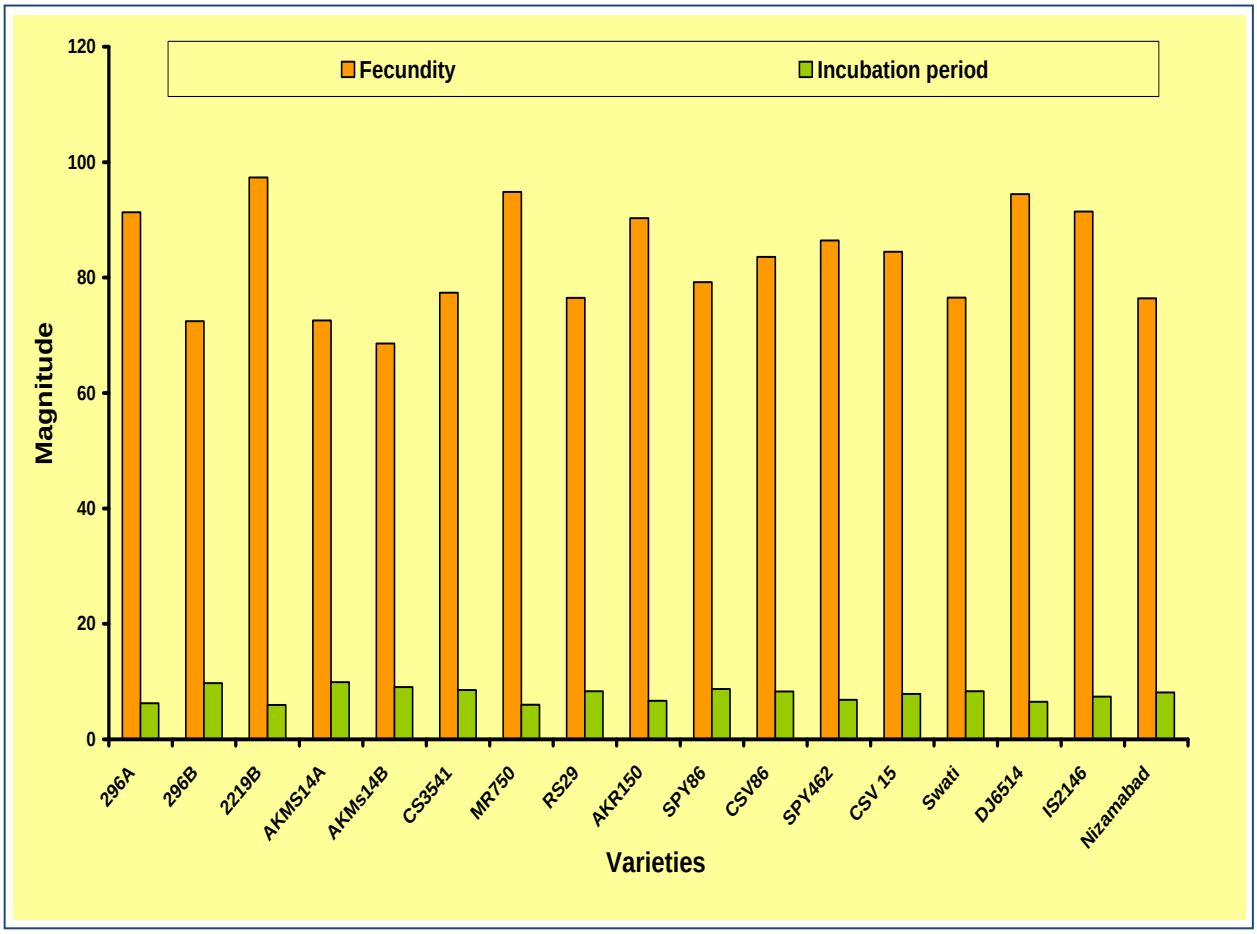


Table 2: Fecundity and incubation period of *Sitophilus oryzae*

Variety	Fecundity	Incubation period (days)
296A	91.33 (9.56)	6.23
296B	72.46 (8.51)	9.73
2219B	97.36 (9.87)	5.93
AKMS14A	72.56 (8.52)	9.90
AKMs14B	68.59 (8.28)	9.04
CS3541	77.39 (8.80)	8.52
MR750	94.85 (9.74)	5.98
RS29	76.49 (8.74)	8.31
AKR150	90.31 (9.50)	6.67
SPY86	79.21 (8.9)	8.69
CSV86	83.57 (9.14)	8.29
SPY462	86.41 (9.29)	6.83
CSV 15	84.46 (9.29)	7.85
Swati	76.54 (8.75)	8.34
DJ6514	94.46 (9.72)	6.52
IS2146	91.46 (9.56)	7.39
Nizamabad	76.42 (8.74)	8.12

Fig. 2: Fecundity and incubation period of *Sitophilus oryzae*



It has been observed that *S. oryzae* after emergence start to capulate and lay eggs which deposited on the surface of Sorghum grains. Voelkel (1924) also reported approximate similar findings regarding copulation of beetles. The Pre oviposition period of the past observed to be minimum on Sorghum variety 2219 B (1.00 day) and maximum 1.85 days on 296B. The highest oviposition period 3.08 days was found on AKMS14A, while it was lesser on 2219B (2.05 days). The eggs deposited among the Sorghum grain varied from 69.59 to 97.36 eggs being minimum on AKMS14B and maximum on 2219B. It is apparent that AKMS14B variety of Sorghum was found least preferred for egg laying, while 2219 B was more preferring variety and its was at per with MR750 and D36514. Somewhat 94.46, 91.46 and 91.33 eggs were deposited among the varieties of DJ6514, IS2146 and 296 respectively. The other varieties showed intermediary behavior regarding fecundity in which the number of eggs laid by female varied from 72.46, 86.41.

The physical characters of Sorghum varieties seem to account for variation in the fecundity. Voelkel (1924) and Rahman *et al*. (1945) have observed the variation in egg laying that is 65 and 89 eggs on different Sorghum varieties. As regarded the incubation period it was maximum (9.90days) in Sorghum variety AKMS14A and minimum (5.93 days) in 2219 B. In other Sorghum varieties it varied from 5.98 to 9.73 days. Similar results were also observed by Rahman *et al*. (1945), Pruthi and Singh (1948) as well Raj Gopalan and Balasubramanian (1975) they hatching percentage and larval period.

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