EFFECT OF SPRAYING NUTRINT SOLUTION (Prosol) AND ALGAE EXTRACT ON GROWTH AND YIELD OF CAULIFLOWER (*Brassica* oleracea var. botrytis) UNDER DRIP IRRIGATION SYSTEM

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Abstract

This study was carried out during winter season of 2017 at experimental field of Horticulture and Landscape Department - College of Agriculture- Al Qassim Green University. This experiment was aimed to study the effect of foliar spray with nutrient solution (prosol) and algae extract in growth and vield of cauliflower. This experiment was designed according to (R.C.B.D) with three replicates and two factors. The first factor includes nutrient solution (Prosol) in three levels (Zero, 1.5, 3) g.L⁻¹. the second factor was the algae extract in three levels (Zero , 1.5, 3) ml/L⁻¹. Using foliar spray with nutrient solution (prosol) and algae extract has showed a significant effect in growth and yield characteristics. The treatment $(3g.L^{-1} \text{ Prosol and } 3ml.L^{-1} \text{ algae extract})$ was recorded higher average in the chlorophyll content, diameter of crud, weight of curds, Perimeter of curds, Total yield, percentage of nitrogen and potassium (70.87 SPAD, 19.33cm, 0.695 kg, 65.33 cm, 23.18 ton. hectare⁻¹, 2.51%, 2.75%) as compared with control treatment which recorded the lowest rate (59.00 SPAD, 14.67cm, 0.418 kg, 48.00 cm, 13.92 ton. hectare⁻¹, 1.21%, 1.89%) respectively. While the treatment (3g.⁻¹ Prosol and 1.5ml.L⁻¹ algae extract) gave the highest rate of number of leaves per plant, total plant weight and phosphorus percentage (23.33 leaf, 1.443 kg, 0.265%) as compared with control treatment which recorded the lowest rate percentage (16.00 leaf, 0.867 kg, 0.098%) respectively.

Key words : Cauliflower, algae extract, nutrient solution

Brassica تأثير الرش بالمحلول المغذي (prosol) و مستخلص الطحالب البحرية في نمو وحاصل القرنبيط olerace تحت نظام الري بالتنقيط

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الملخص

نفذت التجربة خلال الموسم الشتوي 2017 في حقول قسم البستنة و هندسة الحدائق كلية الزراعة- جامعة القاسم الخضراء. لمعرفة تأثير المحلول المغذي (Prosol) ومستخلص الطحالب البحرية في نمو وحاصل نبات القرنبيط , اجريت التجربة وفق تصميم القطاعات العشوائية الكاملة (R.C.B.D) بثلاث مكررات و عاملين. شمل العامل الاول المحلول المغذي (Prosol) ومستخلص الطحالب البحرية ونتي شمل العامل الاول المحلول المغذي (Prosol) ومشخلص الطحالب البحرية في نمو وحاصل نبات القرنبيط , اجريت التجربة وفق وبثلاث مستويات (0, 1.5) غم لتر⁻¹. والعامل الثاني مستخلص الطحالب البحرية وبثلاث مستويات (0, 1.5) غم لتر⁻¹. والعامل الثاني مستخلص الطحالب البحرية وبثلاث مستويات (0, 1.5) غم لتر⁻¹. والعامل الثاني مستخلص الطحالب البحرية تأثيراً معنوياً في صفات النمو والحاصل , اذ اعطت معاملة (٤غم/لتر⁻¹ المحلول المغذي (Prosol) مع 30 / للتر مستخلص الطحالب البحرية تأثيراً معنوياً في صفات النمو والحاصل , اذ اعطت معاملة (٤غم/لتر⁻¹ المحلول المغذي (Prosol) مع 30 / للتر مستخلص الطحالب البحرية تأثيراً معنوياً في معدل في محتوى الكلوروفيل الكلي و قطر القرص الزهري ومري ومحيط القرص الزهري والحاصل بالهكتار والنسبة المئوية للنتروجين والبوتاسيوم معاملة (٤غم/لتر⁻¹ المحلول المغذي (Prosol) مع 30 / للتر مستخلص الطحالب البحرية) اعلى معدل في محتوى الكلوروفيل الكلي و قطر القرص الزهري ووزن القرص الزهري ومحيط القرص الزهري والحاصل بالهكتار والنسبة المئوية للنتروجين والبوتاسيوم معاملة (٤غم/لتر⁻¹ المحلول المغذي (1.5) بالقياس مع معاملة المقارنة التي اعلت المعدل بلغت (1.5) بالقياس مع معاملة المقارنة التي اعلت المعدل بلغت (1.5) بالقياس مع معاملة المعدل بلغت (1.5) بالقيان معدل بلغت (1.5) بالقياس مع معاملة المقارنة التي العلي المعدل بلغت (معدل بلغت (1.5) معدل بلغت (1.5) بالمكاني معدل مي معدل مي معدل بلغت (1.5) بالقياس مع معاملة المعار المعدلي المعدل بلغني (1.5) بالقياس مع معاملة المعدل بلغت (1.5) بالقياس مع معدل بلغت (1.5) بالقياس مع معدل بلغت (1.5) بالقياس الحالب البحرية) اعلى معدل في عدد الاوراق و وزن النبات الكلي و النسبة المئوية الفسفور بلغت (2.5) ما / الرابي المحالي البحرية) اعلى معدل في عدد الاوراق و وزن النبات الكلي و النسبة المئوية الفسفور بل

1- INTRODUCTION

Cauliflower (Brassica olerace var. *botrytis*) belongs to the cruciferae family. This family includes more than 350 species and 4,000 species spread throughout the world, especially the temperate regions of the northern hemisphere. Cauliflower is grown in order to obtain curds, which is the plant edible part (5). Cauliflower is considered as a highly nutritious. This because each 100 grams of fresh weight contains 91% water, 27 calories, 2.7 g protein, 0.2 g fat, 5.2 g carbohydrate, 25 mg calcium, 56 mg phosphorus, 1.1 mg iron, 13 mg sodium, 595 mg potassium, 24 mg of magnesium, 0.11 mg of thiamine, 0.1 mg of riboflavin, 0.7 niacin and 78 mg of ascorbic acid (7). The statistics indicate that the productivity of cauliflower in Iraq is low compared to some Arab countries such as Egypt, Jordan, Lebanon, and Syria.

In order to promote Cauliflower cultivation in Iraq, it is necessary to use advanced agricultural techniques to provide high-quality crops. In addition, display the product in the local markets early in the season can give it a chance to compete with imports product leading to self-sufficiency. Fertilization, especially foliar application, is one of the important agricultural practices that play a major role in plant life. The balance of the nutrient can prevent physiological or biological disturbance in the plant life cycle. Recent studies have aimed to raise the efficiency of agricultural production by adding various nutrients as mineral and organic including nutrient solutions and seaweed extract (11).

Cauliflower has to be fertilized since it affects plant growth and increases the volume of cruds (9). Al-Ajil and Kareem (8) found that cauliflower plants were sprayed with Algaton seaweed extract at a concentration of 2 ml. L^{-1} gave the highest values for vegetative parameters including growth, color, and compaction of the cruds. Al-Maleky (3) also showed that spraying of Biozyme TF (algae extracts) has significantly increased the growth and yield parameters of two types of cabbage, such as leaf area, number of wrapped leaves, head weight, and the total yield. For the importance of the cauliflower plant and to improve its quality and quantity, this study was conducted to determine the effect of spraying the nutrient solution (Prosol) and marine algae extracts on the growth and yield of cauliflower.

2- MATERIAL AND METHODS

The experiment was carried out during winter season of 2017 in a field belongs to department Faculty Horticulture of / Agriculture / Al Qassim Green University. The soil was plowed and leveled. The land was then divided into lines to width 50 cm. Seedlings were planted in the middle of the lines. The distance between the plants were 40 cm while the distance between lines were 75 cm. The plants were irrigated using drip irrigation system. Randomized Complete Block Design (6) was used to study the effect of two factors with three replicates.

The first factor is nutrient solution (Prosol) at three levels (0, 1.5, 3 g.L⁻¹) coded as A_0 , A_1 , A_2 The second factor is the marine algae extract at three levels (0, 1.5, 3 ml.L⁻¹) coded as B_0 , B_1 , B_2 . The treatments for both factors were applied three times(15 days after transplanting, 15 days after the first application, and 15 days after the second application).

In order to study the effects of the factors the nutrient solution (Prosol) and marine algae extracts on chlorophyll content in leaves (SPAD), crud diameter (cm), number of leaves per plant , total plant weight (kg), weight of curd (kg) , the diameter of of curd (cm) and percentage of N, P, K.

3- RESULT AND DISCUSSION

Figure (1, 2) shows the significant effect of spraying nutrient solution (Prosol) and marine algae extract. The treatment (A_2B_2) gave the highest rate of chlorophyll and crud diameter (70.87 SPAD, 19.33 cm) compared to control treatment, which gave the lowest rate (59.00 SPAD, 14.67 cm) respectively. While the figure (3, 4) shows the

superiority of (A_2B_1) treatment which gave the highest rate of number of leaves per plant and total plant weight (23.33 leaf, 1.443 kg) compared to control treatment which recorded the lowest rate (16.00 leaf , 0.867 kg) respectively.

This may be due to the positive effect of the nutrient solution (Prosol), which contains





(b)



Fig. 1 (a, b). Chlorophyll content (spad) in Cauliflower.









(b)

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72

70

68

66

64

62

60

58

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Fig. 4 (a, b) total plant weight (kg) in Cauliflower

Figure (5, 6, 7) shows the significant effect of spraying the nutrient solution (Prosol) and marine algae extract on crud weight, crud perimeter, and the total yield. The treatment (A_2B_2) gave the highest rate (0.695 kg, 65.33 cm, 23.18 ton. hectare⁻¹) compared to control treatment that gave the lowest rate (0.418 kg, 48.00 cm, 13.92 ton. hectare⁻¹) respectively, but (A_2B_1) treatment did not significantly differ with (A_1P_2) treatment.

The reason for the superiority of spray with marine algae extracts and Prosol solution

may be due to the role of nutrients included in their structure and its positive effect on the process of photosynthesis which is represented by increasing leaf area and the number of leaves per plant. This led to an increase in the manufacture of carbohydrates in leaves. The products of processed materials then moved from photosynthesis to their storage locations causing increase crud weight and diameter, thus increasing the total yield (1 ,10).



Fig. 5 (a , b) weight of curd (kg) in Cauliflower







Fig. 7.(a, b) Total yield (t.ha) in Cauliflower

Figure (8, 9, 10) shows the significant effect of applying nutrient solution (Prosol) and marine algae extract in the percentage of nitrogen, potassium and phosphorus. The treatment (A₂B₂) gave the highest rate of N% and K% (2.51%, 2.75%) compared to control treatment which gave the lowest rate (1.21 %, 1.89 %) respectively. While the treatment (A₂B₁) gave the highest rate in phosphorus percentage (0.265%) compared to control treatment, which gave the lowest rate (0.098%).



The reason for the superiority of these treatments may be due to presenting NPK in the studied factors. As a result of its absorption directly by the young plant leaves, it moves to the cruds in the maturity stage. Therefore, these elements do the effect especially nitrogen which is involved in the formation of amino acids to build proteins (1, 4).



Fig. 8.(a, b) Nitrogen contents (%) in Cauliflower



Fig. 9.(a, b) Potassium contents (%) in Cauliflower



Fig. 10.(a, b) Potassium contents (%) in Cauliflower

* Means with similar letters are not significant at 0.05 level of probability using Duncan,s multiple range test.

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