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Short Communication

Interactive Response of Two Wheat Varieties and Three Insect Pests

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ABSTRACT

Interactive response of two commercial wheat varieties (MH-97 & Inq-91) to three insect pests viz., *Tribolium castaneum*, *Rhizopertha dominica* and *Sitotroga cerealella* was studied under laboratory conditions. The response was evaluated on the basis of some physico-chemical characteristics of wheat and population build up of insect pests. On the basis of these observations for 45 days, it was found that the variety MH-97 was comparatively more resistant to the insect pests used in the study than Inq-91. The correlation of weight loss with population increase and moisture contents was highly positive.

Key Words: Wheat storage; Varietal Resistance; *T. castaneum; R. dominica; S. cerealella*; Insect pest

INTRODUCTION

Wheat suffers heavy losses during storage due to insect pests. According to Ahmad (1994), 10-15% post production losses of wheat occur in Pakistan every year. Sarin and Sharma (1982) reported that all stored grain insect pests exhibit the phenomenon of preference and non-preference for the grains of different varieties of the crops. Khattak *et al*. (1996) studied the susceptibility of eight wheat cultivars to *Sitotroga cereallela* under controlled laboratory conditions. The results were evaluated on the basis of percentage weight loss, percentage damage, progeny and developmental period and grain size. None of the cultivars was completely immune to the attack of these pests.

Ramzan *et al.* (1991) studied 10 wheat varieties for storage damage due to *Rhizopertha dominica* and *Trogoderma castaneum*. They reported that PBW-54 was the most viable (89%) and relatively resistant with 10% damage, while WI-2205, ISSML-3 PBW-12 and KSML-1 showed less than 20% damage and at least 80% viability. In another study (Iqbal & Irshad, 1993), Durum D-82754 was recorded to be the least susceptible while Triticale, TCL-83740 and TCL-85745 the most susceptible lines to attack of *S. cerealella*. Khattak *et al*. (2000) reported that wheat variety BWL-91042 was the most resistant line to *T. granarium* with relatively lower percentage of fat (1.34%, protein (11.20%) ash (1%) but the moisture contents (11.32%) and carbohydrates (74.51%) were comparatively higher than that in the other lines.

MATERIALS AND METHODS

In the present study an attempt has been made to investigate the relative response of two wheat cultivars viz., Inq-91 and MH-97 to *T. castaneum*, *R. dominica* and *S. cerealella* during storage. Before experimentation, the moisture content was determined. Three insects were reared in the laboratory in glass jars allowing sufficient time for ovipositon. Newly hatched grubs were placed in separate jars on the basis of per day hatching to have a culture of uniform age for further experiments. These adults were used in the experiment. The experiment was laid out in completely randomized design (two factorial CRD) with four replicates. For this purpose, 200 g sieved grains of each variety were placed kin glass jars, each having a capacity of about 800 g under controlled laboratory conditions (30±2°C and 65% RH). Fifty adults of uniform age were liberated into each of 48 experimental jars containing wheat varieties. The mouth of each jar was covered with muslin cloth and tightened by rubber bands. Data were recorded after 45 days for (i) increase in population (ii) weight loss, and (iii) percent moisture content. At the end of experiment, chemical analysis for carbohydrates, fats and proteins of healthy grains was also carried out. Before weighing the sample, the insects and frass were removed through sieving using mesh sizes of 24, 14 and 5. The separated grains were weighed for loss in weight. Percent weight loss was calculated by the following formula:

$$\text{Per cent weight loss} = \frac{\text{WCS} - (\text{WS}+\text{DGS})}{\text{Weight of control sample}} \times 100$$

Where

WCS = Weight of control sample

WṢDGS = Weight of sound + damaged grains of test sample

Moisture content of each variety was determined with the help of moisture meter. The insects were counted for

population build-up. The correlation between percent weight loss, moisture content and chemical components in case of each variety were worked out. Chemical analysis of the healthy grains (before infestation) of the test varieties was carried out for protein, fat and carbohydrate, (percentage in crude form). The data obtained were subjected to the analysis of variance and Duncun's Multiple Range test (Steel &Torrie, 1980)

RESULTS AND DISCUSSION

The data regarding response of wheat varieties to *T. castaneum*, *R. dominica* and *S. cerealella* in relation to population buildup and loss in weight have been given in Table I. The results revealed that two commercial varieties, i.e. Inq-91 and MH-97 differed significantly in respect of population buildup and loss in grain weight.

The data further showed that Inq-91 was significantly different in number of insects (Table I). Response of these two varieties towards insects has clearly showed that MH-97 is resistant against this insect pest complex. Results further show that increase in population in case of *T. castadneum* was 219.25 on MH-97 as against 226.25 in Inq-91. *R. dominica* population increased to 219.75 in MH-97 as compared to 417.75 in Inq-91. *S. cerealella* showed increase in population to 140.75 in MH-97 as against 375.25 in Inq-91. So MH-97 is resistant variety against these three insect pests.

In the present study, weight loss and increase in population were kept as criteria for determining comparative resistance of two important wheat varieties. Workers like Saxena and Singh (1995) and Khattak *et al.* (1996) have done similar work.

The results (Table II) regarding moisture contents, population development, percent weight loss and percent damage of grains were comparable with those of Khattak *et al*. (2000), Parkash *et al.* (1981) and Hameed *et al*. (1984) who observed that the moisture contents in stored grains had significant effect on relative susceptibility/resistance against stress and grains insect pest.

In addition to the main factors responsible for the variations in the susceptibility of wheat varieties, the chemical constituents of the grains such as protein, fat and carbohydrate are also important. Hameed (1984) found inverse correlation between the susceptibility of the stored grains to insect pests and the nutrient contents (fat, protein, fiber and ash) while a direct correlation was reported between the susceptibility of the stored grains and carbohydrates. The results (Table II) of the present study are, however, not in line with those of previous workers as the percent weight loss is negatively correlated with carbohydrate.

Table I. Analysis of data regarding weight loss in relation to wheat varieties, insect pests and their interaction

Varieties	Mean % weight loss	Mean population increase
Inq-91	9.665a	339.750a
MH-97	3.996b	193.583b
Insect Pests	**Means**	**Means**
T. castaneum	3.513c	222.750b
R. dominica	6.260b	318.750a
S. cerealella	10.719a	258.500b
Insects × varieties	**Means**	**Means**
T. castaneum×Inq.91	3.900d	226.250b
R. dominica×Inq-91	9.470b	417.750a
S. cerealella×Inq-91	15.625a	375.250a
T. castaneum×MH-97	3.125d	219.250b
R. dominica×MH-97	3.050d	219.750b
S. cerealella× MH-97	5.813c	141.750c

Table II. Comparison of means regarding percent moisture contents, fat, protein and carbohydrate

Insect×varieties	%Moisture	Fat	Protein	Carbohydrate
T.castaneum×Inq.91	10.77	2.963a	12.64b	84.27a
R.dominica×Inq-91	9.25	2.963a	12.64b	84.27a
S.cerealella×Inq-91	10.05	2.963a	12.64b	84.27a
T.castaneum×MH-97	11.40	2.640b	13.33a	69.97b
R.dominica×MH-97	9.75	2.640b	13.33a	69.97b
S.cerealella×MH-97	9.975	2.640b	13.33a	69.97b

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