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SCREENING OF DIFFERENT WHEAT VARIETIES AGAINST LESSER GRAIN BORER, *RHIZOPERTHA DOMINICA* FAB. (COLEOPTERA: BOSTRICHIDAE)

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ABSTRACT

A laboratory experiment was conducted on, "Screening of different wheat varieties against lesser grain borer, *Rhizopertha dominica* Fab. (Coleoptera: Bostrichidae)" in the Department of Entomology, Rajasthan College of Agriculture and Post Harvest Technology Scheme, CTAE, MPUAT, Udaipur 2013-14. Among five wheat varieties screened against lesser grain borer *R. dominica*, HI-8498 was found resistant as it recorded minimum grain damage (1.19%), minimum weight loss (0.96%) and minimum population build up (6.36 adults) upto 120 days of storage; while, Lok-1 was most susceptible as it recorded the highest grain damage (20.38%), weight loss (9.04%) and population build up (26.25 adults).

Key words: Lesser grain borer, *Rhizopertha dominica*, resistance, susceptibility and varietal screening

In India, wheat (*Triticum aestivum* L.) is the second most important cereal crop after rice and it contributes nearly 25 per cent to the national food basket. It accounts for an area of 298.64 lakh ha with production of 94.88 million tones. (Anonymous, 2013). The most important food crops that are the chief source of carbohydrates are cereals, which supply more than two-third of edible dry matter of world's food and more than half of protein need. Estimates of losses of stored grains caused by insect pests range from 5-10% of the world production. In India, wheat in storage is heavily infested by a number of insect pests. Among these pests, the lesser grain borer, *R. dominica* causes considerable damage to stored grains (Campbell and Sinha, 1976). Lesser grain borer is a field to store pest and this may cause economic damage in the store (Adedire, 2001). 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 deteriorates the quality of grain and its products (Atwal 1994).

Chemicals are quite harmful to the environment, human beings and animals. At the same time, however, the extensive use of the insecticides, most of which have broad-spectrum activity, has created many complex environmental problems. Due to environmental pollution and hazards of these chemicals, it is essential to explore pest management means other than chemicals. Insecticides/ fumigants give residues and develop insect resistance. 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 wheat varieties were screened under controlled laboratory conditions.

MATERIAL AND METHODS

The experiment was conducted under laboratory conditions. The stock culture of the lesser grain borer was maintained by adult beetles collected from the infested wheat grains. For carrying out the experiment the adults of lesser grain borer were reared on wheat grains in laboratory in glass jars of 2 kg capacity. The mouth of container was covered by muslin cloth fastened with rubber bands. The culture was maintained for use in various investigations undertaken.

The freshly harvested grains of wheat varieties were collected from All India Coordinated Research Project on Wheat at RCA, Udaipur. Five wheat varieties HI-8498, HI-8713, GW-366, Raj-4037 and Lok-1 were used for screening. The sound, unaffected grains of each variety were kept in deep freeze at – 19°C in order to eliminate the insect pest infestation. The moisture content of grains was less than 12 per cent. 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 48h old adult insects were released in each container and were covered with muslin cloth tightly fixed with rubber band. Each plastic jar was examined periodically at monthly intervals to study the weight loss, seed damage and population build up.

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 method (Adams and Schulten, 1978):

$$\text{Weight loss (\%)} = \frac{(UND) - (DNU)}{U\ (ND + NU)} \times 100$$

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 to grains, the grains were thoroughly mixed and samples of 100 grains were drawn for five times from each bottle, the damaged grains in 100 seeds were counted for each sample.

Population build-up

The observation on population build up was recorded by sieving the grains and counting the total number of adult beetles at monthly intervals.

RESULT AND DISCUSSION

Five varieties of wheat were screened to know their resistance/ susceptibility to *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 performance of wheat varieties against *R. dominica*.

Grain damage (%)

The results on mean gain damage by lesser grain borer, their weight loss and progeny development in different wheat varieties (Table-1) revealed that none of the variety was 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 0.00 to 5.00, 0.25 to 10.05, 0.50 to 26.75 and 4.00 to 39.75 per cent after 30, 60, 90 and 120 days of storage, respectively. Significantly higher mean grain damage of 20.38 per cent was recorded in Lok-1. It was followed by Raj-4037, GW-366 and HI-8713 with, 14.50, 12.75 and 6.01 per cent damage, respectively. The minimum grain damage of 1.19 per cent was recorded in HI-8498. Similar findings were made by of Mansoor *et al.* (2002) who recorded that variety Watan had significantly less grain damage (34.8%) as compared to rest of the varieties, *viz.*, Inqalab (39.08%), Punjab 96 (39.80%), MH-97 (40.80%) and Parwaz-94 (41.0%). Similarly, Gupta and Kadyan (1971) revealed that varieties HD-44 and C-281 were less susceptible while S-306, HD-49 and HD-41 were most susceptible on the basis of seed damage.

Weight loss (%)

The results of mean weight loss by lesser grain borer in different wheat 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 0.50 to 4.88, 0.88 to 7.62, 1.20 to 10.14 and 1.27 to 13.52 per cent after 30, 60, 90 and 120 days of storage, respectively. Significantly higher mean weight loss of 9.04 per cent was recorded in Lok-1. It was followed by Raj-4037, GW-366 and HI-8713 with 5.98, 5.90 and 3.03 per dent weight loss, respectively. The minimum weight loss of 0.96 per cent was recorded in HI-8498. Singh *et al.* (2003) also reported maximum weight loss in Raj-3077 (11.50%), while it was minimum in Kalyansona (5.50) after 30 days interval.

Population build up (No. of adults)

The results of mean population build up of lesser grain borer in different wheat varieties (Table-1) revealed that none of the variety was effective to inhibit the population build up. However, their progeny development varied significantly (p=0.05). The population build up of *R. dominica* in different varieties ranged from 3.50 to 23.75, 5.00 to 21.75, 7.00 to 26.25 and 10.00 to 33.75 adults after 30, 60, 90 and 120 days of storage, respectively. Significantly higher mean population build up with 26.25 adults was recorded in Lok-1. It was followed by Raj-4037, GW-366 and HI-8713 with 17.81, 12.81 and 7.50 adults, respectively. The minimum progeny development with 6.37 adults was recorded in HI-8498. Singh *et al.* (1986) reported that adult emergence was higher in K-7402 and K-8121 (65.10%), while it was restricted to 41.05 per cent in UP-115. Similarly, Mahla *et al.* (2005) observed that population build up in next generation (242.7 adults) and adult emergence (92.2%) of *R. dominica* was highest in Raj-3077 and lowest in KharchiaDesi with a mean of 183.5 adults and 89.5 per cent, respectively.

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Table 1. Grain damage, weight loss and population build up by lesser grain borer in different wheat varieties

Varieties	Grain damage* (%)					Weight loss* (%)					Population build-up**				
	30 DAS	60 DAS	90 DAS	120 DAS	Mean	30 DAS	60 DAS	90 DAS	120 DAS	Mean	30 DAS	60 DAS	90 DAS	120 DAS	Mean
HI-8713	6.40 (1.25)	11.24 (3.80)	14.16 (6.00)	21.13 (13.00)	13.23 (6.01)	7.75 (1.82)	9.06 (2.48)	10.27 (3.18)	12.41 (4.62)	9.87 (3.03)	2.06 (3.75)	2.60 (6.25)	3.04 (8.75)	3.43 (11.25)	2.78 (7.50)
HI-8498	0.00 (0.00)	2.83 (0.25)	4.05 (0.50)	11.54 (4.00)	4.60 (1.19)	4.05 (0.50)	5.38 (0.88)	6.29 (1.20)	6.47 (1.27)	5.55 (0.96)	2.00 (3.50)	2.34 (5.00)	2.74 (7.00)	3.24 (10.00)	2.58 (6.37)
Lok-1	12.92 (5.00)	18.43 (10.05)	31.14 (26.75)	39.08 (39.75)	25.39 (20.38)	12.76 (4.88)	16.02 (7.62)	18.57 (10.14)	21.57 (13.52)	17.23 (9.04)	4.92 (23.75)	4.66 (21.25)	5.17 (26.25)	5.85 (33.75)	5.15 (26.25)
Raj-4037	11.16 (3.75)	16.95 (8.5)	24.73 (17.50)	32.10 (28.25)	21.24 (14.50)	9.67 (2.82)	12.81 (4.92)	15.96 (7.56)	17.06 (8.61)	13.88 (5.98)	3.60 (12.50)	3.77 (13.75)	4.09 (16.25)	5.41 (28.75)	4.22 (17.81)
GW-366	7.60 (1.75)	14.18 (6.00)	23.57 (16.00)	31.46 (27.25)	19.20 (12.75)	8.53 (2.20)	13.69 (5.60)	14.21 (6.03)	18.22 (9.78)	13.66 (5.90)	2.60 (6.25)	3.43 (11.25)	3.94 (15.00)	4.39 (18.75)	3.59 (12.81)
SEm±	0.18	0.16	0.29	0.31	0.24	0.08	0.11	0.12	0.14	0.11	0.02	0.03	0.03	0.04	0.03
CD (p=0.05)	0.55	0.49	0.88	0.92	0.71	0.24	0.32	0.37	0.43	0.34	0.083	0.090	0.103	0.123	0.100

*Figures in parentheses are retransformed percent values; ** Figures in parentheses are retransformed values in numbers; DAS – indicates Days After Storage

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