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## Assessment of ovipositional preference of lesser grain borer, *Rhyzopertha dominica* (Fabr.) on TL 174, HI 7747, UPT 72294, K 65 and Kalyan sona varieties of wheat, *Triticum aestivum* Linn. (Poaceae)

**Preeti Singh and BS Chandel****Abstract**

An experiment was conducted for the varietal ovipositional preference of lesser grain borer, *Rhyzopertha dominica* Fabr. on different varieties of wheat, *Triticum aestivum* Linn. (Poaceae). The wheat varieties ie; HI 7747, K 65, TL 174, UPT 72294, HD 1982 and Kalyan sona were used under storage condition at the Department of Botany, D.B.S. College, CSJM University, Kanpur. All the experiments were conducted in incubator at 32 °C. The highest fecundity 121.33 was found in variety TL 174, which differs significantly from the others. The second in order to preference for oviposition, having 73.33 eggs was variety HI 7747 followed by UPT 72294 and HD 1982 in which 67.33 and 54.00 eggs have been laid respectively. Varieties Kalyan sona and K 65 having 27.33 and 30.33 eggs are comparatively less preferred for egg laying. All the varieties showed more or less performance for the protection of *R. dominica*. However, the lowest ovipositional preference 27.33% in Kalyan sona followed by K 65 30.33 per cent; HD 1982, 54.00 per cent; UPT 72294 (67.33%), HI 7747(73.33%) and TL 174 (121.33%), mean egg laid, respectively.

**Keywords:** *Triticum aestivum*, lesser grain borer, TL 174, Kalyan sona and HI 7747

**1. Introduction**

Agriculture is the major occupation of most of the people all over the world and more than 70% of Indian population depends on agriculture for their livelihood (Jeeva *et al.* 2006) [1]. Cereal grains are staples in the diets of human beings and domestic animals (Kiruba *et al.* 2006) [2]. Consequently, their conservation is essential to have this basic food available on an ongoing basis. It occupies roughly

Apart of Ph.D. Thesis of Principal Author 25 million hectares with a production of 71 million tones (Chandel *et al.* 2007) [3]. Wheat, *Triticum aestivum* Linn. (Poaceae) is an important serial food crop's in India (Tewari and Sharma, 2002) [4]. It is a very destructive pest of wheat, buckwheat, rice, maize, sorghum, barley, rye, millets etc. Stored grains are seriously damaged by number of insect pests during storage. There are six important species of insect-pests of stored grains, which are found associated with stored wheat in India. Amongst them, lesser grain borer, *Rhyzopertha dominica* Fabr. is considered to be major under Indian conditions (Zaz *et al.* 1982) [5].

A number of entomologists have studied the varietal resistance of some stored grain varieties to *Rhyzopertha dominica* Fabr. (Singh and Pandey 1975, Verma *et al.* 1999) [6, 7]. Lesser grain borer is a serious pests of stored wheat and distributed in all the countries of the world and huge loss incurred each year due to the severe damage of food grains (Metcalf and Flint, 1962, Huang and Subramanyam, 2005 [8, 9]. To overcome shortfall of food grains each year, a major amount of food grains are imported from abroad which may carry the lesser grain borer, and that also cause severe damages and deteriorates the quality of the grains. The lesser grain borer, *R. dominica* causes extensive damage both in terms of quantity and quality to stored wheat grains. In the stores and godowns this pest cause not only damage of the products but also make them unfit for human consumption (Zakladnoi 1987 and Hill 1990) [10, 11]. Considering the above problem of grain destructions, it is necessary to adopt new alternative aspect of grain protection by growing resistant varieties of wheat and avoid oviposition food preference variety of wheat, *Triticum aestivum* Linn. in present research work was undertaken under storage condition.

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## 2. Materials and Methods

### 2.1 Experimental Site

Experiments were conducted in the Department of Botany, Dayanand Brijendra Swaroop Post-Graduate College, CSJM University Kanpur. Geographically, the Districts Kanpur is located in between latitudes 25.26° and 26.58° North and longitudes 19.31° and 84.34° East, Kanpur is situated at an elevation of about 127.117° metres above the mean sea level and has a semi-arid subtropical climatic conditions.

### 2.2 Test Wheat grains and Test insect

In this experimentation the wheat, *Triticum aestivum* Linn. (Poaceae) varieties like HI 7747, K 65, TL 174, UPT 72294, HD 1982 and Kalyan sona have been used as food for biological activities test insect, the lesser grain borer, *Rhyzopertha dominica* Fabr. (Coleoptera: Bostrichidae) for their biological activities:-

### 2.3 Rearing and Culture of the Test Insect

Adults of lesser grain borer, *Rhyzopertha dominica* Fabr. (Coleoptera: Bostrichidae) collected from local granaries for building up a laboratory culture. After proper identification, these adults will kept in the mason glass jars containing wheat flour + 5% dried brewer's yeast, tied with muslin top under the controlled conditions of 27±2 °C temperature and 70±5% relative humidity for mass breeding.

### 2.4 Tools Used

The tools like egg laying apparatus, glass jars petridish a 100 mesh sieve, plastic jars with perforated top, Camel hair brush, muslin cloth, chemical balance, complete with weight box,

magnifying hand lens and a binocular microscope etc. was used in the present investigation.

### 2.5 Obtaining Eggs for Different Experiments

The newly emerged male and female of *R. dominica* (Fabr.) distinguished by observing a number of characters mentioned above, was kept into a special egg laying apparatus. It is a special device, consisting of glass chimney at the top, tied with muslin top, kept on the ordinary sieve netting. The sieve and chimney kept over petridish will keep above another petridish, which is just reverse in their position as above petridish. The whole device kept on large petridish filled with water Adults will provide 0.5 per cent glucose solution with the help of soaked cotton wool and hanged in the center of the top muslin cloth of the chimney. Just emergence, the adults are sluggish and less active but after a few times they become more active, males are more active than the females. 0-2 and hours old eggs removed from the petri-dish regularly and kept into the specimen tubes labeled with date-wise to find the known aged eggs.

## 3. Experimental findings

### Oviposition preference of *R. dominica* in different varieties of wheat

For the fecundity of insect of the method described earlier was followed and the number of eggs deposited by 30 pairs of moths in 3 and 5 days after release on different varieties are summarized in Table 1.

**Table 1:** Showing the fecundity of lesser grain borer on different varieties of wheat, *Triticum aestivum* Linn. (after 3 days of release)

<i>T. aestivum</i> Varieties	No. of R <sub>1</sub>	Eggs R <sub>2</sub>	Laid R <sub>3</sub>	Total R	Mean number of eggs laid
HI 7747	82	72	66	220	73.33
K 65	43	27	21	91	30.33
TL 174	90	122	152	364	121.33
UPT 72294	60	50	92	202	67.33
HD 1982	42	58	62	162	54.00
Kalyan sona	25	21	36	82	27.33

Thus it is evident from the table 1, the highest fecundity was observed number of eggs laid 121.33 was noticed in TL 174 which differs significantly from the others. The second in order to preference for oviposition, having 73.33 eggs was HI 7747 followed by UPT 72294 and HD 1982 in which 67.33 and 54.00 eggs have been laid respectively. K 65 and Kalyan sona having 30.33 and 27.33 eggs are comparatively less preferred for egg laying.

## 5. Results and Discussions

Under the present investigation, the relative food preferable six varieties of wheat, *Triticum aestivum* Linn. has been tested against the lesser grain borer, *R. dominica* on the basis of preference of food, ovipositional development in different varieties of wheat and its losses and the losses done and also the testing of the various vegetable protectant against *R. dominica* on wheat varieties. Thus the highest fecundity 121.33 was found in TL174 which differs significantly from the others. The second in order to preference for oviposition, having 73.33 eggs was HI 7747 followed by UPT 72294 and HD 1982 in which 67.33 and 54.00 eggs have been laid respectively. K 65 and Kalyan Sona having 30.33 and 27.33 eggs are comparatively less preferred for

egg laying.

It is evident from the foregoing results that a gradation in the preference of varieties for oviposition of *R. dominica* is exhibited by the various varieties tested in this experiment; some of them have been found food for oviposition response. As regards fecundity or total number of eggs laid by a single female, TL174 proved to be most preferred variety in which on an average 121.33 were laid, while K. Sona and K 65 were least preferred varieties having only 27.33 and 30.33 eggs. The other varieties attained in intermediate position and have the order of preference as H.D. 1982, UPT 72294 and HI 174 having the 54.00, 67.33 and 73.00 eggs, respectively.

The variety TL174 is large in size, soft in cracking tests is redish in colour and K 65 and Kalyan sona are small in size but hard in cracking. Thus the shape size or colour responsible for higher oviposition. Besides the physical characters there may be other chemical factors responsible for the attraction of females to a particular variety for oviposition.

Various workers reported the oviposition results gave their findings in the support of present investigations by Singh *et al.* (1972) worked on *Sitophilus oryzae* (L.) and found that besides physical nature of grains, some nutritional and chemical factors

play more important role for encouraging the oviposition. When the exposure period for oviposition was extended from 3 to 6 days, the total number of eggs laid was increased but the varieties were in the same order which clearly confirms the varietal preference for oviposition [16].

Some workers like Singh *et al.* (1977) were also studied the ovipositional preference of pulse beetle, *C. chinensis* on eight major pulses and their suitability for its subsequent development, was studied at 30±1 °C temperature and 70.0 per cent RH. The for ovipositional preference as determined by the average number of eggs laid on different pulses was arhar > lentil and soybean > urd, pea and moong > sem and bengal gram, respectively [17]. During the test varietal preference, it was found that the maximum number of larvae attracted towards UPT 72294 the variety HI 7747 attracted the least number of larvae. There may be various physical and chemical factors responsible for this larval attraction. Satyavir (1982) showed the ovipositional response and development of *C. maculatus* on 20 promising varieties of moth bean. The beetle oviposited on all varieties, but the ovipositional behaviour was not related to the suitability of the seeds for the development. The development of grub was also not dependent on the amount of food consumed [18].

Pant (1990) noticed that Food value of several stored commodities in the development of *Tribolium castaneum* Herbst were wheat Kalyan sona variety was unsuitable for the development of the pest [19]. No differences in sex ratio were observed between beetles on the various pulses. Bhalla *et al.* 2002 conducted an experiment to relative resistance of cowpea genotypes against variety of insects, among them cowpea weevil, *C. maculatus* was found to be susceptible to cowpea grains [20].

Overall our findings can be agreed with the findings of Boldt (1974) observed the fecundity of *S. cerealella* in stored wheat to be greatest at the temperatures 20-30 °C [21]. Development of pupae was shortest at 30-32 °C, and differences due to relative humidity were not significant. The optimum conditions for development, attainment of adult weight and percentage emergence were 30-32 °C and 65-80.0 per cent relative humidity. The findings of their study were reported by Simwat and Chahal (1969) studied the effect of food moisture on the larval development of *T. castaneum* and concluded that the growth index was higher at 13 and 10 than 9.0 per cent moisture content of food [22]. The highest growth index was obtained with crushed wheat grains, followed by whole wheat flour, wheat bran, *Suji*, *Maida* and whole grain.

Many other workers in the agreements of above results reported by Singh *et al.* 1972, Pandey and Singh, 1974, Singh *et al.* 1974, Bhatia *et al.* 1975, Rout and Ahmad, 1976, Mullen and Arbogast 1977, Salunkhe and Jadhav, 1982, Katiyar and Khare, 1983, Satyavir, 1983, Gupta and Bhaduri, 1984 [23, 24, 25, 26, 27, 28, 29, 30, 31, 32].

Besides above Ofuya, 1987b, Khattak, 1987, Singh *et al.* 1993, Singh *et al.* 1996, Ram Chunni and Singh 1996, 2001, Ram and Raju, 2002, Khanna *et al.* 2003, Loganathan *et al.* 2003 [33, 34, 35, 36, 37, 38, 39]. Sing and Sharma (2003) studies of eight variety of cowpea regarding oviposition on response and development of *C. chinensis*, among them CPD-2 has maximum growth index of 2-235 proving there by tope the most preferred one, it has the forest growth of grubs, with the minimum development period of 18-33 days [40].

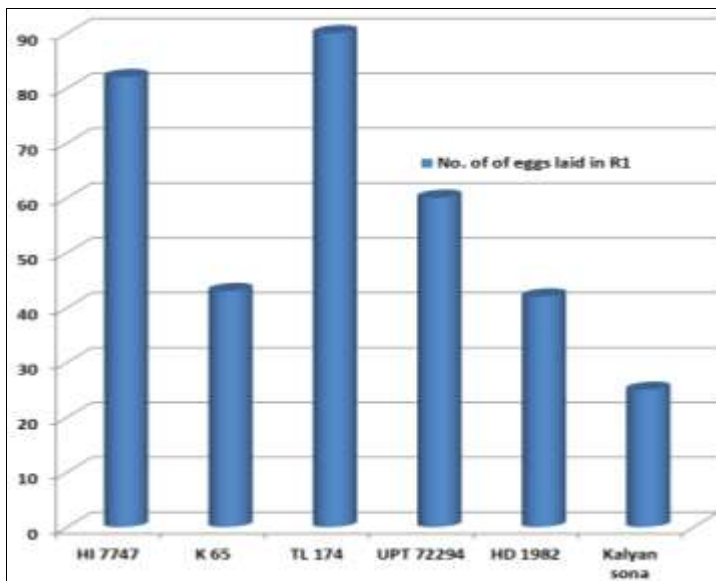


Fig 1: Number fo eggs of *R. dominica* laid in Replication-1 in different varieties of wheat, *T. aestivum* Linn

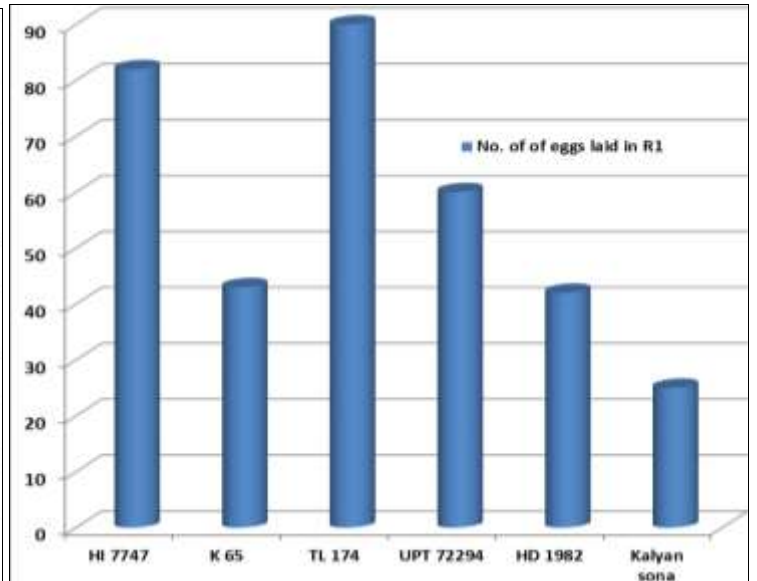


Fig 3: Number for eggs of *R. dominica* laid in Replication-3 in different varieties of wheat, *T. aestivum* Linn

Table 2: Showing the fecundity of *Rhyzopertha dominica* Fabr. on different varieties of wheat (after 3 days of release).

<i>Triticum aestivum</i> Varieties	No. of of eggs laid in R <sub>1</sub>	No. of of eggs laid in R <sub>2</sub>	No. of of eggs laid in R <sub>3</sub>	Total eggs laid R <sub>x</sub>
HI 7747	82	72	66	220
K 65	43	27	21	91
TL 174	90	122	152	364
UPT 72294	60	50	92	202
HD 1982	42	58	62	162
Kalyan sona	25	21	36	82

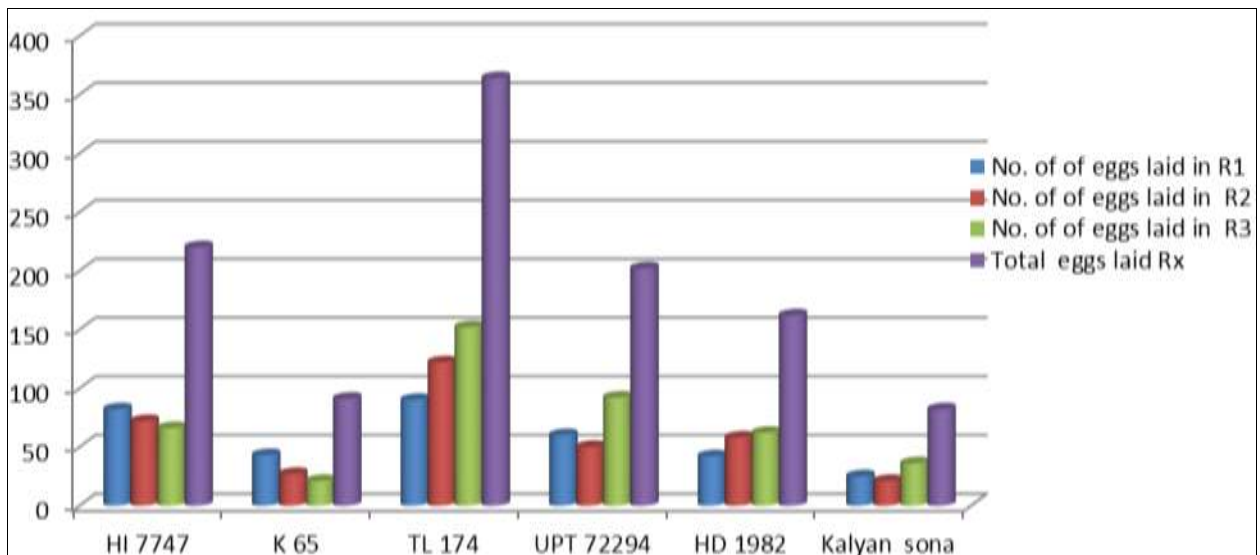


Fig 4: Showing the fecundity of *Rhyzopertha dominica* Fabr. on different varieties of wheat on over all Replication (After 3 days of release).

## 6. Conclusion

Conclusively, our experiments reveal that the highest egg laying 121.33 was noticed in wheat variety TL174 which differs significantly from the others. The second in order to preference for oviposition, having 73.33 eggs was HI 7747 followed by wheat varieties UPT 72294 and HD 1982 in which 67.33 and 54.00 eggs have been laid respectively. K 65 and Kalyan Sona having 30.33 and 27.33 eggs are comparatively less preferred for egg laying.

## 7. Acknowledgement

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