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Relative susceptibility of different wheat varieties against rice weevil, *Sitophilus oryzae* (Linn.)

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Abstract
The present experiment was conducted using ten different wheat varieties to determine their susceptibility to *Sitophilus oryzae* (L.) at S.K.N. College of Agriculture, Jobner during 2015 and 2016. The experiment was laid out in Completely Randomized Design (CRD) with three replications in a control temperature of 27+2 ^{0}C and 70+5 percent relative humidity. Twenty five newly hatched larvae were introduced in each jar (6x9 cm) containing 100 g of grains. Results were evaluated on the basis of percent Adult emergence, Longevity of adult and Growth index. None of the wheat varieties were found resistant to the test insect. However, on the basis of different parameters, comparatively Raj-4037, Raj-3765 and Raj-4083 were found less susceptible while Raj-Molyarodhak-1, Raj-4238, Raj-4079 and Raj-4120 were moderately susceptible, whereas, Raj-1482, Raj-3077 and Raj-3777 were among the most susceptible varieties.

Keywords: *Sitophilus oryzae* L., wheat, susceptibility

Introduction
Wheat (*Triticum aestivum* L.) is the second most important cereal crop after rice in India. India is the second largest producer of wheat in world. It was grown on 30.72 million hectares with the production of 97.44 million tonnes during 2016-17 [1]. Phenomenal increase in wheat production and productivity has been achieved with the advent of high yielding improved varieties. Wheat is heavily infested by a number of insect pests during storage, among these, rice weevil (*S. oryzae* L.); granary weevil (*Sitophilus granarius* L.); lesser grain borer (*Rhyzopertha dominica* F.); Khapra beetle (*Trogoderma granarium* Everts); Angoumois grain moth (*Sitotroga cerealella* (Olivier) and red flour beetle (*Tribolium castaneum* Herbst.) are important [2-6]. The rice weevil is the most widespread and destructive insect-pest of stored cereals throughout the world. The name is misleading, because it may infest other grains besides rice. The rice weevil is a cosmopolite insect supposedly originated in India and spread all around the world through infested and ship-transported grains [7]. The rice weevil (*S. oryzae*) is considered a primary stored-grain insect pest in warm climate areas including India. Both species are often known as "snout weevils" and they penetrate and feed on the internal portions of whole grains in wheat.

Materials and Methods
Experimental details
(i) Design: CRD
(ii) Treatments: 10
(iii) Replications: 3

Treatments (Varieties)
The following wheat varieties were obtained from the Wheat Breeder, Department of Plant Breeding and Genetics, Rajasthan Agriculture Research Institute, Durgapura, Jaipur for studying the varietal susceptibility at S.K.N. College of Agriculture, Jobner during 2015 and 2016. Varieties of wheat tested for their relative susceptibility *viz.*, Raj-1482, Raj-3077, Raj-3765, Raj-3777, Raj-4037, Raj-4079, Raj-4083, Raj-4120, Raj-4238 and Raj-Molyarodhak–1.
The relative susceptibility of the different wheat varieties only sound and healthy grains were selected after mechanical separation. The grains were sterilized at 60±5 ^{0}C for eight hours in order to make these free from hidden infestation. Prior to the experiment, the grains of each variety were conditioned at least for a week in an environmental chamber maintaining 27±2 ^{0}C

and 70±5 percent relative humidity in which the tests were carried out. Twenty five newly hatched larvae were introduced in each jar (6x9 cm) containing 100 g of grains. Observations on growth and development were recorded to evaluate the susceptibility of wheat varieties against this pest. The following observations were recorded -:

(i) Developmental period
(ii) Adult emergence
(iii) Longevity of adult
(iv) Growth index

Experimental procedure

All the host was inoculated simultaneously with three replications from the days fresh emergence started, the dates and number of adults emerged were noted twice (morning and evening) daily to work out the total developmental period (egg to adult) and percent adult emergence on the basis of eggs placed in each specimen tube.

The longevity of male and female adult's weevils were worked out by recording the survival period. The grain damage in each specimen tube was observed after 90 days of experiment. The loss in weight was obtained after removing all insect stages and frass. It was worked out by subtracting the final weight from the initial weight and then converted into percentage. The growth index was calculated by dividing percentage of adult emergence and total developmental period in days.

Statistical analysis

The data obtained on various characters/parameters were subjected to analyses of variance technique applicable for completely randomized design. The level of significance used in 'F' test was p= 0.05 wherever, F calculated was significant, critical difference values were calculated for treatment comparisons. The values obtained in percentage were transformed into angular values and subjected to analysis.

Results and Discussion

Varietal susceptibility of wheat against *S. oryzae*

Developmental period (Table 1)

The average number of days taken to complete the developmental period of *S. oryzae* varied significantly on different wheat varieties. The minimum developmental period was observed on Raj-1482 (26.6 days), which was at par with Raj-3077 (27.7 days) however, Raj-3077 was also at par with variety Raj-3777 (29.4 days). The medium development period was recorded on Raj-4120 (32.5 days) followed by Raj-4079, Raj-4238 and Raj-Molyarodhak-1 which exhibited 33.7, 34.3 and 35.1 days, respectively. However, later three varieties were also at par with Raj-4083 (35.8 days). The longest developmental period was recorded on Raj-4037 (38.6 days), which was at par with Raj-3765 (37.5 days). The present findings corroborate the study of Sudhakar and Pandey [8] who observed that the developmental period of *S. oryzae* was greatly influenced by respective wheat varieties/ genotypes. Similarly Tiwari and Sharma [9] reported that the developmental period of *S. oryzae* ranged from 37.06 to 39.00 days in different wheat genotypes. Patel [10], Yadav and Bhargava [11] and Arve *et al.* [12] reported significant differences in developmental period of *S. oryzae* reared on different varieties of wheat, which is in conformity with the present findings.

Adult emergence (Table 1)

The data presented in table indicated that the emergence of adult was significantly affected in wheat varieties tested. The minimum number of adults were emerged on the variety Raj-4037 (71.85%), followed by Raj- 3765 (73.25%), Raj-4083 (74.00%) which resulted Raj-4083 was also at par with Raj-Molyarodhk-1 (78.42%). The higher numbers of adults were emerged on the variety Raj-1482 (92.32%), which was at par with Raj-3077 (90.70%). The medium adult emergence was recorded in variety Raj-4238 (79.80%) followed by Raj-4079 (81.40%), Raj-4120 (82.60%) and Raj-3777 (85.32%), respectively and which were at par to each other. The present investigations fare in accordance with those of Sudhakar and Pandey [8] and Tiwari and Sharma [9] who found similar variation in adult emergence on wheat varieties indicates the susceptibility/ resistance of that variety. Similarly, Sharma [13] reported that the maximum and minimum number of adult emergence of this pest on different varieties of wheat. Almost similar observations were also made by Patel [10], Yadav and Bhargava [11] and Verma *et al.* [14], support the present findings.

Longevity of adults (Table 1)

The significant difference was recorded in the longevity of adult weevils of both sexes reared on different varieties of wheat. The male adults lasted for 32.80 to 41.20 days in different varieties, being minimum on Raj-4037, while maximum on Raj-1482. The female longevity lasted for 34.20 to 42.10 days at various varieties. Similarly, minimum longevity of female weevil was observed reared on Raj-4037, while maximum on Raj-1482. The results of Sudhakar and Pandey [8] support the present findings, who find the male weevils lived for a shorter period than the female. Similarly, Uttam *et al.* [15] and Yadav and Bhargava [11] also found significant variation in longevity of adult weevil in tested varieties of barley and wheat, respectively.

Growth index (Table 1)

The growth index ranged from 1.86 to 3.47 in different wheat varieties. The minimum growth index was observed in Raj-4037 (1.86), which was followed by Raj-3765 (1.95), Raj-4083 (2.08), Raj-Molyarodhak-1 (2.23), Raj-4238 (2.33) and Raj-4079 (2.42). The maximum growth index was recorded in Raj-1482 (3.47), followed by Raj-3077 (3.27), Raj-3777 (2.91) and Raj-4120 (2.54). The present findings corroborate the study of Gupta *et al.* [16] who observed that the most susceptible genotype of maize showed heavy loss and higher growth index while the least susceptible genotype providing less infestation and poor growth index of *S. oryzae*.

Table 1: Developmental period, adult emergence, adult longevity and growth index of *S. oryzae* in different wheat varieties *

Varieties	Developmental period (days)	Adult emergence (%)	Longevity (days)		Growth index
			Male	Female	
Raj-1482	26.6	92.32 (73.91)**	41.20	42.10	3.47
Raj-3077	27.7	90.70 (72.24)	40.30	41.50	3.27
Raj-3765	37.5	73.25 (58.86)	33.60	35.10	1.95
Raj-3777	29.4	85.32 (67.47)	38.40	40.20	2.91
Raj-4037	38.6	71.85 (57.96)	32.80	34.20	1.86
Raj-4079	33.7	81.40 (64.45)	36.40	38.10	2.42
Raj-4083	35.8	74.00 (59.34)	33.90	35.80	2.08
Raj-4120	32.5	82.60 (65.35)	37.20	39.30	2.54
Raj-4238	34.3	79.80 (63.29)	34.50	37.40	2.33
Raj-Molyarodhak-1	35.1	78.42 (62.32)	34.00	36.20	2.23
SEm±	0.91	1.1	0.71	1.08	-
CD at 5%	2.70	3.45	2.12	3.20	-
CV %	4.59	2.53	3.41	5.01	-

* Data based on three replications

** Percentage transformed to angles; outside values are its back transformation to percentage

Conclusion

Basis of different parameters, comparatively Raj-4037, Raj-3765 and Raj-4083 were found less susceptible while Raj-Molyarodhak-1, Raj-4238, Raj-4079 and Raj-4120 were moderately susceptible, whereas, Raj-1482, Raj-3077 and Raj-3777 were among the most susceptible varieties.

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References

1. Anonymous. Director's Report of AICRP on Wheat and Barley 2016-17. Ed: G. P. Singh. ICAR-Indian Institute of Wheat & Barley Research, Karnal, Haryana, India, 2017, 87.
2. Khattak SU, Sahar K, Karim U, Ahmad S, Aman UK, Jabbar A. Appraisal of rain fed wheat lines against Khapra beetle, *Trogoderma granarium* Everts. Pakistan J Zool. 2000; 32:131-134.
3. Toews MD, Cuperus GW, Phillips TW. Susceptibility of eight U.S. wheat cultivars to infestation by *Rhyzopertha dominica* (Coleoptera: Bostrichidae). Environ. Ent., 2000; 29:250-255.
4. Ebeling W. Pests of stored food products (in Urban Entomology, U.C. Riverside), 2002, 1-43.
5. Atwal AS, Dhaliwal GS. Insect pests of stored grain and other products. In: Agricultural pests of India and South-East Asia. 5th Ed. Kalyani Publisher, New Delhi, India., 2005, 380-394.
6. Shafique M, Ahmad M, Chaudry MA. Evaluation of wheat varieties for resistance to Angoumois grain moth, *Sitotroga cerealella* (Olivier) (Lepidoptera: Gelechiidae). *Pakistan* J Zool. 2006; 38(1):7-10.
7. Metcalf CL, Flint WP. Destructive and useful insects: their habit and control. New York: London: Mc Graw Hill, 1962, 1087.
8. Sudhakar TR, Pandey ND. Relative resistance and influence of wheat varieties on the rice weevil, *Sitophilus oryzae* (L.). Bulletin of Grain Technology, 1982; 20:79-85.
9. Tiwari R, Sharma VK. Susceptibility of wheat germplasm to stored grain pests. Indian Journal of Entomology, 2002; 64(1):1-11.
10. Patel Y. Characterization of relative susceptibility of wheat varieties against rice weevil (*Sitophilus oryzae* Lin.). Asian Journal of Bio Science. 2006; 1(2):106-108.
11. Yadav JP, Bhargava MC. Relative susceptibility of some promising wheat varieties to *Sitophilus oryzae* (Linnaeus) during storage. Journal of Insect Science. 2008; 21(4):146-153.
12. Arve SS, Chavan SM, Patel MB. x Varietal Susceptibility of Wheat Grains against Rice Weevil, *Sitophilus oryzae* L. Trends in Biosciences. 2008; 7(10):925-934.
13. Sharma VK. Impact of container size on the evaluation of varietal resistance in wheat to *Sitophilus oryzae* (Linn.). Journal of Entomological Research. 1984; 8:227-229.
14. Verma RA, Yadav P, Sultana N. Growth and development of *Sitophilus oryzae* on some wheat varieties. Indian Journal of Entomology. 2012; 74(1):88-90.
15. Uttam JR, Pandey ND, Verma RA, Singh DR. Reaction of different barley varieties on growth and development of *Sitophilus oryzae* Linn. *Indian Journal of Entomology*, 2004; 66(2):149-159.
16. Gupta AK, Behal SR, Awasthi BK, Verma RA. Screening of some maize genotypes against *Sitophilus oryzae*. Indian Journal of Entomology. 1999; 61(3):265-268.