Al-Muthanna J. For Agric Sci Print ISSN: 2226-4086 Online ISSN:2572-5149
Vol. 10 , Issue. 02. 2023

https://muthjas.mu.edu.iq/ http://doi.org/10.52113/mjas04/10.2/27

The effect of the number of mowings and the addition of humic and fulvic acid on the growth and fodder yield of alfalfa variety (Masqawi)

Laila Ali Abdul Razzaq[1] & Prof. Dr. Mohamed Radwan Mahmoud[2]

[1,2]Field Crop Department, Agriculture College, AL-Muthanna University, Iraq

[1] agrcr.grad.layla2122@mu.edu.iq

Received on 05/11/2023 Accepted on 03/12/2023 Published on 15/12/2023

Abstract

The field experiment was done in Al-Muthanna Governorate. The experiment examined how mowing frequency and humic and fulvic acid affected Masqawi lucerne growth and yield in 2022–2023. Three replicates of the split plot design, namely the randomized complete block design (RCBD), were used.. The experiment had four humic and fulvic acid concentrations: A0, A1, A2, and A3, representing 0, 20, 40, and 60 L ha^{-1}. There were also four mowings, C0, C1, C2, and C3, representing control, one, two, and three mowings, respectively. The statistical analysis yielded substantial disparities in both acidity levels and fulvic acid concentrations. A3 shown superiority in relation to the wet and dry weight of the cuttings, with values of 12.182 and 2.377 tons ha^{-1}, respectively. Additionally, A3 had a higher percentage of total protein, measuring at 15.746%. In relation to the quantity of mowings, it is noteworthy that the third mowings, denoted as C3, shown superior performance in terms of the cumulative weight of the mowings, yielding a value of 20.682 tons ha-1. Additionally, C3 exhibited a notable proportion of total protein, measuring at 12.725%.

Keyword: mowings, humic, protein, alfalfa, fodder

Introduction

Trifolium alexandrinum L., often known as the clover plant, holds significant value as a fodder crop, ranking second to in terms of importance. In numerous areas, it is often regarded as the primary crop for animal feed, owing to its substantial nutritional content and its ability to enhance soil fertility through nitrogen fixation. The cultivation of alfalfa in Iraq has not yet achieved the desired level of expansion, despite its recognition as a significant fodder crop that contributes to the provision of green fodder for animals. Additionally, alfalfa serves as a crucial legume farm, playing a vital role in the nourishment of ruminant animals and providing high-quality fodder [1].

The act of severing the primary stem of the crop serves to enhance branch proliferation by disrupting apical dominance and promoting the development of terminal

and lateral shoots [2]. Empirical investigations have demonstrated the feasibility of obtaining 4-5 cuttings from the alfalfa crop throughout its growth period, resulting in a yield that varies between 40 and 70. Alfalfa exhibits distinct morphological traits at a rate of one ton per hour to counterbalance the reduction in biomass and mitigate the decline in plant development caused by mowing [3].

Humic acid has been employed in agricultural practices due to its ability to enhance cell membrane permeability [4]. This acid exerts direct effects by facilitating biochemical reactions that result in improved photosynthesis, respiratory processes, and the efficacy of plant hormone-like compounds. One of the consequences of this phenomenon includes Several studies have revealed that it can facilitate seed germination, promote seedling growth, enhance root development, and facilitate the absorption of various minerals including zinc, iron, manganese, phosphorus, potassium, and calcium [5].

The objective of this study is to investigate the impact of varying mowing frequencies on the production of alfalfa, the impact of humic and fulvic substances on the yield of alfalfa, and The present study investigates the correlation between the quantity of weeds and the presence of humic and fulvic acids on the yield of alfalfa.

Materials and methods

The field experiment was carried out in Muthanna governorate on 2022-2023 in a farmers field in the Bandar area, 3 km from the governorate position at 45.26 longitude and 31.31 wideitude, with the aim of studying the effect of the number of ingestions and the addition of humic acid and fulvic acid on the growth and origin of alfalfa (Misqawi) for the 2022-2023 agricultural season in soil with some of its chemical and physical characteristics shown in table

.**Table (1)** Some chemical and physical features of field soil

Type of analysis	the value	unit
EC	4.4	dc m^{-1}
pH	7.8	
N	20.3	mg kg^{-1}
P	13.2	
K	179.6	
Soil separators		
Sand	11.47	%
Silt	35.61	
Clay	52.92	
Soil texture	Clay loam	

Experimental factors

First of all, four mowings (contorl- one mowings - two mowings - three mowings). The symbol sequence C0, C1, C2, C3 follows in sequential order.

Second .humic and fulvic acid, (the contents of which are stated in table 2) it four levels: control (no addition), 20 l ha-1, 40 l ha-1, 60 l ha-1, as indicated [6].

It is represented (A0, A1, A2 and A3) in follow-up.

Table (2) Contents of humic and fulvic acid (commercially synthesized by SUPERIOR Company)

Humic Acids	**10%**
Fulvic Acid	**2%**
K_2O	**2%**
Density g/L	**1.1**

Experiment design

The experiment was carried out in accordance with the split plot design (R.C.B.D.) and three bis, such as the main panels, the acid trim, while the ingestion was put in the secondary panels.So the total of the experimental units be 48.

Field operations

The experimental land was prepared for ploughing, the soil was blessed and then settled by the settlement machine, and according to the design employed, the land was split into 2* 2m surfaces, with 48 experimental units consisting of 3 bis bis in each 16 trial units. Secondary panels were spaced from each other (0.5 m) and seeds were planted as scheduled on 15/11/2022, with a seed amount of 40 kg ha-1.The urea fertilizer (46% N) was used at 100 kg nitrogen/ha added by three batches (after the first bolt and after the second burrow), the three superphosphate fertilizer (P2O5% 21) at 75 kg P2O5/ha added in pre-plant soil preparation, and the potassium sulfate fertilizer (K2SO4%42) at 50 kg K2SO4/ha added by three batches as in nitrogen [7].The herb was done manually and whenever needed.

Plants were manually buried once the plant got almost 40 cm high [8].and a 6-9 cm height was left above the soil surface [9].The ingestion dates for the experimental plants under research were recorded as follows:

- The first mowings was installed after 65 days of agriculture.
- The second mowings was carried out 37 days after the first mowings.
- The third mowings was carried out 25 days after the second mowings .

The dates for installing the floor were added on two dates .

- One after 30 (days of agriculture)
- The second following (first mowings)

Determinant characteristics.

The leaf-to-stem ratio of the plant.

The plants dried up completely at the temperature of an amateur room after putting on the cardboard cardboard, making the vibration of samples between one period and another, then dried up the electric oven at a temperature ranging from 65-72 C to constant weight by dry weight, and then separated the paper from the legs for each plant of the measured experimental unit and extracted the rate. [10].

Green fodder (tons ha^{-1})

The green feed product of the ingestion was calculated from the entire 4m2 treatment board, taking into account the start of the infestation process after the dew was removed from the plant leaves, and then the feeder was weighed directly by the electronic scale to avoid loss of moisture and then converted from kg m^{-2} to tons ha^{-1}

dry fodder of (tons ha^{-1})

The dry feed product was estimated for each bush based on the air drying technique, then the oven drying until the weight of the green feed was stabilized, and then converted from Kg m^{-2} to ton ha^{-1}.

Estimated proportion of total protein%

Samples of the vegetable total were obtained for each experimental unit and for all repeaters separately and after drying were placed in paper bags in an electric oven at 70°C until the weight was

established. The samples were then grinded using an electrical mill and took 0.2 g according to procedure[11].They were put in a 50 ml glass digestor and added 5 ml of H2SO4 and 2 ml of focused perchloric acid (HClO4) as a catalyst. The rotor was put on the heating plate and the temperature was progressively raised to 450°C (until the solution became soft), then the rotor was cooled and the volume was finished in the rotor to 100 ml by adding distilled water, of which the percentages of nitrogen were calculated .

Percentage of protein determined using method [12].and by the following equation

$$\text{Protein } (\%) = \text{Nitrogen} \times 6.25(\%)$$

Statistical analysis

After collecting and tabulating the data, it was statistically analyzed using the 12Genstat program. The averages of the coefficients were compared according to the L.S.D. test at a probability level of 0.05 [13].

Results and discussion

1-The weight of leaves to legs in the plant %

The findings of table 3 indicated that the first Mowings C1 recorded the greatest average of 1.292%, while three Mowings C3 and two Mowings C2 recorded the lowest average of 0.712%, respectively.

Humic acid / **mowings**	Control (without addition)	20 l ha^{-1}	40 l ha^{-1}	60 l ha^{-1}	**Average mowings**
once mowings	1.487	1.160	1.143	1.377	1.292
twice mowings	0.697	1.070	0.933	0.820	0.880

The explanation for the high weight of the s in the first Mowings was the rise in number of branches in these Mowingses, which in turn led to an increase in the ratio of leaves to legs.

Table 3 Impact of number of mowings and the addition of humic and fulvic acid and the overlap between them in weight of leaves to legs in the plant %

triple mowings	0.723	0.657	0.747	0.720	0.712
Average humic	0.969	0.962	0.941	0.972	
L.S.D (0.05)	**humic**		**mowings**		CxA
	N.S		0.2347		N.S

2-Green fodder (tons ha^{-1})

The results of table 4 showed a moral superiority of the levels of humic and fulvic acid in the green feed product of ha-1, with the highest average A3 treatment of 12.182 tons ha^{-1} while the treatment of 20 l ha^{-1} A1 gave an average of 9.805 tons ha-1and an unethical difference from the A0 and A2 levels, which gave an average of 10.70 tons ha^{-1}. This may be due to the fact that the role of Himalayan acid and its essential nutrients and the evolution of vegetation, including nitrogen, which gives plants the ability to form, sustain and increase the size of the largest number of new morphic cells, as well as an increase in the length , i.e., the number of the decade reflected an increase in the vegetable growth of plants and the increase in branches and leaves and an increase in the green feed product. [14].

The number of mowings showed a moral superiority in the green feed product of the three ingested, with C3 (three mowings) exceeding the average of 20.682 tons ha-1 while C1 (one mowings) giving an average of 2.329 tons ha^{-1} while C (two mowings) giving treatment (8.584 tons ha^{-1}), may be due to the increased weight of wet green feed as a result of the ingestion that stimulated the growth and activity of the base buds and increased branches as a result of the amplification of the phytotyre from plant hormones such as Auxins and the pro-growth retrofites, and consequently, the proportion of dry matter in the plant as the plant progressed.

The results also demonstrated a moral superiority of the overlap between the levels of humic acid and fulvic acid and the number of mowings. A3xC3 offered the greatest average of 24.124 tons ha^{-1}, while A0xC1 supplied the lowest average of 1.639 tons ha^{-1}. This indicates that the enhanced presence of nutrients in humic acid and fulvic acid under repeated filling situations effectively contributed to the overlapping development of dry matter expansion. Consequently, enhancing the availability of green fodder.

Humic acid / mowings	Control (without addition)	20 l ha^{-1}	40 l ha^{-1}	60 l ha^{-1}	**Average mowings**

Table 4 Impact of number of mowings and the addition of humic and fulvic acid and the overlap between them in Green fodder (tons ha^{-1})

once mowings	1.639	2.463	2.373	2.842	2.329
twice mowings	8.073	8.509	8.174	9.579	8.584
triple mowings	20.498	18.443	19.664	24.124	20.682
Average humic	10.070	9.805	10.070	12.182	
L.S.D (0.05)	**humic**		**mowings**		CxA
	.8840		9940.		1.760

3- Dry weight of fodder (tons ha^{-1})

The results of table 5 showed a moral superiority of humic acid and fulvic levels in the dry weight of all ingested, with A3 given treated with the highest average of 2.377 tons ha^{-1}, while A0 was given an average treatment of 1.310 tons ha^{-1}, which may be due to the fact that humic acid contains major elements, particularly nitrogen, phosphorous and potassium, and is also working on the preparation of micronutrients in the soil that are involved in the process of making food and breathing in the process of protoplasm construction and is helping Himalayan and Volvec acid to form links between soil molecules, making them more coherent and capable of retaining water and nutrients [15].

With regard to the overlap between the levels of humic acid and fulvic acid and the number of ingestions, A3C3 gave the greatest average of 3.795 tons ha^{-1}, while A0XC1 gave the treatment the lowest average of 2290 tons ha^{-1}. This is consistent with research done by [16] that the inclusion of hemomic acid and fulvic acid Adding the soil might enhance mowing yield by up to 20%.

Table (5) Impact of number of mowings and the addition of humic and fulvic acid and the overlap between them in dry weight of fodder (tons ha^{-1}).

Humic acid / mowings	Control (without addition)	20 l ha^{-1}	40 l ha^{-1}	60 l ha^{-1}	**Average mowings**
once mowings	.2290	.3350	0.411	0.357	0.333
twice mowings	1.716	1.915	2.136	2.979	2.187
triple mowings	1.984	2.636	3.672	3.795	3.022
Average humic	1.310	1.629	2.073	2.377	
L.S.D (0.05)	**humic**		**mowings**		CxA

	446.9	N.S	3300.5

4-**protein %**

The findings of table 6 revealed that the level A3 for humic and fulvic acid were above in the total protein , with the greatest average of 15.746 %, while level A0 (without acid) was below the average of 1.002 %. The reason may be the addition of hemeic acid and fulvic acid to food components, such as nitrogen, which resulted in an increase in vehicles resulting from the light construction process and their conversion to protein, which increases the intake of nutrients and increases the rate of food transport and thus the accumulation of foods by paper, thereby increasing protein content. [17].

Treatment of triple mowings(C3) produced the greatest percentage of protein content about 12.7% compared with the other treatments (Table 6). On the other hand, C0 (without mowings) was the lowest of 10.753%. This may be owing to the lack of rivalry between plant sections for dry matter, thereby boosting protein. This was owing to the fact that the plant was not chopped off, resulting in an increase in its protein.

The overlap, on the other hand, recorded the highest average A3xC3 treatment of 17.197%, while the average A2xC0 treatment of 9.507% was recorded, and the reason for the greater than the third voltage was the increase in the average protein as a result of the addition of acid with higher concentrations than the rest of the concentrate, which increased the amount of nitrogen and nutrients found in the vegetable part, with nitrogen playing an important role in the formation of the protein.

Table (6) Impact of number of mowings and the addition of humic and fulvic acid and the overlap between them in protein %

levels Humic and fulvic acid l ha^{-1}	**Number of mowings**				average
	C0	C1	C2	C3	
A0	8.903	10.680	10.423	10.000	10.002
A1	10.140	10.650	11.587	10.980	10.839
A2	9.507	11.970	10.773	12.723	11.243
A3	14.460	15.330	15.997	17.197	15.746
average	10.753	12.158	12.195	12.725	
L.S.D (0.05)	**Number of mowings**		Humic and fulvic		CxA
	0.5051		1.4430		1.5697

Conclusions

The statistical analysis revealed considerable disparities in the impact of humic acid and fulvic acid. The application rate of 60 l ha^{-1} resulted in the highest mean weight of both wet and dry pieces, as well as protein content. The highest average in cumulative weight and total protein was achieved with triple mowings.

References

1) Salama, H. S. A., El-Zaiat, H. M., Sallam, S. M. A., & Soltan, Y. A. (2020). Agronomic and qualitative characterization of multi-cut berseem clover (Trifolium

alexandrinum L.) cultivars. Journal of the science of food and agriculture, 100(10), 3857–3865.
2) Anter, S. H. (2012). effect of seeding rate, repeated cuttings and herbicide on controlling of weeds in alfalfa field *medicago sativa*. l. mesopotamia journal of agriculture, 40(3).
3) Xiong, Y., He, J., Yu, Q., Zhao, J., Lei, X., Dong, Z., Yang, J., Peng, Y., Zhang, X. and Ma, X. (2020). The Complete Chloroplast Genome of Two Important Annual Clover Species, (Trifolium alexandrinum) and (T. resupinatum) Genome Structure, Comparative Analyses and Phylogenetic Relationships with Relatives in Leguminosae. Plants (Basel(;9(4):478.
4) Zhang, X. and Ervin, E.H. (2004). Cytokinin-Containing Seaweed and Humic Acid Extracts Associated with Creeping Bentgrass Leaf Cytokinins and Drought Resistance.CropScience,44:1737-1745.
5) Arslan, G., & Pehlivan, E. (2008). Uptake of Cr^{3+} from aqueous solution by lignite-based humic acids. Bioresource technology, 99(16), 7597–7605.
6) Taj El-Din, Munther Majed, Hanoun Nahi Kazem Al-Barakat. 2016. The effect of biofertilizer, foliar spraying, and ground application of humic and fulvic acids on the readiness of N, P, and K in the soil. Al-Muthanna Journal of Agricultural Sciences 4 (2), 56:61.
7) Al-Zalzali, Muhammad Hajim 2021. The effect of NPK fertilizer treatments and seed quantities on feed and seed yield in Egyptian clover. Master Thesis. faculty of Agriculture. Al-Muthanna University
8) Borreani, G., Odoardi, M., Rneri, A. and Tabacco, E. (2006). Effect of cutting height and stage of development on Lucerne quality in the Poplanal .J.Agron. .1: 37-43
9) Collins, M., and Joe, F. (2003). Forage Quality In. RF Barnes et al. (ed). Introduction to grassland agriculture Vol.1.6thed.Iowa- pp. 363-390.
10) A. Khiraoui, M. Bakha, F. Amchra, S. Ourouadi',A. Boulli', C. Al-Faiz, A. Hasib'(2017)Nutritional and biochemical properties of natural sweeteners of six cultivars of Stevia rebaudiana Bertoni leaves grown in Morocco.ournal of Materials and Environmental Sciences ISSN: 2028-2508JMES, 2017 Volume 8, Issue 3, Page 1015-102
11) Cresser, M.S. and Parsons, J.W. (1979). Sulphuric-perchloric acid digestion of plant materials for the determination of nitrogen, phosphorus, potassium, calcium and magnesium. Analytica Chemica Acta, 109: 431-436.
12) AOAC "Association of Official Analytical Chemists" .2000. Official Methods of Analysis. Association Analysis.Association of Chemists. 17th Ed. Washington, D.C., USA. of Official Analytical
13) The Rawi, Khashi Mahmoud and Abdul Aziz Muhammad Khalaf Allah. (2000). Design and analysis of agricultural experiments. 1st edition. Ministry of Higher Education and Scientific Research - University of Mosul.
14) AL-Abody, M. A. K., Ramadhan, M. N., & Muhsin, S. J. (2021). Effect of Humic acid on the growth, yield components, and yield of three sunflower cultivars (*Helianthus annuus* L.). In Ecology, Environment and Conservation Paper (Vol. 27).
15) Attia ،M.A. and Shaalan, A. M. (2016). Response of wheat (*Triticum aestivum* L.) to humic

acid and organic fertilizer application under varying Siwa Oasis conditions . IOSR Journal of Agriculture and Ve terinary Science (IOSR-JAVS). Volume 9, Issue 9 Ver .PP 81-86.

16) Al-Zubaidi, Najm Abdullah Juma Wahba Muhammad Ahmad Al-Alusi. 2017. The effect of humic acid and chelated iron on the yield of two varieties of sunflower (Helianthus annuus L.). Diyala Journal of Agricultural Sciences. 9(1): 228-238.

17) Alwan, Israa Emad, Abdul Rahim Sultan Muhammad, and Karim Saeed Al-Obaidi. (2019). The effect of adding humic acid to the soil and spraying with marine extract Alga600 on the characteristics of two varieties of faba bean (Vicia faba L.). Kirkuk University Journal of Agricultural Scie