

Research

Effect of temperature and extract (*Ascophyllum nodosum*) On the vegetative characteristics of marjoram

Abeer Jalil Jabbar^{1,*}, Intedhar Abbas Marhoon²

¹Al-Qadisiyah University/College of Science/Botany Department;
0000-0003-2302-0154

²Al-Qadisiyah University/College of Science/Botany Department;
0000-0003-1156-9043

*Correspondence: abeeraqaseer@gmail.com.

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ABSTRACT

The effect of temperature and the addition of asco phylum nodesum extract on some vegetative characteristics represented by plant height, number of branches, fresh and dry weight, and chlorophyll percentage, and it was found through the results that treating the plant with a concentration of 50% of algal extract is one of the best treatments in improving vegetative characteristics and The least productive treatments were for plants whose seeds were treated at low temperatures. The results were statistically analyzed according to the randomized complete block design and using the computer according to the SPSS system, and the averages were compared using the Anova test at a probability level of 5%.

Keywords: extract- marjoram- *Ascophyllum nodosum*- Effect of temperature

INTRODUCTION

Temperature is one of the most important environmental factors that regulate the process of germination and control to a large extent the growth of seedlings and plants¹ And it has a clear effect on the speed of seed germination², where low temperatures contribute to a decrease in the rate of germination³, and high temperature contributes to achieving an optimal level of germination⁴.

Scientific studies have proven the use of marine algae to aid in soil fertility⁵, as some researches have found inventions related to extracts of seaweed that have proven effective in helping the plant absorb mineral elements from the soil⁶

Benefiting from light energy⁷, as well as marine algae helps the plant to synthesize amino acids inside it, and works to increase the amount of starch⁸.

Among the important marine algae extracts are (*Ascophyllum nodosum*) extract, which improves plant vigor, increases root growth at a better level, enhances chlorophyll synthesis, promotes early flowering, reduces pod breakage, delays ageing, and enhances tolerance to abiotic stress⁹.

Because of the importance of this plant economically and medically at the global level in general, and at the level of Iraq in particular, and because of the low production of this plant in central and southern Iraq, it is necessary to use the best methods or modern techniques that lead to an increase in yield and encourage an increase in the cultivated area in order to raise productivity and resource The economic. One of the justifications for this study is the lack of academic studies that have focused on studying the physiology of the marjoram plant

Temperature is a major factor in controlling the rate of seed germination, as temperature is an important factor in the adaptation and change of growth factors in the specialized medium (water in the soil)¹⁰, but it does not integrate into the plant itself, as there are three temperatures in The effect on germination, where the highest percentage of germination is in the optimum¹¹. Germination occurs, "The maximum temperature is the thermal ceiling above which germination will not occur, as in this case the protoplasm of the seed will decompose and die"¹²

A study was conducted by the researcher¹³ using the algal extract acrocin by spraying on citrus seedlings, which included four concentrations (zero, 25, 50, 70). The results showed that increasing the concentrations of spraying with acrocin led to an increase in most of the studied traits. Such as increasing the diameter of the stem, the number of leaves, the number of growths, and the content of leaves from the elements magnesium, nitrogen and chlorophyll.

One of the important studies is the study of (daab, 2021) that used "the aqueous extract of *Sargassum vulgare* at various concentrations (10%, 20%, 30%, 40%) and its application as a spray fertilizer on eggplant plants, as one spray every seven days and evaluated as a trait, fertilizer and stimulant.

MATERIALS AND METHODS

This study was carried out in one of the greenhouses of a farm in the city of Diwaniyah during the winter season 2021 AD. The seeds were sown in pots containing sandy soil mixture in order to study the effect of temperature difference and the use of algal extract on the germination of marjoram daughters, the effect of temperature and algal extract on the speed of germination and some vegetative characteristics. The seeds were treated with three different temperatures, as the first group was treated with temperature. The second group was treated with a temperature of 50 degrees Celsius, and the third group was treated with a temperature of -5 degrees Celsius .

With a solution of *Ascophyllum nodosum* extract, of Canadian origin, containing nutrients such as macrosaccharides, carbohydrates 7-9%, the mineral iodine, and fats. It contains more than thirty natural compounds, as well as the elements (K₂O 4% - P₂O₅ 4% - N 4%). Natural growth stimulants and microelements (manganese - magnesium - calcium - zinc - boron - iron - sulfur - copper). In addition to vitamins, enzymes, amino acids, (organic substance, at a rate of 18-21%), auxins, gibberelins, and cytokinins.

A solution of algae extract *Ascophyllum nodosum* was prepared by taking 25 ml of the solution added to 975 ml of distilled water named in the first concentration (A1), and the second concentration was prepared by taking 50 ml of the solution added to 950 ml of distilled water named in the second concentration (A2). Then we prepared 45 anvils, each five anvils on one side were designated for normal temperatures, they were filled with 20 seeds for each anvil, and five anvils were allocated for the first concentration (A1) and five other anvils for the second concentration (A2), and each of them was filled with 20 seeds for each anvil, then the concentrations were added (the first, and the second) to the anvils assigned to it. Five special anvils were prepared at a temperature of 50, where the seeds were exposed to a temperature of 50, then added to the anvils, and five other anvils were prepared at a temperature of -5, where the seeds were exposed to a low temperature of -5. Five other anvils were assigned to a temperature of 50 and worked with concentration A1 and five other anvils to a temperature of 50 and worked at a concentration of A2, five anvils to a temperature of -5 and worked at a concentration of A1 and five anvils to a temperature of -5 and worked at a concentration of A2. According to the height of the plant (cm), the vegetative and dry weight (grams) and the number of branches, the field chlorophyll was measured in the leaves of the plant with the Chlorophyll meter SPAD-502 manufactured by Konica minota company.

RESULTS

Should provide a concise and precise description of the experimental results, their interpretation, and possible experimental conclusions:

Subsubsection

Effect of temperature and the algal extract *Ascophyllum nodosum* and their interactions on the vegetative characteristics of marjoram plant from table 1

Effect of temperature and extract *Ascophyllum nodosum* on the number of branches of marjoram table2

Effect of temperature and *Ascophyllum nodosum* extract and their interactions on the dry weight of marjoram plant tablev3

Effect of temperature and *Ascophyllum nodosum* extract and their interactions on fresh weight of marjoram plant table 4

Effect of temperature and algal extract on chlorophyll content of marjoram leaves. Table 5

Numbered lists can be added as follows:

It was noted from the results of Table 1 that all concentrations of the algae extract significantly affected the rate of growth of marjoram, as they differed significantly in the rate of plant height, as marjoram outperformed significantly in height after the second treatment, as it reached the average rate of height of a plant (35,63) at the concentration of 50% at a temperature of 50.

It turns out that the increase in the composition of the added extract had a significant effect on increasing the height of the plant during the experiment season, as the effect increases with the increase in the concentration level of the algal extract.

Table 1. Effect of temperature and *Ascophyllum nodosum* extract and their interactions on the rate of plant height cm and marjoram

The average	Marjoram			Extract concentration
	Temperature			
	50	5	control	
20,27	25,17	15,34	20,32	Control
25,38	30,41	17,25	28,55	75
28,42	35,63	18,24	32,39	50
	30,40	17,28	27,39	The average

Significant at the 0.05 probability level** Significant at the 0.01 probability level.

It was noticed from the data of Table 2 that the marjoram plant significantly outperformed the secondary branches after the second treatment, as the average number of branches in the plants treated with temperatures reached 50, and for both concentrations, the highest percentage was 32.00 at the concentration of 50% of the algal extract, and the lowest percentage was in the plants that were treated at different temperatures, which averaged 13,68 As it becomes clear that the increase in the concentration of the added extract has a significant effect on increasing the number of secondary branches of the plant, and the reason for this is attributed to the role of the extract in improving the nutritional status of the plant and achieving an agreement in the ratio of the vegetative group to the root system. Because it contains nutritious minerals and the reason may be due to stimulating the plant to produce cytokinins that have an important role in encouraging the growth of lateral buds, and the reason for this is due to the effect of cytokinin in its antagonism with the action of auxin accumulated in the terminal bud, which led to overcoming the apical dominance, growth and unfolding Lateral buds, and thus an increase in secondary branches.

Table 2. Effect of temperature and extract of *Ascophyllum nodosum* and their interactions on the average number of branches of marjoram plant.

The average	Marjoram			Extract concentration
	Temperature			
	50	5	Control	
13,68	17,23	14,32	15,50	Control
24,05	25,81	15,61	24,75	75
29,25	30,94	19,83	32,00	50
	24,66	16,58	25,41	The average

Significant at the 0.05 probability level** Significant at the 0.01 probability level.

The data of Table 3 showed the effect of the study's treatments on the dry weight of the vegetative group, as the difference of the variety had a significant effect on this trait, as it reached the dry

weight of the plant in the plants that were treated with a concentration of 50% and the plants that were treated at a temperature of 50 and at a concentration of (50% of the algal extract) 25,27, 24,74 (g. Plant1-) respectively for marjoram.

The data of Table 4 showed the effect of the study treatments on the fresh weight of the vegetative group, as the difference of the variety had a significant effect on this trait, as the weight of the fresh plant in the plants treated with both concentrations reached the highest percentage (28,43 32,16) g. Plant-1, respectively for marjoram

Table 3. Effect of temperature and *Ascophyllum nodosum* extract and their interactions on the dry weight of marjoram plant

The average	Marjoram			Extract concentration
	Temperature			
	50	5	control	
14,36	14,45	13,32	15,31	Control
18,73	19,56	16,23	20,42	٪25
22,56	24,74	17,67	25,27	٪50
	19,58	15,74	20,33	The average

Significant at the 0.05 probability level** Significant at the 0.01 probability level.

It is noted from Table No. 5 that the marjoram plant has a significant effect on the chlorophyll pigment, as the marjoram plants were distinguished in this characteristic, and it was seen in the field that the stems of the marjoram plant were colored in purple, which indicates that it is anthocyanin pigment, and this may have a role in increasing the concentration of the chlorophyll pigment. It is also clear from the table that increasing the spraying with the concentration of the added extract has an effect on increasing the chlorophyll pigment, as the effect increases with the increase in the concentration of the spray. The table shows that there is a significant difference between the treatments, as the plants sprayed with a concentration of 50 ml / L and 25 ml / L gave an average rate of chlorophyll dyes, which amounted to 9.8 8.6, which is a percentage close to the plants that were treated with a temperature of 50 and sprayed with a concentration of 50 ml / L and 25 ml / L, which It reached 9.7 to 8.8 in marjoram plants, and it was noted that there was no change in plants that were treated with normal temperature and plants that were treated with temperature 5, and at temperature 5, which reached an average rate of 6.1, and there was a slight change in plants that were treated with temperature 5 with concentration A1 A2, which amounted to, The reason may be attributed to several factors, including a lack of certain mineral nutrients in the soil, such as a lack of iron, magnesium or zinc

Table 4. Effect of temperature and *Ascophyllum nodosum* extract and their interactions on fresh weight of marjoram plant

The average	Marjoram			Extract concentration
	Temperature			
	50	5	control	
18,93	19,45	17,23	20,12	Control
25,10	27,35	19,54	28,43	٪25
28,41	31,54	21,53	32,16	٪50
	26,11	19,43	26,90	The average

Significant at the 0.05 probability level** Significant at the 0.01 probability level.

Table 5. Effect of temperature and algal extract on chlorophyll content of marjoram leaves.

The average	Marjoram			Extract concentration
	Temperature			
	50	5	control	
6.1	7.4	4.6	6.5	Control
7.5	8.8	5.2	8.6	1/25
9.0	9.7	7.6	9.8	1/50
	8.6	5.8	8.3	Control

DISCUSSION

As a result of the research, the results obtained are very close to being accurate, or we can call them accurate. These results are somewhat close to what was reached by the researcher who conducted a study of the physiological characteristics of the marjoram plant ²¹, as the researcher studied the effect of marine extracts on the formal characteristics of vegetative growth (plant length and number of branches), as the plant height reached 43.8 cm. However, the level of gibberellins that elongates cells and increase chlorophyll synthesis, thus increasing photosynthesis and production of proteins important in plant growth activity (Atiya, et al., 2001). Moreover, Sugiunaet 1962 or the reason is due to the effectiveness of the extract in inhibiting the activity of the enzyme (dehydrogenase) of the (Pentose phosphate cycle) and preserving the activity of the (Ribonuclease) enzyme, whose concentration increases when the leaf enters the aging stage ¹⁹, and perhaps the reason is due to the manufacture of porphyrins that It has a role in building the chlorophyll pigment molecule (Mohammed and Younis, 1991), and the reason may be the increase in chloroplast division and the increase in chlorophyll pigments in the cell. These results are consistent with what was found (Chandel and Bhandari, 1996). As wellas the results are close to what was mentioned ¹⁴, and with what he found ²² Phillips 1975.

CONCLUSION

By studying the characteristics of plants such as plant height, number of leaves, number of flowers and number of fruits, the results showed that using aqueous extract of *Sargassum vulgare* at 40% concentration was sprayed on the leaves of eggplant. Eggplant plants gave the best results compared to plants that were fertilized using other concentrations

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Data Availability Statement: In this section, please provide details regarding where data supporting reported results can be found, including links to publicly archived datasets analyzed or generated during the study. Please refer to suggested Data Availability Statements in section "Bionatura Research Data Policies" at <https://www.revistabionatura.com/policies.html>. You might choose to exclude this statement if the study did not report any data.

Conflicts of Interest: Declare conflicts of interest or state "The authors declare no conflict of interest." Authors must identify and declare any personal circumstances or interest that may be perceived as inappropriately influencing the representation or interpretation of reported research results. Any role of the funders in the design of the study; in the collection, analyses or interpretation of data; in the writing of the manuscript, or in the decision to publish the results must be declared in this section. If there is no role, please state "The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results".

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