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Effect Of Compost And Seaweed Extract (Acadian) On Oil Production For Rosemary Plant Rosmarinus Officinalis L

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ABSTRACT

This study was conducted at a private orchard located in chiman on 108 plants, a four-month-old (*Rosmarinus officinalis L*.) in 9 treatments, adding compost (Remnants Mushroom Factory) with different ratios (0%, 20%, 40%) and spraying seaweed extract Acadian (*Ascophyllum nodosum*) with three concentrations (0 ppm, 500ppm,1000ppm), and their interaction in the manner (20%:500ppm), (20% 1000ppm), (40%: 500ppm)and (40%: 1000ppm) of (compost and seaweed) in order to determine the effect of compost, seaweed extract and their interactions on oil production (ml)/kg, At first cut, was (13.060ml) from the 40% of compost, (13.125ml) from the 1000ppm of seaweed and (17.057ml) from the interaction between 40% of compost with 1000ppm of seaweed. The second cut was (15.908ml) from the 40% of compost, (19.794ml) from the 1000ppm of seaweed, and (22.667ml) from the interaction between 0% of compost with 1000ppm of seaweed. Significant differences were shown regarding the effect of seaweed on all physical characteristics. Significant differences were observed from the effect of compost on all essential oil components of the rosemary plant.

Keywords: Compost, Seaweed Extract, Oil Production, Rosmarinus Officinalis L

INTRODUCTION

Rosemary with scientific name of Rosemary officinalis L. is from the Lamiaceae or Labiatae family. This plant is a perennial evergreen and in the shrub form and fragrant. The leaves and flowering branches form pharmacological organs have flavored oils in terms of chemical composition. It has both medicinal and aromatic properties (2).

Essential oils are found in glandular trachoma's, at the bottom of the leaves and within flowering tops. The oil content in leaves ranges between (1.0–2.5%), depending on whether the leaves are young, or fully mature and dry. The composition of the essential oil may differ depending on the country of origin, weather and cultivation conditions. Genetic variability is also a factor. In a quantitative analysis of the chemical composition of oils from different regions (Iran, Morocco, Spain, France, Algeria, Cuba, Argentina, Italy), the following constituents were identified as shared in common: α-pinene, β-pinene, 1,8 cineole, camphene, borneol, camphor, linalool and β-caryophyllene (15).

The compost involved garden waste, household solid waste, kitchen scraps, manure, leaves, grass clippings, and compost bears little physical resemblance to the raw material from which it

originated. Composting of degradable wastes are used as a method of diverting organic waste materials from landfills and creating a product, relatively effective in cost that is appropriate for agricultural purposes (8).

Compost application to agricultural lands has been recognized as a reliable way to improve the physical properties of most soils, especially soils with poor structure (12). Compost is resulted from the decomposition of organic matter.

Compost can be used as a fertilizer because of its high nutrient content, making both a quantitative and qualitative contribution to the (Soil organic matter) and acting as an organic(11). Soil organic matter-enrichment is a key factor for improving soil fertility and productivity (13).

The seaweed fertilizers application will be useful now for achieving higher production the seaweed fertilizer is often found to be more successful than the chemical fertilizers. Recent seaweed extracts as liquid fertilizers (SLF) has come in the market for a simple reason that they contain many growth promoting hormones like auxin, gibberellins, cytokinin, trace elements, vitamins, amino acids and micronutrients. The addition of seaweed extracts to light soils helps to retain moisture, supplying them with nutrients, reducing chlorophyll catabolism, and improving the yield in quantity and quality (6).

Seaweeds, also known as marine algae or, seaweeds are group of photosynthetic (called macroalgae) that live in the sea. It is a very versatile product. It is used widely for food in direct human consumption, which is 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 (5).

MATERIAL AND METHODS

The experiment was conducted from 15 /5 /2020 till 15/5/2021 at a private orchard located in chiman, 3Km far from Kirkuk and it is located north east of Kirkuk at coordinates (35°28'59.1"N 44°27'22.1"E).

Adding compost (remnants mushroom factory) with different ratio (0%, 20%, 40%) and using the seaweed extract (Ascophyllum nodosum) with three concentrations (0, 500ppm,1000ppm) was prepared using distilled water, the foliar was sprayed every 15 days according to the company recommendation. Table (1) shows some physical data of seaweed.

Table 1: Some physical data of the used seaweed (Ascophyllum nodosum)

Physical Data	
Minerals (ash)	45%-55%
Moisture	max6.5%
Alginic Acid	min10%
Mannitol	min4%
Amino Acid	min4%
other organic matter derived from seaweed	min20%

Fresh aerial parts of plants were dried in a forced-air drier at 35 ºC for 48h until it reached a constant weight. Aerial parts of individual plants were distilled for 5 h using a Clevenger-type system. The oil

volume was measured directly in the extraction burets and kept in vials at 4 ºC until chromatographic analysis (10).

The studied physical properties for oil were:

Viscosity: Determination of the viscosity of rosemary oil using a DVE Viscometer approximately 35-45 mL of an essential oil sample was entered into the viscometer and the values were recorded as mPas English origin.

Refractive Index: It represents the ratio between the sine of the angle of incidence to the sine of the angle of refraction at a given temperature and the estimation of the refractive index using the abbe refract meter device of German origin.

Density: Determination of the density of rosemary oil using a density meter (ASTM D1298) of Chinese origin, and the values were recorded as g/cm3 **(**7).

Determination Of Essential Oil Components: The examination was carried out in the laboratories of the Ministry of Science and Technology/Environment Department. The temperature of the injection area and the detector, respectively: (280, 340 C), while the temperature of the separation column was gradual, starting from (100 - 300) degrees Celsius, and the temperature increased by 10 degrees / min. The use of inert hydrogen gas as a carrier gas is 100 KPa by Gas chromatography (10).

RESULTS AND DISCUSSION

Data in table (2) explain the effect of compost and seaweed extract (Acadian) and their interaction on oil production. As shown in following table the effect of compost on oil production was found with significant differences. The highest value was recorded (13.060) from the 40% of compost, the lowest value was observed (8.989) from 0% of compost. It can be noticed that significant differences were shown regarding the effect of seaweed on oil production, the highest value was recorded (13.125) from the 1000ppm of seaweed, the lowest value was observed (8.489) from 0ppm of seaweed. The same trend was also true for the interaction effect between compost and seaweed extract on oil production of rosemary plant, the highest value was recorded (17.057) from the interaction between 40% of compost with 1000ppm of seaweed, while the lowest value was observed (7.253) from interaction between0% of compost with (0) ppm of seaweed.

Table 2: Effect of the compost and seaweed extract (Acadian) and their interactions on oil interaction for first cut (ml)/kg-1 for rosemary plant

C **SW**	**C1** **0%**	**C2** **20%**	**C3** **40%**	**Effect of** **SW**
SW1 **0 ppm**	7.253 B	8.877 B	9.097 b	8.489 b
SW2 **500ppm**	8.637 B	11.297 Ab	13.027 ab	10.987 ab
SW3	11.077	11.240	17.057	13.125

1000ppm	Ab	Ab	a	a
Effect of C	8.989 B	10.471 Ab	13.060 a	

Means accompanied by the same small letter in the same column are not significantly different at the P = 0.05

Al-Hadi et al., (4) showed that the use of composts gave significant effects in percentage of oil compared to control treatment, and this agree with our results. As the compos increased the yield. Other studies reported that spraying with seaweed caused improvement of plant vegetative growth due to availability of macronutrients and micronutrients that are essential for plant growth in addition to some plant hormones such as cytokinin, auxins, gibberellins, and amino acid along with some carbohydrates, which increased after that vegetative growth characters and yield that will increase secondary product and secondary metabolism yield.

Data in table (3) explain the effect of compost and seaweed extract (Acadian) and their interaction on oil interaction. As shown in the following table, the effect of compost on oil interaction was found with significant differences. The highest value was recorded (15.908) from the 40% of compost, the lowest value was observed (13.902) from 20% of compost. It can be noticed that significant differences were shown regarding the effect of seaweed on oil interaction, the highest value was recorded (19.794) from the 1000ppm of seaweed, the lowest value was observed (11.984) from 500ppm of seaweed. The same trend was also true for the interaction effect between compost and seaweed extract on oil interaction of rosemary plant, the highest value was recorded (22.667) from the interaction between 0% of compost with 1000ppm of seaweed, while the lowest value was observed (9.000) from interaction between0% of compost with (0) ppm of seaweed. Al-Hadi et al., (4) showed that the use of composts gave significant effects percentage of oil compared to control treatment. The reason for the increase of studied properties values with the addition of composites may be to supply of organic matter around the root hair area in which it could lead absorption the organic matter and increase the vegetative growth which enhances the transportation of metabolites of photosynthesis (3).

Table 3: Effect of the compost and seaweed extract (Acadian) and their interactions on oil interaction for second cut (ml)/kg for rosemary plant

C / **SW**	**C1 0%**	**C2 20%**	**C3 40%**	**Effect of SW**
SW1 0 ppm	9.000 E	9.633 De	17.367 bc	12.000 b
SW2 500ppm	10.237 De	11.357 Cde	14.357 cde	11.984 b
SW3 1000ppm	22.667 A	20.715 Ab	16.000 cd	19.794 a
Effect of C	13.968 B	13.902 B	15.908 a	

Means accompanied by the same small letter in the same column are not significantly different at the P = 0.05

As illustrated in table (4), significant differences were observed from effect of compost on all physical characteristic of rosemary plant including Viscosity mPas, Specific weight, Refractive index and Density gm / cm^3, the highest value was recorded (31.066), (0.903), (1.486), (0.979) sequentially from the 40% of compost, the lowest value was observed (30.806), (0.887), (1.469), (0.965) sequentially from 0% of compost. It can be noticed that significant differences were shown regarding the effect of seaweed on all physical characteristics, the highest value was recorded from the 1000ppm of seaweed, the lowest value was observed from 0ppm of seaweed. The same trend was also true for the interaction effect between compost and seaweed extract on all physical characteristics of rosemary plant, the highest value was recorded (31.245), (0.914), (1.495), (0.988) sequentially from the interaction between 40% of compost with 1000ppm of seaweed, while the lowest value was observed (30.715), (0.881), (1.461), (0.988) sequentially from interaction between0% of compost with (0) ppm of seaweed. Organic fertilizer is a direct source of many nutrients' elements needed by plants, also improve the physical, chemical and biological properties of soil (14).

Table 4: Effect of the compost and seaweed extract (Acadian) and their interactions on physical characteristic for rosemary plant

features treatment	Viscosity mPas	Specific weight	Refractive index	Density gm / cm3
0% compost	30.806 C	0.887 c	1.469 c	0.965 c
20% compost	30.986 B	0.899 b	1.482 b	0.976 b
40% compost	31.066 A	0.903 a	1.486 a	0.979 a
0ppm seaweed	30.805 c	0.886 c	1.470 c	0.965 c
500ppm seaweed	30.948 b	0.896 b	1.480 b	0.974 b
1000ppm seaweed	31.106 a	0.906 a	1.488 a	0.982 a
0%+0pp	30.715 i	0.881 i	1.461 i	0.960 i
0%+500ppm	30.785 h	0.885 h	1.468 h	0.963 h
0%+1000ppm	30.920 e	0.894 e	1.4785 e	0.973 e
20%+0ppm	30.820	0.888	1.472	0.966

	g	g	g	g
20%+500ppm	30.985 d	0.898 d	1.484 d	0.977 d
20%+1000ppm	31.155 b	0.911 b	1.491 b	0.984 b
40%+0ppm	30.880 f	0.890 f	1.476 f	0.968 f
40%+500ppm	31.075 c	0.904 c	1.487 c	0.981 c
40%+1000ppm	31.245 a	0.914 a	1.495 a	0.988 a

Means accompanied by the same small letter in the same column are not significantly different at the P = 0.05

Table (5) showed significant differences from effect of compost on all essential oil components of rosemary plant including (Cinol%, Cymene %, Limonene %, Terpinen %, Camphor %, a-pinene %, Camphene %), the highest value was recorded (35.548), (3.513), (4.660), (7.621), (14.645), (9.648). (5.795) sequentially from the 40% of compost, the lowest value was observed (34.433), (2.777), (3.903), (6.973), (13.805), (8.925), (5.126) sequentially from 0% of compost. It can be noticed that significant differences were shown regarding the effect of seaweed on all essential oil components, the highest value was recorded from the 1000ppm of seaweed, the lowest value was observed from (0ppm) of seaweed. The same trend was also true for the interaction effect between compost and seaweed extract on all essential oil components of rosemary plant ,the highest value was recorded (35.960),(3.960),(4.980), (8.075), (15.115),(10.120), (6.155) sequentially from the interaction between 40% of compost with 1000ppm of seaweed, while the lowest value was observed (33.845),(2.510),(3.540),(6.735), (13.420),(8.665).(4.830)sequentially from interaction between0% of compost with (0)ppm of seaweed.

These results are in agreement with (Ahmad, 2019) who showed that using of seaweed and compost individually gave significant differences in all treatments and also was observed Significant differences between interaction compost and seaweed with 10%compost and 6ml of seaweed. Organic fertilizer is a direct source of many nutrients' elements needed by plants, also improve the physical, chemical and biological properties of soil (14). The chemical fertilizers cause many side effects on human health because of the nitrate's accumulation especially with leafy vegetables, which is about 80% of cultivated vegetables in human consumption, compared to other sources of nitrates (9). In order to eliminate these problems, a new direction has been rising up to use organic fertilizers for cultivation and especially vegetables (Ahmad, 2019). The organic fertilizers are characterized by low contents of nitrates and oxalates,

In addition to that, the organic fertilizers improve the physical and chemical features of soil and its nutrient contents to meet the plant growth needs. The organic fertilizers improve the physical and chemical features of soil and its nutrient contents to meet the plant growth needs. The organic fertilizers improve soil texture and increase water-holding capacity (1).

Table 5: Effect of the compost and seaweed extract (Acadian) and their interactions on Determination of essential oil components for rosemary

Features treatment	Cinol %	Cymene %	Limonene %	Terpinen %	Camphor %	a-pinene %	Camphene %
00% compost	34.433 c	2.777 c	3.903 c	6.973 c	13.805 C	8.925 c	5.126 c
20% compost	35.401 b	3.363 b	4.490 b	7.433 b	14.436 B	9.451 b	5.618 b
40% compost	35.548 a	3.513 a	4.660 a	7.621 a	14.645 A	9.648 a	5.795 a
0ppm seaweed	34.588 c	2.787 c	3.905 c	6.958 c	13.826 C	8.9216 c	5.123 c
500ppm seaweed	35.095 b	3.197 b	4.391 b	7.3150 b	14.291 B	9.336 b	5.531 b
1000ppm seaweed	35.700 a	3.670 a	4.756 a	7.755 a	14.768 A	9.766 a	5.885 a
0%+0pp	33.845 i	2.510 i	3.540 i	6.735 i	13.420 I	8.665 i	4.830 i
0%+500ppm	34.135 h	2.640 h	3.745 h	6.855 h	13.670 H	8.775 h	5.010 h
0%+1000ppm	35.320 e	3.180 e	4.425 e	7.330 e	14.325 E	9.335 e	5.540 e
20%+0ppm	34.870 g	2.880 g	3.940 g	6.975 g	13.925 G	8.945 g	5.170 g
20%+500ppm	35.515 d	3.340 d	4.665 d	7.465 d	14.520 D	9.565 d	5.725 d
20%+1000ppm	35.820 b	3.870 b	4.865 b	7.860 b	14.865 B	9.845 b	5.960 b
40%+0ppm	35.050 f	2.970 f	4.235 f	7.165 f	14.135 F	9.155 f	5.370 f
40%+500ppm	35.635 c	3.610 c	4.765 c	7.625 c	14.685 C	9.670 c	5.860 c
40%+1000ppm	35.960 a	3.960 a	4.980 a	8.075 a	15.115 A	10.120 a	6.155 a

Means accompanied by the same small letter in the same column are not significantly different at the P = 0.05

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