



THE RESPONSE OF BARLEY PLANT (LOCAL CULTIVAR) FOR SPRAYING WITH TWO TYPES OF POTASSIUM FERTILIZER AND THEIR EFFECT ON SOME GROWTH TRAITS

Hamdiya Ali Atiyh and Intisar Abdullah Toman

Al-Mussaib Technical Institute, Al-Furat Al-Awsat Technical University, Babylon province, Iraq.

Abstract

An experiment was conducted in the lath house of the Soil and Land Reclamation Department of the agricultural season 2018/2019 to study the effect of spraying two types of potassium fertilizer on some traits of the vegetative growth of the local cultivated barley plant. The study included 3 levels of liquid potassium fertilizer mixed with the Micronutrients are (zero, 50, 100 ml. Liters⁻¹) which contains 10% potassium and 3 levels of liquid potassium fertilizer mixed with sulfur element (0, 50, 100 ml.L⁻¹) which contains (45% potassium, 22% sulfur). The experiment was designed with a Completely Randomized Design (CRD) and with three replicates. The results were as follows: The treatment of liquid potassium spray with the Micronutrients (50 ml.L⁻¹) was significantly excelled and gave the highest averages for the traits of the plant height, the number of tillers per plant, the number of spikes in the plant, the spike length, Number days until the spikes emergency 50% from spikes, while, the treatment of spraying with potassium and sulfur (50 ml.L⁻¹) excelled which gave the highest averages for the same traits above.

Keywords: barley plant, potassium fertilizer, growth traits

Introduction

Hordeum vulgare L. is one of the important grain crops grown in large areas in many countries of the world, due to its nutritional value that excelled other crops. It is used as a green feed or flour to make bread after it is mixed with a certain percentage of wheat flour. Potassium is one of the necessary elements for the growth of different plants, as it participates in many important physiological processes within the plant body such as the formation and stability of proteins and the process of photosynthesis and the transfer and representation of carbohydrates within the plant and has a role in strengthening plants and their lodging wheat resistance (Al-Zubaidi, 2000). Al-Shammari, (2005) used four levels of potassium fertilizer on the barley cultivar, Samir and two locations (Tikrit Island and Al-Alam), where the level 320 kg/ha gave a significant increase in the two weight grains/spike for the first location and the 1000 grains weight for the second location. As for the rest of the traits: plant height, number of Tillers, dry weight, spike length, number of spikes/plant and grain yield, they did not reach the significant level. Al-Jubouri, (2010), when studying four levels of potassium fertilizer in the form of potassium sulfate on the wheat cultivar, IPA 22 significant increases in the levels of fertilizer in the traits of the number of spikes, the 1000 grains weight, the number of spikes, the number of spikelet's, the number of grains, and the increase average amounted to 68%, compared to the control treatment for the last traits. Kotal *et al.*, 2010, when studying the effect of five levels of potassium fertilizer on barley, indicated that there were significant differences in the traits of the 1000 grains weight with the highest average amounted to 19.23 g as measured by the control treatment that gave 11.36 g. while Jubouri *et al.* (2012) showed that the use of potassium fertilizer (zero, 50, 100, 150 kg potassium per ha and ten cultivars of barley resulted in significant differences between the levels. The level of 150 kg potassium / ha gave the highest average in the traits of plant height, number of spikes, total yield, yield index, biological yield and the 1000 grains weight. Al-Yasiri and Al-Sammak, 2015 found that spraying the wheat plant with foliar potassium fertilizer at a level of 4000 mg. Potassium L⁻¹ increased the average plant height,

number of tillers, number of spikes, percentage of protein in grains and total yield. The study aims to compare two types of liquid potassium fertilizer on some traits of vegetative growth of the local cultivars barley plant.

Materials and Methods

An experiment was conducted in the lath house of the Soil and Land Reclamation Department to study the effect of spraying with foliar potassium fertilizer on the leaves of the local cultivars barley. The experiment factors were three levels of liquid potassium fertilizer mixed with Micronutrients are (zero, 50, 100 ml.L⁻¹) which Contains (iron 2.5%, copper 1.5%, manganese 2.5%, zinc 3.5%, and potassium 10%) And three levels of liquid potassium fertilizer mixed with the element of sulfur (zero, 50, 100 ml. Liters⁻¹) which contains (potassium 45%, sulfur 22%). The experiment was designed with a Completely Randomized Design (CRD) and with three replicates. The soil was used as a river soil, and its traits were analyzed according to the methods mentioned in (Black, 1965) (Table 1). 20 seeds were cultivated in 5 kg plastic pods of soil on 11/20/2018. After germination, the plants Thinning to ten. The plants were fertilized with nitrogen fertilizers (urea) and phosphates (superphosphates) according to the specific recommendations of the barley plant. Foliar fertilizers were sprayed with a hand sprayer of 2 liters until full wetness, at an average of 3 times. Duration between 15 days. And the spraying process was conducted in the morning, preceded by irrigation the plants on the previous day, to allow the stomata to swell and open when the water was absorbed by the plant. Before the end of the agriculture season and on 25/4/ 2019, the following traits were measured after selecting 5 plants from each experimental unit (pot) and taking the average for each trait:

- 1- Average plant height (cm)
- 2- Average number of tillers per plant
- 3- Average number of spikes per plant
- 4- Number days until the spikes emergency
- 5- Spike length

The data were statistically analyzed using a method of variance analysis, and the computer averages of the treatments were compared using the least significant mean

difference (L.S.D). At the level of 0.05 and used the Genstat statistical program to analyze the data automatically.

Results and Discussion

Plant Height (cm)

The results in Table 2 indicated that there were significant differences between the potassium and sulfur fertilizer treatments in the traits height of the main stem of the barley plant. The treatment was excelled to 50 ml. Liters-1 significantly and gave the highest averages of 46.33 cm, compared to the control treatment (spraying with water only)

which gave the lowest average amounted to 36.33 cm. The same table also indicates that there are significant differences between the levels of potassium fertilizer and microelements. The treatment 50 ml.L⁻¹ excelled and gave the highest average height of the plant to 46.67 cm compared to the control treatment that gave the lowest averages and reached 35.33 cm. The interaction treatment (50 ml.L⁻¹ potassium and sulfur + 50 ml.L⁻¹ potassium and microelements) was excelled and gave the highest average plant height amounted to 55 cm.

Table 2 : Effect of potassium fertilizer spray on plant height trait (cm)

Average	Potassium fertilizer and micro nutrients ml.L ⁻¹			Potassium and sulfur fertilizer ml.L ⁻¹
	100	50	0	
36.33	37	39	33	0
46.33	47	55	37	50
41.33	42	46	36	100
	42.00	46.67	35.33	average
interaction 8.44	Potassium fertilizer and micro nutrients 4.22		Potassium and sulfur fertilizer 4.22	LSD0.05

The number of tillers.plant⁻¹

The results in Table 3 indicated that there were significant differences between the potassium and sulfur fertilizer treatments in the number of tillers .plant⁻¹, where the treatment 50 ml.L⁻¹ significantly excelled and gave the highest averages amounted to 5.83 (tiller .plant⁻¹) compared to the control treatment (spraying with water only) which gave the lowest averages amounted to 4.63. The same table also indicates that there were significant differences between

the levels of potassium fertilizer and microelements .per plant, The treatment 50 ml.L⁻¹ excelled and gave the highest average number of tillers average amounted to 5.67 tiller.plant⁻¹, compared to the control treatment that gave the lowest averages amounted to 4.93 tiller.plant⁻¹. The interaction treatment (50 ml.L⁻¹ potassium and sulfur + 50 ml.L⁻¹ potassium and micronutrients) was excelled which gave the highest average of the number of tillers amounted to 6.50 tiller .plant⁻¹.

Table 3 : The effect of potassium fertilizer spraying on the number of tillers /plant

Average	Potassium fertilizer and micro nutrients ml.L ⁻¹			Potassium and sulfur fertilizer ml.L ⁻¹
	100	50	0	
4.63	4.7	4.9	4.3	0
5.83	5.7	6.5	5.3	50
5.40	5.4	5.6	5.2	100
	5.27	5.67	4.93	average
interaction 0.74	Potassium fertilizer and micro nutrients 0.37		Potassium and sulfur fertilizer 0.37	LSD0.05

The number of spikes in the plant

The results in Table 4 indicated that there were significant differences between the potassium and sulfur fertilizer treatments in trait of the number of spikes for barley, the treatment 50 ml.L⁻¹ was significantly excelled and gave the highest averages amounted to 4.43 spike.plant⁻¹, compared to the control treatment (spraying with water only) which gave the lowest averages amounted to 3.27. The same table also indicates the presence of significant differences

between the levels of potassium fertilizer and micronutrients, the treatment 50 ml.L⁻¹ excelled and gave the highest average the number of spikes in the plant reached 4.23 spike.plant⁻¹, compared to the control treatment that gave the lowest averages amounted to 3.43 spike.plant⁻¹. The interaction treatment (50 ml.L⁻¹ potassium and sulfur + 50 ml.L⁻¹ potassium and microelements) was excelled and gave the highest average plant height amounted to 4.81 spike.plant⁻¹.

Table 4 : The effect of potassium fertilizer spraying on the number of spikes in the plant

Average	Potassium fertilizer and micro nutrients ml.L ⁻¹			Potassium and sulfur fertilizer ml.L ⁻¹
	100	50	0	
3.27	3.54	3.46	2.80	0
4.34	4.32	4.81	3.90	50
4.04	4.09	4.42	3.60	100
	3.98	4.23	3.43	average
interaction 0.34	Potassium fertilizer and micro nutrients 0.17		Potassium and sulfur fertilizer 0.17	LSD0.05

The number days until the spikes emergency

The results in Table 5 indicated that there were significant differences between the potassium and sulfur fertilizer treatments in the number days until the spikes emergency for barley which it gave the highest average number of days amounted to 74.67 days. The same table also indicates the presence of significant differences between the levels of potassium fertilizer and microelements, the

treatment 50 ml.L⁻¹ was excelled and gave the lowest average number of days reached 65.33 days, compared to the control treatment that gave the highest number of days reached 78.33 days. The interaction treatment (100 ml.L⁻¹ potassium and sulfur + 50 ml.L⁻¹ potassium and micronutrients) was excelled and gave the lowest the number days until the spikes emergency reached 62 days.

Table 5 : The effect of potassium fertilizer spraying on The number days until the spikes emergency

Average	Potassium fertilizer and micro nutrients ml.L ⁻¹			Potassium and sulfur fertilizer ml.L ⁻¹
	100	50	0	
74.67	72	69	83	0
68.33	66	65	74	50
68.00	64	62	78	100
	67.33	65.33	78.33	average
interaction 3.14	Potassium fertilizer and micro nutrients 1.57		Potassium and sulfur fertilizer 1.57	LSD0.05

The average spike length (cm)

The results in Table 6 indicated that there were significant differences between the potassium and sulfur fertilizer treatments in the trait of the average spike length for barley, the treatment 50 ml. L⁻¹ was excelled to significantly and gave the highest average amounted to 6.97 cm, compared to the control treatment (spraying with water only) which gave the lowest average of spike length amounted to 5.67 cm.

The same table also indicates the presence of significant differences between the levels of potassium fertilizer and the microelements, the treatment 50 ml.L⁻¹ excelled and gave the highest average amounted to 7.17 cm, compared to the control treatment that gave the lowest average amounted to 5.70 cm. The interaction treatment (50 ml.L⁻¹ potassium and sulfur + 50 ml.L⁻¹ potassium and microelements) was excelled and gave the highest average amounted to 7.7 cm.

Table 6 : The effect of potassium fertilizer spraying on spike length (cm)

Average	Potassium fertilizer and micro nutrients ml.L ⁻¹			Potassium and sulfur fertilizer ml.L ⁻¹
	100	50	0	
5.67	6.1	6.3	4.6	0
6.97	6.9	7.7	6.3	50
6.70	6.4	7.5	6.2	100
	6.47	7.17	5.70	average
interaction 0.86	Potassium fertilizer and 0.43 micro nutrients		Potassium and sulfur fertilizer 0.43	LSD0.05

The increase in the traits of vegetative growth as a result of spraying potassium fertilizer levels with its two types mixed with sulfur and mixed with micronutrients is due to the effect of potassium on increasing the efficiency of biological processes, especially in the manufacture of carbohydrates, proteins, vitamins and fats, and the regularity of their transmission and storage in plant tissues, As the availability of potassium in the vegetative stage is important and essential for converting the materials manufactured in leaves into spikes to complete their formation and fullness. The significant increase in the average of the traits may be due to the important role of potassium in increasing the activity of enzymes and then regulating the biological processes that take place within the plant tissues, and these processes stimulate flowering and spike nodes, which he referred to (Xuan, 1999).

We conclude from the study that the use of liquid potassium fertilizers mixed with elements of sulfur and some micronutrients sprayed on the barley plant at 50 ml levels. L⁻¹ led to an increase in the traits of vegetative growth for barley, which is the plant height (cm), number of tillers per plant,

number of spikes per plant, Number days until the spikes emergency.

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