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Valuation of Post-Harvest Loss in Stored Chickpea by *Rhizopertha Dominica* and *Tribolium Custanium*

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District Bhakkar is a good producer of grams. A big proportion of the population of this area depends upon gram. A considerable loss of this crop takes place after harvesting and during storage. The aim of this study was to estimate the post-harvest loss in stored chickpea under laboratory conditions due to insects, *Rhyzopertha dominica*, and *Tribolium custanium* in white and brown verities of chickpea. These results indicated that *Rhyzopertha dominica* is more damaging as compared to *Triboliumcustanium* while brown gram is more resistant as compared to a white gram.

Keywords: ***Bhakkar, post-harvest loss, chickpea, Rhyzopertha dominica, Triboliumcustanium***

INTRODUCTION

Chickpea is one of the important Pulses crops of the world ranking third among major food crops next to wheat and rice. Akhtari et al. (1993) stated that during the storage pulses are more sensitive to damage due to insect pests as compare to other stored crops such as cereals. De Lima, (1987) estimated that 25-40 % of stored crops product was damage annually in tropical countries due to the infestation of insect pests. William (1991) reported that the maximum losses of pulses, cereals, and oilseeds were caused by the attack of insects, fungi, and rodents, which generally attack the stored grain products. Negamo et al. (2007) reported that among, all the pests of stored grain products, insects are a significant source of food grain loss. In Pakistan, lesser grain borer (*Rhizoperthadominica)* and *Triboliumcustaneum* r ed flour beetle are two main and damaging stored grain pests that are commonly found in warehouses.

Chickpea (*Cicerориantum*) is one of the most important drought resistance pulse crops of Pakistan. Schenieder (2002) estimated that chickpea gives us a lot of essential constituents such as protein, carbohydrates, minerals, and vitamins. Losses during the postharvest handling, processing, especially storage systems vary between 20-60%. Ahmad and Yousuf (2007) reported that the most effective scheme i.e. host plant resistance method is commonly used against the stored product insect. In the current study, we explored the potential effects of different pulses on the oviposition behavior of both studying insects.

MATERIALS AND METHODS

Lesser grain borer (*Rhizoperthadominica)* and red flour beetle *(Triboliumcustaneum)* were reared on chickpea grains. The culture was maintained at 37± 2ºC and 40± 5% relative humidity. Adult

insects (2-3 days old) were used for experiments. Experiments were conducted in the laboratory at 37± 2ºC and 40± 5% relative humidity. *Cicerориantum* (grams or chana) is used as a medium for the rearing of insects. The newly emerged adults were removed from the rearing jars on a daily basis. These adult insects were kept in culture bottles. All bottles filled with 250gm of white and black gram were taken in 3 replicates. Five pairs of the insect's viz., *Rhyzoperthadominica*, and *Triboliumcustanium* were introducing in each replicate bottle except the control bottle. The bottles were covered with a muslin cloth. The parent beetles were sieved out after 10 days of oviposition and the seeds were retained in laboratory condition up to the development of First progeny. Observation and data recording were done after every 72 hours to monitor the laid eggs, a number of emerged adults, days of adult emergence, and the number of seeds with a damaged hole. When the insects were needed for experiments, the culture medium was sieved through a 3 mm-mesh sieve and the procedure was repeated until the final experiment (Four months). Experiments were performed three times.

RESULTSAND DISCUSSION

Egg-laying or reproductive parameters were the most essential part of the post-harvest loss studies. The results revealed that *Rhizopertha* exhibited more reduction in weight of White grams than the weight of brown grams. *Tribolium* did not cause a significant reduction in the weight of both varieties (Table 1). *Rhizopertha dominica* caused a maximum Percentage of weight loss in white grams followed by brown grams while *Tribolium* showed a similar reduction in both gram varieties (fig 1 and 2). Similarly, *Rhizopertha* revealed maximum infestation percentage in white gram as compare to *Tribolium*.

The present study revealed the different oviposition rates of *Rhyzoperthadominica* and *Triboliumcustanium on* different varieties of a gram. The number of eggs laid on white and brown gram varieties was significantly different. A relatively maximum number of eggs of *Rhyzoperthadominica* was laid on both gram varieties however lower number recorded *Triboliumcustanium* which might be due to the considerable variations in seed size and seed coat. These results revealed because more number of larvae and adults of the former species were found than that of the later. Similar results were reported by Fakhar-un-Nisa et al. (2015) who revealed that among the grains, the seed size was the main feature that influenced the performance of bruchids on different varieties of pulses and cereals.

In the present study a lower number of eggs recovered in red grams. Fakhar-un-Nisa et al .2015 recorded a lower number of eggs on *Lens culinaris* (Masoor), *Cicerorietinum* (grams or chickpea), *Hordeumvulgre* (barley), *Pennisetumglaucum* (Pearl millet), and *Avena sativa* (Oat) which were small-sized seeds and might be due to the small surface area of the egg. The insects did not prefer to lay more eggs on these small-sized grains. Akhtari et al. 1993 confirmed the relationship of small grain size with resistance; the highest number of eggs was recorded on kidney bean (large-sized seed) and maize. According to our findings, the maximum number of eggs was recorded on the white gram (39) and the lowest number of eggs on brown grams is (11). While the basic reason for this great difference is due to its size and its surface area and obviously nutritional value of the diet. The large and smooth surface area provides a greater chance of oviposition by the *Callosobruchuschinensis* (Fakhar-un-Nisa et al. 2015). The results presented here are also consistent with previous observations. The result of the present study shows that *Rhyzoperthadominica* is more damaging to chickpea as compared to *Triboliumcustanium.* The former insect caused more loss to chickpea. The present investigation revealed that the number of resources also influenced the Oviposition behavior of both studied insects. Females of *Rhyzopertha and Tribolium* oviposit on larger, higher-quality hosts (white gram). Similar findings were observed by Schmidt J.M and Smith, (1985), who observed that generally, insects lay a fewer number of eggs on smaller and lower quality hosts. According to the result of Fakhar-un-Nisa et al. (2015), the insects preferred high-quality resources of red beans to lay the greatest number of eggs. The results of the present studies showed that the lowest percentage of oviposition rate as 11% was recorded on the black gram. Moreover, it was also noted that the brown variety was found more resistant to insect attack as compared to the white one. Similarly, %age infestation also indicated that the white variety was more susceptible to insect attack as compared to the brown variety.

Table 1 Losses in weight, percentage weight and infestation of different gram varieties.

Chickpea variety	Insect Species	Wt. loss(gm)	%age wt. loss	%age infestation
White	*Rhyzopertha*	41	16.40	24.87
White	*Tribolium*	2.51	0.99	1.45
Control white	-	0.2	0.0008	00
Brown	*Rhyzopertha*	15.89	6.36	11.98
Brown	*Tribolium*	2.45	0.98	1.34
Control black	-	0.2	0.0008	00

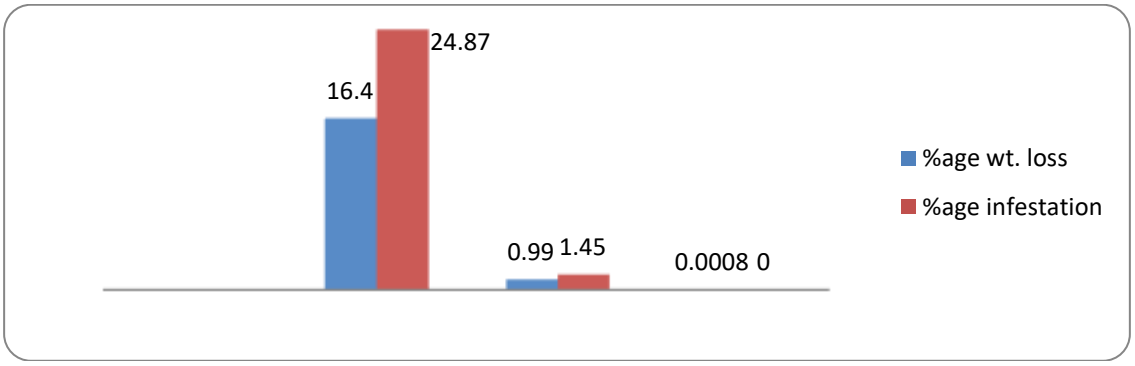

Figure 1: Percentage of weight losses and infestation in White gram

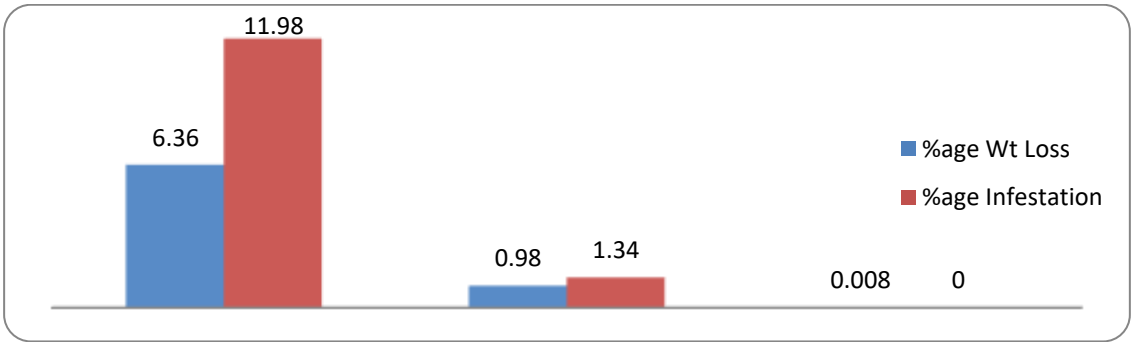

Figure 2: Percentage of weight losses and infestation in brown gram

These findings are in agreement with the findings of many researchers they reported that a lower number of eggs was recorded on the small size pulses because they had a rough seed coat, although rough seed coat was a character preventive for oviposition and absent in susceptible varieties (Sharma, 2013; Yanagi and Miyatake., 2003).

CONCLUSION

The result of the present study shows that *Rhyzoperthadominica* is more damaging to chickpea as compared to *Triboliumcustanium.* The former insect caused more loss to chickpea. The present investigation revealed that the number of resources also influenced the Ovipositor behavior of both studied insects.

CONFLICT OF INTEREST

The authors declared that present study was performed in absence of any conflict of interest.

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