



EFFECTS OF PLANTING METHODS AND FOLIAR FERTILIZATION NPK IN GROWTH AND YIELD OF BARLEY (*HORDEUM VULGARE* L.) GROWN UNDER THE CONDITIONS OF THE CENTRAL REGION.

Ayad Hussain Ali Al-Maeini¹, Hanaa Khudhaier Mohammed Ali Al-Haidary² and Safaa Abd AL-Hassan AL-Zubaidy³

¹Department of Field Crops, College of Agricultural, University of Al-Qasim Green, Babylon, Iraq.

²Department of Field Crops, College of Agricultural Engineering Sciences, University of Baghdad, Karrada District, Al-Jadiriya, Baghdad, Iraq.

³Department of Field Crops, College of Agricultural, University of Al-Qasim Green, Babylon, Iraq.

Corresponding author: janatsafaa2013@gmail.com

Abstract

A field experiment was conducted in 2015 in one of the farmers' fields in Al-Tajia, east of Hilla, in order to study the effect of the methods of agriculture and foliar fertilization NPK in the growth and yield of barley (*Hordeum vulgare* L.). The experiment included two methods of agriculture (scattering on lines) and the different fertilization methods (without spray of fertilizer, spraying for one time, spraying twice) using RCBD by applying the split plots experiment, which included the methods of agriculture (main blots), fertilization methods (sub plots) and three replicates. The results showed the dominance of the method of cultivation on lines in the content of chlorophyll spade, number of tillers. m², number of spikes.m² and grain yield which were 3.90 t.ha⁻¹ while the methods of agriculture did no significant in height of plant (cm), crop growth rate (CGR) gm.m².day and Weight 1000 grain (gm). The results showed an increase of twice the method of spraying twice of the NPK compound fertilizer in most of the growth characteristics and the grain yield which was 4.43 t. ha⁻¹. The results showed a significant interaction between the methods of planting and Number of sprays of NPK as the method of cultivation on the lines with twice spray of NPK compound in the content of chlorophyll, number of tillers. m², number of spikes.m², weight of 1000 grains and grain yield 4.71 t.ha⁻¹, while the method of agriculture exceeded the lines and spraying for one time in crop growth rate.

Keywords : Foliar fertilization, barley, crop growth rate, NPK.

Introduction

Prepare barley (*Hordeum vulgare* L.) is the most important winter crop in Iraq, using green fodder and seed production, which is used in the manufacture of concentrated fodder for large animals and birds, and its seeds are used in the manufacture of malt and bread. Barley also has more salinity, drought and disease than wheat, so its productivity is better in adverse weather conditions (Al-Otaibi, 2000). Barley is grown in Iraq, usually in the prose way in a small area and large and is told in a manner of immersion in the boards often lead to this lack of control in the distribution of water in the field and increase in water losses as well as the irregular distribution of plants in the unit area in the root region and result in poor ventilation as Chemical fertilizers are susceptible to washing, especially nitrogen, because it is very soluble. Therefore, adopting other non-traditional agricultural methods to ensure a suitable environment for plant growth. Therefore, the use of the method of agriculture on the lines is considered important agricultural methods through which to provide an environment suitable for the growth of plants and the optimal distribution of plants in the unit area where Ali and Aljuboori (2011) noted no significant differences in the height of wheat plants planted in boards and prose method. Soomro and others (2009), after applying two methods of growing wheat (lines, prose), agriculture in lines surpassed the prose by the number of branches of the plant, and the method along the lines gave it the highest average weight of 1000 tablets. Jan and Achron (2001) found that agriculture in the lines exceeded the prose method in the weight of 1000 tablets. They gave averages of 45.6 and 43.5 g respectively. E Comparative method of prose 2.0 tons. Khan and others (2000) found that agriculture in the lines exceeded the prose method at an average weight of 1000 grains/g and the grain yield was 4.8 tons. The method of the

lines was 4.2 tons. For the method of prose, and the method of lines in the harvest guide has also been surpassed. Mehrvar and Hormoz (2006) showed that the yield of wheat was three lines, one per cent, and the other, with a yield of 9.3, 8.3.7.8 tons. E respectively. Kilic (2010) indicated that the cultivars were superior to the prose method in the mean protein ratio, which gave 12.2 and 12.18% respectively. Abd El Lattief (2011) concluded that the ratio of protein in grain to three methods (mulch, lines, prose) was 11.6, 11.7 and 11.2%, respectively. The method of planting on the crop was the highest growth rate of the crop, while the prose cultivation gave the lowest rate in the average number of branches of the plant, which differed significantly on the method of cultivation on the lines, while the methods of cultivation did not differ in the content of the leaves of chlorophyll.

Nitrogen is one of the most nutrients needed by plants, ranging from 2% to 5% of plant dry matter. It is an essential component of protoplasm, cellular membranes, nucleic acids, amino acids and some vitamins. It plays an important role in increasing resistance to stress). Phosphorus is a major nutrient needed by the plant in large quantities and involves the synthesis of many important compounds, amino acids, proteins, phosphates and enzymatic compounds such as NAD and NADP. Phosphorus also plays an important role in physiological processes such as photosynthesis, breathing, cell division and root growth. Most plants need fertilizer additives, especially potassium, which is needed by all plants, although not in any organic compound and its absorption is active and to accumulate in the tissues of the plant and affects, this element in the process of division and expansion of mast cells and has a role in the mechanism of opening and closing the gaps as the mechanism of opening and closing, the stomata is associated with the content of

potassium and sugars. (1993, Krauss). Svensson *et al.* (2004) explained that the use of npk liquid fertilizer at different levels caused an increase in plant elongation because nitrogen contributed to the growth and development of plant cells. And Svobodova (2004) of his study of several fertilizer treatments under the conditions of water stress for the barley crop, the use of paper manure caused a significant increase in grain yield and the number of ears and protein content of the grain. RVF (2005) noted that npk fertilization resulted in an increase of 68% compared to a non-fertilizer treatment. Gutierrez *et al.* (2008) concluded that the use of NPK spray on plants caused an increase in the efficiency of fertilization, which increased the development of plants, especially in the early stages of the plant, as well as reducing environmental damage to the soil. The results of Sebastiano *et al.* (2005) showed that in the experiment with the use of liquid npk fertilizer at different stages of plant life, the addition of fertilizer showed significant differences in the grain and protein content in the grains compared with the treatment without adding fertilizer. The study conducted by Haraldsen *et al.* 2010, showed that the use of NPP resulted in an increase in barley yield, especially in low fertility areas, and that the addition of nitrogen caused an increase in nitrate uptake by the plant. Haraldsen (2011) used six fertilizer treatments, including npk, an increase in NPK absorption in grains when used in rasha, which was reflected in barley grain yield. In their study of the effect of different sources of nitrogen (metallic, organic, bio) on the yield and efficiency of wheat yield, Abdel-Rahman and Mohamed (2015) reported that the addition of NPK to the plant gave the higher yield than other treatments.

The aim of this study is to determine the effect of planting methods on the growth and yield of barley, as well as determine the best method for the major elements NPK, which is added to the plant.

Materials and Methods

This study was applied in one of the fields of farmers in the Tajia area east of Hilla city in 2015 to study the effect of the methods of agriculture and paper fertilization NPK in the growth and yield of barley. (M1, M2) Respectively, and the secondary spraying methods (no spray, one spray, two sprays) respectively, the secondary panels (the most important factor) were occupied. The area of the unit was 6 m⁻² for the cultivation of the lines, which included (10) lines in the single panel, the distance between the lines (20) cm (Mansour, 2013).

Methods of adding manure NPK

S0 = without spraying depending on soil fertilization

S1 = one brush at the forest level

S2 = the first two splashes at the forest stage and the second at the elongation stage

Soil analysis:

(5 samples) were taken from all the soil of the experiment and in a depth ranging from (0-30) cm and were mixed well after drying the antenna and analyzed in the laboratories of the Faculty of Agriculture / Department of Field Crops.

Table 1 : Shows some physical, chemical and chemical properties of soil.

EC dsm . ⁻¹	PH	CEC Meg/100g	Sol.Na Meg/100g	OM %	NO ₃ P.P.M	P P.P.M	K Meg/100g	CaCO ₃ %
5.0	7.4	20.3	1.6	1.2	43	3.1	0.81	20.5
Gypsum %	Ca ⁺⁺ Meg/L	SO ₄ Meg/L	CL ⁻ Meg/L	HCO ₃ Meg/L	Mg ⁺⁺ Meg/L	sand	loam	Clay
						21	37	42

The soil was plowed into two perpendicular grooves with a plow, and then the soil was divided into three replicates (6 units) according to the design used. Thus, the total number of units was 18 units. Ground Nitrogen Fertilizer was used for 400 kg N. H-1 in the form of urea 46% N. Added to the first three batches at the agriculture and the second at the ventricle and the third at the ventricle (AL.Haidari, 2003). Add phosphate fertilizer at the rate of (80 kg) P₂O₅ / e in a super phosphate single 20% P₂O₅ added at the rate of one batch of seed when preparing the land was Agriculture on 12/11/2015 completion of the emergence of re-growing lines or plates where the failure to germinate the experiment immediately after planting and then continued irrigation experiment and was as needed.

Attributes studied:

1 - Plant height / cm:

The stem was measured from the surface of the soil to the end of the spike and to ten plants taken randomly from each experimental unit and then by the rate of height of the plant leg per experimental unit.

2 - Number of leaves / leg: According to the number of leaves of ten legs randomly from each experimental unit

3-Crop growth rate.

5 Five plants were taken from each experimental unit randomly from the first reading phase and the second reading elongation phase. Then dried at 75 °C for 72 hours. To extract the average daily growth of gm.m⁻²-day (Simane, 1992).

$$CGR = \frac{1}{A} \times \frac{W_2 - W_1}{T_2 - T_1}$$

whereas:

A = Area occupied by the plant

W₁ = Plant weight during T1 period

W₂ = Plant weight during duration

4- Number of forests / m²: The count was calculated for the length meter and then about to per square meter for each experimental unit.

5- Chlorophyll content: The readings were taken as an average of 5 readings per plant and the average of the experimental unit was extracted using the SPAD device.

7-Number of ears.m²: Al-Sanabel was calculated for an area of 1 m² per experimental unit.

8- Weight of 1000 grain (g): 1000 tablets were taken randomly from the grain yield and weighed after harvest and each experimental unit.

9- The ton of grain. E⁻¹: According to the harvest of three intermediate lines of each experimental unit and about on the basis of tons.

Results and Discussion

1. Growth characteristics

The results of Table (2) showed significant differences between the methods of cultivation used. The method of

agriculture was superior to the average chlorophyll rate, which gave the highest rate of SP. 44.71 compared to the prose method. This was due to the regular distribution of plants and the maximum use of light, which was reflected in the increase in chlorophyll in the leaves and the increase in the number of branches per plant, while the methods of cultivation did not differ significantly in the average height of the plant and the growth rate of the crop. M-2. This day is consistent with the results of both Ali and Aljuboori (2011) and Soomro *et al.* (2009).

Table 2 : Effect of NPK method in some growth characteristics of barley plant.

Numbers of leaf. plant	CGR gm. m ⁻² . day	Chlorophyll content Spad	Numbers of tellers m ⁻²	Plant height (cm)	Treatment
					planting method
5.70	86.22	38.04	429.9	95.6	M ₁
6.61	83.61	44.71	527.5	103.7	M ₂
0.68	N.S	4.96	61.9	N.S	LSD
					fertilization method
5.49	75.31	33.90	424.3	90.7	S ₀
6.03	87.40	42.17	466.4	96.4	S ₁
6.95	92.12	48.07	545.3	111.8	S ₂
0.46	15.1	4.35	24.9	6.1	LSD
					Interaction
5.20	82.00	31.80	359.4	84.4	M ₁ S ₀
5.42	82.46	38.13	413.9	91.0	M ₁ S ₁
6.49	94.10	44.20	516.3	111.5	M ₁ S ₂
5.78	68.32	36.00	489.3	97.0	M ₂ S ₀
6.65	92.41	46.20	518.9	101.8	M ₂ S ₁
7.42	90.13	51.93	574.2	112.2	M ₂ S ₂
0.63	22.12	5.49	38.6	8.11	LSD

The results of Table (2) showed significant differences between the NPK methods in growth characteristics. The method of adding two seedlings achieved the highest average plant length of 111.8 cm compared to other methods. This may be attributed to the fact that paper fertilization NPK caused an increase in elongation and growth, In supporting roots and strengthening them, which is reflected in the growth of legs. This method was significantly higher in the average chlorophyll ratio of 48.07 spade. This was due to the role of nitrogen in increasing the chlorophyll rate in the leaves. This method also gave a significant increase in the growth rate of the crop reached 92.12 g / m² / day, which is due to the role of paper fertilizer in the increase. The cellular divisions of the plant were reflected on the daily growth of the intentions,

The method of adding two plasters of paper fertilizer has exceeded the number of branches/m², which reached 545.3 branches/m², as well as the number of leaves / stalk, which reached 6.95 sheets/leg.

The results of Table (2) showed a significant overlap between the methods of cultivation and the method of paper fertilization NPK. The treatment of M2 S2 gave the method of cultivation on the lines with the addition of two slices of NPK the highest mean length of the plant which is not significantly different from the treatment (M1 S2) The treatment (S2 S2) was higher in the average chlorophyll ratio of 51.93 spad, while the M1 S2 treatment was higher in the

crop growth rate of 94.10 g/m²/day, and the M2 S2 treated the highest average of 574.2 branches.

2- Yield and components

The results of Table (3) showed significant differences between the two methods of agriculture in the average number of saplings. M-2 This may be due to the superiority of this method in giving it the highest average for each of the number of branches. M2 and the number of leaves, which was reflected in the increase in the number of snails. M-2. The method of the lines exceeded the average grain yield of 1 tonne-1, giving a grain yield of 3.90 tonne-1 as compared to the prose method. This can be attributed to the superiority of this method. And this is consistent with the results of Khan and others (2000), Jan and others (2001) and Kilic (2010), while the two methods did not differ significantly in the number of grains. Spike and weight of 1000 grain.

The results of Table (3) indicate significant differences between fertilization methods used in the average number of ears. M 2, as the method of adding two sprayers gave it the highest number of 505.0 m 2. This may be due to increased crop growth and an increase in the number of branches in the plant, which was reflected in the increase in the number of ears. M2. The method of adding two sprayers also exceeded the average weight of 1000 ppm, which was 43.6 g. This can be attributed to increased chlorophyll and plant growth rate, thus increasing the efficiency of photosynthesis and increasing dry matter (source) (Downstream).

Table 3 : Effect of NPK method on yield and its components and quality of barley plant.

Grain yield t.h ⁻¹	Weight 1000 grain. gm	Number of grains. spikes ⁻¹	Number of spikes	treatment
				Planting method
3.51	34.6	34.69	381.3	M₁
3.90	38.5	34.42	508.2	M₂
0.33	N.S	N.S	68.4	LSD
				fertilization method
2.76	28.5	32.99	370.0	S₀
3.92	37.6	35.59	459.3	S₁
4.43	43.7	35.49	505.0	S₂
0.58	6.5	1.8	24.9	LSD
				Interaction
2.68	27.6	32.33	340.1	M₁ S₀
3.69	35.3	35.64	365.2	M₁ S₁
4.15	40.9	36.90	438.7	M₁ S₂
2.83	29.3	33.65	399.9	M₂ S₀
4.16	40.0	35.54	553.3	M₂ S₁
4.71	46.4	34.07	571.3	M₂ S₂
0.68	7.2	2.3	42.7	LSD

It is clear from the results of Table (3) that there are significant differences between the methods of fertilization in the average grain yield of 1 tonne⁻¹, as the method of spraying twice gave the highest mean of 4.43 tons.⁻¹ and this can be attributed to the superiority of this method in the number of ears. M-2 and weight of 1000 tablets. This was reflected in the total grain yield. The results of Table (3) showed a significant overlap between the methods of agriculture and NPK in the average number of ears. M2, giving M2 the highest number of spikes of 571.3 spikes. M-2, which did not differ significantly from the treatment M2 S1, which amounted to 553.3 spike. M-2, this may be attributed to the superiority of M2 S2 treatment in the number of forests. Resulting in an increase in the number of cables. M-2. The M2 S2 treatment excelled at an average weight of 1000 tablets of 46.4 g. The results of Table (3) showed a significant overlap between the coefficients in the average grain yield of 1 tonne-1. The M2 treated S2 achieved the highest yield of 4.71 tons, which can be attributed to the superiority of this treatment in the number of ears. M -2 and the weight of 1000 tablets. Which caused an increase in grain yield.

Conclusions

1. Different methods of agriculture in the studied traits
2. The method of adding manure spread in most studied traits.

Recommend

Cultivation of barley (IBA 99) was done in the manner of the lines, and the NPK was sprayed twice (twice).

References

- Abdel Lattief. E.A. (2011). Bread wheat (*Triticum aestivum* L.) productivity and profitability as affected by methods of sowing and seeding rate under Qena. Environment Asia J. Crop. Sci., 3(4): 188- 196.
- Abu Dahi, D. Yousef Mohammed and Muayed Ahmed Yunus 1988. Directory of Plant Nutrition. Baghdad University. Directorate of the House of Books for Printing and Publishing, Mosul University. Iraq.
- Ali, A.H and Aljuboori, R.K. (2011). Efficient irrigation methods for the production of wheat in the region of central Iraq. Proceeding of salahaddin University, Erbil, Kurdistan, Iraq. 3: 944-947.
- Al-Haidari, H.K. (2003). Effect of dates of addition of levels of nitrogen and seed rates In the characteristics of the growth, yield and quality of bread wheat (*Triticum aestivum*. L). thesis. Baghdad University. College of Agriculture.
- Gutiérrez-Miceli Federico Antonio a,*; Garcí a-Goómez Roberto CarlosRincón Rosales Reiner a, Abud-Archila Miguel a, Oliva Llaven Mari´a Angela Marcos Joaquín Guillen Cruz a, Luc Dendooven.2008. Formulation of a liquid fertilizer for sorghum (*Sorghum bicolor* (L.)Moench) using vermicompost leachate. Bio resource Technology 99: 6174–6180.
- Hashim, M.H. and Khalil, I.M.A. (2012). Effect of Seed and Potassium Fertilizer Rate in Barley Growth and Barley. Journal of Iraqi Agricultural Sciences-J.Bio.Sci.,4(6): 657- 659.
- Jan, M.T.; Haider, A. and Amanullah, J. (2001). Influence of sowing methods and mulching on yield and yield components of wheat. Pak.
- Khan, H. (2000). Effect of sowing method and seed rate on growth and yield of barley (*Hordeum vulgare* L.). Pak. J. Bio. Sci., 6(3): 970-982.
- Kilic, H. (2010). The effect of planting methods on yield and yield components of irrigation spring durum wheat varieties. Sci. Res.E., 5(20): 3063- 2069.
- Krauss, A. (1993). Role of Potassium in fertilizer nutrient efficiency. Cited by K.Menggel and A Kraus. 1993. K availability of soils in west Asia and North Africa. Status and Perspectives. Basel Switzerl and, 39: 57.
- Mansour, H.N. (2013). Response of barley to water stress in the impact of the method of agriculture, Master of the University of Babylon - Faculty of Agriculture.
- Mehrvar, M.R. and Hormoz, A. (2006). Agronomical and seeding rates in wheat (*Triticum aestivum* L.). J. Agron. 5(4): 626-633.
- Misra, B.N.;Verma, B.S. and Singh, K.N. (1982). N, P and K requirements of two-row barley. Indian J. agric. Sci., 52: 669-673.

- Mohamed K.; Abdel-Fattah and Abdel-Rahman M.A.M. (2015). Effect of Different Sources of Nitrogen Fertilizers Combined with Vermiculite on Productivity of Wheat and Availability of Nitrogen in Sandy Soil in Egypt. *American Journal of Plant Nutrition and Fertilization Technology*, 5 (2): 50-60.
- Moiiah, M.S. and Paul, N.K. (2008). Growth Attributes of Barley (*Hordeum vulgare* L.) in Relation to Soil Moisture Regimes, and NPK Fertilizers. *J. Bio-Sci*, 16: 19-24.
- Mollah, M.S. and Paul, N.K. (2011). Responses of Irrigation and Fertilizers on the Growth and Yield of *Hordeum vulgare* L. Bangladesh. *J. Sci. Ind. Res.*, 46(3): 369-374.
- Otaibi (2000). Effect of Nitrogen Fertilization and Seed Rate on Fodder and Dual-Purpose Grain in Barley. King Saud University - Faculty of Agriculture.
- Sebastiano DELFINE*, Roberto TOGNETTI, Ersilio ESIDERIO, Arturo ALVINO. (2005). Effect of foliar application of N and humic acids on growth and yield of durum wheat. *Agron. Sustain. Dev.* 25 : 183–191.
- Simane, B. (1993). Ontogenic analysis of yield components and yield stability of durum wheat in winter limited environment. *Euphytica*, 7: 211- 219.
- Soomro, U.A.; Mujeeb, U.R.; Ejaz, A.O.; Shereen, G. and Abdul Qadir, T. (2009). Effect of sowing method and seed rate on growth and yield of wheat (*Triticum aestivum* L.) world. *J. Agric. Sci.*, 5(2): 159-162.
- Svobodova, P.M. (2004). Effect of drought stress on the formation of yield elements in spring barley and the potential of stress expression, *Soil Environ.*, (10): 439–446.
- Haraldsen, T.K.; Andersen, U.; Krogstad, T. and Sorheim, R. (2010). Liquid digestate from anaerobic treatment of source separated household waste as fertilizer for barley. *Risk assessment—risks of biosources* 5(3): 564-569.