

## Impact of wheat varieties on infestation of lesser grain borer (*Rhyzopertha dominica*)

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### Abstract

Research on impact of wheat varieties on infestation of lesser grain borer (*Rhyzopertha dominica*) was carried out in PG laboratory, Department of Entomology, N. M. College of Agriculture, Navsari Agricultural University, Navsari.

For the study ten varieties of wheat were utilized to find out impact on infestation of lesser grain borer. *R. dominica*. The observation was carried out at 15 days, 30 days and 45 days after storage of wheat varieties. At 15 days minimum adult emergence (6.85%), grain damage (2.18%) and weight loss (0.35%) were observed in the variety GW-496. Significantly minimum adult emergence (8.67%), grain damage (3.93%) and weight loss (1.70%) were observed in the variety GW-496 after 30 days. Whereas At 45 days of storage significantly minimum adult emergence (19.10 %), grain damage (6.59%) and weight loss (2.91%) were recorded in variety GW-496.

**Keywords:** *Rhyzopertha dominica*, Wheat varieties

### Introduction

Wheat (*Triticum aestivum L.*, *Triticum durum*) is considered as staple food after rice all over the world. It belongs to family Poaceae and said to be originated from South Western Asia. Among the wheat growing countries, India ranked second both in terms of area and production. Wheat utilized in many forms, viz., chapatias, dalia, halwa, sweet meal etc. and is consumed by more than one thousand million human beings. In most of the urban areas in the country, wheat used as baked leavened bread, flakes, cakes, biscuits etc. Wheat possesses relatively a high content of niacin, thiamine and protein (gluten) which is essential for bakers.

Wheat cultivation has been undergoing a marked change over the past few decades, as per as variety complex is concern new varieties are coming up every year. With such an enormous change the insect pest complex is also expected. About 39 species of insect pests attack at storage stage and grain produce. Out of all insect the lesser grain borer, *Rhyzopertha dominica* (Fab.) is found more destructive in larval as well as in adult stages. In severe infestation adults produce a considerable amount of frass, spoiling more than what they consume. So, there is need to be identified wheat varieties which is less susceptible to insect pests of stored products.

### Materials and Methods

For the study of this aspect, All the wheat varieties procured 2 Kg quantity from the Wheat Research Station, Sardar Krushinagar Dantiwada Agricultural University, Vijapur, Gujarat. Then after grains of each variety was kept into glass bottles. After that 10 pairs of newly emerged adults were released. The mouth of the glass bottle covered with a muslin cloth and tightened with a rubber band. There were three repetitions for each variety. The wheat varieties were evaluated for their impact of infestation to *R. dominica* based on adult emergence, weight loss, and grain damage during storage.

To found out the impact of each variety on infestation of *R. dominica* 100 grams of ten varieties such as GW-11, GW-173, GW-322, GW-451, GW-496, GW-499, GW-513, GW-1339, GDW-1255 and LOK-1 were taken. After that ten

pairs of adult *R. dominica* age group of 0-24 hr. Where kept in glass jar. Ten pairs of adult *R. dominica* of the age group 0-24 hr. were released in each glass bottle. The mouth of the bottle was covered with muslin cloth and tightened with rubber band. Released adults were allowed to remain in glass bottle containing grains for 10 days for oviposition. The study was carried out with three repetitions and Completely Randomized Design.

Studies were carried out under controlled conditions of temperature and relative humidity of  $30 \pm 1^\circ \text{C}$  and  $75 \pm 5\%$  (R.H) respectively.

To find out a result of adults of *R. dominica* that emerged from different treatments were counted daily and removed from the respective glass bottle. Counting was continued till they cease to emerge. Final data were pooled to get the total number of adults who emerged from each variety and per cent adult emergence was calculated:

$$\text{Per cent adult emergence} = \frac{\text{Number of adult emergence}}{\text{Initial egg population (no.)}} \times 100$$

**Table 1:** Treatment Details for Susceptibility of Wheat Varieties Against *R. dominica*

Sr. No.	Treatment	Variety
1	T1	GW-11
2	T2	GW-173
3	T3	GW-322
4	T4	GW-451
5	T5	GW-496
6	T6	GW-499
7	T7	GW-513
8	T8	GW-1339
9	T9	GDW-1255
10	T10	Lok-1

The weight loss was calculated by deducting the final weight of the sample from the initial weight and then converted to the percentage.

$$\text{Per cent Weight loss} = \frac{W1 - W2}{W1} \times 100$$

Where, W1 = Initial weight of grains  
W2 = Final weight of grains

To calculate grain damaged, damage grain separated, counted and expressed as per cent grain damage. Data were statistically analyzed. Following formula was used to work out per cent grain damage (Pathak and Jha 2003).

$$\text{Per cent grain damage} = \frac{\text{Number of damaged grains}}{\text{Total number of grains}} \times 100$$

## Results and Discussion

The studies on Identifying of wheat varieties having less infestation of lesser grain borer ten varieties of wheat were tested the experiment was conducted on wheat grains under laboratory condition.

### Per cent adult emergence

The results of 15 days of storage depicted in Table 2 and Figure 1, indicated that there were significant differences in the percentage of adults emerged from the grains of ten different wheat varieties. The percentage of adults emerged ranged from 6.85 to 37.28 per cent., Wheat variety GW-496 found less susceptible with (6.85 %) adult emergence. Among all the varieties, GW-499 (37.28%) recorded the highest percentage of adult emergence followed by GW-173 (33.15%). However, the varieties Lok-1, GW-451, GW-1339, GW-11, GDW-1255, GW-513 and GW-322 recorded a moderate percentage of adult emergence with 11.37, 15.62, 18.14, 18.38, 20.48, 24.22 and 27.43 per cent adult emergence, respectively.

The results of per cent adult emergence after 30 days presented in Table 2 and Figure 1, shows that there were significant differences in the percentage of adults emerged from the grains of different wheat varieties. The percentage of adults emerged ranged from 8.67 to 38.33 per cent. Among all the varieties, GW-496 (8.67%) recorded the least percentage of adult emergence followed by Lok-1 (11.69%). The Varieties GW-499 recorded the highest percentage of adult emergence (38.33%) followed by GW-173 (35.99%). While, the varieties GW-451, GW-1339, GW-11, GDW-1255, GW-513 and GW-322 recorded a moderate percentage of adult emergence with 14.70, 20.05, 20.60, 23.23, 25.77 and 31.25 per cent adult emergence, respectively.

The data on per cent adult emergence after 45 days presented in Table 2 and Figure 1 revealed that there were significant differences in the percentage adults emerged. The percentage of adults emerged ranged from 19.10 to 36.24 per cent. Among all varieties, GW-496 (19.10%) recorded the least percentage of adult emergence followed by Lok-1 (22.17%). The variety GW-173 recorded the highest percentage of adult emergence (36.24%) followed by GW-499 (34.83%), GW-322 (34.57%) and GW-513 (32.91%). However, the varieties GW-451, GW-1339, GDW-1255 and GW-11 recorded a moderate percentage of adult emergence with 25.49, 29.15, 30.14 and 31.22 per cent, respectively.

The findings are confined by Sayed *et al.* (2022) [4] revealed that the number of wheat lesser grain borer adults emerged varied with the wheat varieties. The adult emergence was higher in GW-499 (3.90%) and GW-173 (2.04%). While, lower in GW-496 (1.22%). Lal *et al.* (2014) [3], Gami *et al.* (2022) [1] and Kumawat *et al.* (2022) [2] also observed that differential response of adult emergence of lesser grain borer in different varieties of wheat.

### Per Cent Grain Damage

The data on the per cent grain damaged after 15 days shows that in each repetition of different wheat varieties together with the total number of grains observed, healthy and damaged grains counted. The data in Table 4 and Figure.2 showed that maximum and minimum infestation of 2.18 to 18.68 per cent observed in variety GW-496 and GW-499, respectively. A significantly minimum 2.18 per cent grain damage was found in variety GW-496 and it was statistically at par with Lok-1 (3.49%). A significantly maximum 18.68 per cent grain damage was found in variety GW-499 followed by GW-173 (16.53%) and GW-322 (16.12%). However, the varieties GW-451, GW-1339, GW-11, GDW-1255 and GW-513 recorded a moderate percentage of grain damage with 7.02, 9.42, 10.78, 12.19 and 13.35 per cent, respectively.

The data on the percentage of grain damaged after 30 days depicted in Table 5 and Figure 2 showed that maximum and minimum infestation of 3.93 to 22.93 per cent found in variety GW-496 and GW-499, respectively. A significantly minimum 3.93 per cent grain damage was reported in variety GW-496. While, significantly maximum 22.93 per cent grain damage was observed in variety GW-499 followed by GW-173 (21.28%) and GW-322 (19.30%). However, the varieties Lok-1, GW-451, GW-1339, GW-11, GDW-1255, and GW-513 recorded moderate percentage of grain damage with 8.06, 10.04, 11.80, 12.18, 12.86, and 16.07 per cent, respectively.

The data on the percentage of grain damaged incorporated in Table 3 and in Figure 2 showed that maximum and minimum infestation of 6.59 to 31.14 per cent occurred in variety GW-496 and GW-499, respectively. Whereas, significantly maximum of 31.14 per cent grain damage was found in variety GW-499 followed by GW-173 (28.39%). However, the varieties Lok-1, GW-451, GW-1339, GW-11, GW-1255, GW-513 and GW-322 recorded a moderate percentage of grain damage with 9.82, 12.34, 14.98, 17.96, 19.29, 21.34 and 26.09 per cent, respectively.

### Per Cent Weight Loss

The results of per cent weight loss after 15 days presented in Table 3 and Figure 2 revealed that maximum and minimum infestation 16.15 and 0.35 per cent was observed in varieties GW-499 and GW-496, respectively. While significantly minimum 0.35 per cent weight loss was found in variety GW-496. Whereas, significantly highest weight loss (16.15%) was found in variety GW-499 followed by GW-173 (14.86%).

**Table 2:** Percentage of adult emergence of *R. dominica* on different varieties of wheat at different storage periods

Sr. No.	Variety	Per cent adult emergence after days of storage		
		15 days	30 days	45 days
1	GW-11	25.38 (18.38)	27.00 (20.60)	26.85 (31.22)
2	GW-173	35.16 (33.15)	36.87 (35.99)	34.98 (36.24)
3	GW-322	31.59 (27.43)	34.00 (31.25)	32.19 (34.57)

4	GW-451	23.22 (15.62)	22.54 (14.70)	18.69 (25.49)
5	GW-496	15.06 (6.85)	17.12 (8.67)	10.72 (19.10)
6	GW-499	37.65 (37.28)	38.26 (38.33)	32.59 (34.83)
7	GW-513	29.39 (24.22)	30.48 (25.77)	29.50 (32.91)
8	GW-1339	25.13 (18.14)	26.53 (20.05)	23.78 (29.15)
9	GDW-1255	26.85 (20.48)	28.82 (23.23)	25.32 (30.14)
10	Lok-1	19.69 (11.37)	19.96 (11.69)	14.23 (22.17)
SEm±		1.33	1.02	1.26
CD at 5 %		3.93	3.02	3.73
CV %		8.58	6.80	6.30

Note: outside data are arcsine transformed values, data in parentheses are retransformed values

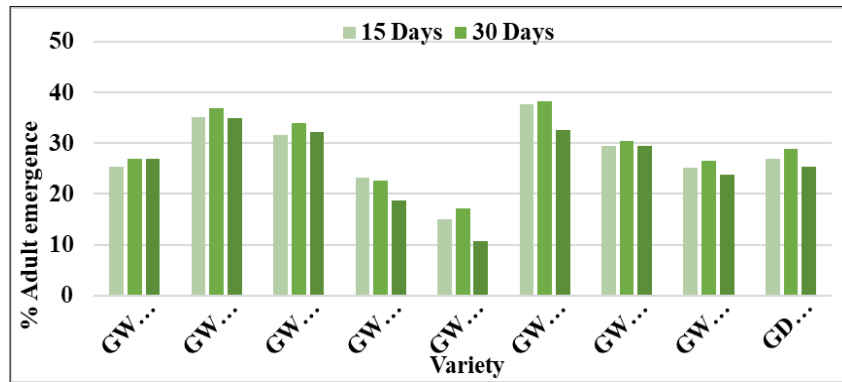


Fig 1: Per cent adult emergence of *R. dominica* on different wheat varieties at different storage periods

The study conducted by Gami (2022) [1] showed that up to 41.81 per cent grain damage was noted due to the lesser grain borer. Sayed *et al.* (2022) [4] studied the damage potential of wheat lesser grain borer and recorded grain

damage up to 17.78 per cent in wheat variety GW-173. Thus, the present investigation also found similar trends with earlier workers.

Table 3: Percentage of grain damage due to *R. dominica* on different varieties of wheat at different storage periods

Sr. no.	Variety	Per cent grain damage after days of storage		
		15 days	30 days	45 days
1	GW-11	19.15 (10.78)	20.42 (12.18)	25.07 (17.96)
2	GW-173	23.97 (16.53)	27.48 (21.28)	32.20 (28.39)
3	GW-322	23.66 (16.12)	26.07 (19.30)	30.71 (26.09)
4	GW-451	15.33 (7.02)	18.42 (10.04)	20.48 (12.34)
5	GW-496	8.40 (2.18)	11.31 (3.93)	14.88 (6.59)
6	GW-499	25.60 (18.68)	28.62 (22.93)	33.93 (31.14)
7	GW-513	21.41 (13.35)	23.64 (16.07)	27.50 (21.34)
8	GW-1339	17.86 (9.42)	20.07 (11.80)	22.74 (14.98)
9	GDW-1255	20.44 (12.19)	20.94 (12.86)	26.05 (19.29)
10	Lok-1	10.74 (3.49)	16.44 (8.06)	18.22 (9.82)
SEm±		0.81	0.93	0.94
CD at 5 %		2.39	2.76	2.77
CV %		7.53	7.60	6.47

Note: outside data are arcsine transformed values, data in parentheses are retransformed values

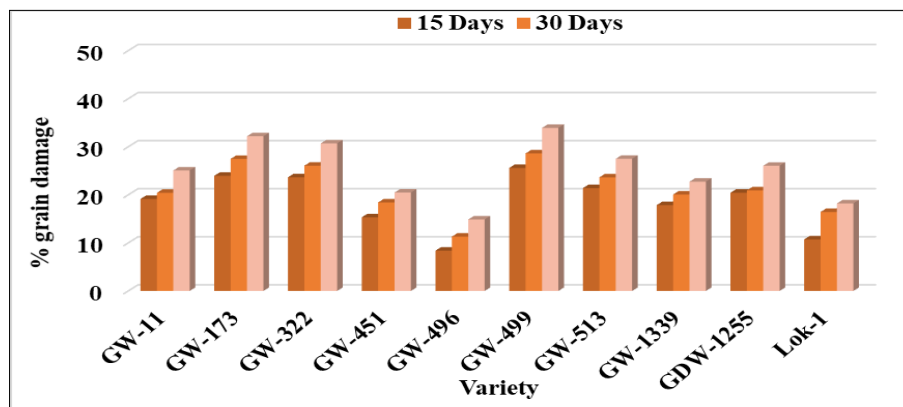
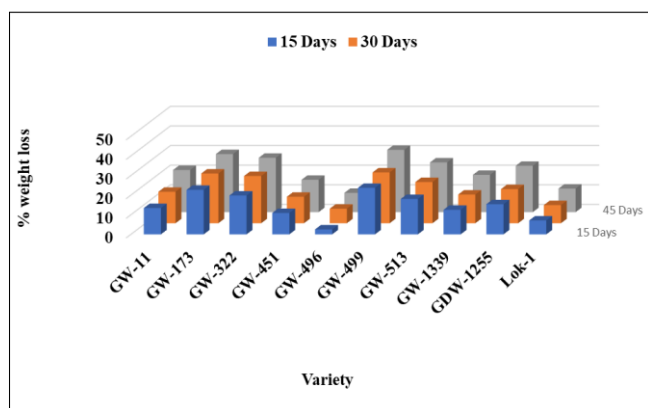


Fig 2: Per cent grain damage due to *R. dominica* on different varieties of wheat at different storage periods

**Table 4:** Percentage weight loss due to *R. dominica* on different varieties of wheat at different storage periods

Sr. No.	Variety	Per cent weight loss after days of storage		
		15 days	30 days	45 days
1	GW-11	13.41 (5.38)	16.05 (7.67)	21.48 (13.55)
2	GW-173	22.68 (14.86)	25.36 (18.35)	29.61 (24.39)
3	GW-322	19.80 (11.48)	24.09 (16.66)	27.70 (21.59)
4	GW-451	10.90 (3.58)	13.50 (5.49)	16.49 (8.05)
5	GW-496	2.53 (0.35)	7.41 (1.70)	9.81 (2.91)
6	GW-499	23.70 (16.15)	25.90 (19.08)	31.75 (27.67)
7	GW-513	18.04 (9.59)	21.01 (12.84)	25.34 (18.34)
8	GW-1339	12.53 (4.72)	14.64 (6.46)	18.99 (10.67)
9	GDW-1255	15.37 (7.03)	17.42 (8.99)	23.62 (16.04)
10	Lok-1	7.10 (1.55)	9.27 (2.60)	12.02 (4.40)
<b>SEM±</b>		0.65	0.77	0.90
<b>CD at 5 %</b>		1.93	2.29	2.66
<b>CV %</b>		7.79	7.72	7.22

**Note:** outside data are arcsine transformed values, data in parentheses are retransformed values



**Fig 3:** Per cent weight loss due to *R. dominica*.

The results of per cent weight loss after 30 days presented in Table 3 and Figure 2 showed that maximum and minimum infestation of 19.08 and 1.70 per cent found in varieties GW-499 and GW-496, respectively. Whereas, significantly highest 19.08 per cent weight loss was observed in varieties GW-499 and followed by GW-173 (18.35%) and GW-322 (16.66%).

**Per Cent Weight loss**

The results presented on per cent weight loss after 45 days in Table 3 and Figure 2 revealed that maximum and minimum infestation of 27.67 and 2.91 per cent found in varieties GW-499 and GW-496, respectively. A significantly minimum 2.91 per cent weight loss was found in varieties GW-496 and followed by Lok-1 (4.40%). Whereas, significantly highest 27.67 per cent weight loss was recorded in varieties GW-499 and was followed by GW-173 (24.39%). However, the varieties GW-451, GW-1339, GW-11, GW-1255, GW-513 and GW-322 recorded moderate percentage of weight loss with 8.05, 10.67, 13.55, 16.04, 18.34 and 21.59 per cent, respectively.

Gami (2022) [1] reported that per cent weight loss due to lesser grain borer was varied from 12.39 to 22.27 per cent at 30 days of storage. Whereas present findings confinement with study of Sayed *et al.* (2022) [4]. They reported that damage potential of wheat lesser grain borer was 18.23 and 16.01 per cent in GW-499 and GW-173 wheat varieties, respectively

**Conclusion**

The results and finding of impact of wheat varieties on infestation of lesser grain borer showed that minimum per cent adult emergence, grain damaged and weight loss occurred in wheat variety GW-496. whereas infestation of lesser grain borer showed that maximum per cent adult emergence, grain damaged and weight loss in wheat variety GW-499.

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