The Effect of Temperature and the Extract of (Ascophyllum Nodosum) on the Chemical Content of Thyme Plant

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Abstract
I have studied in this research the effect of temperature and the extract of (Ascophyllum Nodosum) on the chemical content of thyme plant, where I have planted thyme seeds on 25/November/2021 in plastic pots, with 10 seeds per pot using seven treatments included a regular temperature, low temperature (5c°) and high temperature (50 c°) and two concentrations of (Ascophyllum Nodosum) extract, first one 25% and the second 50% and in temperature of (5c°+25%) and (5c° +50%) and in temperature of(50 c°+25%) and (50 c°+50%) by 5 repetitions for each treatment,. A mixed soil was used for the cultivation and the highly advanced dutch origin peat moss fertilizer type (van egmond) was used and as was mentioned in the brochure it contains high volume of the necessary elements besides the potential hydrogen (PH) level in it ranges between 5-6.5, and the electrical conductivity (E.C.) ranges between (0.8-1.5) and it's good for the continuity of plant's growth for a duration of (4-6) weeks and after the plants reached the adult phase they were treated by spraying them with (Ascophyllum Nodosum) solution with the required concentrations and after three weeks the enzymatic response was measured (catalase and Peroxidase) and the hormonal response (the likes of Gibberellins and Auxins) of the plant. And the results were statistically analyzed by using (SPSS) Statistical Package for the Social Sciences software at the Statistical significance level of 0.05, and the results suggested that the treatment of (50 c°+50%) was the best while the treatment of 5 c° with both concentrations was less responsive among the other treatments.
Keywords: Ascophyllum nodosum, thyme plant, chemical content.

1. Introduction

Temperature is considered as one of the most important environmental factors that regulates cultivation process and controls the growth of seedling and plant. Temperature effects the biological processes inside the plants especially cells growth and their elongation and enzymes activity. Temperature rise leads to increasing plant hormones [1]. As for the algae extract they lead to increasing the vegetative total which next leads to the increase of leaves' content of hormones that make the plant's enzymes more active [2]. A study was conducted by the researcher about the effect of four temperature degrees on lettuce and they were 10 c°, 20 c°, 25 c°, 30 c° and it was noticed that the difference in temperature in day and night has affected the content of Anthocyanin and the decrease of catalase enzyme when temperature is low and the increase of catalase and Peroxidase when temperature rises. Another study was conducted by Pérez-Tello et al. [3] to study the effect of two temperature degrees 2c° and 10 c° on carambola fruit and the enzymatic response was measured and it was found that the concentration of the two enzymes has decreased when the temperature is low and they've increased when the temperature was 10 c°. As for the effect of spraying with algae extract it has led to increase Catalase and Peroxidase enzymes which are considered plant bio-stimulants [4, 5]. It also works on increasing hormones, auxins and gibberellins that regulate the growth of the plant [6].

Scientific studies have proven that the usage of sea algae effected the chemical content of the plant as in an experiment conducted by the researchers [7] on bent grass bush where the spraying of the extract had led to significant increase in Cytokinins in leaves content compared to other plants in the treatment. And it was confirmed by Gawish et al. [8] that the leaves content of potato increases by increasing the foliar fertilization with algae extract.

2. Materials and Work Methods

This study was conducted in one of the plastic houses belonging to a farm in Diwaniyah city during the winter season 2021. Where the seeds were planted in pots containing mixed soil to study the effect of temperature difference and usage of Algae extract on the foliar content of Catalase and Peroxidase enzymes and the likes of Gibberellin and Auxins. The seeds were treated with three different temperatures as the first treatment was treated with regular temperature and the second was treated with 50c° and the third was treated with -5c° then they were treated with the Canadian origin Algae extract (Ascophyllum Nodosum) that contains nutritious elements like large sugars and carbohydrates 7-9%, and mineral iodine and fats.it also contains over thirty natural compounds as well as (K2O 4%- N 4%- P2O5 4%)., and natural growth stimulants and micro-elements like (Manganese – Magnesium – Calcium – Zinc- Boron- Iron-Sulphur – Copper) in addition to

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vitamins, enzymes, amino acids and organic substance in a percentage of 18-21% and Gibberellin, Cytokinins and Auxins.

A solution of (Ascophyllum Nodosum) Algae extract was prepared by adding 25 ml of the solution to 975 ml of distilled water which was later called concentration (25%), and the second concentration was prepared by adding 50 ml of the solution to 950 ml of distilled water called concentration (50%), then we prepared 45 pots and each 5 pots were set aside and allocated for regular temperature, then 10 seeds were planted per pot, 5pots were allocated for concentration (25%), and five other pots for concentration (50%), then with 10 seeds in each pot the concentrations (first and second) were added to their allocated pots. Another 5 pots were allocated for 50 c°, and five more for 5 c°, first five pots for 50 c° were treated with (25%) concentration while the other five were treated with (50%) concentration, then the first 5 c° five pots were treated with (25%) concentration, and the other fiver were treated with (50%) concentration. Then the treatment with Algae extract was done with afore mentioned concentrations 14 days after the seeds' cultivation. Hormonal and enzymatic response for the plant's leaves was measured by spectrophotometer device on wave lengths 222-254 nm for the likes of Gibberellins and auxins, 470 nm for peroxidase, 240nm for catalase.

3. Results and Discussion

It is clear from table (18) that there is a statistical significance increase in foliar content as result from being treated by the Algae extract, as for temperature it has significantly affected the activity of catalase enzyme in thyme, because it's been noticed that temperature's effect has reached its peak by 1.61 at temperature 50 c°, as for the extract's effect it's reached the highest level at 1.73 and the over lapses were the highest at percentage of 2.63 in the treatment that consisted of 50 c° and 50% concentration compared to the comparison treatment, and that is attributed to the components of the Algae extract in the activity and increase of many biological activities that represented by photosynthesis that leads to the increase and accumulation of carbohydrates in foliar content as a result of being sprayed with Algae extract by absorbing it directly by the leaves [9].

Table (1) effect of temperature and Algae extract (Ascophyllum Nodosum) and their over lapses on the foliar content of catalase enzyme in wild thyme

Average	Wild thyme (Thymus serpyllum) Temperature			Algae concentration
	50	5	NO	
0.87	0.91	0.73	0.98	Control
1.05	1.24	0.85	1.15	A1
1.73	2.63	1.06	1.52	A2
	1.61	0.88	1.26	Average

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

The effect of temperature and Algae extract on the foliar content of peroxidase enzyme

It is clear from table (1) that there is a statistical significance increase in foliar content as result from being treated by the Algae extract, as for temperature it has significantly affected the activity of peroxidase enzyme in thyme, temperature has significantly effected in peroxidase enzyme, it's been noticed that temperature's effect has reached the highest level on thyme in a rate of 1.98 at temperature of 50 c°, as for the extract's effect it reached the highest level in a rate 1.96 and the over lapses 2.74 mg\kg in thyme, at temperature of 50 c° and concentration of 50%, and that is attributed to the components of the Algae extract in the activity and increase of many biological activities that represented by photosynthesis that leads to the increase and accumulation of carbohydrates in foliar content as a result of being sprayed with Algae extract by absorbing it directly by the leaves [9, 10].

Table (2) effect of temperature and Algae extract (Ascophyllum Nodosum) and their over lapses on the foliar content of peroxidase enzyme in wild thyme

Average	Wild thyme (thymus serpyllum) Temperature	Algae concentration		
	50	5	0	
0.93	0.93	0.91	0.96	0
1.60	2.27	1.11	1.43	25
1.96	2.74	1.35	1.79	50
	1.98	1.12	1.42	Average

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

4.4.3. the effect of temperature and Algae extract on the foliar content of gibberellins

We noticed clearly form table (2) that there's a significant effect for the treatments on the foliar content as result of being treated with the Algae extract, temperature it has significantly affected the hormone, temperature's highest effect level was 0.85 mg\kg at 50 c° as for the extract its effect was at its highest in 0.77, 0.93 mg\kg in both concentrations in thyme compared to the comparison treatment which reached 0.57 and that is explained by the relationship between temperature and hormone increase whereas gibberellins are found in high concentrations in leaves [11] and then photosynthesis happens at high percentage when temperatures change because temperature effects plant's physiological processes especially cells growth and elongation, as gibberellin produces enzymes during cultivation such as alpha amylase and beta amylase that convert carbohydrates to

necessary sugars for the plant's growth.

Table (3) effect of temperature and Algae extract (Ascophyllum Nodosum) and their over lapses on the foliar content of gibberellins in wild thyme				
Average	Wild thyme (thymus serpyllum) Temperature		Algae concentration	
	50	5	0	
61.0	0.70	0٫46	0٫57	0
0.77	0٫92	0٫59	0٫82	25
0.93	1٫14	0٫69	0٫96	50
	0.85	0.58	0.78	Average
Significant at the 0.05 probability level** Significant at the 0.01 probability level.				

4.4.4. The effect of temperature and Algae extract on the foliar content of auxins

It was noticed from table (4) the existence of a significant difference on the treatments by temperature and Algae extract as temperature's effect reached its highest peaks at 1.24 on thyme, while Algae extract was 1.18 mg\kg and that's explained by the effect of extract on the auxins rate on the terminal peaks of the plant where it exists [12] and that is attributed to a plant hormone that moves polarly causing the activation of plant's and side buds growth, and it's been noticed from the table that there are significant effect for the over lapses in both plants that were treated with 50% concentration and 50 c° which reached 1.37 mg\kg in thyme compared to regular temperature which was 0.91 and the reason is that the biological activity and physiological activity of the natural hormone is effected by the difference in temperature also as for its spread, transfer, concentration and quantity [1], and it was clear as noticed in the table that the activity of enzymes is significantly increased by the increase of temperature and that is attributed to temperature's role in biological activity and the activity of plant's anti-oxidants, and these results conform with what came up with by studying the effect of high temperature on enzymes activity in wheat and the increase of Algae extract leads to vegetative total increase thus leading to hormonal level increase in the plant [13].

Table (4) effect of temperature and Algae extract (Ascophyllum Nodosum) and their over lapses on the foliar content of auxins in wild thyme				
Average	Wild thyme (thymus serpyllum) Temperature			Algae concentration
	50	5	0	
0.91	1٫13	0٫69	0٫91	0
1.07	1٫24	0٫77	1.20	25
1.18	1.37	0.86	1.31	50
	1.24	0.77	1.14	Average
Ascophyllum nodesum Overlap Temperature L.S.D 0.037 0.05 0.05 Thymus vulgaris				

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