The effect of nitrogen fertilization levels and varieties at each mowing on the yield and quality of green and dry fodder for the barley crop *Hordeum vulgare* L.

Fatimah Ali Jamel, Waleed abdulredha Jabail , Khawla Rashige Hassan
Department of Field Crop,College of Agriculture,University of Basrah,Iraq
Fatimah Ali Jamel // fatima.chamel@uobasrah.edu.iq

Abstract:

A field experiment was carried out at the Agricultural Research Station of the College of Agriculture / University of Basrah, Karma Ali site in Basra Governorate during the winter season 2022-2023 with the aim of studying the best level of nitrogen fertilizer and the number of mowing times that give the best yield of green and dry fodder and some qualitative qualities for three varieties The experiment was carried out by arranging the split split plot according to the design of the complete random sectors R.C.B.D and with three repeats where The main plots included the number of times mowing (mowing once, twice, three times) which are (C1, C2, C3) and the varieties occupied the secondary plots (Buraq , Ibaa 99, Ibaa 265) which is symbolized by (V1, V2, V3) while the panels under the secondary included fertilizer levels (100,200,300) N kg h^{-1} and symbolized by N1, N2, N3) and summarized the most important results: -

The fertilizer level N3 significantly exceeded in all the studied traits the yield of green and dry fodder and the protein quotient and the fiber yield and amounted to (20.97, 33.21 and 49.80 tons h^{-1} respectively as a green fodder yield, while the dry yield reached a value of (6.60, 9.62 and 14.90) tons h^{-1} respectively for the three mowings As for the protein yield, if the fertilization level N3 gave the highest average of 1.059 and 1.766 tons h^{-1} respectively for the second and third mowinges only, while the fiber yield was the highest average when treating the mowing for one time, amounting to 1.228 tons $h^{-1,}$ while the results showed the superiority of the V1 variety significantly in the characteristic of the quotient Green and dry fodder and protein yield gave the highest average of (50.84, 15.37 and 1.813) tons ha^{-1}, respectively, for the third mowing. As for the interaction between fertilization levels and types, it was significant in terms of green and dry fodder yield and protein and fiber yields in some mowings.

Keywords: barley, nitrogen fertilization, varieties, yield.

Introduction

The barley crop is *Hordeum vulgare* L. is one of the most important strategic fodder crops and important in the world and is used for two important purposes, namely obtaining green fodder and grains, as well as its uses in various industries, and barley crop is characterized by its high nutritional value because it contains a high percentage of amino acids and protein by 13%, high levels of fiber and contains vitamins, especially vitamin B (1). As well as its uses in the reclamation of soil affected by salinity. Most of the Iraqi land is suitable for cultivation, in central and southern Iraq the barley fields cultivated in these areas are exploited for mowing or direct grazing(2). The yield of green and dry fodder is affected by several factors, including varieties if the barley crop gives 2-3 mowinga and the middle of 12-14 tons h^{-1} green fodder per mowing and this depends on the variety and its ability to regrow and the density of the vegetative group as the yield of green and dry fodder and the percentage of protein and fiber varies according to the varieties and the number of mowinges (3) Another factor is the response of fodder crops to nitrogen fertilization, especially in poor soils because it helps to

ISSN 2072-3857

increase the speed of vegetative growth and improve the nutritional value of feed and it is recommended to add in batches after each mowing to activate branching and regrowth (4, 5) . Nitrogen is an essential nutrient for the plant and is classified as one of the major nutrients needed by the plant in large quantities, and in the event that it is not available at the required level, it limits plant growth and weakens its performance, and then leads to a lack of feed yield (6).

Barley can be planted at an early date, especially in the province of Basra, where there is a lot of animal husbandry and which needs fodder during the winter season in which the bushes and reeds plants, yellow and white corn and others, which are the main fodder material for these animals, and by taking one or two mowinges from it to obtain a quantity of green fodder, especially in the winter season, to address the shortage in this period (7)

Based on the above, and the importance of the crop in the field of green and dry fodder production of importance to livestock, and the large number of approved and traded varieties in Iraq, this study was conducted with the aim of:

1 - Determine the best variety and the best level of nitrogen fertilizer, which gives the highest yield of green and dry fodder and the best quality.

2- Determine the mow that gives the highest yield of green and dry fodder and the best quality.

Materials and Methods

A field experiment was carried out during the winter season in 2022/2023 in Basra Governorate at the Agricultural Research Station of the College of Agriculture / University of Basrah (Karma Ali site of the University of Basra) in soil with a weaving (clay mixture) to find out the effect of levels of nitrogen fertilization and the number of mowings on the yield of green and dry fodder and its quality for three varieties.

The experiment was applied in order Split-Split plots Using the Design of Complete Random Block (R.C.B.D.) And with three repeats the main plots included three mowings (C1,C2,C3)The symbol C1 is a one-time mowing, C2 is a two-time mow, and C3 He was mowing three times. As for the secondary plots , they include three varieties of barley (Buraq and Ibba 99 and Ibba 265) and symbolized by (V1, V2, V3).As for the plots under the secondary they included the quantities of nitrogen fertilizer And three levels (100-200-300) kg h^{-1} symbolizes (N1,N2,N3) the land was divided into plots (2×2=4 m2) contains the unit Experimental on 10 lines under planting and the seeds were placed in lines and the distance between one line and another 20 cm, planting was on the first of November for all experimental units and at a seeding rate of (180) kg h^{-1} (8)As for phosphate fertilizer, which is added in the amount of (60 kg P2O5 h^{-1}) in the form of triple superphosphate fertilizer P2O5% (46%) before planting (9).The land was irrigated immediately after planting, while other irrigations were given as needed, while nitrogen fertilizer was added according to the study parameters and by three equal batches in the form of urea fertilizer (46%N). ،The first after emergence and the second addition after the first mowing, while the last batch after the second mowing analyzed the data statistically According to the method of analysis of variance for each of the studied traits, the averages of the coefficients were compared with the calculation of the lowest significant difference L.S.D . and below the probability

ISSN 2072-3857

level of 0.05 and according to what was mentioned (10) .

The following qualities were calculated:

1- Green fodder yield (ton h^{-1}): according to the yield of green fodder per Mowing through square meters From each unit experimentally randomly taking into account the start In the process of mowing After the dew disappears from the leaves of plants, then the weight of the feed yield by an electronic scale to avoid moisture loss, then the weight is adjusted on the basis of tons h^{-1} With the full mower of the experimental unit when taking the reading and then calculated as the total quotient of the total green fodder and for all the mowings for each experimental unit

2- Dry feed yield (tons h^{-1}).

Dry feed yield per mowing was calculated depending on the use of oven To dry the samples of green fodder yield until the weight is stable by taking 100 g per experimental unit and then calculated the percentage of dry matter according to the equation: - Percentage of dry matter = dry weight / wet weight * 100

Then calculate the feed yield and for all coefficients from the following equation:

Dry feed yield (ton h^{-1}) = yield of green fodder (ton h^{-1})* % of dry matter

3- Crude protein yield (tons. h^{-1}): It was calculated according to the following equation:

Crude protein yield (tons. h^{-1}) = dry matter yield (ton.h^{-1}) ×% for crude protein.

4- Fiber yield: It was calculated according to the following equation: -

Crude fiber yield (ton h^{-1}) = dry matter yield (ton h^{-1}) ×% of fiber

Results and discussion

1- Green fodder yield (ton h^{-1})

Table (1) shows the existence of significant differences between the levels of nitrogen fertilization and varieties and the interaction between them, as the level exceeded N3 and a significant difference from the rest of the levels, giving the highest average yield of green fodder amounting to 20.97, 33.21 and 49.80 tons h^{-1} respectively .While N1 gave the lowest average for this trait of 14.88, 26.69 and 42.67 tons h^{-1} respectively .For the mowings C1, C2 and C3 and the reason may be that The addition of nitrogen led to an increase in the growth of the vegetative system and an increase in the height of the plant and the number of seedlings and the prolongation of the vegetative growth period, which causedan increase in the total green fodder yield, and this is consistent with) (3) The results also showed that the varieties have differed significantly in this characteristic, as the V1 class excels in The three mowings gave the highest averages, which amounted to 19.72, 33.32 and 50.84 tons h^{-1} respectively, and the reason may be attributed to the abundant growth of the V1 variety (Buraq). While the V2 variety gave the lowest average for this trait amounting to 14.77, 26.90 and 39.95 tons.h^{-1} This may be due to the genetic factors of the variety, which may contain genetic factors that led to an increase in its efficiency in absorbing nutrients from the soil and an increasein the activity of vital processes within the plant and an increase in the storage of other substances such as sugars and amino acids, which It is reflected in the increase and vegetative growth activity of this variety and thus increase the yield of green fodder and this result agreed with (1,11,19)

The results of the same table indicate a significant effect of interaction between varieties and fertilization levels only. For C1 and C2, the combination (N3×V1) excelled at the highest average of 22.73 and 37.40 tons h^{-1} for the two mowings respectively While the combination (N1×V2) gave the lowest average

ISSN 2072-3857

of 12.23 and 23.53 tons h^{-1} respectively.For the two mowings The reason for this is due to the positive role of nitrogen in increasing cell division and activity and increasing their size, so growth improves and increases plant height and the number of shoots, as well as the genetic nature of the varieties.

Table (1) The effect of nitrogen fertilization and varieties on the average characteristic of the total green fodder yield ton h^{-1} .

One-time mowing (C1)				
fertilization / Varieties	**N1**	**N2**	**N3**	**Average Varieties**
V1	**17.54**	**18.88**	**22.73**	**19.72**
V2	**12.23**	**14.20**	**17.87**	**14.77**
V3	**14.87**	**15.91**	**22.30**	**17.69**
Average fertilization	**14.88**	**16.33**	**20.97**	
lsd	**interaction=1.169**	**Varieties =1.099**	**Fertilization = 0.539**	
Two-time mowing (C2)				
fertilization / Varieties	**N1**	**N2**	**N3**	**Average Varieties**
V1	**29.40**	**32.90**	**37.40**	**33.23**
V2	**23.53**	**27.67**	**29.50**	**26.90**
V3	**27.13**	**29.83**	**32.73**	**29.90**
Average fertilization	**26.69**	**30.13**	**33.21**	
lsd	**interaction=1.391**	**Varieties =1.182**	**Fertilization = 0.750**	
three-time mowing (C3)				
fertilization / Varieties	**N1**	**N2**	**N3**	**Average Varieties**
V1	**47.76**	**49.60**	**55.17**	**50.84**
V2	**37.10**	**39.97**	**42.80**	**39.95**
V3	**43.15**	**47.22**	**51.43**	**47.27**
Average fertilization	**42.67**	**45.59**	**49.80**	
lsd	**interaction=NS**	**Varieties =1.323**	**Fertilization = 1.292**	

2- Dry feed yield (ton h^{-1})

The results of Table (2) showed a significant effect between the levels of nitrogen fertilization and varieties and the overlap between them in the characteristic of dry feed yield if the N3 level gave the highest average of 6.60, 9.62 and 14.90 tons h^{-1} respectively, while the N1 level gave the lowest average for this trait was 4.46, 7.89 and 13.19 tons h^{-1}. sequentially for the three mowings The reason is attributed to the increase in the yield of green fodder Table (1) and this is consistent with(12)The results indicated that the varieties differed

significantly in this characteristic in the second and third mowing only V1 outperformed and recorded the highest averages of 9.71 and 15.37 tons h^{-1} respectively, while class V2 gave the lowest average for this trait of 8.01 and 12.54 tons.h^{-1} For the two mowings sequentially The reason for this may be due to the increase in the yield of green fodder and this result agreed with (11, 13,18) As for the effect of interaction between varieties and fertilization levels It was significant at the third mowing only, as the combination (N2×V3) excelled at the highest average of 16.16 tons $h^{-1,}$ while the combination (N2×V2) gave the lowest average of 11.28 tons h^{-1} and this is consistent with (14).

Table (2) Effect of Nitrogen Fertilization and Varieties on the Average Characteristic of Total Dry Feed Yield Ton h^{-1} .

One-time mowing (C1)				
fertilization / Varieties	**N1**	**N2**	**N3**	**Average Varieties**
V1	**4.99**	**5.30**	**7.02**	**5.77**
V2	**3.60**	**4.90**	**5.43**	**4.64**
V3	**4.79**	**4.54**	**7.35**	**5.56**
Average fertilization	**4.46**	**4.91**	**6.60**	
lsd	**interaction=NS**	**Varieties =NS**	**Fertilization = 1.048**	
two-time mowing (C2)				
fertilization / Varieties	**N1**	**N2**	**N3**	**Average Varieties**
V1	**9.38**	**9.65**	**10.09**	**9.71**
V2	**6.41**	**8.20**	**9.41**	**8.01**
V3	**7.88**	**9.16**	**9.35**	**8.80**
Average fertilization	**7.89**	**9.01**	**9.62**	
lsd	**interaction=NS**	**Varieties =0.878**	**Fertilization = 0.729**	
three-time mowing (C3)				
fertilization / Varieties	**N1**	**N2**	**N3**	**Average Varieties**
V1	**15.22**	**15.87**	**15.01**	**15.37**
V2	**11.42**	**11.28**	**14.92**	**12.54**
V3	**12.94**	**16.16**	**14.76**	**14.62**
Average fertilization	**13.19**	**14.44**	**14.90**	
lsd	**interaction=2.146**	**Varieties =1.663**	**Fertilization = 1.248**	

3- Crude protein yield (tons. h^{-1})

The results of Table (3) show that there is a significant effect of varieties and fertilization levels on protein yield when treating mowing twice C2 and mowing for three times C3 if the fertilization level N3 gave the highest

average of 1.059 and 1.766 tons h^{-1} respectively for C2 and C3, while the N2 level gave the lowest average of 0.806 and 1.421 tons h^{-1} respectively. The reason for this may be attributed to the high amount of the total yield of green fodder and the dry matter yield of the treatment C3 compared to the treatment of mowing for one time C1 and this result is consistent with(15).As for the effect of the varieties, it was significant when treating the mowing for two times C2 and the mowing for three times C3 only, as the class V1 outperformed and recorded the highest average of 1.073 and 1.813 tons h^{-1} respectively for C2 and C3, while the class V2 gave the leastmediated for this trait amounted to 0.830 and 1.389 tons h^{-1}The reason for this is due to the genetic factors of the V1 variety and containing genes that enable its leaves to increase the formation of amino acids because of its efficiency in absorbing nutrients, especially nitrogen and phosphorus, which enter into the synthesis of amino acids and thus increase the composition of protein and its proportion in green fodder and this result is consistent with the findings (1, 15) .The results of the same table also indicate a significant effect of the interaction between the levels of fertilization and varieties when treating C3 only, as the combination **(**N2×V1**) gave** the highest average of 1.957 tons h^{-1}**,** and these results are consistent with (15,16).

Table (3) Effect of Nitrogen Fertilization and Varieties on the Average Protein Yield Characteristic Ton h^{-1}.

One-time mowing (C1)				
fertilization / Varieties	**N1**	**N2**	**N3**	**Average Varieties**
V1	**0.505**	**0.550**	**0.720**	**0.591**
V2	**0.356**	**0.440**	**1.780**	**0.860**
V3	**0.489**	**0.430**	**0.729**	**0.550**
Average fertilization	**0.450**	**0.470**	**1.080**	
lsd	**interaction=NS**	**Varieties =NS**	**Fertilization = NS**	
two-time mowing (C2)				
fertilization / Varieties	**N1**	**N2**	**N3**	**Average Varieties**
V1	**0.979**	**1.119**	**1.121**	**1.073**
V2	**0.625**	**0.855**	**1.008**	**0.830**
V3	**0.815**	**0.942**	**1.048**	**0.935**
Average fertilization	**0.806**	**0.972**	**1.059**	
lsd	**interaction=NS**	**Varieties =0.0872**	**Fertilization =0.0763**	
three-time mowing (C3)				
fertilization / Varieties	**N1**	**N2**	**N3**	**Average Varieties**
V1	**1.642**	**1.957**	**1.840**	**1.813**
V2	**1.202**	**1.258**	**1.707**	**1.389**
V3	**1.420**	**1.842**	**1.751**	**1.671**
Average fertilization	**1.421**	**1.686**	**1.766**	

ISSN 2072-3857

lsd	**interaction=0.2559**	**Varieties =0.1938**	**Fertilization =0.1510**	

4- Crude fiber yield (ton.h^{-1}).

The results of Table (4) indicated that there are significant differences between the levels of fertilization when treating the mowing C1 only if the N3 level gave the highest average for this trait of 1.228 tons h^{-1} compared to the N1 level which gave the lowest average of 0.936 tons h^{-1}**.** The reason for this is that the number of times the mowing control the increase and decrease of the percentage of fiber in green fodder with the addition of nitrogen fertilizer and this is consistent with (17) We note from the same table that there is no significant effect of the varieties in all mowings, while the interaction between the levels of fertilization and varieties was significant when treating C3, the combination (N3×V2) gave the highest average for this trait of 2.770 tons h^{-1} and the reason for this may be due to the frequency of mowing that led to an increase in the yield of dry matter, which has a positive role in the yield of fiber and this result is consistent with(14).

Table (4) Effect of Nitrogen Fertilization and Varieties on the Average Fiber Yield Characteristic Ton h^{-1}.

One-time mowing (C1)				
fertilization / Varieties	**N1**	**N2**	**N3**	**Average Varieties**
V1	**1.015**	**1.097**	**1.298**	**1.136**
V2	**0.773**	**1.135**	**1.075**	**0.994**
V3	**1.021**	**0.950**	**1.310**	**1.094**
Average fertilization	**0.936**	**1.061**	**1.228**	
lsd	**interaction= NS**	**Varieties =NS**	**Fertilization =0.1944**	
two-time mowing (C2)				
fertilization / Varieties	**N1**	**N2**	**N3**	**Average Varieties**
V1	**1.721**	**1.640**	**1.640**	**1.667**
V2	**1.280**	**1.512**	**1.627**	**1.473**
V3	**1.586**	**1.581**	**1.640**	**1.603**
Average fertilization	**1.529**	**1.578**	**1.636**	
lsd	**interaction=NS**	**Varieties =NS**	**Fertilization = NS**	
three-time mowing (C3)				
fertilization / Varieties	**N1**	**N2**	**N3**	**Average Varieties**
V1	**2.612**	**2.665**	**2.586**	**2.621**
V2	**2.084**	**1.954**	**2.770**	**2.269**
V3	**2.442**	**2.764**	**2.593**	**2.600**
Average fertilization	**2.380**	**2.461**	**2.650**	
lsd	**interaction=0.3861**	**Varieties =NS**	**Fertilization = NS**	

ISSN 2072-3857

references

1- Al-Jiashi, Mahmoud Thamer Abed.2020. The effect of mowing, planting dates and varieties on some characteristics and yield of fodder and grains for barley crop. *Hordeum vulgare* L. PhD thesis, college Agriculture, Muthanna University.

2- Shanta, Kazem Saad. 2016. The impact of climate change on strategic cereal production and food security in Iraq. Journal of Literature, University of Baghdad, 119:353-386.

3- Al-Kinani, Ahmed Hatem Ajeel Maadi.2019. Effect of nitrogen fertilization and the number of mowings on the yield of fodder and grains of barley crop. *Hordeum vulgare* L. Master's thesis, Department of Field Crops, College of Agriculture, University of Basra.

4- Plaza-Bonilla, D. Cantero-Martinez, C.; Bareche, J.; Arrüe, J. L.; Lampurlanés, J. and Alvaro-Fuentes, J. (2017). Do no-till andpig slurry application improve barley yield and water and nitrogen use efficiencies in rainfed Mediterranean conditions? Field Crops Research, 203: 74-85.

5- Al-Rafi'i, Zeina Thamer Abdel Hassan. 2019. Study of the efficiency of barley plant *Hordeum vulgare* L. Warka was classified in the use of nitrogen and related titrants under the influence of nitrogen fertilizer levels and the number of cuts. Karella University Scientific Journal, 14 (4): 191-182.

6- Vicente, R.; Vergara Bort, -Diaz, 0.; Kerfal, S.; Lopez, A.; Melichar, J.; and Kefauver, S. C. (2018). Identification of traits associated with barley yield performance using contrasting nitrogen fertilizations and genotypes. Plant Science

7- Ziara, Ahmed Jaafar.2013. Effect of sowing quantities and mowing dates on the growth and yield of feed and grain for barley *Hordeum vulgare* L. Master's thesis.College of Agriculture. University of Basrah.

8- Yasser, Zainab Abdul Karim.2016. Effect of Irrigation Water Magnetization and Seed Rates on Barley Growth and Yield Hordeum vulgare L. Master's thesis. College of Agriculture - University of Basrah.

9- Mahdi, Ali Salim, Maha Nayef Kazem and Samira Abdullah.2011. Barley agriculture, productivity, industry and consumption. General Authority for Agricultural Extension and Cooperation, Ministry of Agriculture, Republic of Iraq.

10- Alrawi, Kmowinga Mahmoud and Abdul Aziz Khalaf Allah. 1980. Design and analysis of agricultural experiments. Dar Al-Kutub Foundation for Printing and Publishing. University of Mosul. Ministry of Higher Education and Scientific Research. Iraq .

11- Al-Kafa'i, Maryam Hamid Kazim.2018.Response of newly introduced varieties of wheat Triticum aestivum L. and barley .Hordeum vulgare L to different planting dates. Master's Thesis. Faculty of Agriculture - Muthana University.

12- Al-Shuwaili, Muhammad Hassan Fares.2014.Effect of Nitrogen Fertilization and Seed Quantities of

Barley (*Hordeum vulgare* L.*)* with Egyptian clover (*Trifolium alexandrinum* L.) in the yield and quality of feed .

13- Latif, Ahmed Abdul Rahim.2005. The effect of the frequency of mowing and the stages of cutting on the yield of green fodder and its quality in four varieties of barley. (18) No. 3. Eighth, Technical Learning Commission, Baghdad.

14- Al-Laheef, Esraa Saud Mohammed. 2022. Effect of Egyptian alfalfa seeding rate, oats and spraying with elements micro in growth, yield and quality of feed. Master Thesis, Department of Field Crops, Faculty Agriculture, University of Basrah.

15- Al-Attabi, Bayda Karim Jaaz.2011. Response of two varieties of barley (*Hordeum vulgare* L.) for fertilization Nitrogen and the number of mowings in the green yield and grains. Master Thesis, Technical College-
Al-Musayyib.

16- Al-Bouthamer, Wafa Kamel Jaber.2018. The effect of mowing on the characteristics of the nu and the yield of some varieties of barley And oats, Master's thesis, College of Agriculture, Muthanna University.

17- Hajighasemi, S.; Keshavarz-Afshar, R. and Chaichi, M. R. (2016) Nitrogen fertilizer and seeding rate influence on grain and forage yield of dual-purpose barley. Agronomy Journal, 108(4): 1486-1494.

18- Alrubaiee, S. H. and Alsulaiman M. A.(2023). Effect of foliar application of Humic acid on some Growth properties and forage yield of Oat cultivars (Avena sativa L.). Bionatura. 8(3):131**.**

19- Alshadiwi SMA, Alrubaiee SHA (2022). Effect of foliar applied amino acid on growth characteristics of Oat (Avena sativa L.). SABRAO J. Breed. Genet. 54(5): 1183–1190**.**

.