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EFFECT OF FOLIAR PHOSPHORUS FEEDING ON VEGETATIVE GROWTH INDICATORS AND YIELD OF TWO WHEAT CULTIVARS

[1]Dunya M. Mohsin, [1]shabeeb M. Jasim, [2]Taghreed M. K. AlFarjawi, [3]Ali.R. Alhasany, [3]Ali H. Noaema
[1]Department of Animal Production, Faculty of Agriculture, University of Misan, Iraq.
[2]Data Palm Research Center, University of Basrah, Iraq.
[3]Field Crops Department, Faculty of Agriculture, University of Al-Muthanna, Iraq
dunya.m.mohsin@uomisan.edu.iq, shabib.mandesh@uomisan.edu.iq, taghreed.kuder@uobasrah.edu.iq, ali_raheem2002@mu.edu.iq, ali.algayashe@mu.edu.iq

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Abstract:

A field experiment was conducted in the fields of a farmer in Al-Rumaitha district, 25 km north of Samawa city during the growing season 2022-2023 to study the response of two wheat varieties (Rasheed and Buhuth 22) to foliar spraying of three phosphorus concentrations (0.2000, 4000 mg L-1). This was done using R.C.B.D design with three replications and split plot method. The experiment included two factors: the first factor was the wheat variety in the secondary plots and the second factor included the phosphorus spray concentration in the main plots. Variety Buhuth 22 (V2) significantly outperformed the varieties in terms of number of grains per ear and total yield, with the highest average yield of 34.70 grains Ear-1 and 3.61 t ha-1, while variety Rashid (V1) achieved the highest values in terms of plant height, flag leaf area and thousand-grain weight. There were no significant differences in number of ears per square meter and biological yield among the varieties. The results showed that the 2000 mg P L1 concentration had significant advantages in plant height, flag leaf area, number of spikes per square meter, thousand-grain weight and total grain yield, with average values of 78.95 cm, 45.65 cm2, 412.80 spikes·m -2, 45.15 g and 3.33 t ha-1, respectively. The interaction of plant height, number of spikes, thousand-grain weight and total yield was significant, among which the interaction treatment of Bohouth 22 and the highest phosphorus spraying concentration (P2V2) had the highest yield of 4.52 t/ha.

Keywords: Phosphorus; Vegetative Growth; Wheat Cultivars.

INTRODUCTION

The wheat plant Triticum aestivum L. has an important nutritional value, which is reflected in the good balance between carbohydrates and proteins in its grains. In addition, it contains vitamins (B1 and B2), fats and some minerals as well as essential amino acids required by humans (Noaema et al. 2020). The growing interest in this plant has brought many positive things, the most important of which is the development of new varieties with high production capacity by many research institutions in the country. However, the production capacity of each variety, regardless of its specifications, depends on the service procedures carried out according to the correct scientific principles, and experts are committed to investing in methods to increase the productivity of new varieties (Al-Hasany et al. 2020). One of the main ways to achieve this goal is the interest in mineral nutrition, as it plays an important role in improving the growth and productivity of this plant. General nutrients, including phosphorus, play an important role in many important and physiological processes within the plant, such as respiration, photosynthesis, energy production (ATP), enzyme reactions, amino, fat and nucleic acid synthesis, and increasing the efficiency of the transportation of photosynthesis products from the production site to the rest of the plant is an important basis for plant growth and development (Al-Hasany et al., 2018). Foliar fertilization is characterized as an economical method because it reduces the need for macronutrients compared to other methods, in addition, it ensures a rapid response of the nutrient uptake by the vegetative parts of the plant, making it more effective and efficient than other methods (Bryan, 1999). Therefore, the present study was conducted to investigate the response of two bread henna cultivars to foliar application of phosphorus fertilizer and its effect on wheat growth and yield.

MATERIALS AND METHODS

A field experiment was conducted in a farmer's field in Al-Rumaitha district, 25 km north of the governorate during the 2022-2023 growing season to study the response of two wheat varieties (Rashid and Buhuth 22), each represented by a symbol (V2, V1) was symbolized for examination of foliar spraying with three phosphorus concentrations (0, 2000, 4000 mg L-1), each represented by a symbol (P2, P1, P0). R.C.B.D design with three replications and split-plot method were used. The experiment consisted of two factors: the first factor was the wheat variety placed in the secondary panel and the second factor was the phosphorus spray concentration in the primary panel. Composite samples were collected from the depth of cultivated soil (0-30 cm) and the chemical and physical properties of the test soil were analyzed before planting. The details are shown in Table (1).

Table (1) the chemical and physical properties of the experimental soil before planting

Attribute		Value	Unit
pH		7.39	
E.C.		4.21	Desimines M^{-1}
CEC		17.13	Centimeter (+) kg $^{-1}$
Nitrogen Ready		19.71	Mg kg $^{-1}$ soil
Phosphorus Ready		9.15	Mg kg $^{-1}$ soil
Potassium ready		151	Mg kg $^{-1}$ soil
Analysis of minute volumes	sand	367	Kg kg $^{-1}$
	gluten	436	
	Clay	197	
Texture		Silty clay loam	

The test plots were ploughed twice vertically with a rotary harrow before planting and then leveled, leveled and divided according to the plan used. Sowing took place on November 16, 2022, and the test plots were fertilized with phosphorus fertilizer 80 kg P ha-1, heavy superphosphate (46% P2O5), and potassium fertilizer 80 kg K ha -1, which was added in batches at the time of planting. Nitrogen fertilizer was added in the form of urea fertilizer (46% N) in two batches, the first at the time of sowing and the second at 120 kg ha-1 (Al-Abadi, 2011). Phosphorus was sprayed on the plants at the lining stage and in the early morning using a 16-liter backpack sprayer..

RESULTS AND DISCUSSION

1- Plant height (cm)

Table 2 The results show that the variety Rashid (V1) has an advantage, with the highest plant height of 78.23 cm, which is 8.5% higher than the variety Buhuth 22 (V2) with the lowest plant height of 72. 10 cm. . These differences in plant height can be attributed to the different genetic composition of the varieties and the adaptation to the surrounding environmental conditions. This result is consistent with the information of (Al-Hasany, et al. 2019).

Table 2 Plant height results show that after spraying phosphorus fertilizer, the plant height increased significantly due to the superior second phosphorus concentration (P1), reaching 78.95 cm compared to the variety without phosphorus application, with the highest plant height of 71.65 cm. . The increase in plant height may be due to the fact that phosphorus improves plant growth by promoting the formation and proliferation of chlorophyll and many other biochemical processes. This leads to an increase in the efficiency of the photosynthesis process and an increase in the amount of substances produced, which is reflected in the increase in the number of internodes or internode length or

both, which means an increase in plant height. This result is consistent with the information of (Aljana, et al 2022). The results in Table 2 show that the highest plant height was 84.50 cm when Rashid (V3) interacted with the highest phosphorus concentration (P2), and the lowest plant height was 65 cm when the same concentration (P2) interacted with the variety Buhuth 22. , 30 cm Results.

Table (2) Response of two wheat varieties to phosphorus spraying and their interaction in plant height (cm)

V / P	V			**Mean V**
	P_0	P_1	P_2	
V_1	70.50	79.70	84.50	78.23
V_2	72.80	78.20	65.30	72.10
Mean P	71.65	78.95	74.90	
L.S.D. 0.05	V	P	V×P	
	4.46	5.45	7.74	

2- Flag leaf area (cm^2)

The results in Table 3 show that the variety Rashid (V1) with the highest average flag leaf area (56.80 cm2) outperformed the variety Buhuth 22 (V2) with the lowest average flag leaf area (42.40 cm2). The results are consistent with (Noaema et al., 2023).

Table 3 also shows that phosphorus spraying resulted in a significant increase in the average flag leaf area, with the highest average flag leaf area of 57.60 cm2 due to the effect of treatment P2, and the lowest average flag leaf area of the control treatment of 41.65 cm2, which are consistent with what Mosari et al. 2006). As for the interaction between variety and phosphorus spray concentration, no significant difference was found for this trait..

Table (3) Response of two wheat varieties to phosphorus spraying and their interaction in Flag leaf area (cm^2)

V / P	V			**Mean V**
	P_0	P_1	P_2	
V_1	49.60	53.50	67.30	56.80
V_2	33.70	45.60	47.90	42.40
Mean P	41.65	49.55	57.60	
L.S.D. 0.05	V	P	V×P	
	7.68	9.40	N.S	

3- Number of spikes per m^2 (spike m^2)

The results in Table 4 show that spraying plants with the second concentration (P1) of phosphorus resulted in a significant increase, with an average of 412.80 panicles m-2 being achieved, compared to not spraying with phosphorus (an average of 293.30 panicles m-2). The reason for this may be due to the important role of phosphorus in increasing the photosynthesis process, which leads to an increase in the number of panicles per unit area. These results are consistent with both (Poudel et al., 2023). There were no significant differences between varieties and the interaction of this trait..

Table (4) Response of two wheat varieties to phosphorus spraying and their interaction in Number of spikes per m^2 (spike m^2)

V / P	V			**Mean V**
	P_0	P_1	P_2	
V_1	286.00	476.20	302.50	354.90
V_2	301.70	349.30	452.30	367.80
Mean P	293.30	412.80	377.40	
L.S.D. 0.05	V	P	V×P	
	N.S	29.58	N.S	

4- Number of grains per spike (spike $grain^{-1}$)

The results in Table 5 show that the variety Buhuth 22 (V2) had the highest rate of grains per ear, reaching 34.70 grains per ear, while the variety Rashid (V1) had the lowest rate of grains per ear, reaching 28.74 grains per ear. The

reason for this can be attributed to the differences in genetic composition among the varieties, and these results are consistent with (Al-Hasany et al., 2019).
For this trait, there was no significant difference between the phosphorus spray concentrations.
Although the interaction between variety and phosphorus spray showed a significant effect on the grain number per ear trait, the P1V2 combination was found to outperform the rest of the treatments with a yield of 37.80 (Table 5).

Table (5) Response of two wheat varieties to phosphorus spraying and their interaction in Number of grains per spike (spike grain^{-1})

V / P	V			**Mean V**
	P_0	P_1	P_2	
V_1	32.00	22.83	31.40	28.74
V_2	30.57	37.80	35.73	34.70
Mean P	31.28	30.32	33.57	
L.S.D. 0.05	V	P	V×P	
	3.66	N.S	6.35	

5- Weight of 1000 grains (g)

The results in Table 6 show that the average weight of 100 seeds of the variety Rashid (V1) was the highest, at 43.34 g, while the average weight of the variety Buhuth 22 (V2) was the lowest, at 39.32 g. The reason for this can be attributed to the differences in genetic composition between the varieties, which is consistent with (Al-Nasr-Allah and Al-Hasany, 2023).
The results in Table 6 show that the average value of spraying with the second concentration (P1) was the highest, at 45.15 g, compared with 38.33 g without spraying (P0). The reason is that the increase in grain weight is inversely proportional to the average number of grains per ear, because the fewer the number of grains per ear, the higher the seed weight, which is consistent with (Peirce et al., 2019).
The results in Table 6 show that the interaction treatment (V2) among the 22 trials and the second concentration of phosphorus spraying (P1) had the highest acquisition rate of this trait, reaching 46.30 g, while the comparison treatment (P0) of the same variety obtained the highest rate of this trait. V2) had the lowest rate, reaching 38.33 g.

Table (6) Response of two wheat varieties to phosphorus spraying and their interaction in Weight of 1000 grains (g)

V / P	V			**Mean V**
	P_0	P_1	P_2	
V_1	43.00	44.00	43.00	43.34
V_2	35.67	46.30	36.00	39.32
Mean P	38.33	45.15	39.50	
L.S.D. 0.05	V	P	V×P	
	1.60	1.96	2.80	

6- Total grain yield (t ha^{-1})

As can be seen from Table 7, Buhuth 22 (V2) variety performed well with the highest yield of 3.61 tons per hectare, while Rashid (V1) had the lowest yield of 2.72 tons per hectare. The reason for this may be the increase in the number of grains per ear (Table 5), which contributed to the increase in total grain yield. This result is consistent with the explanation of (Al-Nasr-Allah and Al-Hasany, 2023).
The results in Table 7 show that the second phosphorus concentration (P1) achieved the highest grain yield of 3.33 tons per hectare, while no spraying (P0) was 3.08 tons per hectare. The reason can be attributed to the increase in yield components (number of ears per square meter (Table 4) and thousand-grain weight (Table 6)), because total yield is the final result of the influence of environmental factors. Conditions and genetic composition and their interactions and their effects on yield components. These results are consistent with (Ali et al. 2014). The interaction treatment between cultivar Buhuth 22 and the highest P spray concentration (P2V2) had the highest grain yield of 4.52 t/ha, while the interaction treatment between cultivar Rashid and the same concentration had the lowest grain yield of 1.67 t/ha..

Table (7) Response of two wheat varieties to phosphorus spraying and their interaction in Total grain yield (t ha^{-1})

V / P	V			**Mean V**
	P_0	P_1	P_2	

V_1	2.63	3.78	1.67	2.72
V_2	3.52	2.78	4.52	3.61
Mean P	3.08	3.33	3.09	
L.S.D. 0.05	V	P	V×P	
	0.29	0.21	0.61	

7- Biological yield (t ha^{-1})

Table (7) showed that there are no significant differences between the varieties and phosphorus spray concentrations and the interaction between them in the biological yield characteristic.

Table (8) Response of two wheat varieties to phosphorus spraying and their interaction in Biological yield (t ha^{-1})

V / P	V			**Mean V**
	P_0	P_1	P_2	
V_1	8.53	11.03	6.88	8.81
V_2	8.48	7.97	10.53	8.99
Mean P	8.51	9.50	8.70	
L.S.D. 0.05	V	P	V×P	
	N.S	N.S	N.S	

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