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SUSCEPTIBILITY OF 5-NEW WHEAT VARIETIES TO *RHIZOPERTHA DOMINICA* (F.) AND *TROGODERMA GRANARIUM* EVERTS

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Out of five wheat varieties tried for susceptibility to *Rhizopertha dominica* (F.) and *Trogoderma granarium* Everts, LU-23 was found least susceptible followed by Sandal and LU-26 whereas, LU-26A and PK.3563 x CH.70 were most susceptible to the attack of these two insects.

INTRODUCTION

Rhizopertha dominica (F.) and *Trogoderma granarium* Everts, are undoubtedly the two most destructive insect pests of wheat under storage conditions in Pakistan and are responsible for causing tremendous losses to stored grains alongwith some other insect pests.

Some work has been done on the relative resistance of different wheat varieties to various insect pests under storage conditions but no authentic quantitative data have been provided regarding the degree of susceptibility of these wheat varieties. It was, therefore, thought necessary to take up present investigations with the object of determining the relative resistance of these varieties so as to pass on this information to the wheat breeders for evolving such varieties which are better suited to our storage conditions.

MATERIALS AND METHODS

Adults of *Rhizopertha dominica* (F.) and grubs of *Trogoderma granarium* collected from wheat godowns were liberated separately into glass jars having wheat variety LU-26 and placed in the laboratory at 80°F and 70 R.H., for multiplication.

Forty newly hatched grubs of *Trogoderma granarium* and an equal number of adults of *Rhizopertha dominica* (F.) of the same age were liberated separately and also in combination into glass jars having five wheat varieties selected for experiments. Sexing in *Rhizopertha dominica* was facilitated by Stemley *et al.* (1966). In another treatment, 20 grubs of

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Trogoderma granarium and an equal number of adults of *Rhizopertha dominica* were liberated together, into each of the five wheat varieties contained in the glass jars. Thus the total number of jars came to 60 under all the treatments. The mouths of the jars were covered with muslin cloth held in position with the help of a rubber ring so as to disallow the exist and entry of insects.

The loss in weight caused by insect pests to each variety was determined after every three months and six months. The percentage of damaged grains was worked out by taking a sample of 100 grains from each of the infested samples and comparing it with control. The data obtained were subjected to analysis of variance and Duncan's New Multiple Range Test, following Steel and Torrie (1960). The results achieved are presented in Table 1 and 2.

RESULTS AND DISCUSSION

Percentage of Damaged Grains

Table 1 reveals that the highest number of grains was damaged by the combination of *Rhizopertha dominica* and *Trogoderma granarium* and this came to 44.83 per cent. The percentage of damaged grains due to attack of *Rhizopertha dominica* and *Trogoderma granarium* was 41.70 and 39.50 respectively.

Out of all the varieties LU-26A and PK.3563 × CH-70 showed 47.38 and 46.50 per cent damaged grains and did not differ significantly from each other. Varieties LU-26, Sandal and LU-23 showed 42.88, 38.27 and 35.17 per cent damaged grains respectively and the difference was found to be significant both at 5 per cent and 1 per cent level. The number of grains damaged on an average, were found to be 55.28 per cent after a period of six months as against 28.80 per cent after three months.

With regard to the attack of individual species of insects on different varieties, it was found that the number of grains damaged by *Rhizopertha dominica* was 50.67, 45.17, 42.00, 37.17 and 33.50 per cent in case of varieties LU-26A, PK-3563 × CH-70, LU.26, Sandal and LU-23 respectively and all the varieties differed significantly from one another in the order of susceptibility to the attack of *Rhizopertha dominica*. These results help to conclude that variety LU-23 is undoubtedly the least susceptible whereas, varieties Sandal and LU-26 came second and third for their resistance.

Table 1. *Analysis of variance of damaged grains in various wheat varieties caused by different insects at different time intervals.*

Source of variation	D.F.	S.S.	M.S.	F.R.	S.E.
Varieties	4	1991.16	497.79	176.52**	0.396
Insects	2	416.16	208.08	73.79**	0.31
Times	1	15787.38	15787.38	5598.36**	0.25
Varieties × Insects	8	425.51	53.18	18.86**	
Varieties × Times	4	36.40	9.10	3.23*	
Times × Insects	2	38.42	19.21	6.81**	
Varieties × Times × Insects	8	525.79	65.72	23.30**	
Error	60	169.01	2.82		
Total	89				

SHORTEST SIGNIFICANT RANGES

INSECTS:

	2	3
5%	0.88	0.92
1%	1.17	1.22

Insects:	*R. dominica* + *T. granarium*	*R. dominica*	*T. granarium*
Averages:	44.83	41.70	39.60

VARIETIES:

Rp	2	3	4	5
5%	1.12	1.18	1.22	1.24
1%	1.49	1.55	1.60	1.63

Varieties:	LU-26A	PK-3563 × CH-70	LU-26	Sandal	LU-23
Averages:	47.38	46.50	42.88	38.27	35.17

TIMES:

Rp	2
5%	0.71
1%	0.94

Times:	Six months	Three months
Averages:	55.28	28.80

SHORTEST SIGNIFICANT RANGES

INTERACTION:

Rp		2	3	4	5
5%		1.95	2.06	2.13	2.17
1%		2.59	2.70	2.78	2.84
R. dominica × Varieties:	LU-26A	PK-3563 × CH-70	LU-26	Sandal	LU-23
Averages:	50.67	45.17	42.00	37.17	33.50
T. granarium × Varieties:	PK-3563 × CH-70	LU-26	LU-26A	Sandal	LU-23
Averages:	46.33	43.33	39.83	36.50	32.00
R. dominica × *T. granarium* × Varieties:	LU-26A	PK-3563 × CH-70	LU-26	Sandal	LU-23
Averages:	51.67	48.00	43.33	41.17	40.00

Percentage Loss in Weight

Table 2 reveals that the percentage loss in weight over a period of six months was significantly different from that recorded after three months. The percentage loss caused by *Rhizopertha dominica* over a period of six months was 52.00, 47.00, 43.00, 38.00 and 33.00 in varieties LU-26A, PK-3563 CH-70, LU-26, Sandal and LU-23, respectively.

The percentage loss was the highest in LU-26A and the lowest in LU-23. Similar results were obtained when varieties were subjected to the attack of *Rhizopertha dominica* and *Trogoderma granarium* together, with the highest loss of 47.00 per cent recorded in LU-26A and the lowest of 31.00 per cent in LU-23.

Table 2. *Analysis of variance of data for loss in weight in various wheat varieties.*

Source of variation	D.F.	S.S.	M.S.	F.R.	S.E.
Varieties	4	0.246744	0.061686	139.87**	0.0049
Insects	2	0.093086	0.046543	105.53**	0.0038
Times	1	2.004054	2.004054	4544.34**	0.0031
Varieties × Insects	8	0.035703	0.004462	10.12**	0.0086
Varieties × Times	4	0.004429	0.001107	2.51N.S.	
Times × Insects	2	0.001163	0.000581	1.31N.S.	
Varieties × Times × Insects	8	0.045166	0.005645	12.80**	
Error	60	0.026505	0.00044l		
Total	89				

SHORTEST SIGNIFICANT RANGES

INSECTS:

Rp	2	3
5%	0.0108	0.0113
1%	0.0143	0.0149

Insects:	*R. dominica*	*R. dominica* + *T. granarium*	*T. granarium*
Averages:	43.00	40.00	35.00

SHORTEST SIGNIFICANT RANGES

VARIETIES:

Rp	2	3	4	5
5%	0.0139	0.0146	0.0154	0.0157
1%	0.0184	0.0192	0.0197	0.0204

Varieties:	LU-26A	PK-3563 × CH-70	LU-26	Sandal	LU-23
Averages:	45.00	44.00	40.00	35.00	30.00

TIMES:

Rp	2
5%	0.01
1%	0.01

Times:	Six months	Three months
Averages:	54.00	24.00

SHORTEST SIGNIFICANT RANGES

INTERACTION:

Rp	2	3	4	5
5%	0.0243	0.0256	0.0265	0.0275
1%	0.0323	0.0337	0.0347	0.0359

R. dominica × Varieties	LU-26A	PK-3563 × CH-70	LU-26	Sandal	LU-23
Averages:	52.00	47.00	43.00	38.00	33.00
T. granarium × Varieties	PK-3563 × CH-70	LU-26	LU-26A	Sandal	LU-23
Averages:	41.00	38.00	35.00	32.00	28.00
R. dominica					
T. granarium × Varieties	LU-26A	PK-3563 × CH-70	LU-26	Sandal	LU-23
Averages:	47.00	44.00	40.00	37.00	31.00

The results of present investigations differ from that of Azeem (1976) in whose experiments, loss percentage varied from 7.22 to 18.66. The difference may be due to variation in number of insects released and duration of the storage. Shah (1969) showed percentage of damaged grains ranging from 9.84 to 11.96 and percentage loss in weight from 4.66 to 6.22. The damage and loss variation from the present studies might be due to the fact that Shah used to disturb and sieve the grains at the end of every month, which might have resulted in loss of eggs through sieving process and thus causing decrease in the total pest population. In addition to this the number of insects released was less than that of present work.

The studies on the degree of susceptibitity of these wheat varieties has not been attempted earlier, so on the basis of this discussion, it is suggested that extensive work be conducted in order to reach some final conclusion so that effective measures may be adopted to save the cereal products from the disastrous attack of various insects.

LITERATURE CITED

Azeem, M.I., M. Ahmad and M. Haq. 1976. Relative susceptibility of some varieties of wheat to Khapra beetle and Brown grains beetle during storage. Pak. J. Agri. Scs. 13(4): 63—66.

Sha, M.A. 1969. Evaluation of stored wheat losses caused by *T. granarium* and *R. dominica*. M.Sc. Thesis submitted to W.P.A.U., Lyallpur.

Steel, R.G.D. and J.H. Torrie. 1960. *Principles and Procedures of Statistics*. McGraw Hill Book Co. New York, U.S.A. pp. 107—109.

Stemley, Porcey, G. and Donald, A. Wilber, 1966. A colour characteristics for sexing live adults of lesser grain borers. J. Econ. Ent. 59(3): 760-61.