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INFLUENCE OF LEVELS OF NITROGEN AND MOWING ON GRAIN YIELD AND ITS COMPONENTS FOR BARLEY CROP (*HORDEUM VULGARE* L.)

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ABSTRACT

A field experiment was conducted at Al-Hilla, Babylon province and for the two seasons 2017-2018 and 2018-2019. To know the effect of different levels of nitrogen (140,60,0 and 220 kg N.ha^{-1}) and the number of Mowing (without mowing and one and two mowing) and their interaction in the yield and quality of grain for barley crop cultivar bohuth 244. In this experiment, the split plots were used with three replicates, Nitrogen levels were occupied by the main plots and the number of Mowing in the subplots. The results showed that adding of nitrogen fertilizer resulted in a significant increase in the studied traits of the two seasons except for the number of grains/spike and the weight of 1000 grains for the first season and The treatment 220 kg /N.ha^{-1} excelled in each of the numbers of spikes/m^2, number of grain/ spike, weight of 1000 grain for the second season, and grain yield for the two seasons. As for the effect of the Mowing, it showed a significant effect on all the studied traits, and the treatment without Mowing was distinguished in both the number of grain/spike, the grain yield for both seasons, and the weight of 1000 grains for the second season only. No significant difference with the treatment one Mowing showed in the trait of the number of spikes/m^2 for both seasons and the weight of 1000 grain for the first season.

Keywords : Barley, Number of grain/ spike, Grain yield.

Introduction

Hordeum vulgare L. is an important grain crop in Iraq, where it is used mainly in most countries of the world as a feed crop, either as a green feed or as a grain in a concentrated diet mixture. It is also used on a small scale in human feeding, especially in poor countries, by mixing its flour with wheat flour in making bread. Barley bread is also used in feeding diabetics. Grain crops respond to nitrogen fertilization, especially in poor soils, as it helps to increase the speed of vegetative growth and improve the nutritional value of feed by increasing its protein content and increasing the grain yield. Nitrogen is an important component of the plant where it is included in the synthesis of amino acids, nucleic acids and protein (Al- Sadawi and Younis, 1992). Baktash and Kadhim (2002) found significant differences between nitrogen levels and above 180 kg N.ha^{-1} in the number of spikes/m^2, the number of grains/spike, grain yield and for both agriculture season for the wheat crop. In a study of the effect of Mowing on two cultivars of barley, the without Mowing treatment excelled in 1000-grain weight trait. The one Mowing treatment excelled on the two Mowing treatment (Latif *et al.*, 1996) and Latif *et al.* (2002) showed that the grain yield and its components were "significantly" affected by the Mowing operation, where the number of spikes/m^2, the weight of 1000 grains and the grain yield increased, After taking one Mowing, compared to a treatment without Mowing, two Mowing and three Mowing for the barley cultivar, Samir. It was supported by Al-Jubouri *et al.* (2003) when studying the effect of the Mowing on the grain yield and its components of the barley crop, where the one Mowing treatment was superior to one grain in the number of spikes/m^2, number of grains/spike, weight of 1000 grains, and this was reflected in the total grains yield. Al-Saadi (2000), when studying levels of nitrogen and the number of Mowing , found that the high levels of nitrogen led to a significant increase in the number of spikes, the number of grains, the weight of 1000 grains and the grain yield, and that the treatment without Mowing was excelled to the treatment of one and two Mowing. Still, the process of producing barley where feed inside Iraq is limited and needs more studies to advance this crop because of its important role in feeding animals of all kinds. Therefore, interest in growing feed crops and increasing their production and diversifying their sources is important. Therefore, this study was conducted to know the effect of nitrogen fertilization and Mowing and their interaction on the grain yield and its components of the barley yield, cultivar bohuth 244.

Materials and Methods

A field experiment was conducted at Al-Hilla, Babylon province and for the two seasons 2017-2018 and 2018-2019. To know the effect of different levels of nitrogen and the number of Mowing and their interaction in the yield and quality of grain for barley crop cultivar bohuth 244. In soils with physical and chemical properties are shown in Table (1). The experiment was conducted according to the arrangement of split-plot design and with three replicates. The treatments were distributed according to the Randomized complete block design (R.C.B.D). The nitrogen levels (140,60,0 and 220 kg N. ha^{-1}) were distributed to the main plots, while the Mowing treatments were distributed (without a Mowing, One

Mowing, two Mowing) on the subplots. The soil of the experiment was plowed, then smoothing and leveling, and then divided into plots with dimensions of (4×3m). The plots contain 15 lines and represent every 5 treatment lines and the distance between one line and another 15 cm and the distance between one treatment and another 30 cm, and plots were separated by a distance of 1.5 m to prevent compost leakage between the main plots. cultivation took place on 1/11 2017 for the first season and on 4/11/ 2018 for the second season with a seed quantity of 120 kg ha^{-1}. The experiment was fertilized with triple calcium superphosphate (46% $5P_2O$) and on the basis of (40 kg P. ha^{-1}), it was added in one batch when cultivation. Urea fertilizer (46%) used a source of nitrogen, added to the first batches after two weeks of cultivation, while the rest of the batches, they are added after each Mowing to ensure that the plants are encouraged to grow after the Mowing. The harvest took place in the second and third week of May, the following traits have been studied:

Number of spikes/m^2: The spikes were calculated in meters length, and then converted to an area of 1 m^2 per experimental unit.

Number of grain/ spike: Calculated from 10 spikes, taken "randomly" in each experimental unit.

Weight of 1000 grain (g): We weighed 1,000 grain "randomly" after harvest and for each experimental unit.

Grain yield (tons. ha^{-1}): The three mean lines for all treatments were harvested at a length of (3 m) after leaving (0.5 m) from both ends of each line. Then the weight of the grain yield added to it (the yield of ten spikes) and turned into tons.ha^{-1}.

Statistical analysis of the data was done on the basis of the analysis of variance for each of the studied traits and the mean of the treatments was compared by calculating the least significant difference. LSD under the probability level of 5% (Steel and Torrie, 1960).

Table 1 : Some chemical and physical properties of soil *

Soil Texture	The soil content of lime ($g.kg^{-1}$)	Organic matter ($g.kg^{-1}$)	pH	EC $dsm.m^{-1}$	Components of soil separates ($g.kg^{-1}$)		
					Sand %	Silt %	Clay %
silty clay	238	12.2	7.3	5.5	17.4	52.3	30.3
silty clay	240	11.3	7.1	7.2	16.5	50.5	33.0

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Results and Discussion

Number of spikes/m^2

Table (2) showed a significant effect of nitrogen levels on the average of this trait, where fertilization treatment at concentration 220 kg N.ha^{-1} gave the highest average for this trait and for both seasons and reached 497.02 and 508.61 respectively, and did not differ statistically from the treatment of 140 kg N. ha^{-1} for the first season. The reason is due to the increase in vegetative growth and the efficiency of branching by increasing the amount of added nitrogen, which leads to an increase in the number of spikes. These results are consistent with Khushnaw (2000), Baktash and Kadhim (2002), Shaker (2014) and Al-Karkhi (2014) found, as they stated that increasing nitrogen leads to an increase in the number of spikes of barley and wheat crops. The results also showed a significant effect of the Mowing, where the control treatment without a Mowing was excelled on the treatment of one and two Mowing and for both seasons and gave the highest average number of spikes / m^2 to 496.19 and 473.35 respectively, and it did not differ significantly from the treatment of one Mowing. From the table, there was a "significant" effect of the interaction, where the treatment 220 kg N.ha^{-1} and with no Mowing and one Mowing on the rest treatments and for the two seasons. The reason is that the nitrogen fertilizer encourages branching and the plant has enough time to form the spikes, and the one Mowing Mowing encouraged the plant to branch out, which increased the number of spikes in the treatments that were Mowing for once, but repeated Mowing may lead to the death of some branches and the depletion of stored foodstuffs in the plant and not having enough time to complete the growth, which reduced "significantly " the number of spikes with barley. This is consistent with Al-Bahadly (1989), Al-Saadi (2000), Munsif *et al.* (2013) and Al-Ta'i (2016) in crops, where they mentioned that high fertilization treatments and without Mowing and one Mowing resulted in an increase in the number of spikes in the feed crops belonging to Poaceae family studied by barley, oats, Triticale and millet.

The number of grains/spike

The results in Table (3) show that there was a significant effect of increasing nitrogen quantities added for the second season only, and the treatment 220 kg N. ha^{-1} gave the highest average number of grains was 50.56 grain/ spike. However, it did not differ statistically from the treatment of 140 kg N.ha^{-1}. This may be due to the increase in the number of fertile spikelet's in spike by increasing the amount of nitrogen fertilizer, and this is consistent with Bakr *et al.* (1991), Baktash and Kadhim (2002) and Al-Alawi (2011) have found, as they found an increase in the number of grains /spike with an increase in nitrogen levels. The results show in the table that there was a significant decrease in the average number of grains in spike after one Mowing and two Mowing, compared to the treatment without Mowing for both seasons, which gave the highest average of grains/spike (50.81 and 50.38) for both seasons, respectively. The reason for the decrease is due to the shortening of the period of the spike development due to the lack of sufficient time for the development of meristem and consequently affected the formation and development of a sufficient number of new spikelet's (Dunphy *et al.*, 1982). These results are consistent with Bakr *et al.* (1991) and Singh *et al.* (2014). They stated that the Mowing and its frequency affected negatively "the number of grains/spike in the crops of barley and oats. This we did not notice a significant interaction between nitrogen and the number of times the Mowing and the two seasons of cultivation.

Weight of 1000 grain (g)

Table (4) indicates the presence of significant differences with increasing nitrogen fertilizer for the second season only, and the treatment 220 kg N. ha^{-1} gave the highest average for this trait was 33.55 g. The reason may be due to that nitrogen led to an increase in vegetative growth and then to an increase in the average and efficiency of photosynthesis, which in turn led to an increase in the accumulation of chemical components in the grain and increased its fullness (Langer and Liew1973). These results agree with Bakr et al (1991) and Al-Saadi (2000). They stated that, with increased nitrogen levels, the weight of grains in the crops of barley, oats, Triticale and millet increased. While Alazmani *et al.* (2014b) found a 1000 grain weight decrease with increased nitrogen fertilization levels. A significant decrease in the weight of 1000 grains is observed after the Mowing . The reason for the decrease in the grain weight is due to the decrease in the size of the tissue in the process of photosynthesis, which led to a decrease in the accumulation of chemical components in the grain and that repeated Mowing leads to the depletion of nutrients and the shortening of the growing period of the crop (Dunphy and others. 1982 and Isa 1990) These results agree with Latif *et al.* (1996) and Latif and Ramadan (2000) and Alazmani *et al.* (2014b). They found a decrease in the weight of 1000 grains after repeated Mowing in the barley and structural crops. from the same table, there is a significant interaction between nitrogen levels, the number of Mowing and The combination 220 kg N. ha^{-1} with treatment without Mowing and for both seasons excelled, but it did not differ statistically "from the combination 220 kg N.ha^{-1} with one Mowing.

Grain yield (tons. ha^{-1})

The results in Table (5) indicate the presence of significant differences between the different fertilization levels in the grain yield average, where treatment 220 kg N. ha^{-1} excelled compared to other treatments and gave the highest yield, reaching 4.59 and 3.95 tons. E^{-1} for both seasons respectively. These results agree with Al-Bahadly (1989) and Baktash and Kadhim (2002), who explained that the increase in nitrogen fertilizer led to an increase in the grain yield. The reason may be due to an increase in the number of spikes, the number of grains, and the weight of 1,000 grains. The results show that there were significant differences between the Mowing treatments in the grain yield average. The treatment without Mowing was excelled compared to the rest of the treatments, as it gave the highest average of grain yield 4.74 and 3.72 tons.ha^{-1} for the two seasons respectively. These results agree with Bakr *et al.* (1991), Alazmani *et al.* (2014a) and Al-Ta'i (2016). They stated that the treatment without Mowing excelled on the rest of the treatments and that the Mowing resulted in a reduction in the yield of the barley crop. The results indicate a significant interaction in the average of this trait, where the combination 220 kg N. ha^{-1} with without Mowing treatment excelled and gave the highest grain yield of 5.41 Tons.ha^{-1} did not differ statistically from treatment 140 kg N. ha^{-1} With without Mowing treatment for the first season, the combination 220 kg N. ha^{-1} with one Mowing for the second season was excelled. It gave 4.40 tons. ha^{-1} which was not statistically different from the combination of 220 kg N. ha^{-1} with treatment without Mowing, These results agree with Bakr *et al.* (1991), They stated that the treatments that were given the highest nitrogen fertilization and were not exposed to Mowing gave the highest grain yield.

Table 2 : Shows the effect of different levels of nitrogen and the number of Mowing on the average number of spikes/m^2.

Second season						First season				
Average	**Two Mowing**	**One Mowing**	**without Mowing**	**N× Mowing**		**Average**	**Two Mowing**	**One Mowing**	**without Mowing**	**N× Mowing**
377.29	344.63	385.45	401.79	**N0**		422.09	404.82	423.41	438.05	**N0**
434.32	373.21	485.09	444.66	**N60**		467.16	394.77	516.78	489.91	**N60**
455.06	398.53	458.55	508.12	**N140**		482.37	432.66	495.30	519.05	**N140**
508.61	440.66	546.34	538.83	**N220**		497.02	418.86	534.50	537.68	**N220**
—	389.26	468.85	473.35	**Average**		—	412.77	492.50	496.19	**Average**
N-C 23.54	**C** 11.77	**N 19.41**	**L.S.D**			**N-C 23.28**	**C** 11.64	**N 21.84**	**L.S.D**	

interaction = NC Mowing = C nitrogen = N

Table 3 : Shows the effect of different levels of nitrogen and the number of mowing on the average number of grains/spike

Second season						First season				
Average	**Two Mowing**	**One Mowing**	**without Mowing**	**N× Mowing**		**Average**	**Two Mowing**	**One Mowing**	**without Mowing**	**N× Mowing**
45.78	43.28	47.12	46.95	N0		48.28	46.22	47.52	51.12	N0
47.85	45.48	48.10	49.98	N60		48.80	45.88	50.14	50.38	N60
49.75	46.62	50.79	51.85	N140		49.08	48.18	48.18	50.87	N14 0
50.56	47.77	51.19	52.74	N220		49.67	48.66	49.48	50.87	N220
—	45.79	49.30	50.38	Average		—	47.23	48.83	50.81	Average
NC n.s	C 0.80	N 1.70	L.S.D			NC n.s	C 1.20	N n.s	L.S.D	

Table 4 : Shows the effect of different levels of nitrogen and the number of Mowing on an average of The1000 grain weight (g)

Second season						First season				
Average	**Two Mowing**	**One Mowing**	**without Mowing**	**N× Mowing**		**Average**	**Two Mowing**	**One Mowing**	**without Mowing**	**N× Mowing**
31.95	30.74	32.53	32.57	**N0**		34.66	33.31	35.56	35.11	**N0**
31.84	30.67	32.31	32.54	**N60**		34.61	32.66	35.67	35.52	**N60**
32.36	30.59	32.94	33.57	**N140**		35.72	31.99	36.15	36.01	**N140**
33.55	31.03	34.61	35.01	**N220**		34.55	32.08	35.13	36.44	**N220**
——	30.76	33.10	33.42	**Average**		——	32.51	35.63	35.77	**Average**
NC 0.56	**C** 0.28	**N 0.30**	**L.S.D**			**NC 1.15**	**C** 0.58	**N n.s**	**L.S.D**	

Table 5 : Shows the effect of different levels of nitrogen and the number of mowing on average grain yield (tons. ha^{-1})

Second season						First season				
Average	**Two Mowing**	**One Mowing**	**without Mowing**	**N× Mowing**		**Average**	**Two Mowing**	**One Mowing**	**without Mowing**	**N× Mowing**
2.71	2.23	2.84	3.05	N0		3.08	2.44	3.28	3.53	N0
3.16	2.49	3.44	3.55	N60		3.95	2.96	4.13	4.75	N60
3.38	2.62	3.61	3.90	N140		4.29	3.20	4.41	5.27	N140
3.95	3.06	4.40	4.39	N220		4.59	3.53	4.83	5.41	N220
——	2.60	3.57	3.72	Average		——	3.03	4.16	4.74	Average
N_xC 0.21	C 0.10	N 0.17	L.S.D			N_xC 0.22	C 0.11	N 0.09	L.S.D	

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