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SUSCEPTIBILITY OF NEW VARIETIES OF TRITICALE AND WHEAT TO *SITOPHILUS GRANARIUS* L.

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The cereal, triticale T-183 was compared with 3 varieties of wheat Pb-81, PK-81 and LYP-73 for attractiveness to *Sitophilus granarius* and in a specially designed olfactometer. It was observed that *Sitophilus* infested more on wheat varieties than triticale in multiple choice tests. However, when cereals were tested without choice, all were equally preferred. Insects preferred cereal from previous year than newly harvested crop. The studies on reproductive potential revealed that *Sitophilus* produced fewer progeny on triticale than on wheat during the test period of 30 days.

Key words: Susceptibility, Stored grain, Cereal.

INTRODUCTION

In recent years cereal breeders have developed a number of new varieties of grain crops bred for high yield, shorter growing season, and resistance to pathogens and stress. In the process triticale has been developed as a new cereal crop from a cross between wheat and rye for having high protein content and the ability to withstand adverse environmental conditions. Farmers have reported that certain new cereal varieties are more vulnerable to post-harvest insect attack than traditional varieties. Therefore, researchers have evaluated various cereal grain varieties for their susceptibility to certain stored grain insects. Varieties of rice were evaluated against *Sitotroqa cerealella* (Olivier) (Russel, [1], Russel and Cogburn, [2]), *Sitophilus Sasakii* (Breese, [3],) and *Sitophilus oryzae* (L.) and *Rhyzopertha dominica* F. (Cogburn [4]). Wheat varieties were tested against *S. oryzae* and *R. dominica* (Bhatia and Gupta [5]) and maize cultivars were tested against *S. zeamais* (Mots.) (Dobie, [6]). In these studies susceptibility of varieties to insect attack has been attributed to relative hardness of the Kernel, hull characteristics, weight or amylose contents but no definite reason has been found. Dobie and Kilminster [7] compared triticale cultivars with wheat, barley and maize to attack of 3 species of *Sitophilus* and reported that all 3 species of *Sitophilus* increased in number on triticale quicker than on wheat, maize or barley. A similar observation was recorded by Malik [8]. Since new varieties of wheat and triticale have been developed, their susceptibility to stored grain insects was tested. A new triticale variety T-183 was compared with some new commercial wheat varieties. In earlier studies, grain susceptibility was evaluated by observing reproductive potential of insect pests in a given amount of cereal. In the present study an additional method based on the attractiveness of cereals was developed.

MATERIALS AND METHODS

Insect culture. Sitophilus granarius was reared on whole wheat at a controlled temperature of 29 ± 1° and 55% RH. The cereal varieties were kept in freezer for 2 weeks and then conditioned to laboratory temperature prior to test. Cereal varieties included, triticale, T-183 and wheat; Punjab 81, Pak-81 and LYP-73, triticale was supplied by the breeding division of NIAB and wheat varieties by Ayub Agricultural Research Institute, Faisalabad.

Biotest apparatus. The biotest apparatus (Fig. 1) consisted of 3 parts, lower plate, central plate and top plate.

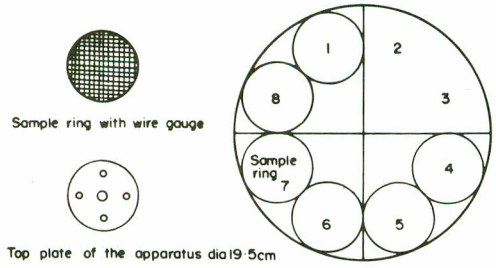

Fig. 1. Biotest apparatus for *Sitophilus granarius*.

The circular unit was made of perspex, 19.5 cm dia having one central hole and 4 peripheral holes of 15 mm dia for release of insects. In multiple choice tests, insects were released from the central hole and in alternate choice tests insects were released from peripheral holes. The holes were closed with cellotape after release of insects. Inside the chamber, there was a central plate 5 mm thick having 8 equidistant holes for sample rings. The sample rings were made of pyrex glass tubing dia 45 mm, height 20 mm and wire gauze attached to lower side. The lower plate was divided into 4 equal parts so that two rings and one peripheral hole was in each part. The lower plate and central plates were lined with filter paper for easy movement of insects. Inside the chamber the weevils could travel from one ring to another. If the cereal was preferred over another variety they would move toward the preferred variety. In alternate, choice, the two varieties to be tested were placed al-

ternately. In each assay there were 5 units. The assembled units were kept in complete darkness in a controlled temperature (29°) and humidity (55% RH) room. Twenty four hours after the release of insects, the apparatus was disassembled and sample chambers were immediately emptied into petri plates individually and number of insects present in each ring and outside the rings was counted. Insects attracted to similar varieties were pooled in each unit and the mean number per unit (± SE) was calculated.

The moisture contents and carotene contents were determined prior to equilibration by AOAC official methods.

RESULTS AND DISCUSSION

Multiple choice preference. In these trials four varieties of cereals were placed in alternate rings and 40 unsexed adult *Sitophilus* were released from the central holes. The results reveal that wheat varieties were more attractive compared to triticale, (Fig. 2). Among wheat varieties, LYP-73 was preferred over the other two varieties. When only one variety was used, there was an equal distribution in all rings and the observed distribution was not statistically different from expected.

No choice preference. In these trials in all the rings same variety was tested against *Sitophilus*. It was observed that when no preference is offered, the insects infested equally to all varieties. The distribution varied from 81 to

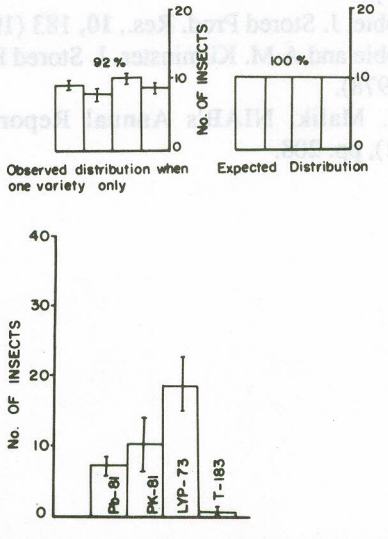

Fig. 2. Distribution of *Sitophilus* in multiple choice of cereals.

96.5% and differences were not statistically significant (X^2 test).

Alternate choice preference. In other trials preference was studied between two varieties placed alternately in the rings and 10 insects were released from each peripheral hole. It was observed (Fig. 3) that triticale was less preferred than wheat. When wheat varieties were tested among themselves, although more insects moved toward LYP-73 variety, differences were not significant (Fig. 4). In all these tests 80-90% of insects moved toward rings containing cereals.

Effect of storage period. In other trials, cereals of different harvest years were evaluated to find effect of storage period. (Fig. 5) reveals that insects preferred cereal from previous year than newly harvested crop.

Reproductive potential in different cereals. The reproductive potential was studied by confining insects in a given amount of cereal for a given period. In these tests, jam jars (13cm x 6.5cm) were used. In each jar 50 gm of cereal was infested with 20 unsexed adults. After one week the cereal was sieved and adults transferred to new jar containing cereal and old sieved cereal was placed back in the

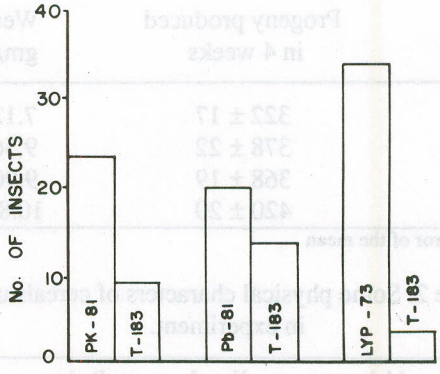

Fig. 3. Distribution of *Sitophilus* in alternate choice test of wheat vs triticale-183.

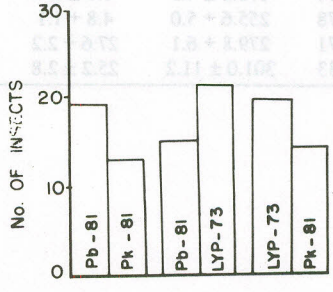

Fig. 4. Distribution of *Sitophilus* in alternate choice test of wheat varieties only.

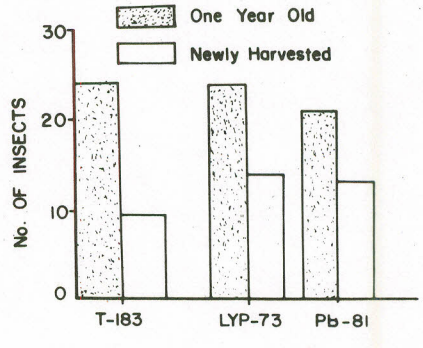

Fig. 5. Effect of storage of cereals on olfaction of *S. granarius*.

same jar and kept in C.T. room. After 35 days of incubation, the emerging adults were counted. The reproductive potential was studied for 4 weeks and pooled together (Table 1). The weight loss was also recorded. The results show that fewer insects developed in triticale than wheat varieties and maximum number of progeny was observed in LYP-73. This indicates that triticale is less preferred over existing cereals under the experimental conditions.

Physical characteristics like moisture content, number of grain/10g, broken grain and carotene contents were correlated to susceptibility of the cereals. It was observed (Table 2) that in triticale there was less moisture and carotene contents and fewer numbers of grain as compared to wheat. But in wheat no such correlation could be established. Number of grain was maximum in PK-81 i.e. 300 grain/10gm, but infestation was less than LYP-73.

Table 1. Reproductive potential of *Sitophilus* and weight loss of various cereal varieties during 4 weeks.

Varieties	Progeny produced in 4 weeks	Weight loss gm/200 gm
T-183	322 ± 17	7.12 ± 1.01
Pb-81	378 ± 22	9.56 ± 0.74
PK-81	368 ± 19	9.90 ± 0.96
LYP-73	420 ± 20	10.84 ± 0.62

±Standard error of the mean

Table 2. Some physical characters of cereals used in experiment.

Varieties	Moisture contents per cent	No. of grain/ 10gm	Broken grain/ 10gm	Carotene contents ppm.
T-183	7.58 ± 0.34	176.0 ± 4.5	1.0 ± 0.6	4.99
Pb-81	9.62 + 0.78	255.6 + 5.0	4.8 + 1.1	7.16
LYP-73	9.53 + 0.71	279.8 + 6.1	27.6 + 2.2	N.D.
PK-81	9.20 ± 0.33	301.0 ± 11.2	25.2 ± 2.8	8.06

N.D. not determined

From these studies it can be inferred that triticale T-183 is less preferred than existing wheat varieties under the experimental conditions which is quite contrary to earlier observations. This difference may be attributed to improvement in triticale over the years and most probably to less carotene contents but further studies are needed to find mechanism of preference.

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