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EFFECT OF GROUND FERTILIZATION WITH HUMIC ACID AND SPRAYING WITH SEAWEED EXTRACT AND BAKING YEAST AND THEIR EFFECT ON THE BUKTHORN TAFAHE SEEDLING

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Abstract

Experiment was conducted in the wooden canopy of the Department of Horticulture - College of Agriculture - Anbar University during the beginning of 2023 on three-year-old Sidr seedlings to determine the effect of humic acid H_0, H_1 at two concentrations of 0.10 g l^{-1} and spraying with algae extract A_0, A_1, A_2 at three concentrations of 0. 1, 1.5 g L^{-1} and baking yeast Y_0, Y_1, Y_2 at three concentrations 0, 10, 20 g L^{-1} and their interactions. The results showed the superiority of the H1 treatment by recording the highest rate of increase in seedling height (cm), number of leaves (seedling $leaf^{-1}$), leaf area (cm^2), percentage of nitrogen and total protein in leaves (%) and chlorophyll content of leaves (mg 100 g weight Soft) compared to the comparison treatment that gave the lowest values. Regarding foliar feeding with seaweed extract, treatment A_2 was significantly superior to the other by giving the highest rates and percentages, while comparison A_0 gave the lowest rates and percentages. As for spraying with yeast, treatment Y_2 excelled by giving the highest values for the studied traits, while the comparison treatment Y_0 recorded the lowest values. As for the bilateral interaction between the study factors, the H_1A_2, H_1Y_2, and A_2Y_2 outperformed the other treatments for most of the studied traits, except for the leaves area treatment, A_1Y_2, which significantly outperformed all other treatments.

Keywords: Humic acid, Seaweed extract, Baking yeast, Buckthorn tafahe seedlings.

تأثير التسميد الأرضي بحامض الهيومك والرش بمستخلص الطحالب البحرية وخميرة الخبز وتأثيرهما في النمو الخضري للسدر صنف تفاحي

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الخلاصة

أجريت التجربة في الظلة الخشبية التابعة لقسم البستنة – كلية الزراعة – جامعة الأنبار خلال بداية عام 2023 على شتلات سدر عمرها ثلاث سنوات لمعرفة تأثير حامض الهيومك H0، H1 بتركيزين 0، 10 غم لتر$^{-1}$ والرش بمستخلص الطحالب A0، A1، A2 بثلاث تراكيز 0، 1، 1.5 غم لتر$^{-1}$ وخميرة الخبز Y0، Y1، Y2 بثلاث تراكيز 0، 10، 20 غم لتر$^{-1}$ وتداخلاتهم. بينت النتائج تفوق المعاملة H1 بتسجيلها أعلى معدل للزيادة في كلّ من ارتفاع الشتلات (سم)، عدد الأوراق (ورقة شتلة$^{-1}$)، المساحة الورقية (سم^2) والنسبة المئوية للنتروجين والبروتين الكلي في الأوراق (%) ومحتوى الأوراق من الكلوروفيل (ملغم 100 غم وزن طري) قياساً بمعاملة المقارنة التي أعطت أقل القيم. بالنسبة للتغذية الورقية بمستخلص الطحالب البحرية فقد تفوقت المعاملة A2 معنوياً على المعاملات الأخرى بإعطائها أعلى المعدلات والنسب بينما أعطت المقارنة A0 أقل المعدلات والنسب. أما الرش بالخميرة فتفوقت المعاملة Y2 بإعطائها أعلى القيم للصفا ت المدروسة بينما سجلت معاملة المقارنة Y0 أدنى القيم. أما التداخل الثنائي بين عوامل الدراسة فقد تفوقت المعاملة H1A2 وH1Y2 وA2Y2 على المعاملات الأخرى لأغلب الصفات المدروسة ماعدا معاملة المساحة الورقية A1Y2 التي تفوقت معنوياً على جميع المعاملات الأخرى.

كلمات مفتاحية: حامض الهيومك، مستخلص الطحالب البحرية، خميرة الخبز، شتلات السدر التفاحي.

Introduction

Buckthorn trees belong to the Sidr family, Rhamnaceae, and to the genus Ziziphus, which contains more than 100 species of plants that grow in tropical, subtropical, and temperate regions of the world. Buckthorn has economic and medicinal importance and many other benefits. Buckthorn fruits are distinguished by their high nutritional value, due to their high content of vitamin C, as well as cartenoids. They also contain good concentrations of sugars, and its trees have many uses. They are found in Iraq. There are many varieties whose cultivation is widespread, especially in the southern region, the most important of which are the olive and tafahe varieties belonging to the type Z. Mauritiana Lam (12).

Ground fertilization with humic acid has an essential role, as it reduces the PH of the soil through its role in increasing the porosity of the soil and increasing its aeration. It has a high exchange capacity, as it is characterized by its rapid dissolution in water. It has a role in increasing the efficiency of the photosynthesis process. It is a reserve source of nutrients for the plant, especially nitrogen, and is used. Mainly to improve fruit characteristics in terms of weight, total soluble solids, reducing sugar, and reduce fruit hardness and total acidity (27).

Foliar feeding also contributes to increasing the efficiency of the fertilizers used and thus increasing plant growth, which is reflected in the production of fruit trees (26). Feeding with marine algae extract has an essential role in plant growth and development, as it contains higher quantities of essential and micronutrients, which It has a physiological effect on plant growth, including vitamins, natural hormones, and antioxidants, which gives plants treated with it more strength to withstand environmental and land stress and resist pests and fungi (10 and 11).

As for spraying with bread yeast extract, it is of great importance in improving vegetative growth because it is a natural source for the production of plant hormones and because it encourages cells to elongate and divide, increase carbohydrates, manufacture protein and nucleic acids, and form chlorophyll. It contains nitrogen, which causes an increase in vegetative growth, such as plant height and leaf area (2 and 5).

The aim of conducting this research is to determine the effect of fertilizing with humic acid and spraying with seaweed extract and baking yeast and their interactions on the vegetative growth characteristics of seedlings of Buckthorn tafahe variety.

Materials and Methods

The study was carried out in the wooden canopy of the College of Agriculture - Anbar University for the period from 28/2/2023 to 1/11/2023 on seedlings of Buckthorn variety tafahe grafted on seed origin, and the seedlings were 3 years old, to know the role of ground fertilization with humic acid and spraying with algae extract. Marine (Alga Mix) and baking yeast and their interactions in increasing the characteristics and rate of vegetative growth. The spraying operation took place on 1/4/2023, 1/5/2023, 1/6/2023, 1/9/2023 and 1/10/2023

The experiment was designed as a factorial experiment 2*3*3 with three replicates, each replicate consisting of 36 seedlings/plot, bringing the total number of seedlings for the experiment to 108 seedlings. A factorial experiment with a completely randomized block design with (RCBD) was used, and the data was analyzed according to the program. The statistician GENSTAT, and the arithmetic averages were compared using the least significant difference (D.S.L) at the 5% probability level (12).

Three agents were used: humic acid in the form of potassium humate, seaweed extract (Alga Mix), and baking yeast (Sacchromyces cervisiae). The distribution of the treatments was as follows Control (control treatment) spraying with water and liquid soap only. And Fertilization with humic acid, symbolized by the letters (H0 and H1), in the form of a solution with a concentration of 0.10 g L^{-1} and Spraying

with seaweed extract, symbolized by the letter (A0, A1, and A2), in the form of a solution at three concentrations 1.5, 1, 0 g L^{-1}, respectively (16) and Spraying with bread yeast, which we symbolize with the letter (Y0, Y1 and Y2) in the form of a solution at concentrations 0, 10, 20 g L^{-1} sequentially, where the bread yeast was dissolved in water and sugar was added in a ratio of 1:1, then the suspension was kept in the dark for 24 hours to double. Yeast and its activation (4). and Interactions of the above two- and three-way transactions. Characteristics studied: The following characteristics were measured on 1/11/2023.

Rate of increase in seedling height (cm) and Rate of increase in the number of leaves (seedling leaf $^{-1}$) and Rate of increase in leaf area (cm^2) and Percentage of nitrogen in leaves % and Percentage of total protein in leaves (%) and Total chlorophyll content of leaves (mg 100 g fresh weight).

Results and Discussion

Rate of increase in seedling height (cm): The results of Table 1 showed that there were significant differences between the experimental treatments. The addition of humic acid had a significant effect on the rate of increase in seedling height (cm), as the H1 treatment 10 g L^{-1} outperformed by giving it a higher the rate of increase was 128.63 cm, which exceeded the comparison H0, which recorded the lowest rate of 67.70 cm. The same table shows the appearance of significant differences in this characteristic when spraying with marine algae extract, as treatment A2 with a concentration of 1.5 g L^{-1} was significantly superior to all other treatments by giving it the highest rate of 129.39 cm, while treatment A1 with a concentration of 1 g L^{-1}. It was significantly superior to the comparison treatment A0, which gave the lowest rate of 75.11 cm.

As for foliar spraying with bread yeast, treatment Y2 at a concentration of 20 g L^{-1} outperformed the other treatments by giving it the highest rate of increase for this trait, which amounted to 110.94 cm, followed by treatment Y1, which in turn was significantly superior to the comparison treatment Y0 (0 g L^{-1}), which the lowest rate was recorded at 86.44 cm.

As for the dual interaction of the study agents, humic acid and seaweed extract, treatment H1A2 (10 g L^{-1} + 1.5 g L^{-1}) outperformed all other treatments by giving it the highest rate of 182.00 cm, while the comparison treatment H0A0 recorded the lowest rate of 62.22 cm. As for the binary interaction between humic acid and baking yeast, treatment H1Y2 (10 g L^{-1} + 20 g L^{-1}) showed the highest rate, reaching 148.33 cm,while the comparison treatment H0Y0 recorded the lowest rate, reaching 62.78 cm.

As for the interaction between seaweed extract + baking yeast, the two treatments A2Y2 (1.5 g L^{-1} + 20 g L^{-1}) outperformed all other treatments by giving it the highest rate of 148.50 cm, while the comparison treatment A0Y0 gave the lowest rate for this trait, reaching 70.83 cm .Regarding the triple interaction of adding humic acid with spraying with marine algae extract and baking yeast, the results of the statistical analysis showed that there are no significant differences between the interaction coefficients in this characteristic.

Table 1: Shows the effect of fertilizing with humic acid and spraying with seaweed extract and baking yeast and their interaction on the rate of increase in seedling height (cm).

Humic acid (H)	seaweed extract (A)	baking yeast (Y)			H*A
		Y0	Y1	Y2	
H_0	A_0	61.67	63.33	61.67	62.22
	A_1	63.00	65.00	64.33	64.11
	A_2	63.67	72.00	94.67	76.78
H_1	A_0	80.00	86.33	97.67	88.00
	A_1	99.00	103.67	145.00	115.89
	A_2	151.33	192.33	202.33	182.00
					Average(H)
H*Y	H_0	62.78	66.78	73.56	67.70
	H_1	110.11	127.44	148.33	128.63
					Average(A)
A*Y	A_0	70.83	74.83	79.67	75.11
	A_1	81.00	84.33	104.67	90.00
	A_2	107.50	132.17	148.50	129.39
		86.44	97.11	110.94	Average(Y)
		LSD 5%			
H*A*Y	A*Y	H*Y	H*A	Y	A	H
N.S	12.77	10.43	10.43	7.38	7.38	6.02

The rate of increase in the number of leaves (seedling leaf^{-1}): The table 2 shows that the addition of humic acid had a significant effect on the rate of increase in the number of leaves (seedling leaf^{-1}), as treatment H1 was significantly superior to the comparison treatment H0 by giving it the highest rate. It reached 113.67 seedling leaves^{-1}, while the comparison treatment recorded the lowest rate of 75.15 seedling leaves^{-1}. As for spraying with seaweed extract, treatment A2 at a concentration of 1.5 gm L^{-1} was significantly superior to all other treatments by giving it the highest rate of increase of 106.00 seedling leaves^{-1}, followed by treatment A1, which in turn was significantly superior to the comparison treatment A0, which gave the lowest rate of 82.67. Seedling paper^{-1}. Regarding foliar spraying with bread yeast extract, treatment Y2 outperformed all other treatments by giving it the highest rate of increase, which amounted to (101.78 seedling leaves^{-1}), followed by treatment Y1, which in turn significantly outperformed the comparison treatment Y0, which recorded the lowest rate, amounting to (75.33 seedling leaves^{-1}).As for the dual interaction of the study agents, humic acid and seaweed extract, treatment H1A2 recorded the highest rate for this trait, which amounted to 119.33 (seedling leaf^{-1}), which was superior to the comparison treatment H0A0, which recorded the lowest rate, amounting to 57.22 (seedling leaf^{-1}).As for the double interaction between humic acid and bread yeast, the interaction between seaweed extract and bread yeast, and the triple interaction of adding humic acid with spraying with seaweed extract and yeast, the results of the statistical analysis showed that there are no significant differences between the interactions in this characteristic.

Table 2: Shows the effect of fertilizing with humic acid and spraying with seaweed extract and baking yeast and their interaction on the rate of increase in the number of leaves (seedling leaf^{-1}).

Humic acid (H)	seaweed extract (A)	baking yeast(Y)			H*A
		Y0	Y1	Y2	
H_0	A_0	48.33	58.67	64.67	57.22
	A_1	66.00	74.67	86.00	75.56
	A_2	84.33	92.00	101.67	92.67
H_1	A_0	102.33	110.00	112.00	108.11
	A_1	110.00	109.67	121.00	113.56
	A_2	115.67	117.00	125.33	119.33
		Average(H)			
H*Y	H_0	66.22	75.11	84.11	75.15
	H_1	109.33	112.22	119.44	113.67
		Average(A)			
A*Y	A_0	75.33	84.33	88.33	82.67
	A_1	88.00	92.17	103.50	94.56
	A_2	100.00	104.50	113.50	106.00
		87.78	93.67	101.78	Average(Y)
		LSD 5%			
H*A*Y	A*Y	H*Y	H*A	Y	A	H
N.S	N.S	N.S	10.66	7.54	7.54	6.15

Rate of increase in leaf area (cm^2): Table 3 indicates that treatment with humic acid had a significant effect on the rate of increase in leaf area (cm^2), as treatment H1 was significantly superior to the comparison treatment H0 by giving it the highest rate of 57.68 cm^2, while it gave in comparison, the lowest rate was 45.68 cm^2. Regarding spraying with algae extract, treatments A1 and A2 were significantly superior to the comparison treatment by giving them the highest rate of increase of 56.21 and 52.87 cm^2, and the comparison A0 recorded the lowest rate of 45.03 cm^2. The same table shows that when spraying with yeast extract, treatment Y2 outperformed the other treatments by giving it the highest rate of 59.93 cm^2, compared to the comparison treatment Y0, which recorded the lowest rate of 46.62 cm^2, which did not differ from treatment Y1, which gave 47.57 cm^2.

Regarding the binary interaction between humic and seaweed, treatment H1A1 was significantly superior to all other treatments by giving it the highest rate of increase in leaf area, giving 63.98 cm^2, while the comparison treatment H0A0 recorded the lowest rate of 36.01 cm^2. As for the binary interaction between humic and yeast, significant differences appeared between the treatments. H1Y2 was significantly superior to all other treatments by giving it the highest rate of increase in leaf area, 71.58 cm^2.

As for the bilateral interaction between marine algae extract and baking yeast, it gave significant differences between the treatments. Treatment A1Y2 was significantly superior to all other treatments by giving it the highest rate of increase in leaf area, 70.95 cm^2, while treatment A0Y1 gave the lowest rate of 37.30 cm^2. The same table shows that the three-way interaction between adding humic acid and spraying with seaweed extract and baking yeast.

Table 3: Shows the effect of fertilizing with humic acid and spraying with seaweed extract and baking yeast and their interaction on the rate of increase in leaf area (cm^2).

Humic acid (H)	seaweed extract (A)	baking yeast(Y)			H*A
		Y0	Y1	Y2	
H_0	A_0	39.15	29.76	39.12	36.01
	A_1	51.95	37.83	35.51	41.76
	A_2	41.32	66.28	70.23	59.28
H_1	A_0	48.28	44.85	69.04	54.06
	A_1	64.56	53.34	74.02	63.98
	A_2	34.44	53.35	71.67	53.15
					Average(H)
H*Y	H_0	44.14	44.62	48.28	45.68
	H_1	49.09	50.52	71.58	57.06
					Average(A)
A*Y	A_0	43.72	37.30	54.08	45.03
	A_1	58.26	45.59	54.77	52.87
	A_2	37.88	59.81	70.95	56.21
		46.62	47.57	59.93	**Average(Y)**
		LSD 5%			
H*A*Y	A*Y	H*Y	H*A	Y	A	H
N.S	9.47	7.73	7.73	5.47	5.47	4.46

The percentage of nitrogen in the leaves (%): Table 4 indicates that fertilization with humic acid has significantly affected the percentage of nitrogen in the leaves (%), as the H1 treatment significantly outperformed the comparison treatment H0 by recording the highest percentage of 1.71%, while the treatment gave the lowest comparison rate was 281%. Regarding spraying with algae extract, treatment A2 was significantly superior to all other treatments by recording the highest percentage of 1.63%, followed by treatment A1, which in turn was significantly superior to the comparison treatment A0, which gave the lowest percentage of 1.31%. The same table shows that spraying with yeast extract recorded a significant superiority for treatment Y2 over all treatments by giving it the highest rate of 1.61%, followed by treatment Y1, which in turn was significantly superior to the comparison treatment Y0, which recorded the lowest rate of 1.40%. As for the binary interaction of the study agents, humic and marine algae, treatment H1A2 gave the highest percentage of nitrogen, amounting to 1.93%, while the comparison recorded the lowest percentage of nitrogen, amounting to 1.16%. A The H1Y2 treatment was significantly superior to by giving it the highest rate of increase in the percentage of nitrogen, reaching 1.79%,

Regarding the bilateral interaction between marine algae extract and yeast, significant differences appeared between treatments A2Y1 and A2Y2 over all other treatments, giving them the highest percentage of 1.65 and 1.68%, respectively, while treatment A0Y0 gave the lowest percentage of 1.16%. The same table shows that the triple interaction of humic acid fertilization with spraying with algae and yeast. The results of the statistical analysis showed that the treatments H1A2Y1 and H1A2Y2 were superior to all other treatments by recording the highest percentage at 1.96 and 1.98%.

Table 4: shows the effect of fertilizing with humic acid and spraying with seaweed extract and baking yeast and their interaction on the percentage of nitrogen in the leaves (%).

Humic acid (H)	seaweed extract (A)	baking yeast(Y)			H*A
		Y0	Y1	Y2	
H_0	A_0	0.96	0.97	1.55	1.16
	A_1	1.27	1.35	1.37	1.33
	A_2	1.29	1.34	1.38	1.34
H_1	A_0	1.37	1.43	1.56	1.45
	A_1	1.68	1.76	1.81	1.75
	A_2	1.84	1.96	1.98	1.93
					Average(H)
H*Y	H_0	1.17	1.22	1.43	1.28
	H_1	1.63	1.71	1.79	1.71
					Average(A)
A*Y	A_0	1.16	1.20	1.55	1.31
	A_1	1.48	1.56	1.59	1.54
	A_2	1.56	1.65	1.68	1.63
		1.40	1.47	1.61	**Average(Y)**
LSD 5%					
H*A*Y	A*Y	H*Y	H*A	Y	A	H
0.11	0.08	0.06	0.06	0.04	0.04	0.04

Percentage of total protein in leaves (%): Table 5 shows that treatment with humic significantly affected the percentage of total protein in leaves (%). Treatment H1 was significantly superior to the comparison treatment H0 by giving it the highest percentage of total protein, reaching 10.68% compared to the comparison treatment, which recorded the lowest percentage of 7.97%.

The same table shows the moral superiority of spraying with seaweed extract, where treatment A2 was significantly superior to the other treatments by recording the highest rate of 10.19%, followed by treatment A1, which in turn was significantly superior to the comparison treatment A0, which gave the lowest rate of 8.16%. As for spraying with bread yeast extract, the treatment had Y2 was significantly superior to all other treatments by giving the highest percentage of total protein, reaching 10.06%, followed by treatment Y1, which in turn was significantly superior to the comparison treatment, Y0, which gave the lowest percentage, amounting to 8.76%. As for the binary interaction of humic acid and seaweed extract, the H1A2 treatment outperformed all other treatments by recording the highest percentage of total protein, which amounted to 12.03%, while the comparison treatment gave the lowest percentage, which amounted to 7.24%. As for the binary interaction between humic acid and baking yeast, significant differences appeared between the treatments, as the H1Y2 treatment was significantly superior to all other treatments by giving it the highest rate of 11.16%, while the comparison treatment H0Y0 recorded the lowest rate of 7.33%. As for the bilateral interaction between algae extract and yeast, A2Y1 andA2Y2 were significantly superior to all treatments by giving them the highest percentage of 10.30 and 10.51%, respectively. Treatment A0Y0 gave the lowest percentage of 7.27%.

While it is noted that the triple interaction of fertilization with humic acid with spraying with seaweed extract and bread yeast, the results of the statistical analysis showed that the treatments H1A2Y1 and H1A2Y2 were superior to all other

treatments by giving them the highest percentage of 12.23 and 12.40% compared to the comparison treatment, which recorded the lowest percentage of 6.00%.

Table 5: shows the effect of fertilizing with humic acid and spraying with seaweed extract and baking yeast and their interaction on the percentage of total protein in leaves (%).

Humic acid (H)	seaweed extract (A)	baking yeast(Y)			H*A
		Y0	Y1	Y2	
H_0	A_0	6.00	6.06	9.67	7.24
	A_1	7.96	8.46	8.56	8.33
	A_2	8.04	8.38	8.63	8.35
H_1	A_0	8.54	8.92	9.75	9.07
	A_1	10.52	10.98	11.33	10.94
	A_2	11.48	12.23	12.40	12.03
					Average(H)
H*Y	H_0	7.33	7.63	8.95	7.97
	H_1	10.18	10.71	11.16	10.68
					Average(A)
A*Y	A_0	7.27	7.49	9.71	8.16
	A_1	9.24	9.72	9.95	9.64
	A_2	9.76	10.30	10.51	10.19
		8.76	9.17	10.06	**Average(Y)**
		LSD 5%			
H*A*Y	A*Y	H*Y	H*A	Y	A	H
0.66	0.47	0.38	0.38	0.27	0.27	0.22

Average leaf content of total chlorophyll (mg 100 g fresh weight): Table 6 shows that fertilization with humic acid has significantly affected the total chlorophyll rate in the leaves (mg 100 g fresh weight) as the treatment with humic acid was significantly superior to the comparison treatment by giving it a higher the rate reached 44.73 mg/100 gm fresh weight, while the comparison treatment gave the lowest rate of 32.99 mg/100 gm fresh weight. As for spraying with algae extract, treatment A2 was significantly superior to all other treatments by giving it the highest rate of 43.23 mg per 100 grams of fresh weight, followed by treatment A1, which in turn was significantly superior to the comparison treatment A0, which recorded the lowest rate of 34.59 mg per 100 grams of fresh weight. The same table shows that spraying with yeast extract gave treatment Y2 a significant superiority over all other treatments by giving it the highest rate of total chlorophyll, amounting to 40.75 mg 100 g fresh weight, while the comparison treatment Y0 recorded the lowest rate, amounting to 37.11 mg 100 g fresh weight. Regarding the binary interaction of humic acid and seaweed extract, treatment H1A2 was significantly superior to all other treatments by recording the highest rate of 48.68 mg 100 g fresh weight, while the comparison recorded the lowest rate of 28.21 mg 100 g fresh weight. As for the binary interaction of humic acid and baking yeast, treatment H1Y2 was significantly superior to all other treatments by giving them the highest rate of 47.15 mg 100 gm fresh weight, while the comparison treatment H0Y0 recorded the lowest rate of 31.56 mg 100 gm fresh weight.

The results of the statistical analysis showed that the binary interaction of marine algae extract and baking yeast gave significant differences between the treatments, as treatment A2Y2 was significantly superior to all other treatments by giving it the

highest rate of 46.03 mg 100 g fresh weight, while the comparison treatment A0Y0 recorded the lowest rate of 33.55 mg 100 g fresh weight.

The same table shows that the triple interaction of adding humic acid and spraying with marine algae extract and bread yeast. The results of the statistical analysis gave significant differences for this trait, as the H1A2Y2 treatment outperformed all other treatments by recording the highest rate of 52.98 mg 100 gm fresh weight compared to the comparison treatment H0A0Y0, which gave the lowest rate. Average amounted to 28.17 mg per 100 g fresh weight.

Table 6: shows the effect of fertilizing with humic acid and spraying with seaweed extract and baking yeast and their interaction on the total chlorophyll rate in leaves (mg 100 g fresh weight).

Humic acid (H)	seaweed extract (A)	baking yeast(Y)			H*A
		Y0	Y1	Y2	
H_0	A_0	28.17	28.26	28.18	28.21
	A_1	30.21	32.96	35.80	32.99
	A_2	36.29	37.94	39.08	37.77
H_1	A_0	38.92	41.22	42.81	40.98
	A_1	43.99	43.95	45.65	44.53
	A_2	45.04	48.04	52.98	48.68
					Average(H)
H*Y	H_0	31.56	33.05	34.36	32.99
	H_1	42.65	44.40	47.15	44.73
					Average(A)
A*Y	A_0	33.55	34.74	35.50	34.59
	A_1	37.10	38.46	40.73	38.76
	A_2	40.67	42.99	46.03	43.23
		37.11	38.73	40.75	**Average(Y)**
		LSD 5%			
H*A*Y	A*Y	H*Y	H*A	Y	A	H
1.07	0.76	0.62	0.62	0.44	0.44	0.36

The reason for the increase in vegetative characteristics and the content of leaves of mineral elements when adding ground humic may be because of its important and fundamental role in plant growth through direct and indirect effects. The direct effects on the plant can be attributed to the effect on the cell walls, membranes, and cytoplasm, and in a way Mainly on natural hormones (3), the indirect effects on plant growth are through increasing soil nutrients, increasing the biological activities of soil microorganisms and cation exchange capacity, which improves soil structure (19).

Fertilization with humic acid gave the highest values for all the vegetative traits studied, which were significantly superior to the control treatment. This may be due to the increase in chlorophyll in the leaves when humic acid was added, as it led to an improvement in the vegetative growth traits represented by an increase in the speed and outputs of the photosynthesis process, which the plant benefits from in All the vital processes that take place in the plant, including the construction of new tissues, cell division and expansion (18 and 22), and that most of the characteristics of vegetative growth have increased as a result of fertilization with humic acid, and these results are consistent with what found in olives. Kindle The reasons are that humic is a release of nutrients, and it works to improve the cation exchange capacity and increase the readiness of nutrients and thus facilitate their absorption by the plant and increase their quantity internally, in addition to building a root system with high

efficiency in absorbing nutrients, which helps the plant grow. Spraying with seaweed extract has improved most of the characteristics of vegetative growth in the leaves, this may be due to the fact that seaweed extract contains many nutritional elements that have an important role in increasing the metabolic activities of the plant (6), including potassium, which works to activate enzymes that synthesize amino acids and protein, and also helps Manufacturing chlorophyll, which is necessary in the process of photosynthesis and the formation of proteins, sugars, and energy compounds ATP, which leads to increased plant growth and size and thus increased vegetative growth (7 and 25), or because marine algae extract contains auxins that stimulate the process of cell division and elongation, thus increasing vegetative growth, root diameter, and taste (23 and 24).

As for spraying with bread yeast extract, it has led to an increase in the characteristics of vegetative growth because it contains many vitamins and nutrients, which has led to improving the metabolic processes of the plant and improving the production of carbohydrates manufactured in the photosynthesis process and thus creating the enzyme Nitrate reductase to reduce and assimilate nitrates, which leads to an increase in nitrogen accumulation. And increasing the absorption of phosphorus and potassium and transporting it to the leaves (13, 15 and 16). These elements have a role in increasing the products of the photosynthesis process, represented by carbohydrates, which are transformed through metabolic paths into the chalcone compound, which is transformed into the naringenin compound, which is oxidized to form anthocyanins in the cell vacuoles according to the biological path. Anthocyanins (9 and 20), and the reason is that the yeast contains stimulant substances. For growth, such as vitamin B1 (thiamine) and riboflavin (8, 14 and 21), which have their role in metabolizing carbohydrates and building amino acids (23), which are transported to new places of active growth.

Conclusions

Regarding the study's findings, it can be said that the seedlings of Buckthorn tafahe variety reacted to foliar nutrition by treatments of seaweed extract and baking yeast and their interactions. As a result, we advise treating with the research variables that enhance the chemical composition and growth of seedlings.

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