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Effect Of Different Levels Of Nitrogen Fertilization And Cultivars On The Green Fodder Yield And The Grain Yield Of Oats (*Avena Sativa* L.)

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Abstract
The experiment was conducted during the 2020-2019 agricultural season, at one of the agricultural fields of the Agricultural Extension Department, in Al-Muthanna Governorate, to study the effect of different levels of nitrogen fertilization and cultivars on green fodder yield, grain yield and oat crop components.The experiment included two factors, the first of which was four levels of fertilization (N0, N80, N160 and N240).The second factor was three cultivars of oats (Bohoth11, Jouda and Shefaa). The experiment was carried out using the split-plots design using R.C.D.B. and with three replicate.Fertilization levels were placed in the main plots and cultivars in the sub plots.
The results showed that Jouda cultivar was better than the number of tillers in the first clipping, while Shefaacultivar outperformed in the second clipping, and also surpassed in specific weight, number of leaves and green fodder yield for the first clipping with the highest averages, and for the specific weight and number of leaves for the first and second clipping, and green fodder for the first clipping, as for the second clipping, Joudacultivar was superior. Shefaacultivar also surpassed in the number of grains in the dahlia, the weight of a thousand grains, and the grain yield by giving the highest averages. As for fertilization treatments, the N240 fertilization treatment outperformed all the studied traits in the experiment except for the number of tillers in the first clipping. The interaction, the combination (V3 X N240) outperformed most of the study traits.
Keywords:nitrogen fertilization, cultivars, fodder yield, grain yield, oats (*Avena sativa* L.)

Introduction
Oats (*Avena sativa* L.)were a wintry annual herbaceous plant of the Poaceae family. It was grown in many countries of the world as a dual-purpose crop for cereal and fodder production, as it is fed by animals, characterized by the intensity of its vegetative growth and the abundance of leaves, which was characterized by being soft, which makes it palatable for animals(Rines, 2006).
Clippingwas an important factor affecting the growth, yield and quality of the forage crop, this effect varies according to the number of clipping, because it was one of the factors most influencing the production of green and dry fodder (Patel *et al*., 2013).
The yield increase per unit area of feed, comes as a result of the development of agricultural technologies, as the use of appropriate quantities of nitrogen fertilizer, which improving plant growth, by entering mainly in the manufacture of proteins, amino acids and energy compounds (Hopkins, 1999).

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Benaragama (2011) noted that the superiority of the SA05001 genotype, which gave the highest feed yield of 10.78 tons. ha^{-1}, compared to the SA05479 genotype, which gave 7.90 tons. ha^{-1}.
Al-Zarkani (2017) show that when studying four cultivars of the oat crop, foundthe superiority of the genusaniacultivar in the characteristic of plant height over the rest of the varieties.
Al-Hassani (2014) noted that the two genotypes gave the highest average grain yield, reaching 8.55 and 8.44 tons. ha^{-1}.
Hameed et al. (2014) reported that when studying three genotypes of oats, V3 genotype was significant, as it recorded the highest averages in the quality of the number of leaves and the green fodder yield, it reached 5.41 leaves and plant 68.43 tons. ha^{-1}.
Therefore, it became necessary to search for other means or technologies, lead to an increase in the yield, as a study of the best amount of fertilizer with a number of cultivars, This study came with the aim of studying the effect of different levels of fertilizer treatments and cultivars on feed yield, grain yield and its components.

Materials and Methods

A field experiment was conducted at Al-Warka District, Al-Muthanna Governorate. During the 2019-2020season, to determine the effect of different levels of nitrogen and clipping on the feed yield and grain yield of three cultivars of oats in soil, some of their chemical and physical properties (Table 1).

Table 1. Some chemical and physical properties of field soil.

Type of analysis	Value	Units
Electrical conductivity EC	6.2	ds. m^{-1}
pH	6.1	
Available nitrogen	17.7	mg. Kg^{-1}
Available phosphorous	28.7	mg. Kg^{-1}
Available Potassium	121.5	mg. Kg^{-1}
Soil properties		
sand	270	g. Kg^{-1} soil
Silt	600	g. Kg^{-1} soil
Clay	130	g. Kg^{-1} soil
Soil texture	Silt Loam	

The experiment was carried out according to the split-plot design, using the (R.C.B.D) Complete BlockDesign with three replicates. The treatments were distributed randomly within each block, bringing the total of the experimental units to 36 experimental units.Where the cultivars were represented (Bohoth11, Jouda and Shefaa), denoted by V1, V2, and V3,at the sub plots. While nitrogen levels were developed (N0, N80, N160, and N240) kg N. ha^{-1}, at the main plots, it was denoted by N1, N2, N3, and N4. Clipping was carried out when the height of the plant was 35-40 cm. The experimentland was prepared by plowing two perpendicular to the tipping plow, the soil was enriched with disc harrows, and settled by the settlement machine. The land was divided according to the design used into panels with an area 2 × 2 m. The cultivation was carried out on the lines of the distance between one line and another 20 cm, the sub plots were separated from each other 0.5 m.

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Studied traits

1. **Number of tillers. m^2:**It was calculated from a 25 cm longitudinal section of each experimental unit randomly and then converted on the basis of square meters.

2. **The number of leaves per plant (leaf. $Plant^{-1}$):**The number of leaves per plant was calculated as the average of ten plants, randomly selected after each plant.

3. **Specific weight of plant leaves (g. cm^2):**Calculate through the following equation:
   The specific weight of the paper is g. cm^2 = leaf area. cm^2 / leaf weight, g

4. **Green fodder yield (tons ha^{-1}):**According to each straw from each experimental unit through a mulch of (0.25) m^2, taking into account the start of the clipping process after the removal of dew from the leaves of the plant, then the weight of the result by an electronic scale was transformed into a ton ha^{-1}.

5. **The number of grains in the dahlia (grain. $Dahlia^{-1}$):**It was calculated as an average of the number of grains of ten pallets taken randomly from the middle lines.

6.The thousand grain weight (g): The amount of grain yield per unit experimental.

7. **Grains yield (tons ha^{-1}):**A measure of midline beans and around on the basis of an tons ha^{-1}.

Results and discussion

1. Number of tillers (m^{-2}):

Table (2) showed that the cultivars affected the characteristics of the number of tillers, as the V2 cultivar gave the highest average (384), while the V1 cultivar gave the lowest average (377) in the first clipping, as for the second clipping, it outperformed the V3 cultivar, giving the highest average (402.4). The reason for the difference in the cultivars in this trait was due to the difference in their genetic nature. This result was agreed with the results of Arif*et al.* (2002).

As for the levels of nitrogen fertilization, treatment N160 exceeded the mean by giving it the highest average (404) in the first clipping, while the treatment exceeded N240 in the second clipping, registering the highest average (445.4), while the treatment N1 gave the lowest mean of 316 and 328.4 in the first and second clipping, respectively, this may be due to the role of high levels of nitrogen in increasing the vegetative growth of the plant in general, and increasing the vegetative growth of plants leads to better utilization of sunlight, especially at the beginning of the growing season, this increases the material that supports the emergence and formation of primers of the shin and the success of their continued growth, (Ismael, 2002; Al-Jayashiet al., 2020).

The results also showed the presence of significant interaction, as the combination (V2×N240) gave the highest average of 468 in the first clipping, while the combination (V1×N240) gave the highest average of 452.0 in the second clipping.

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Table 2. The effect of fertilization levels and cultivars on the of the number of tillers of the oat crop.

N Level	First clipping			N mean
	V1	V2	V3	
N1	326	288	334	316
N2	374	357	375	369
N3	375	423	414	404
N4	433	468	278	393
V mean	377	384	350	
L.S.D$_{0.05}$	N=70.9	V=59.7	N×V=110.6	
Second clipping				
N level	**V1**	**V2**	**V3**	**N mean**
N1	346.0	298.3	341.0	328.4
N2	376.3	363.7	376.3	372.1
N3	380.3	430.7	449.0	420.0
N4	452.0	441.0	443.3	445.4
V mean	388.7	383.4	402.4	
L.S.D$_{0.05}$	16.12	22.47	38.66	

2. Specific weight:

Table 3. showed that the cultivars affected the specific weight trait, the V3 cultivar outperformed significantly by giving the highest average (29.39 and 43.67) in the first and second clipping, respectively, while the V1 cultivar gave the lowest average (27.61 and 39.89) for the two clipping respectively. The reason for this is mainly due to the different response of the varieties to the environmental conditions.

The results also showed that fertilization affected this trait, as treatment N240 outperformed significantly by giving it the two highest averages (34.15 and 44.07) for the first and second clipping, respectively.This can be explained on the basis that nitrogen increases the size of cells and the speed of their division, as well as raising the efficiency of photosynthesis and food processing, provides a constant demand for nitrogen sources, which explains the superiority of the trait with high levels of nitrogen.

The results also showed significant interaction between workers in the second garden only, the combination (V2×N240) gave the highest mean (45.97). The reason for this is attributed to what was mentioned in the factors which were alone.

Table 3. The effect of fertilization levels and cultivars on the specific weightof the oat crop.

N Level	First clipping			N mean
	V1	V2	V3	
N1	19.48	23.49	21.71	21.56
N2	25.63	25.97	28.04	26.55
N3	31.89	33.04	33.74	32.89
N4	31.45	34.93	34.08	34.15
V mean	27.61	29.36	29.39	
L.S.D$_{0.05}$	N=2.91	V=1.00	N×V=N.S	
Second clipping				
N level	**V1**	**V2**	**V3**	**N mean**
N1	31.60	40.23	40.86	37.56

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N2	43.23	41.89	46.08	43.73
N3	42.15	45.12	43.08	43.45
N4	42.60	45.97	43.67	44.07
V mean	39.89	43.30	43.67	
L.S.D$_{0.05}$	N=2.53	V=1.03	N×V=3.50	

3. Number of leaves (leaf. Plant^{-1}):

Table 4. showed that the cultivars affected of the number of leaves in the plant, as the V3 cultivar outperformed, gave the highest average (9.42 and 7.48) in the first and second clipping, respectively.Whereas, V2 cultivar scored the lowest average and without a significant difference with V1 cultivar in the first clipping.The reason for the different varieties is due to their genetic nature (AlbuThamer, 2018).

The results also showed a significant effect of fertilization levels on the number of leaves per plant, as fertilization treatment N240 outperformed the rest of the experiment treatments by giving it the highest average for the first and second clipping, which reached 9.98 and 7.98, respectively, while the comparison treatment gave the lowest mean of 8.52 and 6.59 for the two clipping, respectively, this can be attributed to the role that nitrogen enters as a basis in physiological processes, such as photosynthesis, amino acid formation and green plastid formation, as well as encouraging the division, expansion and elongation of cells, which means the formation of new vegetative and root growth (Kocar and Albayrak 2012),

The results also showed that there was significant interaction between factors in the second clipping only, the combination (V3×N240) gave the highest average of 8.50, this was due to what has been mentioned in the interpretation of the factors, which was alone.

Table 4. The effect of fertilization levels and cultivars on number of leaves (leaf. Plant^{-1})of the oat crop.

N Level	**First clipping**			**N mean**
	V1	**V2**	**V3**	
N1	8.52	8.49	8.55	8.52
N2	9.34	9.24	9.82	9.46
N3	9.24	9.56	9.82	9.54
N4	10.35	10.12	9.48	9.98
V mean	9.36	9.35	9.42	
L.S.D$_{0.05}$	N=0.58	V=0.25	N×V=N.S	
Second clipping				
N level	**V1**	**V2**	**V3**	**N mean**
N1	6.70	6.68	6.40	
6.59	7.37	7.67	7.14	
7.39	7.70	7.00	7.13	
7.27	8.04	7.67	8.50	
7.98	7.45	7.25	7.48	
L.S.D$_{0.05}$	N=0.34	V=0.40	N×V=0.60	

4. Yield of green fodder (ton. ha^{-1}):

Table 5. showed that the varieties affected the yield of green fodder in the second clipping only, as the V2 cultivar significantly outperformed, gave the highest average of 6.94 tons. ha^{-1}. The

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reason for this is attributed to the superiority of the variety in the trait of the number of tillers (Table 1), as well as the difference in the genetic nature of varieties (Chohan*et al*., 2004).

Fertilization treatments also significantly affected the yield of green fodder, as the fertilization treatment N240 gave the highest averages of 6.35 and 7.94 tons. ha^{-1} for the first and second clipping, respectively. The reason for this was attributed to the ability of plants to make better use of the materials produced and accumulated, this resulted in better leaf growth and thus an increase in their weight, was reflected in the most recent increase in the account of the vegetative parts, and this result agreed with Pourrezaet al. (2010).

The results also showed the presence of significant interaction, as the combination (N240×V2), gave the highest average (6.60 tons.ha^{-1}) in the first clipping, while the combination (N240×V3)in the second clipping gave the highest average (8.41 tons. ha^{-1}), while the comparison treatment gave the lowest combination (N0×V3), the least two averages (4.37 and 5.44) respectively.

Table 5. The effect of fertilization levels and cultivars on yield of green fodder (ton. ha^{-1})of the oat crop.

N Level	First clipping			N mean
	V1	V2	V3	
N1	4.48	4.59	4.37	4.48
N2	5.18	4.95	4.90	5.01
N3	5.30	4.90	5.84	5.35
N4	6.16	6.60	6.33	6.35
V mean	5.28	5.26	5.36	
L.S.D$_{0.05}$	N=0.69	V=N.S	N×V=0.50	
Second clipping				
N level	**V1**	**V2**	**V3**	**N mean**
N1	5.81	5.93	5.44	5.73
6.59	6.28	6.66	6.23	6.39
7.39	6.51	7.40	7.34	7.08
7.27	7.62	7.78	8.41	7.94
7.98	6.55	6.94	6.85	
L.S.D$_{0.05}$	N=0.52	V=0.42	N×V=0.80	

5. The number of grains in the dahlia (grain. Dahlia^{-1}):

Table 6. showed a significant difference between the cultivars in the number of dahlia, the V3 cultivar significantly outperformed the rest of the cultivars, giving the highest average of 27.02 grains. Dahlia^{-1}, while the V1 cultivar gave the lowest average (25.80 grains. Dahlia^{-1}). The reason for this is attributed to the increase in the number of grains in the dahlia, with increasing levels of nitrogen fertilization during the growth stages of the crop, nitrogen contributed to raising the efficiency of photosynthesis and increasing its yields, which led to the preparation of dry matter for the construction of flower facilities, the length of the spike and then the increase in the number of grains in the dahlia, these results were agreed with Al-Saadi (2006); Al-Karkhi (2013);Abdel Khaleq(2017) and Hasanetal. (2020).

The different fertilization treatments showed a significant effect on this characteristic, as fertilization treatment N240 outperformed significantly, by giving it the highest average

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(28.85grains. Dahlia^{-1}), while the comparison treatment gave the lowest average (24.20grains. Dahlia^{-1}). The reason for this is due to the availability of nitrogen during the growth and development stages of the crop, helps increase the number of fertile spikelets, that turns into beans and thus increases the number of grains in the dahlia.

Table 6. The effect of fertilization levels and cultivars on the number of grains in the dahlia (grain. Dahlia^{-1})of the oat crop.

N Level	Cultivars			N mean
	V1	V2	V3	
N1	24.48	22.97	25.15	24.20
N2	26.08	25.38	26.48	25.98
N3	27.92	27.78	27.83	27.87
N4	28.71	29.19	28.64	28.85
V mean	25.80	26.33	27.02	
L.S.D$_{0.05}$	N=1.32	V=0.32	N×V=N.S	

6. Weight of a thousand grains (g):

Table 7. showed that the cultivars differed in this trait, the V3 cultivar significantly outperformed by giving the highest average (27.05 g), while the V2 cultivar gave the lowest average (26.77 g). The reason for this is because the weight of the grain depends on the genetic origin, supplying the material represented by the crop pot after the flowering period, this result was in agreement with what Yanminget al. (2006);Buerstmayret al. (2007) and Al-Nadawi(2011), who showed that the varieties differ in the weight of a thousand grains.

The results also showed the effect of fertilization treatments on the weight of seeds, as fertilization treatment N240 outperformed the rest of the treatments, gave the highest average (29.21 g), while the comparison treatment recorded the lowest average (24.98 g), fertilization can help the plant grow and absorb water, nutrients and light, allowed the plant to grow, block the sun's rays, increase the photosynthesis process and transfer the representative materials to the growing grains.

Table 7. The effect of fertilization levels and cultivars on the weight of a thousand grains (g)of the oat crop.

N Level	Cultivars			N mean
	V1	V2	V3	
N1	25.00	24.49	24.98	24.98
N2	26.37	25.89	26.01	26.01
N3	27.26	27.45	27.30	27.33
N4	28.71	29.27	29.65	29.21
V mean	26.83	26.77	27.05	
L.S.D$_{0.05}$	N=0.67	V=0.29	N×V=N.S	

7. Grains yield (tons. ha^{-1}):

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Table 8. showed that the cultivars affected the grain yield, as the V3 cultivar outperformed significantly by giving the highest mean of 2.71 tons. ha^{-1}, without a significant difference with the rest of the cultivars in the experiment. The superiority of the cultivarwas mainly due to its superiority in the yield components as well as the difference in its genetic nature, this conclusion was in agreement with Gautam*et al*. (2006); Ahmad *et al*. (2008) and Muhammad (2017). who showed the difference of cultivars in the quantity of the quotient.

The results also showed a significant effect of fertilization treatments on this characteristic, as fertilization treatment N240 outperformed significantly by giving it the highest average (2.86 tons. ha^{-1}, without a significant difference with some fertilizer treatments.It could be the cause of the increase in the grain yield, to the positive effect of high nitrogen levels on both the number of grains in the dahlia / spike (Table 6), and the weight of a thousand grains (Table 7), as considered the addition of nitrogen levels to be an important factor in increasing these two components, and then the grain yield.These results are agreed with those obtained by Waines andEhadaie (2001) and Ismail (2002).

Table 8. The effect of fertilization levels and cultivars on grains yield (tons. ha^{-1})of the oat crop.

N Level	Cultivars			N mean
	V1	V2	V3	
N1	2.07	2.26	1.95	2.09
N2	2.34	2.59	2.24	2.39
N3	2.73	2.77	2.67	2.72
N4	2.95	2.91	2.71	2.86
V mean	2.52	2.63	2.71	
L.S.D$_{0.05}$	N=2.91	V=1.25	N×V=N.S	

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