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Review Article

Effects of Humic Spraying and Marine Algae Extract in Certain Physical and Chemical Attributes Soil and (Local) Barley Yield Growth

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Abstract: The experiment was conducted on the land of Al-Mussaib Technical Institute - Al-Furat Al-Awsat Technical University in the winter season 2024-2025 to study the effect of spraying humic at three concentrations (2, 1, 0) L. dunum^{-1} and the effect of seaweed at three concentrations (150, 100, 0) mg. L-1. The experiment was conducted using a factorial experiment method that followed the RCBD design. The averages were compared using the LSD test at a 5% level of significance. A number of physical and chemical parameters, including bulk density, soil moisture, soil salinity, soil interaction, growth indicators, plant height, flag leaf area, number of ears, and total yield, were found to rise significantly when humic spraying was used. The treatment was given (humic spraying 2 liters. dunam^{-1}) The highest averages in the aforementioned soil characteristics and crop growth indicators were obtained sequentially, while the treatment (spraying seaweed extracts (150 mg.L^{-1}) The highest averages were in the aforementioned soil characteristics and yield growth indicators, respectively. The combination of the intervention (humic spraying 2 litres. dunam-1 and spraying seaweed extracts 150 mg. litre^{-1}) also gave the highest averages above.

Keywords: Humic Spray, Marine Algae Extracts, Local Barley.

INTRODUCTION

A lot of nations hold barley in high regard as a strategic crop. Grain crops like this one are cultivated for their edible grains, which find use in baking, concentrated animal feed, and many industrial processes. For the purpose of making green fodder, it is a crucial crop [1]. The current global trend is towards using less synthetic chemical fertilizers, which are harmful to both humans and the environment. Instead, people are turning to natural alternatives, such as extracts from marine plants, such as algae, which have the same beneficial qualities as the plants themselves. They are extracted using special methods as organic fertilizers, that encourage the growth of additives [2]. It was found that these marine algae, extracts have positive effects on the speed of growth in the production of the agricultural crops studied. This is due to the fact that these extracts contain active compounds such as amino acids, vitamins, and hormones, which in turn led to an increase in agricultural production [3]. The properties of humic acids that positively affect plant growth, Such as increasing cell membrane permeability, stimulating enzyme reactions, and improving cell division and cell elongation Increased production of plant enzymes and stimulation of vitamins within cells [11]. The results also showed that when marine algae extracts were added, there was an increase in plant, height and leaf area. They are also substances that encourage plant growth when the required concentrations are used, as they contribute to most of the important physiological functions of crops [5]. The study aims to determine the extent to which humic spraying, marine algae extracts, and some physical and chemical characteristics affect the growth and yield of local barley.

MATERIALS RESEARCH METHODS

The field experiment was carried out on the land belonging to the [Al-Mussaib Technical Institute]. Local barley grains were planted for the winter season 2023-2024.

1. Preparing and preparing the land for cultivation: Divide the field into square-shaped panels with a side length of 2*3 m and add 40 kg.ha^{-1} of dab fertilizer, and 100 kg.ha^{-1} of urea fertilizer.

2. Planting the crop: Local barley grains were sown on 16/11/2023
3. Irrigating the crop: with irrigation using an electric pump, which included giving the plant irrigation directly after planting the seeds, and in the event of rainfall in sufficient quantities, the plant was given water after two weeks had passed.
4. Harvest date: 15/4/2024.

Studied Attributes

Soil Separations: Soil separations were estimated using the hydrometer method described in Black (1965a) to determine the texture type [8].

1. The bulk density was measured using a metal cylinder core sample with a height of 0.05 m and a diameter of 0.05 m (a1965) Black.
2. Moisture content: I followed the gravimetric method proposed by Gardner and used the metal cylinder core mentioned in (Black, 1965a).

$$100\,\frac{Mm-Ms}{Ms} = \theta_m$$

ɵm = mass moisture content (g water g dry soil)

Mm = mass of wet soil(g)

Ms = dry soil mass(g)

3. Soil salinity
4. Soil interaction

Characteristics of Vegetative Growth

Five plants were taken at harvest and randomly from each experimental unit

1- Flag leaf area (cm^2): Using the following equation to determine the mean of five plants randomly selected from each experimental unit:
Flag leaf area = flag leaf length * width at the middle * correction factor (0.95).

2- Number of ears (m^2):The number of ears per square meter, then each sample from each experimental unit was weighed.

3- The total yield is tons. E^{-1}: Calculate from number of ears per meter and number of grains, the weight of 1000 grains per square meter, then convert the result to a ton. E^{-1}

4- The results were analyzed statistically: significant difference test at the level of 0.05.

Table 1. Some soil traits used in the study.

Units	Values	Traits	
—	**7.3**	pH	
DS.m^{-1}	**2.62**	Electrical conductivity (ECe)	
%	**0.83**	Organic matter	
Mg.m^{-3}	**1.39**	Bulk density	
g.kg^{-1}	**241.3**	Calcium carbonate	
cm.h^{-1}	**4.7**	Water conductivity	
%	**14.6**	Moisture content	
mg.kg^{-1}	**7.33**	available nitrogen	
	0.35	available phosphorus	
	10.1	available potassium	
g.kg^{-1}	**292**	sand	**Soil separations**
	421	silt	
	287	Clay	
loam Silty		**Soil texture**	

RESULTS AND DISCUSSION

Bulk Density (Microgram m^{-3})

Table (2) demonstrated that the average bulk density treatments differed significantly; for example, the comparative treatment that did not include the maximum value yielded 1.47 mic grams m^{-3}, whereas to the 2-liter humic spray treatment. $Donum^{-1}$, which gave the lowest values, amounting to 1.37 mic grams m^{-3}, achieved a decrease of 7.29%. The same table indicates that using the comparison treatment without adding the highest value is 1.47 mg m^{-3} compared to the treatment of spraying marine algae extracts 150 mg. L^{-1}, which gave the lowest values, amounting to 1.38 mg m^{-3}, achieving a decrease of 6.52%. As for the overlap in the same table, it has, a significant effect on bulk density characteristic. It gave the highest treatment compared to 1.52 mic grams m^{-3} compared to the treatment (spraying humic 2 liters. $dunam^{-1}$ + spraying marine algae extracts 150 mg. $liter^{-1}$), which gave the least. The values reached 1.34 Mg m^{-3} and achieved a decrease of 13.43%.

Table 2. The effect of humic spraying and marine algae extracts and their overlap in average bulk density, mica grams m^{-3}.

Marine Algae Extract mg/L^{-1}	Bulk Density Mica Grams m^{-3}			
	Humic liter/ $dunum^{-1}$			
	0	1	2	Average
0	1.52	1.47	1.42	1.47
100	1.47	1.37	1.36	1.40
150	1.44	1.36	1.34	1.38
Average	1.47	1.40	1.37	
L.S.D 0.05	Marine algae extract 0.53	Humic 0.53	Interference 1.06	

Soil Moisture (%)

Statistically significant variations in average soil moisture content are displayed in Table (3). The 2-liter humic spray per $dunum^{-1}$ treatment yielded the highest values,15.59%, compared to the 12.40% control treatment, achieving an increase of 25.72% The same table indicates that the use of marine algae extract spray treatment of 150 mg L^{-1} gave the highest values of 14.83 compared to the 13.33 and achieved an increase of 11.25%. As for the overlap in the same table, it had a significant on the moisture characteristic Soil: The treatment (spraying humic acid 2 liters per $dunum^{-1}$ + spraying marine algae extracts 150 mg per $liter^{-1}$) was superior and gave the highest values of 16.8% compared to the treatment of 12.1% and achieved an increase of 38.84%.

Table 3. Effect of spraying humic and Marine algae extracts and their overlap in average soil moisture%

Marine algae extract mg/L^{-1}	Soil Moisture (%)			
	Humic liter/ $dunum^{-1}$			
	0	1	2	Average
0	12.10	13.24	14.67	13.33
100	12.3	14.27	15.3	13.92
150	12.8	14.91	16.80	14.83
Average	12.40	14.14	15.59	
L.S.D 0.05	Marine algae extract 0.74	Humic 0.74	Interference 1.48	

Soil Salinity (Desmins.m^{-1})

The average soil salinity trait treatment differs significantly from the comparison treatment, as shown in Table (4), when the highest values of 2.52 dm^{-1} are not added. compared to the treatment of spraying humic 2 liters. dunum^{-1}, which gave the lowest values of 2.31 dm^{-1} and achieved a decrease of 9.09%. The same table indicates that using the (comparison without adding the highest values of 2.51 dSm^{-1}) compared to the treatment of spraying marine algae extracts 150 mg L^{-1}, which gave the lowest values of 2.33 dSm^{-1} and achieved a decrease of 7.72%. As for the overlap in the same table, it has a significant effect on the apparent density characteristic, as the comparison gave the highest value of 2.62 dSm^{-1} compared to the treatment (Spraying humic2 liters. dunum^{-1} + spraying marine algae extracts 150 mg. L^{-1}) which gave the lowest values of 2.20 dSm^{-1} and achieved a decrease of 19.09%.

Table 4. Effect of spraying humic and Marine algae extracts and their overlap in average soil salinity (desmens m^{-1})

Marine algae extract mg/L^{-1}	Soil salinity (desmins.m^{-1})			
	Humic liter/ dunum^{-1}			
	0	1	2	Average
0	2.62	2.49	2.43	2.51
100	2.53	2.40	2.31	2.41
150	2.45	2.34	2.20	2.33
Average	2.52	2.41	2.31	
L.S.D 0.05	Marine algae extract 0.47	Humic 0.47	Interference 0.94	

Soil Interaction (pH)

We notice from Table (5) the presence of significant in the treatment of the average soil reaction trait, as the comparison treatment without adding the highest values of 7.53 compared to the treatment of spraying humic 2 liters. dunum^{-1}, which gave the lowest values of 7.36 and achieved a decrease of 2.309%. The same table indicates that using the comparison treatment without adding the highest values of 7.52 compared to the treatment of spraying marine algae extracts 150 mg. L^{-1}, which gave the lowest values of 7.37 and achieved a decrease of 2.035%. As for the overlap in the same table, it has a significant effect on the apparent density characteristic, as the comparison treatment gave the highest value of 7.60 compared to the treatment (Spraying humic acid 2 liters per dunum^{-1} + spraying marine algae extracts 150 mg per liter^{-1}) which gave the lowest values of 7.25 and achieved a decrease of 4.82%.

Table 5. Effect of spraying humic and Marine algae extracts and their overlap in average soil interaction (pH)

Marine algae extract mg/L^{-1}	Soil interaction (pH)			
	Humic liter/ dunum^{-1}			
	0	1	2	Average
0	7.60	7.50	7.47	7.52
100	7.53	7.48	7.37	7.46
150	7.47	7.38	7.25	7.37
Average	7.53	7.45	7.36	
L.S.D 0.05	Marine algae extract 0.69	Humic 0.69	Interference 1.38	

Area of Flag Paper (cm^2)

We notice from Tabl (6) the presence of significant in the treatment of the average trait of the flag leaf, as the comparison treatment without adding the lowest value of 16.76 cm^2 compared to the treatment of spraying 2 liters of humic acid per dunum^{-1}, which gave the highest value of 21.49 cm^2 and achieved an increase of 28.22%. The same table indicates that using the (control treatment without adding) the lowest value was 17.63 cm^2 compared to the treatment of spraying

marine algae extracts at 150 mg L^{-1}, which gave the highest value of 21.12 cm^2 and achieved an increase of 19.79%. As for the overlap in the same table, it had a significant effect on the flag leaf trait. The comparison treatment gave the lowest value of 16.47 cm^2 compared to the treatment (spraying humic 2 liters. $dunum^{-1}$ + spraying marine algae extracts 150 mg. L^{-1}), which gave the highest values of 24.82 cm^2 and achieved an increase of 50.69%

Table 6. Effect of spraying humic and Marine algae extracts and their overlap in average flag leaf (cm^2)

Marine algae extract mg/L^{-1}	Area of flag paper (cm^2)			
	Humic liter/ $dunum^{-1}$			
	0	1	2	Average
0	16.47	17 .77	18.67	17.63
100	16.55	18.57	20.97	18.69
150	17.26	21.27	24.84	21.12
Average	16.76	19.20	21.49	
L.S.D 0.05	Humic 1.62	Interference 3.24	Marine algae extract 1.62	

Number of Spikes (m^2)

Table (7) shows the presence of significant in the treatment of the average number of spikes trait, as the comparison treatment without adding the lowest value of 186 m^2 compared to the treatment of spraying 2 liters of humic acid per $dunum^{-1}$, which gave the highest value of 227 m^2 and achieved an increase of 22.04%. The same table indicates that using the comparison treatment without adding the lowest value was 196 m^2 compared to the treatment of spraying marine algae extracts at 150 mg/L^{-1}, which gave the highest value of 224 m^2 and achieved an increase of 14.28%.As for the overlap in the same table, it had a significant effect on the number of sanabil trait. The comparison treatment gave the lowest value of 183 m^2 compared to the treatment (spraying 2 liters of humic acid $dunum^{-1}$ + spraying 150 mg of marine algae extracts L^{-1}), which gave the highest values of 254 m^2 and achieved an increase of 38.79%.

Table 7. The effect of spraying humic and marine algae extracts and their overlap in average number of spikes l (m^2)

Marine algae extract mg/L^{-1}	Number of spikes (m^2)			
	Humic liter/ $dunum^{-1}$			
	0	1	2	Average
0	207	198	207	196
100	221	208	221	205
150	254	229	254	224
Average	227	211	227	
L.S.D 0.05	Humic 5.6	Interference 11.2	Marine algae extract 5.6	

Total Yield (Tons.Ha^{-1})

It is, noted from Table (8) there are significant differences in the average total yield treatment, as the comparison treatment without adding the lowest value gave 1.940 tons.ha^{-1} compared to the humic spray treatment of 2 liters. $Donum^{-1}$, which gave the highest value of 625.2 tons.ha^{-1}, achieving an increase of 35.30%. The same table indicates that using the comparison treatment without adding the lowest value is 2,100 tons.ha^{-1} compared to the treatment of spraying marine algae extracts of 150 mg. L^{-1}, which gave the highest value of 2,610 tons.ha^{-1}, achieving an increase of 24.28%. As for the

overlap in the same table, it has a significant impact on the character of the total yield tons.ha^{-1}. It gave the lowest value for the comparison treatment, 1,680 tons.ha^{-1}, compared to the treatment (spraying humic 2 liters. dunam^{-1} + spraying marine algae extracts 150 mg. liter^{-1}) which gave the highest values of 2,860 tons.ha^{-1} and achieved an increase of 70.23%.

Table 8. The effect of spraying humic and seaweed extracts and their overlap in average Total yield (tons. ha^{-1})

Marine algae extract mg/L^{-1}	Total yield (tons. ha^{-1})			
	Humic liter/ dunum^{-1}			
	0	1	2	Average
0	2.154	2.467	2.467	2.100
100	2.400	2.550	2.550	2.266
150	2.680	2.660	2.860	2.293
Average	2.323	2.559	2.625	
L.S.D 0.05	Humic 1.13	Interference 2.26	Marine algae extract 1.13	

The results in Tables (2, 3, 4, 5, 6, 7, 8) gave results in the studied characteristics that explain the effect of humic acid and marine algae extracts and their interaction in some physical and chemical characteristics and growth indicators, respectively. We note that each of the above-mentioned characteristics causes an increase in, This growth might be attributed to humic acid's influence on soil fertility, biological traits, and certain physical and chemical properties. It also increased nutrient availability through its effect on exchange capacity. All of this works to enhance the soil's properties, including its aeration and the ease with which roots can develop in it. As a counterpoint, the extensive root system expansion is indicative of vegetative growth [11].

Humic acid is a nutrient reservoir that boosts the plant's exchange capacity, nutrient availability, and nutrient absorption, all of which lead to an improvement in the measured traits [6]. Humic acid's capacity to enhance the soil's physical, chemical, and biological properties suggests that its spraying may be responsible for the observed improvement in the analyzed parameters. Also lowers the pH of the soil solution, which makes microelements more available for absorption by plants, and also aids in the dissolving of certain insoluble mineral elements. The process of photosynthesis and other plant physiological activities are enhanced by this work, leading to an increase in leaf area, improved plant balance, and enhanced vegetative growth, all of which have positive effects on the soil and plants [4]. The aforementioned improvements are a result of the high concentrations of cytokanins, auxins, and amino acids found in marine algae extracts. These compounds play a role in promoting cell division and expansion, among other physiological and biological processes; they also influence root growth by increasing root absorption of water and nutrients dissolved in it, which in turn promotes shoot growth [5-7].

It is noted that spraying local barley plants with marine algae extract has positive effects on plant hormones and macro- and micro-nutrients included in the formation of marine algae extracts, which play a major role in increasing plant cell division, in addition to their importance in root growth, which reflects positively on soil characteristics and growth indicators [9-13].

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