

Reaction of some sorghum varieties against lesser grain borer, *Rhizopertha dominica* Fab. (Coleoptera: Bostrichidae)

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ABSTRACT

Among five sorghum varieties (CSV-15, CSV-23, CSV-17, PC-1080 and PJ-1430) screened against *R. dominica*. CSV-23 and CSV-15 recorded minimum grain damage of 7.44 and 12.25 per cent, weight loss of 1.54 and 2.15 per cent and progeny development as 23.88 and 30.06 adults, respectively, upto 120 days of storage. Variety PC-1080 was found susceptible as it recorded high grain damage, high weight loss, and higher progeny development with mean of 18.63%, 10.50%, and 44.31 adults respectively.

Key words : Lesser grain borer, resistance, sorghum, *Rhizopertha dominica*, bostrichidae.

INTRODUCTION

Sorghum, *Sorghum bicolor* (L.) Moench is one of the important food, feed and fodder crop of our country. It is the gifted genus of the tropical regions that provide food, feed, fodder and fuel to millions of poor farmer families and their livestock's. It is one of the most important crops in the world because of its adaptation to a wide range of ecological conditions, suitability for low input cultivation and diverse uses (Doggett, 1988). It occupies 5th place among the food grains after wheat, rice, maize and barley in terms of production and acreage. It is a staple food crop for millions of the poorest and most food-insecure people in the semi-arid tropics of Africa, Asia and Central America. Worldwide it is cultivated on 40 million ha with a production of 60 million tones. Sorghum has great potential to supplement fodder resources in India because of its wide adoption, rapid growth, high green fodder yield with high drought tolerance. In India, it covers about 6.32 m ha with an annual grain production of 6.03 million tones and productivity of about 954 kg/ha (Anonymous, 2013). Besides production constraints the insect pest problem, improper sanitation and storing methods cause both qualitative and quantitative losses in sorghum. About 39 species of insect pests attack the stored grains and grain produce. Out of these the lesser

grain borer (*Rhizopertha dominica* F.) is more important, as it is destructive in larval as well as in adult stages (Irshad, 1990). Lesser grain borer, *R. dominica* is a field to store pest and this may cause economic damage in the store (Adedire, 2001). The adults are powerful fliers and migrate from one godown to another, causing fresh infestation. When the infestation is severe, the adults produce a considerable amount of frass, spoiling more than what they eat. The flour, so produced, serves as nourishment for the young grubs until they are ready to bore into the grain. It not only reduces the quantity but also deteriorate the quality of grain and its products (Atwal, 1994).

Due to environmental pollution and hazards of chemicals, it is essential to explore alternative means to control pests. To reduce grain losses in stores, resistant or least susceptible varieties are of particular interest for resource poor developing countries. Keeping these facts in view, five promising sorghum varieties were screened against lesser grain borer under laboratory conditions.

MATERIALS AND METHODS

The experiment was conducted in under laboratory condition. The stock culture of the lesser grain borer was maintained by collect adult beetles from the infested sorghum grains. For carrying out the experiment the adults of lesser grain borer

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were reared in laboratory in glass jars of 2 kg capacity containing the sorghum grains. The mouth of container was covered by muslin cloth fastened with rubber band. The cultures was maintained for use various investigations undertaken.

The freshly harvested seeds of sorghum varieties were collected from All India Coordinated sorghum Improvement Project, Rajasthan College of Agriculture, Udaipur. The sorghum varieties viz., CSV-15, CSV-23, CSV-17, PC-1080 and PJ-1430 were used for the study. The sound, unaffected grains of each variety were kept in deep freeze at -19°C in order to eliminate the insect pest infestation. The grains of each variety weighing 100 g were kept in plastic containers of 250 g capacity separately to evaluate susceptibility against lesser grain borer. Ten pairs of 48 h old adult insects were released in each bottle and tops were kept covered with muslin cloth and tightly fixed with rubber band. Each plastic jars were examined periodically at monthly intervals to study the weight loss, seed damage, population build up and grain moisture content.

Weight loss (%) : The observation on per cent weight loss was recorded by counting number of un-infested grains and number of infested grains. Weight loss was worked out by using the following formula (Adams and Schulten, 1978).

$$\text{Per cent weight loss} = \frac{(\text{UND}) - (\text{DNU})}{\text{U}(\text{ND} + \text{NU})} \times 100$$

Where U = Weight of uninfested seeds (g)
 NU = Number of uninfested seeds
 D = Weight of infested seeds (g)
 ND = Number of infested seeds

Seed damage (%) : Before estimating the damage grains, the grains were thoroughly mixed and samples of 100 grains were drawn for five times from each bottle, then damage grains in 100 seeds were counted for each sample.

Population build up (No. of adults) : The observation on population build up was recorded by sieving the grains and counting the total number of adult beetles at monthly intervals.

RESULTS AND DISCUSSION

Five varieties of sorghum were screened to know their resistance/susceptibility against *R. dominica* upto 120 days of storage. The observation on per cent seed damage, weight loss and population

build up were taken into consideration to decide the resistant of sorghum varieties against *R. dominica*.

Grain damage (%) : The results of mean grain damage by lesser grain borer, weight loss and progeny development in different sorghum varieties (Table 1) revealed that none of the variety was found completely free from lesser grain borer grain damage. However their damage varied significantly ($p = 0.05$). The mean grain damage by *R. dominica* among different varieties ranged from 0.25 to 4.50, 3.50 to 9.00, 9.50 to 21.50 and 16.50 to 39.50 per cent after 30, 60, 90 and 120 days of storage, respectively. Significantly higher grain damage of 18.6 per cent was recorded in PC-1080. It was followed by PJ-1430, CSV-17 and CSV-15 with 15.50, 15.0 and 12.25 per cent damage, respectively. The minimum grain damage of 7.44 per cent was recorded in CSV-23. These results are in agreement with to finding of Lal *et al.* (2014) that HI8498 variety of wheat was found resistant as it recorded minimum grain damage (1.19%); while Lok-1 was most susceptible as it recorded the highest grain damage (20.38%) upto 120 days after storage.

Weight loss (%) : The results of mean weight loss by lesser grain borer in their different sorghum varieties (Table 1) revealed that none of the variety was found completely free from weight loss. However, their weight loss varied significantly ($p=0.05$). The mean weight loss by *R. dominica* in different varieties ranged from 0.48 to 7.33, 1.26 to 8.37, 1.86 to 10.56 and 2.56 to 15.75 per cent after 30, 60, 90 and 120 days of storage, respectively. Significantly higher weight loss of 10.50 per cent was recorded in PC-1080. It was followed by PJ-1430, CSV-17 and CSV-15 with 9.87, 3.33 and 2.15 per cent weight loss, respectively. The minimum weight loss of 1.54% was recorded in CSV-23. These results are in agreement with Mahla *et al.* (2005) who found highest weight loss in Raj-3077 (3.81%) which was at par to Lok-1. Lal *et al.* (2014) found that HI8498 variety of wheat was found resistant as it recorded minimum weight loss (0.96%) upto 120 days after storage; while Lok-1 was most susceptible as it recorded the highest weight loss (9.04%).

Progeny development (No. of adults) : The results of mean progeny development of lesser grain borer

Table 1. Progeny development, grain damage and weight loss by lesser grain borer in different sorghum varieties.

S. No.	Varieties	Grain damage (%) at				Weight loss (%) at				Progeny development (No. of adults) at			
		30	60	90	Mean	30	60	90	Mean	30	60	90	Mean
		DAS	DAS	DAS		DAS	DAS	DAS		DAS	DAS	DAS	
1.	CSV-15	1.50 (7.03)*	6.50 (14.77)	19.50 (26.20)	12.25 (18.91)	1.04 (5.85)*	1.56 (7.17)	2.35 (8.82)	2.15 (8.21)	21.50 (4.69)**	25.50 (5.10)	32.0 (5.70)	30.06 (5.49)
2.	CSV-23	0.25 (2.87)	3.50 (10.78)	9.50 (17.95)	7.44 (13.89)	0.48 (3.97)	1.26 (6.44)	1.86 (7.84)	1.54 (6.86)	17.50 (4.24)	20.50 (5.57)	25.50 (5.10)	23.88 (5.15)
3.	CSV-17	2.50 (9.10)	6.50 (14.77)	14.50 (22.38)	15.00 (20.86)	2.29 (8.70)	3.08 (10.11)	4.59 (12.37)	3.33 (10.43)	22.50 (4.80)	29.0 (5.43)	34.50 (5.92)	31.94 (5.66)
4.	PC-1080	4.50 (12.25)	9.00 (17.46)	21.50 (27.62)	18.63 (24.07)	7.33 (15.71)	8.37 (16.82)	10.56 (18.96)	10.50 (18.72)	37.50 (6.16)	41.0 (6.44)	46.0 (6.82)	44.31 (6.68)
5.	PJ-1430	3.50 (10.78)	8.50 (16.95)	19.50 (26.20)	15.50 (21.86)	6.63 (14.72)	7.79 (16.20)	9.80 (18.24)	9.87 (18.04)	26.50 (5.20)	29.00 (5.43)	35.50 (6.00)	33.44 (5.80)
	SEm±	0.08	0.14	0.23	0.20	0.09	0.11	0.12	0.12	0.03	0.04	0.04	0.05
	CD at 5%	0.24	0.42	0.71	0.60	0.28	0.32	0.36	0.35	0.12	0.14	0.14	0.16

* Figures in the parentheses are arcsine transformed values, DAS = Days after storage; **Figures in the parentheses are square root transformed values

in different sorghum varieties (Table 1) revealed that none of the variety was found effective to inhibit the progeny development. However, their progeny development varied significantly ($p=0.05$). The progeny development of *R. dominica* in different varieties ranged from 17.50 to 37.50, 20.50 to 41.00, 25.50 to 46.00 and 32.00 to 52.75 adults after 30, 60, 90 and 120 days of storage, respectively. The Significantly higher progeny development with 44.31 adults was recorded in PC-1080. It was followed by PJ-1430, CSV-17 and CSV-15 with 33.44, 31.94 and 30.06 adults, respectively. The minimum progeny development with 23.88 adults was recorded in CSV-23. These results are in agreement with the finder of Mahla *et al.* (2005) who observed that population builds up in next generation (242.7 adults) and adult emergence (92.2%) of *R. dominica* was highest in Raj-3077 and lowest in Kharchia Desi with a mean of 183.5 adults and 89.5 per cent, respectively. Wheat variety HI8498 was found resistant as it recorded minimum population development build up (6.36%) upto 120 days after storage; while Lok-1 was most susceptible as it recorded the highest (26.25%) population build up (Lal *et al.*, 2014)

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