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Variation in Antioxidant Enzymes of 11 Wheat Cultivars from Iran

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ABSTRACT

To evaluate some antioxidant enzymes in 11 wheat cultivars from Khuzestan province, Iran, this experiment was conducted in 2011. Experimental design was randomized complete block design with four replications, and the evaluated factors were alpha-amylase, catalase and glutathione peroxidase. Results indicated that alpha-amylase content was significantly the same in the 11 cultivars; however, catalase and glutathione peroxidase content varied significantly between the cultivars (P≤0.01). Mean comparison indicated that the highest catalase and glutathione peroxidase content (1.32 µM/min/g fresh weight and 0.079 mM/min/g fresh weight, respectively) were related to Chamran cultivar. Generally, results of this experiment showed that Chamran, S 78, Karkheh, Dena, Behrang and Veryanak contained the highest catalase and glutathione peroxidase.

Keywords: alpha-amylase, catalase, glutathione peroxidase, wheat.

INTRODUCTION

Wheat is an important food crop for human life which is cultivated all around the world, in greatly different climatic conditions; thus, is encountered with various abiotic stresses. These stresses not only affect plants growth and yield, but also alter plants cellular mechanisms and enzymes activity. One of the biochemical changes in plants, under stress condition, is the production of reactive oxygen species (ROS) and free radicals which damage plants [9-10]. These ROS are toxic for cells and damage cells lipids, proteins and nucleic acids, and finally inhibit the natural metabolism of plant [3, 6]. One of the biochemical strategies plants employ to alleviate the effect of ROS is the production of enzymatic and non-enzymatic antioxidants.

Catalase and peroxidase are important antioxidants which eliminate free radicals; protecting plants from damages under stress conditions (such as drought stress) [7]. Ghorbanli et al. [4] observed an enhancement in rapeseed catalase content under salinity stress condition. Siram et al. [7] reported that drought stress increased the activity of antioxidant enzymes in plants. In different experiments it has been proved that plants with higher antioxidants contents tolerate superoxides better [5, 8].

So, this experiment was conducted with the objective of studying the variations in 11 wheat cultivars from Khuzestan province, Iran.

MATERIALS AND METHODS

This experiment was conducted in 2011 at the fields of Dezful Jahad, Iran, to study the antioxidant enzymes in 11 wheat cultivars from Dezful, Khuzestan province, Iran. The experiment was conducted in the form of a randomized

complete block design with four replications. Treatments of the experiment included: Veryanak, S 81, Chenab, Dena, Chamran, Behrang, Karkheh, Star, S 80, Kavir and S 83 cultivars. When wheat cultivars were harvested in fall, alpha-amylase, catalase and glutathione peroxidase were measured at the laboratory of Islamic Azad University, Karaj branch, Iran:

Alpha-amylase measurement method. 15 seedlings along with 15 ml distilled water were grinded in Chinese mortar and after obtaining the milky mixture, after 3-4 h, it was passed through two cleaning layers and one filter paper. Then, 1 ml of the filtrated solution was transferred into a 50 ml volumetric flask and diluted to 50 ml with distilled water. This solution contained alpha-amylase [11].

Catalase measurement method. 2.5 ml of 0.05 M phosphate buffer (pH = 6.8) was mixed with 0.2 ml of 3% hydrogen peroxide, then, 0.2 ml of the enzyme containing extract was added to the solution. Absorption was measured at 240 nm by a spectrophotometer. Finally, the enzyme activity was calculated as µM/min/g fresh weight.

Peroxidase measurement method. 2 ml of 0.2 M acetate buffer (pH = 5) was mixed with 0.4 ml of 3% hydrogen peroxide and 0.2 ml of 0.01 M benzidine (solved in 50% alcohol), then, 0.2 ml of the enzyme containing extract was added to the solution. Absorption was measured at 530 nm by a spectrophotometer. Finally, the enzyme activity was calculated as mM/min/g fresh weight.

Data were analyzed using SAS, after data conversion, and means were compared according to the Duncan's multiple range test.

RESULTS AND DISCUSSION

Analysis of variance indicated no significant difference in alpha-amylase content in the wheat cultivars; however, catalase and glutathione peroxidase were significantly different (Table 1). Mean comparison of the cultivars showed that the highest catalase (1.32 µM/min/g fresh weight) and glutathione peroxidase (0.079 mM/min/g fresh weight) content were observed in Chamran cultivar (Table 2). The lowest catalase content (0.16 µM/min/g fresh weight) was observed in Star cultivar and the lowest glutathione peroxidase content (0.026 mM/min/g fresh weight) was observed in S 83 cultivar. Generally, results of this experiment indicated that Chamran, S 78, Karkheh, Dena, Behrang and Veryanak were the best cultivars regarding their catalase and glutathione peroxidase contents.

Table 1. Analysis of the variance of the measured traits.

SOV	df	Mean Squares (MS)		
		Alpha-amylase	Catalase	Glutathione peroxidase
Rep	3	0.267	0.045	0.3434
Cultivar	10	ns	**	**
Error	30	0.163	0.048	0.00022
CV (%)	-	17.26	27.44	28.61

*ns, nonsignificant; *, significant at P≤0.05; **, significant at P≤0.01.*

Table 2. Antioxidant enzymes content variation in 11 wheat cultivar.

Treatments	Alpha-amylase (ppm)	Catalase (µM/min/g fresh weight)	Glutathione peroxidase (mM/min/g fresh weight)
Veryanak	6.891a	0.6919abc	0.04346bc
S 78	5.917a	1.3022ab	0.06797ab
Chenab	5.516a	0.5325bc	0.05148b
Dena	5.952a	0.7266abc	0.05050b
Chamran	6.001a	1.3256a	0.07907a
Behrang	5.335a	0.6928abc	0.04762bc
Karkheh	5.685a	0.9422abc	0.05516b
Star	6.000a	0.1631d	0.04363bc
S 80	5.049a	0.4453cd	0.05748ab
Kavir	5.387a	0.5531bc	0.04544bc
S 83	3.910a	0.3762cd	0.02638c

Means in a column followed by the same letter are not significantly different at P≤0.01.

FAO statistics [1] represents that 1 billion of world population are undernourished due to insufficient food; more than 2 billion suffer from hidden hunger. Hidden hunger refers to malnutrition of vitamins and minerals, caused by low quality of food products. In fact, many people even in rich societies and developed countries do not receive sufficient vitamins, minerals, etc., from their daily consumed foods [2]. So, it is necessary to improve plants quality, in addition to yield.

Wheat plays a vital role in human nutrition, especially in poor societies and underdeveloped countries. Selecting wheat cultivars with higher quality may be an effective method to improve human health. Result of this experiment indicated a great variability in antioxidant enzymes of different wheat cultivars; Chamran cultivar had the highest content of catalase and glutathione peroxidase. Because these enzymes are important for human health, selecting cultivars such as Chamran, S 75, Dena and Karkheh for cultivation can be an effective way to improve the whole society health.

REFERENCES

[1] FAO, Foot Insecurity in the World. Economic Crises - Impacts and Lessons Learned. Food and Agriculture Organization of the United Nations, Rome, **2009**.
[2] G Kennedy, G Nantel and P Shetty, *Food Nutrition Agric*, **2003**, 32, 8-16.
[3] GH Badawi, Y Yamauchi, E Shimada, R Sasaki, N Kawano, K Tanaka and K Tanaka, *Plant Sci*, **2004**, 166, 919-928.
[4] M Ghorbanli, A Satei and A Moghiseh, *Pjouhesh va Sazandegi*, **2003**, 16 (1), 39-43.
[5] ML Dionisio-Sec and S Tobita, *Plant Sci*, **1998**, 135, 1-9.
[6] QX Lai, ZY Bao, ZJ Zhu, QQ Qian and BZ Mao, *J Zhejiang Univ Sci B*, **2007**, 8, 458-464.
[7] RK Siram, K Veerabhadra Rao, and GG Srivastava, *Plant Sci*, **2002**, 200, 1-70.
[8] SA Korori, *Duch Biochemical Vegetale*, **1989**, 65, 120-129.
[9] V Ghorbani Ghujdi and L Moghaddam, Oxidative Stresses and Plant Responses, Nashre Daruyee Publications, Tehran, Iran, **2005**.
[10] Y Pan, LJ Wu and ZL Yu, *Plant Growth Regul*, **2006**, 49, 157-165.
[11] Z Xiao, R Storms and A Tsang, *Analytical Biochemistry*, **2006**, 351, 146-148.