

## The study of food preference of *Sitophilus oryzae* L. on common cultivars of rice in Guilan province

Seyedeh Masoomeh Hasheminia

Department of agronomy, Roudehen Branch, Islamic Azad University, Roudehen, Iran

Corresponding author s email: [mhasheminia@riau.ac.ir](mailto:mhasheminia@riau.ac.ir)

**Abstract:** Rice product after wheat has special importance as the second agriculture strategic product. Rice weevil as one of the most important stored pest has the main role in losses of stored product. So in this research, the pest effects was studied on 4 common varieties of rice in Guilan province "Taroum, Hashemi, Ali kazemi and Dylamani" in two conditions of facultative and obligatory nutrition. Results showed that Taroum variety was the most sensitive variety in conditional of facultative and obligatory nutrition and after it Hashemi variety was in the second category and had significant difference with Taroum variety. Ali kazemi and Dylamani varieties didn't have significant difference with together and had the lowest sensitive.

[Seyedeh Masoomeh Hasheminia. The study of food preference of *Sitophilus oryzae* L.on common cultivars of rice in Guilan province. Journal of American Science 2011;7(6):430-434]. (ISSN: 1545-1003). <http://www.americanscience.org>.

**Key words:** Rice weevil, Food preference, Rice varieties

### 1. Introduction

Regarding production, rice is the second important agricultural product after wheat. Paddy lands under cultivation are approximately 628000ha. Province of Guilan with 200000ha land under cultivation has the second rank regarding rice production after Mazandaran which has 201000ha land under cultivation. Rice is traditionally the main food in Iran which meets 13% of required calorie. Mean per capita consumption of rice in the world equaled to 81.3 Kg in 2003 per capita, consumption of rice in developing countries is 98.5 Kg whereas per capita consumption of rice in Asia equals to 119Kg and Iran equals to 53.5 Kg. National organization of rice research has performed measures in the area of preservation and increasing rice production which resulted in performance increase from 2-4 ton/ha. Some of these measures are as follows: 1-Introducing high yield varieties which resulted in 7 ton performance increase in some varieties such as Sepidrood, Amol3, Khazar, Neda, Nemat and so on. 2-Creation and development of mound brook reservation in order to decrease seed density as well as proper control of reservoir irrigation, using plastic cover at reservoirs in order to prevent damage of early spring cold. 3- Useful recommendation about amount, time and application way of fertilizer based on soil properties and the needs of cultivated varieties. 4- Introduction, planting, preserving and harvesting and keeping performance at storage conditions by decreasing damages to pest. Recent investigation has shown that paddy storage loss contains a high percent. Based on research result, proper storage management can have a basic role in decreasing storage loss and most of the wastage in due to weak storage conditions

and lack of protective qualifications against rodents and birds attack. Result has shown that usually there is 4% of paddy loss at current stores (Anonymous, 2000). Weevils of wheat and rice are cosmopolite insects which are most spread worldwide due to international exchanges. However distribution of wheat weevil is limited to cold and moderate areas whereas rice weevil is seen at tropical and semitropical areas. These pests feed on grains such as wheat, barley, rye, corn, sorghum and cause heavy loss (Bagheri-Zenouz, 1996). Storage pests attack as well as ignoring principles of stored products protection sometimes results in quality loss. Consequently chemical composition, color and taste of such products change and become low quality and sometimes completely useless. In general keeping storage preparations either economically or sanitarly based on technical and scientific principles is very important. In this regard not only establishment of proper stores but also recognizing pests and prevention ways is necessary (Anonymous, 1989). The most important damage caused by rice and wheat weevils is related to their larvae. Adults feed on seeds during life (Bagheri-Zenouz, 1996). Cogburn (1978) investigated viability of rice weevils as well as two other pests of these products against six varieties of rice and concluded that seed content is a determining factor in different insect's responses (Cogburn, 1978). Bernabe and Bernardo (1976) have done food preference tests on rice weevils in order to determine resistance mechanisms of ten varieties of corn against them. They observed differences in the seed varieties regarding spawning point and found that feeding on some varieties resulted in decreasing reproduction of adults, body weight and the number of progeny (Bernabe et al.,

1976). Singh and Thapar (1998) investigated resistance of six varieties of rice against rice weevil and realized that varieties Jaya and IR8 had lower senility compared to PR107, PR109, PR103 and PR108 and growth duration of rice weevil on Jaya and IR8 was respectively 41 and 42 days and on varieties of PR was 35.6-36.8 day (Singh et al., 1998). Investigating effective factors in survival and growth of rice weevil on outer layers of rice grain, Haryadi and Fleurat-Lessard (1982) observed that removing outer layers while peeling off rice had an effect on growth time of weevils so that lack of some of the outer layers such as fetus layer affected growth life of the these insects (Haryadi et al., 1982). Sarup (1991) examined the relationship between some of the food ingredients and different parameters for measuring resistance of 24 varieties of corn against *Sitophilus oryzae*; they found that percent and rate of corn loss showed a negative correlation with fat ingredients and positive correlation with sugar ones as well as tryptophan amount of rice (Sarup, 1991). Balbasi (2001) investigated food preference of rice weevil on the growth duration and least progeny of weevil during one year was the most vulnerable ones and Neda ranked average (Balbasi, 2001). Asemi (2002) examined food preference of rice weevil on different varieties of rice and found that Neda and Tarom were the most sensitive varieties to this pest (Asemi, 2002). The objective of the present study were as follow: 1- Decrease in loss due to activity of storage pests 2- Increase in farmers benefit 3- Keeping product quality during storage time and protecting seeds and their nutritious value 4- Selection and introducing the best native variety among examined varieties with respect to storage.

## 2. Materials and Methods

This experiment was done in two obligative and facultative food preference conditions of *Sitophilus oryzae* at fully randomized design with three replications in the fall of 2008. Means comparison was performed using multirange Duncan test by SAS and MSTATAC software. Treatments in this research contained the most common native varieties in Guilan such as Hashemi, Alikazemi, Musa Taroum and Dylamani which were exposed to obligative and facultative conditions of food preference. Experimental procedures are explained in the following section respectively:

### 2.1. Mass production of *Sitophilus oryzae*

Some pest damaged rice was collected to product rice weevil on different native varieties of Guilan rice. Hashemi variety was selected as the main variety and 200g of this grain was scattered at glass containers.

Some pores created at the containers lids for air ventilation and gauze was sticked on the pores. Forty pairs of male and female insects collected from rice native varieties were randomly released at the containers. In this way a lot of insects were collected during 28- 30 days before beginning of the respected experiments.

### 2.2. Investigation of food preference of *Sitophilus oryzae*

Rice used in this experiment was prepared from standard varieties produced by national rice research organization. These varieties included Hashemi, Alikazemi, Musa Taroum and Dylamani. Each variety was placed at single line bags. In order to disinfect the varieties, bags were placed under a large plastic cover containing pesticide pill to prevent pollution. Then the bags were opened for air ventilation. Finally rice grains were saved and sound grains were separated from damaged ones. After separating the said varieties experiment was done in two different following ways.

#### A- Investigation of food preference in facultative food conditions:

The objective of this experiment was to consider insect tendency for selecting the aforesaid rice varieties completely facultative so that only the insect tendency and the grain variety were effective factors in selection. In this regard a cylindrical container made from transparent polystyrene with diameter of 20 cm and high of 10 cm was selected. Then the container circumference was partitioned by four equal parts using cardboard walls. A cylindrical space was regarded for releasing insects at the center of the container. 50g of grain per experimental unit was randomly scattered inside each part. Then hundred male and female insects of 1-3 days were released at the center of experimental container. After twenty days the insects were returned to the original stub with the help of an aspirator. Since the laid eggs on the grains surface were not recognizable, the number of hatchings was considered as food preference criteria. In order to count the insects of f1 generation, every grain of different varieties was transferred to single glass containers. Containers containing f1 insects were controlled every day and the numbers of exited insects were determined followed by separating males from females and noting their counts. This experiment was performed at the temperature of  $27 \pm 1^\circ\text{C}$  and relative humidity  $65 \pm 5\%$ .

#### B- Investigation of food preference in facultative food conditions:

The objective of this experiment was to know that whether forcing insects to feed on a special variety of

rice will change food preference. Again in this research some glass containers were regarded for four varieties of rice followed by removing 50g of rice grains and scattering them at the containers. Eight pairs of male and female 1-3 days insects were released at the containers using an aspirator and after twenty days feeding, these insects were transferred to the original stub.

### 3. Results and Discussion

#### A-Investigation of feeding and spawning in facultative food conditions:

1-3 days insects and counting f1 insects within 25 days, we observed that Taroum and Hashemi rice prevalently had the most average insects count. On the other hand Taroum rice was approached to its most count regarding adult insect number compared to other

rice varieties, i.e. Hashemi, Ali Kazemi and Dylamani needed more time to reach their peak regarding adult insect counts. In order to further investigate food preference on different rice varieties hatching or the numbers of male and female insects appeared on rice grains were determined and analysis of variance of data of male and female insect count in facultative releasing conditions showed a significant difference at probability level of  $\alpha=1\%$ . Results showed the most count of the male insects were placed on Taroum at "A" group, on Hashemi at "B" group and on Dylamani at "C" group. Similarly the most count female insects were placed on Taroum at "A" group, on Hashemi at "B" group and on Ali Kazemi and Dylamani at "C" group. These results are in line with Balbasi observations.

Table 1. Analysis of variance of male insects count appeared on different rice varieties in facultative releasing conditions

SOV	df	SS	MS	F
Treatment	3	159.427	53.142	7.407**
Error	8	1.084	0.135	-
Total	11	162.354	-	-

Table 2. Comparing means of regarded parameters for determining food preference on rice weevil in facultative releasing conditions

Variety	Mean number of male insects	Classification
Taroum	68.47	A
Hashemi	59.27	B
Ali Kazemi	19.31	C
Dylamani	17.54	C

Table 3. Analysis of variance of female insects count appeared on different rice varieties in facultative releasing conditions

SOV	df	SS	MS	F
Treatment	3	179.354	59.784	456.366**
Error	8	1.051	0.131	-
Total	11	181.451	-	-

Table 4 Comparing means of regarded parameters for determining food preference on rice weevil in facultative releasing conditions

Variety	Mean number of female insects	Classification
Taroum	84.31	A
Hashemi	72.53	B
Ali Kazemi	29.43	C
Dylamani	26.54	C

Based on analysis of variance and comparing the means of different treatment a significant difference was observed between treatments. In the facultative food conditions, the most percent of weight loss was related to Taroum followed by Hashemi, Ali Kazemi and Dylamani ranked lower but there wasn't any significant relationship between them.

Table 5. Analysis of variance of the percent of weight loss of different rice grain in the facultative food conditions

SOV	df	SS	MS	F
Treatment	3	51.471	17.157	22.024**
Error	8	6.235	0.779	-
Total	11	61.422	-	-

Table 6. Comparison between the means of percent of weight loss of different rice grain in the facultative food conditions

Variety	Rate of weight loss	Classification
Taroum	5.21	A
Hashemi	3.27	B
Ali Kazemi	1.42	C
Dylamani	1.01	C

### B- Investigation of feeding and spawning in obligative food conditions:

Investigation of adult insects was observed at Taroum variety with the average of 47 insects follow by Hashemi, Ali Kazemi and Dylamani with the average of 38, 29 and 27 insect respectively. In Taroum variety the number of insects reached to its peak earlier compared to the other varieties. Female insects were counted and analyzed too. Results showed that the most count of the male insects was seen at Taroum variety followed by Hashemi while there wasn't any significant difference between the two other varieties.

Table 7. Analysis of variance of male insects count appeared on different rice varieties in obligative releasing conditions

SOV	df	SS	MS	F
Treatment	3	154.421	51.473	411.784**
Error	8	1.005	0.125	-
Total	11	160.325	-	-

Table 8. Comparing means of regarded parameters for determining food preference on rice weevil in obligative releasing conditions

Variety	Mean number of male insects	Classification
Taroum	79.27	A
Hashemi	57.41	B
Ali Kazemi	27.22	C
Dylamani	25.41	C

Table 9. Analysis of variance of female insects count appeared on different rice varieties in obligative releasing conditions

SOV	df	SS	MS	F
Treatment	3	175.437	58.479	467.832**
Error	8	1.005	0.125	-
Total	11	179.223	-	-

Table 10. Comparing means of regarded parameters for determining food preference on rice weevil in facultative releasing conditions

Variety	Mean number of female insects	Classification
Taroum	95.41	A
Hashemi	84.21	B
Ali Kazemi	22.11	C
Dylamani	19.47	C

Based on classification of experimental treatments the most count of female insects was appeared on Taroum variety which showed a significant difference with other varieties and after that Hashemi variety differed significantly from the other varieties. However Ali Kazemi and Dylamani varieties were in the same group and didn't show significant difference.

Table 11. Analysis of variance of the percent of weight loss of different rice grain in the obligative food conditions

SOV	df	SS	MS	F
Treatment	3	48.274	16.091	21.744**
Error	8	5.927	0.740	-
Total	11	51.231	-	-

Table 12. Comparison between the means of percent of weight loss of different rice grain in the obligative food conditions

Variety	Rate of weight loss	Classification
Taroum	6.01	A
Hashemi	4.23	B
Ali Kazemi	1.47	C
Dylamani	1.23	C

#### 4. Conclusion

*Sitophilus oryzae* L. was an important stored pest. Based on this research Taroum variety was the most sensitive variety in conditional of obligative and facultative nutrition. On the other hand Ali Kazemi and Dylamani varieties had the lowest sensitive.

#### Acknowledgement

Financial support from Islamic Azad University, Roudehen Branch (Iran) is gratefully acknowledged.

#### Corresponding Author:

Dr. Seyedeh Masoomeh Hasheminia. Department of agronomy, Roudehen Branch, Islamic Azad University, Roudehen, Iran. Corresponding author s email: mhasheminia@riau.ac.ir

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5/22/2011