

Effect of Nitrogenic Fertilizer and Seaweed Extract (Fitoalg) in some Green Growth and Total Yield on the Plant Coriander, *Coriandrum sativum* L.

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ABSTRACT

Key words:

Nitrogen fertilization, seaweed, coriander.

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This research was done in the Department of Biology/ Education College for Girls/ University of Mosul during the period from 2nd October/2012 till 25th March/ 2013 on the (*Coriandrum sativum* L.) for studying the response of the plant to fertilizing with the nitrogen fertilizer with three levels which are: zero, 50 and 100Kg.h⁻¹ and the spraying with the Seaweed extract (Fitoalg) in three concentrations which are: zero, 1 and 2 cm³.L⁻¹ experiment was carried out by designing the factorial experiment conducted in a Randomized Complete Block Design.. The results showed that the nitrogen fertilization in its two used concentrations has a significant effect in recording highest values for the properties of plant height, number of leaves, leafy area, stem diameter and the dry and fresh weights for the total chlorophyll besides total height of the Coriander. The spraying of the plant with the seaweed extract in 1cm³.L⁻¹ had a significant effect in recording highest values for the properties of plant height about 34.33cm and leaves area 62.84cm².plant⁻¹ and fresh weight 26.57g and concentration each of chlorophyll and carotene about 17.31mg.100g⁻¹ fresh weight and 6.32mg.100g⁻¹ fresh weight successively. The results of the interaction between the factors referred that the best values were recorded for the most studied properties when the factors interaction with each other especially at the fertilization with the level 50Kg.h⁻¹ with concentration about 1cm³.L⁻¹.

تأثير التسميد النتروجيني ومستخلص الأعشاب البحرية Fitoalg في بعض صفات النمو الخضري والحاصل لنبات الكزبرة *Coriandrum sativum* L.

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الخلاصة

اجري هذا البحث في قسم علوم الحياة/ كلية التربية للبنات/ جامعة الموصل، خلال المدة من 2 /تشرين اول/ 2012 ولغاية 25 /أذار/ 2013 على نبات الكزبرة بهدف دراسة استجابة النبات للتسميد بالسماذ النتروجيني بثلاث مستويات هي: صفر و 50 و 100 كغم.هكتار⁻¹ والرش بمستخلص الأعشاب البحرية Seaweed extract (Fitoalg) بثلاثة تراكيز هي: صفر و 1 و 2 سم³.لتر⁻¹ نفذت التجربة العملية بتصميم القطاعات العشوائية الكاملة وبثلاثة مكررات . وتم تحليل نتائج التجربة واختبرت إحصائيا باختبار دنكن متعدد المدى عند مستوى احتمال 5%. أوضحت النتائج: ان التسميد النتروجيني بتركيزيه المستخدمين تأثير معنوي في تسجيل اكبر القيم لصفات إرتفاع النبات وعدد الأوراق والمساحة الورقية وقطر الساق والوزنين الرطب والجاف للمجموع الخضري فضلا عن إرتفاع الحاصل الكلي لنبات الكزبرة. وكان لرش النباتات بمستخلص الأعشاب البحرية بالتركيز 1سم³.لتر⁻¹ تأثير معنوي في تسجيل أكبر القيم لصفات إرتفاع النبات 34.33 سم و المساحة الورقية 62.84 سم².نبات⁻¹ والوزن الرطب 26.57 غم وتركيز كلا من الكلوروفيل والكاروتين 17.31 ملغم.100 غم⁻¹ و 6.32 ملغم. 100 غم⁻¹ وزن رطب على التوالي. وكذلك تشير نتائج التداخل الثنائي بين العوامل موضوع الدراسة إلى أن أفضل القيم سجلت ولأغلب الصفات المدروسة عندما تداخلت العوامل مع بعضها ولاسيما عند معاملة التداخل بين التسميد بالمستوى 50 كغم.هكتار⁻¹ مع التركيز 1 سم³.لتر⁻¹.

الكلمات المفتاحية:

التسميد النتروجيني، مستخلص أعشاب بحرية، الكزبرة.

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Introduction:

Coriander (*Coriandrum sativum* L.) is one of the most important of vegetables, spice and medicinal plant. It is an annual and herbaceous plant, belonging to the Apiaceae family. The coriander seeds have essential oil as an active substance, which is used in pharmaceutical industry as an antispasmodic and a carminative (Kumar *et al.*, 2002).

Coriander is a herbal plant used in many industries, including the manufacture of pharmaceuticals, food and cosmetics. The plant material used for processing by the herbal industry is the fruit (Fructus Coriandri) and essential oil (Oleum Coriandri) extracted from coriander fruit (Carrubba *et al.*, 2009). Coriander fruits are useful for processing because of their rich chemical composition as well as the rich taste and aroma. Coriander fruits own their flavour mainly to essential oil, which contains many terpinene and others (Diederichsen-γ-pinene, α-volatile compounds, such as linalool, geraniol (Weiss 2002). Coriander oil also possesses medicinal properties, as: antibacterial, anti-fungal or anti-oxidant properties (Singh *et al.* 2006, Matasyoh *et al.*, 2009, Asgarpanah and Kazemivash 2012).

Nitrogen has the most profound influence on agricultural and biological traits of plants (Okut and Yidirim, 2005). This element is the basic component of protoplasm. It plays an important role in the synthesis of many chemical compounds (including proteins and enzymes), which translates into the processes involved in the growth and development of plants (Podsiadło, 2005; Carrubba *et al.*, 2009, Khan *et al.*, 2012; Khalid, 2013). Nitrogen deficit in soil leads to retarded growth and loss of weight of plant aerial organs as well as premature ripeness of plants (Oliveira *et al.*, 2003). Excess nitrogen causes abundant growth of vegetative organs to the detriment of generative ones (Oliveira *et al.* 2003, Carrubba, 2009), makes plants more vulnerable to lodging and diseases, prolongs the period of vegetation and delays maturity and harvest. In short, a proper course of ontogenesis depends on nitrogen, which functions as a limiting factor of agricultural yields (Okut and Yidirim 2005, Rzekanowski *et al.*, 2008; Khalid, 2013).

Infact Nitrogen fertilization plays a major role in crop yield improvement with better plant health (Kizil and Ipek, 2004). Regarding various nutrients, it is the most limiting nutrient and coriander that requires approximately 50Kg N ha⁻¹. Efficient application of nitrogen from organic and inorganic sources effectively enhances yield and quality of coriander and soil health.

Experimental research has proven that optimal doses of nitrogen, ensuring the best coriander yields, are within 20 to 90Kg N·ha⁻¹ (Okut and Yidirim, 2005; Rzekanowski *et al.*, 2008; Tehlan and Thakral, 2008). Differences in nitrogen fertilization and coriander yields may stem from originated of this plant and its adaptation to warm and dry climates. In moderate climatic conditions, the uptake of nitrogen from soil and its effective use to produce yields can be modified by different thermal and moisture conditions (Brady and Weil, 2000; Wiedenhoeft, 2006).

Seaweeds, also known as marine algae or, Seaweeds are group of photosynthetic (called macroalgae) that live in the sea (FAO, 2014). It is a very versatile product. It is used widely for food in direct human consumption, are a concentrated source of bioavailable minerals, electrolytes and trace elements. Because of their extremely high iodine content. It is also an ingredient for the global food and cosmetics industries and is used as fertilizer and as an animal feed additive (Wernberg, *et al.*, 2011).

Fertilizer uses of seaweed date back at least to the nineteenth century. Early usage was by coastal dwellers, who collected storm-cast seaweed, usually large brown seaweeds, and dug it into local soils (Pereira *et al.*, 2012).

Seaweed are used as a fertilizer which is suitable for use in organic agriculture (López-mosquera *et al.*, 2011). Energy-rich methane can be harnessed from seaweed deposits by anaerobic digestion. However, the high heavy metal content in the seaweed and its digestates limits their use as fertilizers. The efficient utilization of seaweed for biogas 742 Food Industry production, and the partial heavy metals mobilization to enable the metal removal for improved fertilizer quality (Nkemka and Murto, 2012). The red alga *Chondracanthus squarulosus* was cultured under semi-controlled conditions to valuate growth (biomass production) with agricultural fertilizers

(ammonium nitrate, ammonium sulphate and urea). analytical grade inorganic salts; sodium nitrate (analytical grade) and seawater were used as controls (Pacheco-Ruiz *et al.*, 2004).

Seaweeds are rich in vitamins A, E, C, and Niacin with similar content in red algae (Rhodophyta), brown algae (Ochrophyta) and green algae (Chlorophyta). The concentration of vitamins B12, B1, panthothetic acid, folic, and folinic acids are generally higher in greens and reds than in browns (Mchug, 2003).

In this study show that effect of nitrogen fertilizer and spraying with seaweed extract in growth and total yield of coriander.

Materials and Methods:

Research was done in that house of shade, Department of Biology/ Education College for Girls/ University of Mosul during the period from 2nd October/ 2012 till 25th March/ 2013, seeds available in local markets and planted in Nineveh were used in this study, where its germination rate was 97% by testing on moisture filter paper, experimental units were irrigated directly after planting, then they were irrigated as necessary. Tossing and weeding operations were made homogenously and for all experimental units, plant were planted in 30 cm² diameter pottery. The experiment includes the following:

Nitrogen Fertilizer: nitrogen fertilizer urea CO (NH₂) N rate 46% with three levels: zero, 50, 100 Kg.h⁻¹ treatment adding to soil twice, first when it plant's length reached 10-15cm, second, after one month from the first spray, main factor was accounted and was put in the main plot.

Spraying with seaweed extract: seaweed extract (Fitoalg) (Chase Organics GB.LTD. England) spraying was made, it is an aqueous seaweed extract belongs to Laminarinaceae and Fucaceae which contains the following nutritive elements: nitrogen 0.25%, Potassium 0.50%, Calcium 100mg/L, Iron, 100mg.L⁻¹, Manganese 25mg.L⁻¹, Zinc 20 mg.L⁻¹, Phosphor 0.25mg.L⁻¹, Sodium 0.50mg.L⁻¹, Magnesium 100mg.L⁻¹, Boron 30mg.L⁻¹, and Lead 20 mg.L⁻¹, as well as Cytokinin, bentaines 60mg.L⁻¹ with three concentrations: zero, 1, 2cm³.L⁻¹, where plants were sprayed after germination of 1-2 leaves on the plants and till the beginning of flowering, some granules of washing detergent was added as a spread substance, treatment was made by using seaweed extract twice, first after one week of fertilization with nitrogen, second after one month of the first spray, compared plants were sprayed with distilled water and it was considered as a minor plot, early morning spray till wetness was made, a spread substance was added for each concentration so as to lower the surface tightening of the solution, weeding, tossing and controlling insects and diseases operations were made when necessary. experiment consists of 9 factor treatments: 3 levels of nitrogen fertilizer, 3 concentrations of seaweed extract (3×3) and each treatment was repeated three times, factorial experiment conducted in a Randomized Complete Block Design.

Studied Features of the Green Growth: the following data were registered when flowering 50% of the experimental unit plants, and the following were measured:

Plant's length (cm) it was measured by using measuring tape starting from plant's stem till the upper plant's edge.

Number of total leaves (leaf.plant⁻¹): selecting three plants in each experimental unit.

Leaf area (cm².plant⁻¹).

Stem's diameter (mm): stem's diameter was measured above 5cm in height soil and it was calculated by using Vernier caliper through selecting three plants in a random.

Fresh & dry weight of the plant (g): by registering the fresh weight of the plant (g) then drying on 70c° till weight stable, then dried weight was calculated (g).

Chlorophyll concentration in leaves (mg.100g⁻¹ fresh weight): Total chlorophyll in leaves was measured according to where absorption spectrum of the filter was read on the wave length 652 nanometer by Spectrophotometer, type, ALEP-PD303, total chlorophyll was measured according to the following equation(using acetone concentration 80%) :

Total chlorophyll = 652 nanometer x 27.8 (stable)

Carotene concentration in seeds (m.100g^{-1} fresh weight): according to Goodwin (1976) by measuring it on a wave length 480 nanometer by using Spectrophotometer and according to the following equation (using acetone concentration 80%):

$$\text{Carotene concentration (mg / L)} = \frac{\text{OD wave length 480 nanometer} \times \text{total solution volume (ml)} \times 100}{2500 \times 100}$$

Total yield (Kg.h^{-1}): according to the planed area which equals 2200m^2 and according to the following equation:

$$\text{Total yield (kg / h)} = \frac{\text{Experimental unit yield (kg)}}{\text{Experimental unit volume (m}^2\text{)}} \times 8800$$

Statistical analysis: data were analyzed by using SAS (2001), Duncan's multiple range test was used with possibility level reached to 5%.

Results and Discussion:

Data in table (1) refers that the plant height has been significantly effect, where plant's height was increased when fertilizing with nitrogen with its two concentrations till reaching to 35.11cm when spraying with a concentration of 100 Kg.h^{-1} , this value has been differed significantly from values obtained in control treatment 29.00cm, addition with seaweed extract gave to an increase in the plant's height when spraying with a concentration of $1\text{cm}^3.\text{L}^{-1}$, while it was decreased when increasing seaweed concentration $2\text{cm}^3.\text{L}^{-1}$ which was low in comparison treatment.

Data of the interaction between nitrogen fertilization and seaweed extract refer that the highest value of the plant's height reached to 36.33cm when spraying with a concentration of 100Kg.L^{-1} interaction with spraying of a concentration of $1\text{cm}^3.\text{L}^{-1}$, while the value was 26.33cm when not spraying the plants with nitrogen fertilization with a concentration of $2\text{cm}^3.\text{L}^{-1}$ of seaweed extract.

Table 1. Effect nitrogen fertilizer and spraying the Seaweed extract in height plant (cm) of (*Coriandrum sativum* L.).

nitrogen fertilizer (Kg.h^{-1})	Seaweed extract ($\text{cm}^3.\text{L}^{-1}$)			mean nitrogen fertilizer (Kg.h^{-1})
	Zero	1	2	
Zero	28.33 de	32.33 de	26.33 e	29.00 b
50	34.00 a-d	34.33 a-c	31.76 cd	33.33 a
100	35.67 ab	36.33 a	33.33 a-c	35.11 a
mean Seaweed ($\text{cm}^3.\text{L}^{-1}$)	32.67 b	34.33 a	30.44 c	

Values with the same letters for each factor or their interaction do not differ significantly according to Duncan's multiple range test according to ($p < 0.05$).

Table (2) shows that number of leaves for each plant increased significantly when fertilizing plants with nitrogen fertilizer and it reached to $26.11 \text{ leaf.plant}^{-1}$ when fertilizing with a concentration of 50 and 100Kg.h^{-1} respectively, while it was decreased to $18.84 \text{ leaf.plant}^{-1}$ for comparison treatment plants, while spraying with seaweed extract didn't show any significant effect in values of this feature, interaction results between nitrogen fertilizer and seaweed extract showed superiority of the registered values of fertilizing plants with nitrogen fertilizer with a control of 50Kg.h^{-1} with spraying with one of $1\text{cm}^3.\text{L}^{-1}$ the two seaweed extract concentrations which reached to 29.00 and $28.00 \text{ leaf.plant}^{-1}$ respectively, and also when fertilizing with nitrogen fertilizer with a concentration of 100Kg.h^{-1} with any of seaweed extract concentration, while this value decreased into lowest value $17.76 \text{ leaf.plant}^{-1}$ of average treatment plants.

Table 2. Effect nitrogen fertilizer and spraying the Seaweed extract in the number of leaves (leaf.plant⁻¹) of (*Coriandrum sativum* L.).

nitrogen fertilizer (Kg.h ⁻¹)	Seaweed extract (cm ³ .L ⁻¹)			mean nitrogen fertilizer (Kg.h ⁻¹)
	Zero	1	2	
Zero	17.76 d	19.43 cd	19.33 cd	18.84 b
50	21.33 cd	29.00 a	28.00 a	26.11 a
100	27.00 ab	27.33 a	24.00 a-c	26.11 a
mean Seaweed (cm ³ .L ⁻¹)	22.03 a	25.25 a	23.78 a	

Values with the same letters for each factor or their interaction do not differ significantly according to Duncan's multiple range test according to (p<0.05).

Table (3) shows that fertilizing with nitrogen fertilizer at two levels 50 and 100Kg.h⁻¹ gat an increase in plant's leaf area and it reached to 67.88 and 62.68cm².plant⁻¹ respectively in front of lowest value of comparison treatment which reached to 42.70Kg.h⁻¹, while the highest value was registered when spraying with seaweed extract with a concentration of 1cm³.L⁻¹ and reached to 62.84cm².plant⁻¹, comparison with control lowest 52.30cm².plant⁻¹.

data showed that there are significant difference between treatments, the greatest one was when fertilizing with nitrogen fertilizer at the level 50Kg.h⁻¹ interfered with spraying seaweed extract with a concentration 1, 2cm³.L⁻¹ which reach 78.30 and 72.67cm².plant⁻¹ respectively, while comparison treatment registered the lowest value 37.12cm².plant⁻¹.

Table 3. Effect nitrogen fertilizer and spraying the Seaweed extract in the leafy area (cm².plant⁻¹) of (*Coriandrum sativum* L.).

nitrogen fertilizer (Kg.h ⁻¹)	Seaweed extract (cm ³ .L ⁻¹)			mean nitrogen fertilizer (Kg.h ⁻¹)
	Zero	1	2	
Zero	37.12 d	44.50 cd	46.46 cd	42.70 b
50	52.56 bc	78.30 a	72.67 a	67.88 a
100	67.10 ab	65.73 ab	55.20 bc	62.68 a
mean Seaweed (cm ³ .L ⁻¹)	52.30 b	62.84 a	58.11 ab	

Values with the same letters for each factor or their interaction do not differ significantly according to Duncan's multiple range test according to (p<0.05).

Table (4) shows that nitrogen fertilizer caused significant increase in plant's stem diameter where it 4.59 and 5.11mm when treating with a concentration of 50 and 100Kg.h⁻¹ respectively, in front of 3.36mm of comparison treatment plants, while spraying with seaweed extract didn't lead to a significant increase in the stem diameter.

interaction treatment data between nitrogen fertilizer and seaweed extract show that there is no significant differences between studied treatments values which were superior on all control treatment value where it registered the lowest value 2.70mm.

Table 4. Effect nitrogen fertilizer and spraying the Seaweed extract in the stem diameter (mm) of (*Coriandrum sativum* L.).

nitrogen fertilizer (Kg.h ⁻¹)	Seaweed extract (cm ³ .L ⁻¹)			mean nitrogen fertilizer (Kg.h ⁻¹)
	Zero	1	2	
Zero	2.70 b	4.13 ab	3.23 ab	3.36 b
50	4.17a b	5.13 a	4.47 ab	4.59 a
100	5.33 a	4.70 ab	5.30 a	5.11 a
mean Seaweed (cm ³ .L ⁻¹)	4.07 a	4.66 a	4.32 a	

Values with the same letters for each factor or their interaction do not differ significantly according to Duncan's multiple range test according to (p<0.05).

Table (5) shows that there is no significant differences when adding nitrogen fertilizer at level 50Kg.h⁻¹ and significant effect of control treatment plants, while the best significant values of fresh weight treatment when spraying with seaweed extract with a concentration of 1cm³.L⁻¹ reached to 26.57g in front of the lowest value of control treatment plants. In general, when interaction treatment data, we notice that there is a superiority in the obtained values of nitrogen fertilizer at level 50Kg.h⁻¹ with spraying with seaweed extract with a concentration of 1 and 2cm³.L⁻¹ which reached to 27.34 and 26.97g respectively, and decreased into lowest significant value when not fertilizing with nitrogen fertilizer interfered with not spraying with seaweed extract and it reached 19.90g.

Table (6) shows that fertilizing plants with nitrogen fertilizer at the two levels 50 and 100Kg.h⁻¹ gave an increase in the dried weight of the green total where it reached 5.11 and 5.26g respectively in front of the lowest values of comparison treatment plants which reached 3.40g, also when spraying with seaweed extract, the dried weight of the green total increased and it reached 4.85 and 4.41g. When spraying with a concentration of 1 and 2cm³.L⁻¹, while comparison treatment plants registered the lowest significant values which reached 4.01g.

Table 5. Effect nitrogen fertilizer and spraying the Seaweed extract in the fresh weight for chlorophyll totality (g) of (*Coriandrum sativum* L.).

nitrogen fertilizer (Kg.h ⁻¹)	Seaweed extract (cm ³ .L ⁻¹)			mean nitrogen fertilizer (Kg.h ⁻¹)
	Zero	1	2	
Zero	19.90 e	25.78 ab	24.46 bc	23.38 b
50	21.9 ed	27.32 a	26.97 a	24.96 a
100	25.35 ab	26.61 ab	22.92 cd	25.40 a
mean Seaweed (cm ³ .L ⁻¹)	22.38 c	26.57 a	24.79 b	

Values with the same letters for each factor or their interaction do not differ significantly according to Duncan's multiple range test according to (p<0.05).

Interaction treatment data showed that there are significant differences between treatments, the greatest one was when fertilizing with nitrogen fertilizer at the level 50Kg.h⁻¹ interfered with spraying with seaweed extract with a concentration of 2cm³.L⁻¹ which reached 6.35g in front of 2.82g of comparison treatment plants and also when not fertilizing with nitrogen fertilizer and when spraying with a concentration of 1cm³.L⁻¹ which reached 3.24g.

Table 6. Effect nitrogen fertilizer and spraying the Seaweed extract in the dry weight for (g) of (*Coriandrum sativum* L.).

nitrogen fertilizer (Kg.h ⁻¹)	Seaweed extract (cm ³ .L ⁻¹)			mean nitrogen fertilizer (Kg.h ⁻¹)
	Zero	1	2	
Zero	2.82 e	3.24 e	4.14 d	3.40 b
50	4.02 d	5.43 bc	6.35 a	5.11 a
100	5.20 c	5.89 ab	4.25 d	5.26 a
mean Seaweed (cm ³ .L ⁻¹)	4.01 b	4.85 a	4.61 a	

Values with the same letters for each factor or their interaction do not differ significantly according to Duncan's multiple range test according to (p<0.05).

Table (7) shows that fertilizing plants with nitrogen fertilizer at the level 100Kg.h⁻¹ gave significant differences 18.79mg.100g⁻¹, while there are no significant differences between the control treatment and fertilization at the level 50Kg.h⁻¹, spraying with seaweed extract gave an increase in the total chlorophyll when spraying with a concentration of 1cm³.L⁻¹. Interaction treatment data results show that there are no significant differences between the interaction.

Table 7. Effect nitrogen fertilizer and spraying the Seaweed extract in the concentration of total chlorophyll in the leaves (mg.100g⁻¹ fresh weight) of (*Coriandrum sativum* L.).

nitrogen fertilizer (Kg.h ⁻¹)	Seaweed extract (cm ³ .L ⁻¹)			mean nitrogen fertilizer (Kg.h ⁻¹)
	Zero	1	2	
Zero	14.79 a	15.92 a	12.91 a	14.54 b
50	14.72 a	16.28 a	12.66 a	14.55 b
100	17.38 a	19.72 a	19.28 a	18.79 a
mean Seaweed (cm ³ .L ⁻¹)	15.63 ab	17.31 a	14.80 b	

Values with the same letters for each factor or their interaction do not differ significantly according to Duncan's multiple range test according to (p<0.05).

Table (8) data show that treatment with nitrogen fertilizer didn't significant differences between registered values in carotene concentration. Also data show that the greatest significant values registered when spraying plants with seaweed extract with a concentration of 1cm³.L⁻¹ and reached 6.32mg.100g⁻¹ fresh weight in front of the lowest values of control treatment plants. Interaction treatment between show that greatest values of carotene concentration in the green total was at any level of nitrogen fertilizer interfered with any concentration of seaweed extract have register the greatest values of this between 5.34-6.49 mg.100g⁻¹, these values significantly but they different with the lowest registered values 5.08mg.100g⁻¹ of the control treatment plants.

Table 8. Effect nitrogen fertilizer and spraying the Seaweed extract in the concentration of Carotin (mg.100g⁻¹ fresh weight) of (*Coriandrum sativum* L.).

nitrogen fertilizer (Kg.h ⁻¹)	Seaweed extract (cm ³ .L ⁻¹)			mean nitrogen fertilizer (Kg.h ⁻¹)
	Zero	1	2	
Zero	5.08 a	6.20 ab	6.49 a	5.78 a
50	6.14 ab	6.46 a	5.55 ab	5.92 a
100	5.34 ab	6.30 ab	5.71 ab	6.05 a
mean Seaweed (cm ³ .L ⁻¹)	5.52 b	6.32 a	5.92 b	

Values with the same letters for each factor or their interaction do not differ significantly according to Duncan's multiple range test according to (p<0.05).

Table (9) data show that nitrogen fertilizer caused significant increase in the total yield quantity where highest values was 686.56Kg.h⁻¹ when treating with a concentration of 50Kg.h⁻¹ in of 478.11Kg.h⁻¹ of control treatment, while spraying with seaweed extract didn't gave a significant increase in the total yield quantity.

Under the experiment interaction treatment, mutual interference data show that there aren't significant differences between values which were all superior on control treatment value, where reached to the highest value 773.60Kg.h⁻¹ when fertilizing with a concentration of 50Kg.h⁻¹ interfered with spraying with a concentration of 2cm³.L⁻¹, while comparison treatment registered the lowest values 412.5Kg.h⁻¹.

Table 9. Effect nitrogen fertilizer and spraying the Seaweed extract in the total yield quantity (Kg.h⁻¹) of (*Coriandrum sativum* L.).

nitrogen fertilizer (Kg.h ⁻¹)	Seaweed extract (cm ³ .L ⁻¹)			mean nitrogen fertilizer (Kg.h ⁻¹)
	Zero	1	2	
Zero	412.5 c	482.0 bc	539.8 a-c	478.11 b
50	591.6 a-c	694.4 ab	773.6 a	686.56 a
100	657.2 a-c	634.7 a-c	481.1 a-c	590.99 ab
mean Seaweed (cm ³ .L ⁻¹)	553.80 a	603.69 a	598.17 a	

Values with the same letters for each factor or their interaction do not differ significantly according to Duncan's multiple range test according to (p<0.05).

Growth response was varied according to the factors, where data in tables (1, 2, 3, 5, 6 and 7) show that plant's height and number of leaves, the two fresh and dry weights and chlorophyll concentration were increased in values when treating with nitrogen fertilizer at the two levels 50 and 100Kg.h⁻¹ significantly to control treatment, and this due to that the nitrogen fertilizer is considered one of the macro elements in which the plant needs them greatly where they are found in a great number of the important organic elements in the vital operations of the plant where it is found in DNA , RNA , proteins , chlorophyll and many of the enzyme escorts like: DNA and NADP and forming power compounds ATP, NADP and NADPH₂ and in forming cell membrane and mytocandaria and green plastids, also nitrogen shares in increasing leaves area and stem's length by increasing green growth in general for being used in the main formations of plant's tissues, the increase of total chlorophyll in leaves because of spraying with nitrogen dues to nitrogen which is found in the formation of chlorophyll molecule, and also leads to an increase in the side buds growth (Taiz and Zeiger, 2002).

Main stem's diameter increase when increasing nitrogen fertilizer may be due to nitrogen activity in increasing photosynthesis and producing nutritive materials, also their main role in the meristem activity and this is emphasized by the researcher (Wiedenhoeft, 2006) who found that plant's diameter growth happed because of its meristem vessel activity which leads to form new cells add to the minor diameter growth and increases the plant's or stem's thickness and as a result of this growth the main tissues are increased by losing specialization character where meristem tissues are formed which lead to increase stem's diameter. Also Carrubba *et al.*, (2009) mentioned that meristem vessel activity results forming cells add to the plant's diameter growth, and he found that most of this growth continues because of producing main tissues and losing specialization character so meristem tissues are formed and lead to an increase in the stem's diameter growth.

Ayanoglu *et al.*, (2002) mentioned that the increase of stem's diameter may be due to that nitrogen shares in forming amino acids which are formed from okcenates which encourage on increasing cellular divisions and lengthening cells so tissues growth is increased and leads to an increase in cambium layer activity which gives this increase when it is divided.

The effect of nitrogen fertilizer in the number of leaves when adding fertilizer may be due to the high average of the root subsidiaries and to the high average of the dried substance (tables: 4 and 5) which lead absorb a great amount of water which increases the plant's activity when nitrogen is found to make the photosynthesis which causes an increase in the plant's total growth, also Asgarpanan (2012) mentioned that nitrogen is considered one of the main nutritive elements which helps plants to grow where it connects strongly with the increase found in number of plant's leaves.

The increase in number of leaves and leaf area (tables: 2 and 3) which gave to an increase in photosynthesis and then an increase in the percentage of dried weight. This is comported with Carrubba (2009) that adding nitrogen to the plant leads to general plant growth, in other words, an increase in the stem's diameter length and number and area of leaves and then causes an increase in the dried weight of the green total. These results are comported with Khalid (2013) and also harmonize with the effect of nitrogen fertilizer in the dried weight of the plant, (Carrubba *et al.*, 2002).

Data in tables (1, 3, 5, 7 and 8) show that the best values of plant's height and fresh and dry weight and concentration of chlorophyll and carotene related to spraying plants with seaweed extract with a concentration 1cm³.L⁻¹, Wu and Lin (2000) proved that treating plants with seaweed extract leads to an increase in the living mass of plants, in this regard Ayad (1998) mentioned that the stimulating action of seaweed extract in plant's growth dues to its content of real quantities of growth regulators which contain Gibberellins, Auxins and Cytokines, where Mchug (2003) that they contain cytocaynenats, Zhang and Ervin (2004) diagnosed it as Zeatin riboside as much as 57µg, which lead to an increase in internal cytocaynenats level, Schubert and Kerting (1981) that Cytex contains caytene equivalent with a concentration of 100mlm/l, and that is enhances growth in plants cells to keep their vitality, López-mosquera *et al.*, (2011) proved, while it was mentioned that IAA and also gibbrilnats and similar substances have the same action (Lowlor, 2002; Haidar *et al.*, 2015).

On the other hand, growth enhancement may exist because seaweed extract contains number of nutritive elements like Calcium, Copper, Iron as well as Potassium, Magnesium, Sodium, Lead and Zinc which may be varied according to plant's quality and also production location, which may affect positively on plant's growth when using the extract as a spray $1\text{ cm}^3.\text{L}^{-1}$ and this is Pereira *et al.*, (2012), as well as, Zhang and Ervin (2004) mentioned that the nutritive elements exist in seaweed extract are pawing with organic molecules which are more benefit, in this regard, Hurd *et al.*, (2014) showed that transferring the pawing elements like iron, manganese and copper inside the plant is more faster than these elements exist in the plant as a free mineral element, and this shows the significant importance in enhancing the plant's performance, Zodape *et al.*, (2008) explained the encouraging effect of seaweed extract which is due to its activation of roots so that plant can be able to absorb the great amount of nutrition from the soil in far and deep locations. Wernberg *et al.*, (2011) notices that significant stimulators may cause simulative effect in absorbing the great elements and also the difference that exists in the small elements of the plant, seaweed extract role can't be miss out because it contains many substances exist within antibacterial and antifungal and killing for insects and destruct nematode and may enhance growth through this effect (Rizvi, 2003), as well as its role as an antioxidant to protect from oxidant substances derived from natural metabolism (Ayad, 1998). Data in the former tables show that the increase of the used concentration into $\text{cm}^3.\text{L}^{-1}$ makes a decrease in the value of plant's height and number of leaves, which may be due to using a high concentration, where Zodape *et al.*, (2008) mentioned that the high concentrations of seaweed extract lead to disable plant's growth which may be due to the high salts in the extract which affects growth and yield.

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