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Evaluation of diversity and selection of superior genotypes in irrigated cultivation of some oat genotypes (*Avena sativa* L.)

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Introduction

Oat is becoming increasingly popular due to its healthy and nutrient-rich properties for human consumption. Improvement of oat production is of importance and required by the domestic and international markets. The importance of this product is due to its high protein percentage and good quality of seeds and fodder, so that it has the highest production in the two countries of Canada and Russia with 5.2 and 4.5 million tons per year respectivel., after corn, Rice, wheat, sorghum, millet and barley rank seventh among cereals (FAO, 2022). Currently, the screening and introduction of genotypes with high yield and desirable agricultural characteristics is one of the main goals of breeding programs, especially in relation to oats, and it is one of the most important features in obtaining superior genotypes (Wen *et al.*, 2023). On the other hand, even limited efforts have been made by researchers to identify its high-yielding varieties. Therefore, there is an urgent need to increase and identify improved oat cultivars with high nutritional value due to the economic dynamics of oat production, emphasizing the contribution of oats to agricultural sustainability and the wider economy (Ranjan *et al.*, 2024).

Materials and methods

In order to evaluate and determine the best genotype in terms of yield traits and yield components of 11 oat genotypes, an experiment was conducted using a randomized complete block design in three replications in 2023-2024 the Research Farm of the Faculty of Agriculture, Razi University. The traits studied in this experiment included grain yield, thousand grain weight, number of grains per spike and number of spikes per square meter. To measure the grain yield and the number of spikes per square meter, after removing the border effect, three lines of one-meter length were taken from each plot and after calculation, the yield and the number of spikes of each genotype per square meter were obtained. After collecting and checking the normality of the data distribution, the analysis of variance was performed and then the comparison of means was done to determine the best genotypes using the least significant difference (LSD) method through SAS software. Path analysis was also done to investigate the relationship between traits and grain yield as a dependent variable using SPSS software and Excel environment.

Results and Discussion

Variance analysis of the data showed that there is a significant difference between the genotypes in terms of the thousand grain weight and the number of grains per spike (Table 1). The results of mean comparison for yield and other agricultural traits (Table not reported) showed that genotypes No. 10 and 11 had the highest grain yield with 769.78 and 779.56 gram per square meter, and also the average grain yield was 672.36 gram per square meter. In terms of thousand grain weight trait, genotypes No. 10 and 1 had the highest and lowest thousand grain weight with 32.94 and 24.94 gram, respectively. Also, the average of thousand grain weight was 29.43 gram. Genotypes No. 11 and 8 had the highest number of spikes per square meter and the number of grains per spike with 844.45 and 368.67, respectively. The average number of grain per spike was 283.52 and the average number of spike per square meter was 725.73. Based on the correlation analysis, the number of spike per square meter had a significant positive correlation with grain yield, which was consistent with the results of other researchers' experiments ((Kabiri *et al.*, 2023; Molaei *et al.*, 2024).

Table 1. Analysis of variance of 11 cultivated oat genotypes

S.O.V	df	Grain yield	Thousand grain weight	Number of spike	Number of grain per spike
Replicate	2	47912.40*	1.88	9799.42	5680.39
Treatment	10	23795.62	15.74*	18596.85	6714.62**
Error	20	11823.66	6.53	14136.97	1896.96
CV%	-	16.17	6.68	16.38	15.36

* and ** respectively significant at the 5 and 1 percent probability level

Table 2. Correlation coefficient between the studied traits in tested genotypes

Traits	Grain yield	Thousand grain weight	Number of spikes per m^2	Number of grains per spike
Grain yield	1			
Thousand grain weight	0.1	1		
Number of spikes per m^2	0.422*	0.128	1	
Number of grains per spike	0.142	-0.127	-0.26	1

Conclusion

The results of this research showed the performance potential of the investigated genotypes in terms of the measured traits. Among the investigated genotypes, genotype No.10 with the highest grain yield and thousand grain weight could be selected as the best genotype. Therefore, it can be used as a parent in crossing to create a superior genotype. It is suggested to continue the evaluation and screening of other agricultural oat cultivars in order to identify sources with high yield and desirable agricultural characteristics. In the correlation analysis, the trait number of spike per square meter had the most positive correlation with grain yield, so these traits could be used to improve grain yield and other agronomic characteristics in oat cultivars.

Keywords

Analysis of variance, Correlation analysis, Grain yield, Oat

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