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Research Article

EVALUATION OF PHOSPHORUS USE EFFICIENCY IN FOUR WHEAT CULTIVARS

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ABSTRACT
In order to Evaluation of phosphorus use efficiency in four wheat cultivars in greenhouse pot experiment was conducted in Azad University of Gorgan the 2011-2012 crop years. Phosphorous fertilizer levels (control (no fertilizer), 50% and 100% recommended fertilizer and figures (Mihan, Pishtaz,Parsi,Pishgam), a factorial experiment in a completely randomized design with four replications was done. The figures in terms of grain yield, agronomic efficiency of fertilizer utilization efficiency of phosphorus fertilizer and Recycling rate of P fertilizer showed significant difference at 1%. Results showed that the highest of grain yield of 100% of the recommended amount of phosphorus in Mihan and the lowest figure was Parsi grain yield and without phosphorus fertilizer use (control). Indicators in terms of agronomic yields and fertilizer recovery rates of 50% recommended fertilizer consumption of fertilizer Parsi treatments figure was higher than other treatments the and the lowest obtained in Pishtaz and Pishgam figures by fertilizer recommendations, respectively 100 percent. Thus Parsi cultivars as efficient cultivars are recommended for conditions of phosphorus limitation.

Keywords: *Wheat Cultivars, Grain Yield, Phosphorus Efficiency*

INTRODUCTION
Phosphor is one of the important elements in growth of herbal nutrition and stability. The plant consumes it most after nitrogen. As 20% of distributed phosphor fertilizer was absorbed by herbs in first year as a result of absorption limit, the rest would stay in an unreachable state in soil. On the other hand, special behavior of phosphor in most of the soils leads us to use phosphor-contained fertilizer every year. But, the failure of the method and economic ecologic problems in two recent decades, as well, made the scientists consider plants adaptation to the natural condition of soil and try to select and modify the genotypes, consuming soil and fertilizer' nutrition with high yield. Aztork *et al.,* (2005) have found that there is a meaningful different among the cultivars of wheat with respect to phosphor efficiency. Different reactivity to phosphor application of wheat cultivars is because of their different levels of nutrition need. In other words, some of the wheat cultivars need a higher availability of phosphor in nutrition solution in order to increase the performance (Geil *et al.,* 1994; Anasya *et al.,* 2009). They believed that the difference in a same environmental condition is because of the genetic differences. In present research, we evaluate the reaction of 4 types of wheat (Pishtaz, Mihan, Pishgam and Parsi) with different amounts of phosphor levels in order to select the best cultivar with respect to phosphor fertilizer efficiency.

MATERIALS AND METHODS
This experiment was conducted in a completely randomized design with four repetitions in greenhouse condition in factorial way in 2010. We have tested 4 types of wheat including Pishtaz, Mihan, Pishgam and Parsi in three levels of phosphor; Shahed (without fertilizer), 50% suggested fertilizer and 50% triple super phosphate. The soil was selected and analyzed of a fallow farm and the suggested fertilizer was selected based on the result of chemical analysis. The selected vases are 24*19 centimeter (with 10 kg capacity). After cultivation, they were keeping in normal light and temperature. 14 seeds were cultivated in each vase. After germination, they were reduced to 7. Chemical nitrogenized fertilizer was added to the vases in three steps equally. Potash fertilizer also added to each vase based on suggested cultivar after it was solved in water. Seed performance was computed after harvesting. The phosphor amount of each seed organs was measured by GC-MS. Phosphor efficiency was computed by following equations:

1) Fertilizer efficiency (Eriblar *et al.*, 2007)
2) Fertilizer agronomic yield (Daverdas *et al.*, 2008)

$$AE = \frac{\text{Yield in fertilized plot (kg ha}^{-1}\text{) - Yield in control plot (kg ha}^{-1}\text{)}}{\text{Quantity of fertilizer nutrient applied (kg ha}^{-1}\text{)}}$$

3) Phosphor fertilizer recycle percentage (Jagdisveran and *et al.*, 2005)

$$ANR = \frac{\text{Uptake in fertilized plot (kg ha}^{-1}\text{) - Uptake in control plot (kg ha}^{-1}\text{)}}{\text{Quantity of fertilizer nutrient applied (kg ha}^{-1}\text{)}}$$

To analyze the collected data, we've used MSTAT-C software and to draw the tables and diagrams, we've used Excel software. Averages comparison was performed through LSD method at 1% level.

RESULTS AND DISCUSSION

Applying the different amounts of phosphor has positive effect on performance features of seeds. Agronomic yield indexes, fertilizer efficiency and fertilizer recycle is decreased by the increasing of phosphor level which is significant at 1% probability level. Best performance was in Mihan wheat (1311.10 gpm^2) with 100% consumption of suggested fertilizer and the worst one was in Parsi wheat (254.00 gpm2) without any consumption (table 1). Different reactivity of wheat cultivars to phosphor application is because of different levels of nutrition need of them. In other words, some of the wheat cultivars need a higher availability of phosphor in nutrition solution in order to increase the performance. The most agronomic yield was in Parsi wheat (69.70 kg/kg) with 50% consumption of suggested fertilizer and the least one was in Pishgam wheat (44.26kg/kg) with 100% consumption of suggested fertilizer (table 1). Phosphor efficiency index was decreased by all the cultivars. The most efficiency was in Pishgam (31.57%) with 50% consumption of suggested wheat and the least one was in Parsi (10.94%) with 100% consumption of suggested fertilizer. This efficiency decrease was the result of this fact that the increase of wheat performance with 50% consumption of suggested fertilizer was more than the performance increasing of the wheat with 100% consumption of suggested fertilizer. In other words, the performance of the wheat has no remarkable increasing by the increasing of phosphor.

Table 1: The comparison between the effects of wheat types and the level of phosphor fertilizer on wheat features

Treatment		Grain yield)g/m(	agronomic efficiency of fertilizer(kg/kg)	Utilization efficiency of phosphorus (%)	Recycling rate of phosphorus (%)
With out usage phosphour	pishtaz	435.00d	-	-	-
	mihan	399.00d	-	-	-
	pishgam	462.60d	-	-	-
	parsi	254.00e	-	-	-
50% required phosphour	pishtaz	1090.25bc	61.56b	28.05ab	22.25bc
	mihan	1139.85bc	57.96b	25.19bc	18.99cd
	pishgam	1166.30bc	62.63b	31.57a	26.99ab
	parsi	1052.05c	69.70a	21.65cd	29.69a
100% required phosphour	pishtaz	1181.25b	39.24d	17.40de	12.05e
	mihan	1311.10a	47.88c	19.24d	17.33cd
	pishgam	1165.45bc	44.26cd	13.57ef	13.77de
	parsi	1134.55bc	46.52c	10.94f	15.31de

Treatment with at least one common word in terms of ISD test doesn't have the significant difference at 5% probability level.

Most phosphor yield was in Parsi wheat (29.69%) with 50% consumption of suggested fertilizer and the least one was in Pishtaz wheat (12.05%) with 100% consumption of suggested fertilizer.

As it's expected, there are remarkable differences among phosphor efficiency, agronomic yield and phosphor yield among the variable cultivars of wheat at different levels of phosphor. Parsi wheat has the most agronomic and phosphor yield among the others with 50% consumption of suggested fertilizer. So, one can select the Parsi in the case of phosphor limit. Also one can conclude that Parsi wheat could manage its optimized consumption of phosphor and its metabolic activities in such a way that use the least absorbed phosphor the best. However, to make the right decision, it should be investigated on more types of wheat because they have different behaviors at different levels of phosphor. In future researches, one should investigate efficiency mechanisms details and control genes alongside the recognition of character types to produce types with higher efficiency through genetic features transmission. If this is happened, there will be a new door in phosphor fertilizers consumption management, decreasing the consumption and as a result, decreasing the costs of production and lead to the stable agriculture and environment maintenance.

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