

## **Influence of farmyard manure and seaweed extract on growth, yield of herb and the economic evaluation of (*Majorana hortensis*, Moench) plants.**

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### **Abstract :**

In order to examine the influence of various seaweed extract rates (0.0, 2, 4 and 8 ml/l) under various farmyard manure rates (0.0, 20, 40 and 60 m<sup>3</sup>/ hectare) on of marjoram (*Majorana Hortensis* L.) plants, a field experiment was conducted during the 2023 and 2024 seasons. Farmyard manure rates were distributed in main plot while seaweed extract rates were arranged in sub plot. The influence of these treatments on plant growth traits, herb yield and volatile oil production of marjoram was determined. The results suggested a significant improve in all studied growth trait values (plant height and number of branches/plant) and herb yield (herb fresh and dry weights per plant and per hectare) as well as volatile oil production (percentage and yield per plant and per hectare of volatile oil) with increasing the rates of farmyard manure and seaweed extract at both cuts during both seasons. The maximum values of theses parameters were achieved with the treatment of seaweed extract at 8 ml/l combined with farmyard manure at the highest rate (60 m<sup>3</sup>/ hectare). the economic evaluation of this study, it was found that the highest net return and value of marjoram plants were obtained by applying 60 m<sup>3</sup>/ha of farmyard fertilizer

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with seaweed extract at a concentration of 8 ml/L, where the profit/cost ratio was recorded as 3.064 compared to other interaction treatments under study.

**Keywords:**

Marjoram, farmyard manure, seaweed, growth, herb, volatile oil and economic evaluation.

**INTRODUCTION:**

One of the most significant commercial aromatic plants in the Lamiaceae (Labiatae) family is marjoram (*Majorana majorana* (L.) H. Karst *Origanum majorana* L., syn. *Majorana hortensis* Moench) (Pandey, 2004 and Kumar, 2009). Due to the rising demand from both local industry and export, aromatic and medicinal plants are in high demand. Growing interest in the production of aromatic and therapeutic plants has been established in Egypt in order to offset this growth (Ghallab and EI-Gahdban, 2004). The leaves of marjoram have a lovely scent. Dried leaves, leaf extract, and essential oil are the elements of marjoram that are used. Marjoram was widely recognized as a traditional medicinal herb. Its leaves can be used to make a calming, antispasmodic, and warming tea. It soothes the stomach, assists the digestive system, and treats headaches, coughs, and asthma. Marjoram essential oil is widely used in aromatherapy for sleeplessness and as a component of body massage oils for relaxation (Choi, 2018). Additionally, it is utilized in perfumery and warm baths as a bath scent. Antibacterial, antioxidant, antiviral, antifungal, cardioprotective, antiprotozoal, antimetastatic, anti-platelet, anticancer and anti-inflammatory, are just a few of the volatile oil's numerous pharmacological properties in contemporary medicine (Bina and Rahimi, 2017). Essential oils and leaves are both used to flavor food items. The total marjoram cultivated area in 2022 in Egypt was 0.3006 hectare (0.2170 hectare in new land and 0.0836 hectare in old land) which yielded 8049 tons (5958 tons from new land and 2091 tons from old land) with average 6.374 ton/hectare (6.535 tons / hectare in new land and 5.952 tons/hectare in old land) according to **Statistics of the Ministry of Agriculture (2022)**.

Experimental studies further report anti-inflammatory effects, potentially associated with modulation of inflammatory mediators (Baser, 2002). Additionally, marjoram exhibits antispasmodic properties, explaining its ethnomedicinal application in gastrointestinal disorders such as indigestion and abdominal cramps. Clinical research has also explored its role in hormonal regulation, with a randomized controlled trial indicating

improvement in hormonal profiles among women with polycystic ovary syndrome (**Haj-Husein et al., 2016**). Nevertheless, larger clinical trials are needed to confirm these therapeutic applications. marjoram is generally regarded as safe when consumed in culinary amounts, although concentrated essential oil preparations should be used cautiously.

Manure from farms plays a significant role in agricultural ecosystems' nutrient cycle. For crops to receive a steady supply of nutrient meals that are well-balanced, FYM was essential. **Gafsi et al. (2006)** found that applying FYM at rates of 2 or 3% to sandy soil following maize harvesting slightly decreased pH and EC values. Numerous studies have validated the beneficial effects of organic amendments. The enhancement of soil's physical and chemical characteristics, as well as its nutrient status, is greatly impacted by the prudent application of organic materials as amendments. The best product in terms of quantity and quality is produced by medicinal and aromatic plants using organic manures, which are also safe for the environment, animals and people (**Al-Fraihat et al., 2011**). Moreover, **Arafa et al. (2017)** pointed out that applying farmyard manure was favorable for increasing *Mentha longifolia* herb and oil yield than control. Likewise, rosemary height and its lateral branches number /plant as well as total biomass fresh and dry weights noticed the highest values when plants foliar sprayed with 10% seaweed extract compared to control (**Abdel-Hamid, 2019**). Organic manures are more important to apply to medicinal plants than to other plants since they improve their growth and productivity while also changing the quality of their products (**Rostaei et al., 2024**).

Seaweed products, whether in the form of powder or extract, are a new generation of natural organic compounds that also promote plant growth. They help seeds germinate more quickly, cause rapid growth, increase crop production, and make several crops more resistant (**Dhargalkar and Pereria, 2005**). Seaweed extract considered as a great bioactive components source such as amino acids, protein, carotenoids, vitamins, essential fatty acids, minerals and growth regulators (**Bhaskar and Miyashita, 2005**). Seaweed extract have been demonstrated to improve plant growth and productivity. Seaweed extract provides macro nutrients like (N, P and K) and micro nutrients like Fe, Mn, Zn and Mo (**Crouch et al., 1990**). Seaweed extract includes natural plant growth regulators such as cytokinins gibberellins and auxins (**Crouch and Van Staden, 1994**). In addition, the fennel height, branch and umbel numbers per plant, yield of fruit per plant, feddan

fruit yield, volatile oil percentage and its yield per plant and per feddan were all significantly enhanced by foliar sprays of 4 ml/l seaweed extract at a high concentration (Ali *et al.*, 2023).

The purpose of this study was to determine which applying rate of seaweed extract and farmyard manure affected the marjoram plant's ability to produce the most vegetative development, herb yield, oil production and economic evaluation.

#### **MATERIALS AND METHODS:**

In the summer seasons of 2023 and 2024, a field experiment was carried out at a private farm in the Sohage Government of Egypt. This experiment was done to study the impact of four farmyard manure levels (0, 20, 40, and 60 m<sup>3</sup>/hectare) and four concentrations of seaweed extract (0, 2, 4 and 8 ml/L as well as their interactions on the growth, herb yield and volatile oil production of marjoram (*Majorana hortensis*, Moench) plants.

As indicated in Table 1 by **Chapman and Pratt (1978)**, a randomized soil sample was obtained prior to planting in order to carry out a traditional approach of physical and chemical evaluation.

**Table 1: Physical and chemical properties of experimental soil (average of both seasons)**

Physical analysis	Soil texture
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Clay (%)		Silt (%)		Sand (%)		Clay							
57.33		28.24		14.43									
Chemical analysis													
pH	E.C. dSm <sup>-1</sup>	Organic Matter (%)	CaCO <sub>3</sub> (%)	Soluble cations (meq./l)				Soluble anions (meq./l)					
				Ca <sup>++</sup>	Mg <sup>++</sup>	Na <sup>+</sup>	K <sup>+</sup>	CO <sub>3</sub> <sup>-</sup>	HCO <sub>3</sub> <sup>-</sup>	Cl <sup>-</sup>	SO <sub>4</sub> <sup>-</sup>		
7.82	3.57	2.02	0.69	8.15	11.8 7	3.89	3.20	0.00	7.79	5.92	14.92		
Available nutrient (mg kg <sup>-1</sup> soil)													
N		P		K		Fe		Zn		Cu		Mn	
47.32		17.09		257		3.41		0.91		0.82		0.48	

### Plant Material and cultivation:

Marjoram seeds were obtained from the Research Centre of Medicinal and Aromatic Plants in Dokky, Giza, and were planted in speeding seed trays under plastic tunnels on December 15, 2022, and March 15, 2023, respectively, after being watered in the first and second seasons. The seedlings were then moved to the opposite sides of the row, with a 25-cm gap between hills. Five rows, each three meters long and 60 centimeters apart, were included in the experimental plot size (3.00 × 2.5 m) of 7.5 m<sup>2</sup>.

### Experimental design:

Three replications and a split plot design were used for the experiment. The main plot (A) was farmyard manure (FYM) rates (FYM0= 0, FYM1=20, FYM2=40 and FYM3=60 m<sup>3</sup>/ha. while the Seaweed Extract treatment (B) were allocated to the sub-plots and were also four treatments (SW1=0, SW2=2, SW3=4 and SW4=8 ml/L) three times at two week intervals every cuts. Every other cultural custom was observed as usual.

### Sampling and Data Collection

At the end of cuts, the following data were recorded: plant height (cm), branches number/ plant, herb fresh and dry weight g/ plant, volatile oil % in the herb was extracted and determined according to the method described by **Divya et al. (2014)**, then volatile

oil yield (ml)/ plant was calculated by multiplying volatile oil % in herb yield (g)/ plant and volatile oil yield (l)/ ha. was calculated.

### **Economic evaluation:**

The net return farm, which is equal to the difference between the costs and benefits, and the project's economic profitability while the value is positive are two criteria that might be employed in economic evaluation. These criteria are consistent with the field trial circumstances and economic logic. Second, the ratio of benefits to expenses, also known as the cost-benefit analysis, is a measure of the project's profitability. If the proportion is high, the various crops are categorized based on economic trade and profitability.

### **Statistical Analysis**

All obtained data were tabulated and statistically analyzed according to **Black (1965)** using the L.S.D. test at 5 % to know the differences among all treatments according to **Page *et al.* (1982)**. The means were compared using computer program of Statistix Version 9 (**Analytical software, 2008**).

## **RESULTS AND DISCUSSION:**

### **Plant growth:**

Data in Tables 2 and 3 shows that all determined marjoram growth parameters (plant height and branch number per plant) were gradually increased as farmyard manure rates increased at both cuts during the two seasons. The maximum values of plant height (44.83, 47.67, 46.58 and 49.83 cm) as well as branch number/plant (13.15, 15.29, 16.06 and 16.75 branches) were detected with the highest rate of farmyard manure (60 m<sup>3</sup>/ hectare) at 1<sup>st</sup> and 2<sup>nd</sup> cuts during 1<sup>st</sup> and 2<sup>nd</sup> seasons, respectively. On the other side, the minimum values of these traits were belonged to control treatment. It is worth to mention that in some cases there were no significant difference between control treatment and the lowest rate (20 m<sup>3</sup>/ hectare) of farmyard manure treatments. These observations hold true at both cuts during both seasons.

Farmyard manure may have a beneficial impact on the plant height and branch number per plant by improving the physical conditions of the soil, which in turn improved the availability and uptake of nutrients and fed microorganisms, all of which boosted plant growth. The solubilization influence of plant nutrients caused by the addition of farmyard

manure, which improved uptake of NPK, may be the cause of the increased plant growth (Sendurkumaran *et al.*, 1998). These results are in accordance with those found by Sakr *et al.* (2014) on sweet basil, Eisa (2016) on sweet fennel, Arafa *et al.* (2017) on *Mentha longifolia* and Mondani *et al.* (2024) on *Achillea millefolium*.

As shown in Tables 2 and 3 sprayed marjoram plants with seaweed extract at any rate enhanced all recorded marjoram growth traits (plant height as well as branch number/plant). Moreover, there was a positive relationship between seaweed extract rate and values of these traits. The highest values of plant height (44.83, 47.67, 46.75 and 49.50 cm) and number of branches per plant (12.79, 13.75, 14.58 and 15.83 branches) were achieved with 8 ml/l of seaweed extract. While, the lowest values of these traits were noticed with control treatment. This result was demonstrated at both cuts during both seasons.

**Table 2. Effect of farmyard manure rate, seaweed extract rate and their interaction on plant height (cm) of *Majorana hortensis* plant during both seasons**

Treatments	First cut		Second season	
	2023 season	2024 season	2023 season	2024 season
	Effect of farmyard manure rate (m <sup>3</sup> / hectare)			

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<b>0.0</b>		41.58	44.08	43.25	45.42
<b>20</b>		41.58	44.08	43.58	46.00
<b>40</b>		43.42	45.50	45.33	47.17
<b>60</b>		44.83	47.67	46.58	49.83
<b>L.S.D. at 5 %</b>		<b>0.48</b>	<b>0.95</b>	<b>0.63</b>	<b>0.95</b>
<b>Effect of seaweed extract rate (ml / l)</b>					
<b>0.0</b>		40.75	42.92	42.50	44.83
<b>2</b>		42.33	44.75	44.17	46.33
<b>4</b>		43.50	46.00	45.33	47.75
<b>8</b>		44.83	47.67	46.75	49.50
<b>L.S.D. at 5 %</b>		<b>0.26</b>	<b>0.39</b>	<b>0.24</b>	<b>0.28</b>
<b>Effect of farmyard manure rate × seaweed extract rate</b>					
<b>0.0</b>	<b>0.0</b>	39.00	42.00	40.67	43.67
	<b>2</b>	41.00	43.67	42.67	45.00
	<b>4</b>	42.33	44.67	44.00	46.00
	<b>8</b>	44.00	46.00	45.67	47.00
<b>20</b>	<b>0.0</b>	40.00	41.67	42.00	43.67
	<b>2</b>	41.00	43.33	43.00	45.00
	<b>4</b>	42.00	45.00	44.00	47.00
	<b>8</b>	43.33	46.33	45.33	48.33
<b>40</b>	<b>0.0</b>	41.67	43.00	43.33	45.00
	<b>2</b>	43.00	45.00	45.00	46.33
	<b>4</b>	44.00	46.00	46.00	47.33
	<b>8</b>	45.00	48.00	47.00	50.00
<b>60</b>	<b>0.0</b>	42.33	45.00	44.00	47.00
	<b>2</b>	44.33	47.00	46.00	49.00
	<b>4</b>	45.67	48.33	47.33	50.67
	<b>8</b>	47.00	50.33	49.00	52.67
<b>L.S.D. at 5 %</b>		<b>0.66</b>	<b>1.16</b>	<b>0.75</b>	<b>1.07</b>

Seaweeds are valuable marine resources that are inexpensive and abundant in a variety of bioactive substances, including amino acids, carbohydrates, proteins, lipids, phytohormones, osmoprotectants, mineral minerals and antimicrobials (**Raghunandan et al., 2019**). Numerous research on the benefits of seaweeds on plant growth have been published i.e. **Abdel-Hamid (2019)** on rosemary and moringa plants, **Ali et al. (2023)** on *Foeniculum vulgare* and **Amer et al. (2024)** on *Salvia hispanica* plants.

**Table 3. Effect of farmyard manure rate, seaweed extract rate and their interaction on number of branches per plant of *Majorana hortensis* plant during both seasons**

Treatments	First cut		Second season		
	2023 season	2024 season	2023 season	2024 season	
<b>Effect of farmyard manure rate (m<sup>3</sup> / hectare)</b>					
<b>0.0</b>	11.33	11.92	12.63	14.06	
<b>20</b>	11.73	12.48	13.13	14.42	
<b>40</b>	11.96	12.58	13.29	14.69	
<b>60</b>	13.15	15.29	16.06	16.75	
<b>L.S.D. at 5 %</b>	<b>0.20</b>	<b>0.52</b>	<b>0.44</b>	<b>0.53</b>	
<b>Effect of seaweed extract rate (ml / l)</b>					
<b>0.0</b>	11.40	12.38	12.94	14.00	
<b>2</b>	11.77	12.90	13.58	14.81	
<b>4</b>	12.21	13.25	14.00	15.27	
<b>8</b>	12.79	13.75	14.58	15.83	
<b>L.S.D. at 5 %</b>	<b>0.09</b>	<b>0.13</b>	<b>0.15</b>	<b>0.15</b>	
<b>Effect of farmyard manure rate × seaweed extract rate</b>					
<b>0.0</b>	<b>0.0</b>	10.83	11.25	11.83	13.00
	<b>2</b>	11.17	11.83	12.50	14.00
	<b>4</b>	11.50	12.08	12.83	14.42
	<b>8</b>	11.83	12.50	13.33	14.83
<b>20</b>	<b>0.0</b>	11.17	11.92	12.42	13.42
	<b>2</b>	11.50	12.33	12.92	14.17
	<b>4</b>	11.83	12.67	13.42	14.83
	<b>8</b>	12.42	13.00	13.75	15.25
<b>40</b>	<b>0.0</b>	11.25	11.83	12.42	13.75
	<b>2</b>	11.58	12.25	13.00	14.50
	<b>4</b>	12.25	12.75	13.50	14.83
	<b>8</b>	12.75	13.50	14.25	15.67
<b>60</b>	<b>0.0</b>	12.33	14.50	15.08	15.83
	<b>2</b>	12.83	15.17	15.92	16.58
	<b>4</b>	13.25	15.50	16.25	17.00
	<b>8</b>	14.17	16.00	17.00	17.58
<b>L.S.D. at 5 %</b>	<b>0.25</b>	<b>0.56</b>	<b>0.51</b>	<b>0.59</b>	

Concerning the influence of the combination between different rates of farmyard manure and various rates of seaweed extract, it was found that the interaction between the highest rate of seaweed extract (8 ml/l) and the highest farmyard manure rate (60 m<sup>3</sup>/ hectare)

gained the maximum values of all investigated marjoram growth traits (Tables 2 and 3). On the contrary, the minimum values of these traits were recorded when marjoram plants were fertilized with the lowest rate of farmyard manure as well control and sprayed with tap water instead of seaweed extract. This result was proved at both cuts during both seasons. Generally writing, as was already mentioned, the rates of seaweed extract (8 ml/l) and farmyard manure (60 m<sup>3</sup>/ hectare) both boosted plant development; when combined, they may have the most effect, producing the tallest plants and the most branches per plant. Similarly, in terms of plant height and leaf count per plant, fennel grew more when farmyard manure was applied at 100% with seaweed extract than when chicken manure or inorganic fertilizer was applied at 100% with seaweed extract (Eisa, 2016).

### **Herb yield components:**

Data in Tables 4, 5, 6 and 7 indicates that farmyard manure at any rates had significant influence on herb fresh and dry weights per plant as well as per hectare at 1<sup>st</sup> cut, 2<sup>nd</sup> cut and 1<sup>st</sup> + 2<sup>nd</sup> cuts compared to control (without farmyard manure addition), in the two seasons. The highest values of total herb fresh weight per plant (244.75 and 254.25 g/ plant), total herb fresh weight per hectare (29.70 and 30.51 ton/hectare) as well as total herb dry weight per plant (52.65 and 54.67 g/ plant) and total herb dry weight per hectare (6.32 and 6.56 ton/hectare) when marjoram plants fertilized with farmyard manure at high rate (60 m<sup>3</sup>/ hectare) compared to the other rates under study in both cuts during both seasons.

**Table 4. Effect of farmyard manure rate, seaweed extract rate and their interaction on herb fresh weight per plant (g) of *Majorana hortensis* plant during both seasons**

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*Influence of farmyard manure and seaweed extract on growth, yield of herb and the economic evaluation of (Majorana hortensis, Moench) plants.*

Treatments	Herb fresh weight /plant (g) on 1 <sup>st</sup> cut		Herb fresh weight /plant (g) on 2 <sup>nd</sup> cut		Total herb fresh weight /plant (g) on 1 <sup>st</sup> + 2 <sup>nd</sup> cut		
	2023 season	2024 season	2023 season	2024 season	2023 season	2024 season	
	<b>Effect of farmyard manure rate (m<sup>3</sup> / hectare)</b>						
<b>0.0</b>	107.17	109.50	112.00	116.00	219.17	225.50	
<b>20</b>	109.58	112.42	115.17	119.25	224.75	231.67	
<b>40</b>	112.25	115.33	117.83	122.00	230.08	237.33	
<b>60</b>	118.00	123.33	126.75	130.92	244.75	254.25	
<b>L.S.D. at 5 %</b>	<b>0.73</b>	<b>1.52</b>	<b>0.84</b>	<b>0.50</b>	<b>1.11</b>	<b>1.13</b>	
	<b>Effect of seaweed extract rate (ml / l)</b>						
<b>0.0</b>	107.33	110.42	113.17	117.33	220.50	227.75	
<b>2</b>	111.17	114.00	116.50	120.67	227.67	234.67	
<b>4</b>	113.17	116.92	119.83	123.58	233.00	240.50	
<b>8</b>	115.33	119.25	122.25	126.58	237.58	245.83	
<b>L.S.D. at 5 %</b>	<b>0.53</b>	<b>0.62</b>	<b>0.56</b>	<b>0.51</b>	<b>0.65</b>	<b>0.79</b>	
	<b>Effect of farmyard manure rate × seaweed extract rate</b>						
<b>0.0</b>	<b>0.0</b>	103.67	105.67	107.67	111.67	211.33	217.33
	<b>2</b>	106.33	107.67	110.00	114.33	216.33	222.00
	<b>4</b>	108.33	111.33	114.00	117.67	222.33	229.00
	<b>8</b>	110.33	113.33	116.33	120.33	226.67	233.67
<b>20</b>	<b>0.0</b>	105.33	108.00	111.00	116.00	216.33	224.00
	<b>2</b>	109.00	111.33	113.67	118.00	222.67	229.33
	<b>4</b>	111.00	114.33	117.33	120.00	228.33	234.33
	<b>8</b>	113.00	116.00	118.67	123.00	231.67	239.00
<b>40</b>	<b>0.0</b>	107.00	110.33	113.33	117.67	220.33	228.00
	<b>2</b>	112.00	115.00	117.33	121.67	229.33	236.67
	<b>4</b>	114.00	117.00	119.33	123.33	233.33	240.33
	<b>8</b>	116.00	119.00	121.33	125.33	237.33	244.33
<b>60</b>	<b>0.0</b>	113.33	117.67	120.67	124.00	234.00	241.67
	<b>2</b>	117.33	122.00	125.00	128.67	242.33	250.67
	<b>4</b>	119.33	125.00	128.67	133.33	248.00	258.33
	<b>8</b>	122.00	128.67	132.67	137.67	254.67	266.33
<b>L.S.D. at 5 %</b>	<b>1.17</b>	<b>1.86</b>	<b>1.28</b>	<b>1.01</b>	<b>1.58</b>	<b>1.77</b>	

**Table 5. Effect of farmyard manure rate, seaweed extract rate and their interaction on herb fresh weight per hectare (ton) of *Majorana hortensis* plant during both seasons**

Treatments	Herb fresh weight /hectare (ton) on 1 <sup>st</sup> cut		Herb fresh weight /hectare (ton) on 2 <sup>nd</sup> cut		Total herb fresh weight /hectare (ton) on 1 <sup>st</sup> + 2 <sup>nd</sup> cut		
	2023 season	2024 season	2023 season	2024 season	2023 season	2024 season	
	<b>Effect of farmyard manure rate (m<sup>3</sup> / hectare)</b>						
<b>0.0</b>	12.86	13.14	13.44	13.92	26.30	27.06	
<b>20</b>	13.15	13.49	13.82	14.31	26.97	27.80	
<b>40</b>	13.47	13.84	14.14	14.64	27.61	28.48	
<b>60</b>	14.16	14.80	15.21	15.71	29.70	30.51	
<b>L.S.D. at 5 %</b>	<b>0.09</b>	<b>0.18</b>	<b>0.10</b>	<b>0.06</b>	<b>0.13</b>	<b>0.14</b>	
	<b>Effect of seaweed extract rate (ml / l)</b>						
<b>0.0</b>	12.88	13.25	13.58	14.08	26.46	27.33	
<b>2</b>	13.34	13.68	13.98	14.48	27.32	28.16	
<b>4</b>	13.58	14.03	14.38	14.83	27.96	28.86	
<b>8</b>	13.84	14.31	14.68	15.19	28.51	29.50	
<b>L.S.D. at 5 %</b>	<b>0.06</b>	<b>0.07</b>	<b>0.07</b>	<b>0.06</b>	<b>0.08</b>	<b>0.09</b>	
	<b>Effect of farmyard manure rate × seaweed extract rate</b>						
<b>0.0</b>	<b>0.0</b>	12.44	12.68	12.92	13.40	25.36	26.08
	<b>2</b>	12.76	12.92	13.20	13.72	25.96	26.64
	<b>4</b>	13.00	13.36	13.68	14.12	26.68	27.48
	<b>8</b>	13.24	13.60	13.96	14.44	27.20	28.04
<b>20</b>	<b>0.0</b>	12.64	12.96	13.32	13.92	25.96	26.88
	<b>2</b>	13.08	13.36	13.64	14.16	26.72	27.52
	<b>4</b>	13.32	13.72	14.08	14.40	27.40	28.12
	<b>8</b>	13.56	13.92	14.24	14.76	27.80	28.68
<b>40</b>	<b>0.0</b>	12.84	13.24	13.60	14.12	26.44	27.36
	<b>2</b>	13.44	13.80	14.08	14.60	27.52	28.40
	<b>4</b>	13.68	14.04	14.32	14.80	28.00	28.84
	<b>8</b>	13.92	14.28	14.56	15.04	28.48	29.32
<b>60</b>	<b>0.0</b>	13.60	14.12	14.48	14.88	28.08	29.00
	<b>2</b>	14.08	14.64	15.00	15.44	29.08	30.08
	<b>4</b>	14.32	15.00	15.44	16.00	29.76	31.00
	<b>8</b>	14.64	15.44	15.92	16.52	30.56	31.96
<b>L.S.D. at 5 %</b>	<b>0.14</b>	<b>0.22</b>	<b>0.15</b>	<b>0.12</b>	<b>0.19</b>	<b>0.21</b>	

Organic manures, particularly FYM, may have been more effective since they would have supplied micronutrients like Fe, Zn, Cu, Mo and Mn at optimal levels. Therefore,

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applying organic manure would have increased herb output by supplying these vital micronutrients and assisting in plant metabolic activity (**Anburani and Manivannan, 2002**). When compared to one another, **Hamza et al. (2007)** found that farmyard manure (FYM) doses improved dry weight per plant, seed production per plant and plot. When given the medium FYM dose (20 m<sup>3</sup>/ feddan), *Plantago ovata* plants showed the significant performance. Moreover, the high level of FYM (20 m<sup>3</sup>/ feddan) was the most effective in fruit yield/cumin plant and /feddan compared to control (**Abdou et al., 2019**).

**Table 6. Effect of farmyard manure rate, seaweed extract rate and their interaction on herb dry weight per plant (g) of *Majorana hortensis* plant during both seasons**

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*Influence of farmyard manure and seaweed extract on growth, yield of herb and the economic evaluation of (*Majorana hortensis*, Moench) plants.*

Treatments	Herb dry weight /plant (g) on 1 <sup>st</sup> cut		Herb dry weight /plant (g) on 2 <sup>nd</sup> cut		Total herb dry weight /plant (g) on 1 <sup>st</sup> + 2 <sup>nd</sup> cut		
	2023 season	2024 season	2023 season	2024 season	2023 season	2024 season	
<b>Effect of farmyard manure rate (m<sup>3</sup> / hectare)</b>							
<b>0.0</b>	24.71	25.44	25.46	26.28	50.17	51.72	
<b>20</b>	24.77	25.94	25.92	26.79	50.68	52.73	
<b>40</b>	25.00	26.15	26.24	27.17	51.24	53.32	
<b>60</b>	25.73	26.92	26.92	27.75	52.65	54.67	
<b>L.S.D. at 5 %</b>	<b>0.10</b>	<b>0.14</b>	<b>0.16</b>	<b>0.17</b>	<b>0.22</b>	<b>0.26</b>	
<b>Effect of seaweed extract rate (ml / l)</b>							
<b>0.0</b>	24.44	25.33	25.40	26.23	49.83	51.56	
<b>2</b>	24.83	25.86	25.90	26.73	50.73	52.59	
<b>4</b>	25.21	26.34	26.34	27.13	51.55	53.48	
<b>8</b>	25.73	26.92	26.90	27.90	52.63	54.81	
<b>L.S.D. at 5 %</b>	<b>0.10</b>	<b>0.17</b>	<b>0.13</b>	<b>0.13</b>	<b>0.18</b>	<b>0.19</b>	
<b>Effect of farmyard manure rate × seaweed extract rate</b>							
<b>0.0</b>	<b>0.0</b>	23.92	24.33	24.33	25.17	48.25	49.50
	<b>2</b>	24.33	25.27	25.27	25.92	49.60	51.18
	<b>4</b>	24.83	25.67	25.75	26.53	50.58	52.20
	<b>8</b>	25.75	26.50	26.50	27.50	52.25	54.00
<b>20</b>	<b>0.0</b>	24.33	25.42	25.42	26.17	49.75	51.58
	<b>2</b>	24.67	25.67	25.67	26.58	50.33	52.25
	<b>4</b>	24.92	26.17	26.08	26.92	51.00	53.08
	<b>8</b>	25.17	26.50	26.50	27.50	51.67	54.00
<b>40</b>	<b>0.0</b>	24.58	25.67	25.75	26.67	50.33	52.33
	<b>2</b>	24.83	26.08	26.17	26.92	51.00	53.00
	<b>4</b>	25.10	26.28	26.37	27.33	51.47	53.62
	<b>8</b>	25.50	26.58	26.67	27.75	52.17	54.33
<b>60</b>	<b>0.0</b>	24.92	25.92	26.08	26.92	51.00	52.83
	<b>2</b>	25.50	26.42	26.50	27.50	52.00	53.92
	<b>4</b>	26.00	27.25	27.17	27.75	53.17	55.00
	<b>8</b>	26.50	28.08	27.92	28.83	54.42	56.92
<b>L.S.D. at 5 %</b>	<b>0.19</b>	<b>0.33</b>	<b>0.28</b>	<b>0.29</b>	<b>0.38</b>	<b>0.42</b>	

Tables 4, 5, 6 and 7 shows that at the two cuts during both seasons, using of seaweed extract significantly raised herb yield components of *Majorana hortensis* as compared to the control. As seaweed extract was used at 4 and 8 ml/l, respectively, the herb fresh and

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dry weights per plant as well as per hectare at 1<sup>st</sup> cut, 2<sup>nd</sup> cut and 1<sup>st</sup> + 2<sup>nd</sup> cuts also increased. One of the most promising uses of seaweeds nowadays is as plant biostimulants. The presence of plant growth-promoting compounds in algal extracts, such as cytokinins, polyamines, gibberellic acid, abscisic acid, and indoleacetic acid (IAA), can account for this impact (Prasad *et al.*, 2010). Spraying sweet basil plants with seaweed extracts resulted in a significant enhance in herb weight and its yield/feddan (Sakr *et al.*, 2010).

**Table 7. Effect of farmyard manure rate, seaweed extract rate and their interaction on herb dry weight per hectare (ton) of *Majorana hortensis* plant during both seasons**

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*Influence of farmyard manure and seaweed extract on growth, yield of herb and the economic evaluation of (*Majorana hortensis*, Moench) plants.*

Treatments	Herb dry weight /hectare (ton) on 1 <sup>st</sup> cut		Herb dry weight /hectare (ton) on 2 <sup>nd</sup> cut		Total herb dry weight /hectare (ton) on 1 <sup>st</sup> + 2 <sup>nd</sup> cut		
	2023 season	2024 season	2023 season	2024 season	2023 season	2024 season	
	<b>Effect of farmyard manure rate (m<sup>3</sup> / hectare)</b>						
<b>0.0</b>	2.97	3.05	3.06	3.15	6.02	6.21	
<b>20</b>	2.97	3.11	3.11	3.22	6.08	6.33	
<b>40</b>	3.00	3.14	3.15	3.26	6.15	6.40	
<b>60</b>	3.09	3.23	3.23	3.33	6.32	6.56	
<b>L.S.D. at 5 %</b>	<b>0.01</b>	<b>0.02</b>	<b>0.02</b>	<b>0.02</b>	<b>0.03</b>	<b>0.03</b>	
	<b>Effect of seaweed extract rate (ml / l)</b>						
<b>0.0</b>	2.93	3.04	3.05	3.15	5.98	6.19	
<b>2</b>	2.98	3.10	3.11	3.21	6.09	6.31	
<b>4</b>	3.03	3.16	3.16	3.26	6.19	6.42	
<b>8</b>	3.09	3.23	3.23	3.35	6.32	6.58	
<b>L.S.D. at 5 %</b>	<b>0.01</b>	<b>0.02</b>	<b>0.02</b>	<b>0.02</b>	<b>0.02</b>	<b>0.02</b>	
	<b>Effect of farmyard manure rate × seaweed extract rate</b>						
<b>0.0</b>	<b>0.0</b>	2.87	2.92	2.92	3.02	5.79	5.94
	<b>2</b>	2.92	3.03	3.03	3.11	5.95	6.14
	<b>4</b>	2.98	3.08	3.09	3.18	6.07	6.26
	<b>8</b>	3.09	3.18	3.18	3.30	6.27	6.48
<b>20</b>	<b>0.0</b>	2.92	3.05	3.05	3.14	5.97	6.19
	<b>2</b>	2.96	3.08	3.08	3.19	6.04	6.27
	<b>4</b>	2.99	3.14	3.13	3.23	6.12	6.37
	<b>8</b>	3.02	3.18	3.18	3.30	6.20	6.48
<b>40</b>	<b>0.0</b>	2.95	3.08	3.09	3.20	6.04	6.28
	<b>2</b>	2.98	3.13	3.14	3.23	6.12	6.36
	<b>4</b>	3.01	3.15	3.16	3.28	6.18	6.43
	<b>8</b>	3.06	3.19	3.20	3.33	6.26	6.52
<b>60</b>	<b>0.0</b>	2.99	3.11	3.13	3.23	6.12	6.34
	<b>2</b>	3.06	3.17	3.18	3.30	6.24	6.47
	<b>4</b>	3.12	3.27	3.26	3.33	6.38	6.60
	<b>8</b>	3.18	3.37	3.35	3.46	6.53	6.83
<b>L.S.D. at 5 %</b>	<b>0.02</b>	<b>0.04</b>	<b>0.03</b>	<b>0.03</b>	<b>0.05</b>	<b>0.05</b>	

In terms of combination, it was observed that farmyard manure fertilization at 60 m<sup>3</sup>/hectare combined with 8 ml/l of seaweed extract produced the highest values on herb

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yield per plant and per hectare of marjoram plants during both seasons, with a significant difference between the other combination treatments, according to the data presented in Tables 4, 5, 6 and 7. Additionally, at any farmyard manure rate, seaweed extract rates increased from 4 to 8 ml/l, resulting in a progressive increase in herb yield components at both cuts across both seasons. Likewise, **Abd EL-Kafie *et al.* (2020)** found that the highest values of fruit yield (g /plant and kg /feddan) of coriander plant were influenced by the interaction between various organic fertilizers (plant compost and farmyard manure) and foliar application of seaweed extract over the course of two seasons.

### **Volatile oil production:**

Data of both seasons recorded in Tables 8, 9 and 10 reveals that volatile oil percentage, volatile oil yield per plant and per hectare of marjoram plants were significantly influenced by the fertilization of farmyard manure compared to control. The best treatment regard volatile oil production was 60 m<sup>3</sup>/hectare of farmyard manure at both cuts during both seasons. Generally, there are a gradual increase was noticed by increasing farmyard manure rates from 20, 40 to 60 m<sup>3</sup>/ hectare. Applying farmyard manure may have increased the yield of marjoram herb yield because organic fertilizer enhances the physical, biological and chemical characteristics of soil, thereby increasing soil organic matter, mineral nutrient availability, cation exchange capacity and water-holding capacity. This, in turn, increases the production of volatile oil. In addition, the volatile oil percentage, production of volatile oil per plant and yield of volatile oil per feddan of coriander plants in both seasons were significantly impacted by FYM treatment, particularly at 20 m<sup>3</sup>/feddan rate (**Ali *et al.*, 2023**).

The findings in Tables 8, 9, and 10 make it abundantly evident that the rates of seaweed extract significantly impacted the percentage of volatile oil, the amount of volatile oil produced per plant, and the amount of volatile oil produced per hectare of marjoram plants in the two cuttings during both seasons. When compared to the other treatments, the application of seaweed extract at a rate of 8 milliliters per liter produced the highest values in this regard. Seaweed extract promotes healthy foliage and enhances photosynthesis (**Kavitha *et al.*, 2008**). The potential uses of seaweed extract in organic agricultural methods needs to be investigated. Moreover, **Bakr *et al.* (2024)** proposed that treating *Pelargonium graveolens* with 1 g/l of seaweed extract could enhance the

production of volatile oil. Also, **Bressan *et al.* (2024)** pointed out that essential oil yield of *Pelargonium graveolens* plant was improved due to seaweed extracts.

The percentage of volatile oil and its yield per plant and per hectare at the first cut, second cut, and first + second cuts at the two seasons were significantly impacted by the interaction between farmyard manure and seaweed extract rates, according to data in Tables 8, 9, and 10. This was in contrast to the control, which did not include the addition of farmyard manure and seaweed extract. The highest values of volatile oil yield per plant (0.676 and 0.737 ml/ plant) as well as total volatile oil yield per hectare (81.12 and 88.48 l/hectare) when marjoram plants fertilized with farmyard manure at high rate (60 m<sup>3</sup>/ hectare) in combination with seaweed extract at high rate (8ml/l) compared to the other combinations under study in both cuts during both seasons. Likewise, when fennel plants were treated with 4 ml/l seaweed extract and cultivated in soil supplemented with organic manure at a rate of 4 kg/plot, the volatile oil content of fennel fruit reached its maximum values in comparison to other combinations (**Ali *et al.*, 2023**).

**Table 8. Effect of farmyard manure rate, seaweed extract rate and their interaction on volatile oil percentage of *Majorana hortensis* plant during both seasons**

Treatments	First cut		Second season	
	2023 season	2024 season	2023 season	2024 season
Effect of farmyard manure rate (m <sup>3</sup> / hectare)				

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<b>0.0</b>		1.102	1.131	1.154	1.198
<b>20</b>		1.120	1.165	1.186	1.221
<b>40</b>		1.130	1.181	1.210	1.249
<b>60</b>		1.152	1.216	1.248	1.290
<b>L.S.D. at 5 %</b>		<b>0.023</b>	<b>0.019</b>	<b>0.010</b>	<b>0.006</b>
<b>Effect of seaweed extract rate (ml / l)</b>					
<b>0.0</b>		1.098	1.139	1.163	1.204
<b>2</b>		1.113	1.164	1.190	1.228
<b>4</b>		1.129	1.179	1.207	1.248
<b>8</b>		1.163	1.210	1.238	1.278
<b>L.S.D. at 5 %</b>		<b>0.004</b>	<b>0.005</b>	<b>0.005</b>	<b>0.005</b>
<b>Effect of farmyard manure rate × seaweed extract rate</b>					
<b>0.0</b>	<b>0.0</b>	1.073	1.100	1.123	1.170
	<b>2</b>	1.090	1.120	1.143	1.187
	<b>4</b>	1.103	1.137	1.160	1.207
	<b>8</b>	1.140	1.167	1.190	1.227
<b>20</b>	<b>0.0</b>	1.093	1.137	1.153	1.183
	<b>2</b>	1.107	1.157	1.177	1.210
	<b>4</b>	1.123	1.167	1.190	1.233
	<b>8</b>	1.157	1.200	1.223	1.257
<b>40</b>	<b>0.0</b>	1.103	1.147	1.173	1.210
	<b>2</b>	1.120	1.170	1.200	1.237
	<b>4</b>	1.133	1.190	1.220	1.257
	<b>8</b>	1.163	1.217	1.247	1.293
<b>60</b>	<b>0.0</b>	1.123	1.173	1.203	1.253
	<b>2</b>	1.137	1.210	1.240	1.280
	<b>4</b>	1.157	1.223	1.257	1.293
	<b>8</b>	1.190	1.257	1.290	1.333
<b>L.S.D. at 5 %</b>		<b>0.024</b>	<b>0.020</b>	<b>0.013</b>	<b>0.010</b>

**Table 9. Effect of farmyard manure rate, seaweed extract rate and their interaction on volatile oil yield per plant (ml) of *Majorana hortensis* plant during both seasons**

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*Influence of farmyard manure and seaweed extract on growth, yield of herb and the economic evaluation of (Majorana hortensis, Moench) plants.*

Treatments	Volatile oil yield /plant (ml) on 1 <sup>st</sup> cut		Volatile oil yield /plant (ml) on 2 <sup>nd</sup> cut		Volatile oil yield /plant (ml) on 1 <sup>st</sup> + 2 <sup>nd</sup> cut		
	2023 season	2024 season	2023 season	2024 season	2023 season	2024 season	
<b>Effect of farmyard manure rate (m<sup>3</sup> / hectare)</b>							
<b>0.0</b>	0.273	0.288	0.294	0.315	0.367	0.603	
<b>20</b>	0.278	0.302	0.308	0.327	0.585	0.630	
<b>40</b>	0.283	0.309	0.318	0.340	0.601	0.649	
<b>60</b>	0.297	0.328	0.336	0.358	0.633	0.686	
<b>L.S.D. at 5 %</b>	<b>0.006</b>	<b>0.007</b>	<b>0.004</b>	<b>0.003</b>	<b>0.010</b>	<b>0.008</b>	
<b>Effect of seaweed extract rate (ml / l)</b>							
<b>0.0</b>	0.269	0.289	0.296	0.317	0.565	0.605	
<b>2</b>	0.277	0.301	0.308	0.329	0.585	0.630	
<b>4</b>	0.285	0.311	0.318	0.339	0.603	0.650	
<b>8</b>	0.299	0.326	0.333	0.357	0.632	0.683	
<b>L.S.D. at 5 %</b>	<b>0.002</b>	<b>0.003</b>	<b>0.003</b>	<b>0.002</b>	<b>0.003</b>	<b>0.004</b>	
<b>Effect of farmyard manure rate × seaweed extract rate</b>							
<b>0.0</b>	<b>0.0</b>	0.257	0.268	0.274	0.296	0.531	0.564
	<b>2</b>	0.265	0.283	0.289	0.308	0.554	0.591
	<b>4</b>	0.274	0.292	0.299	0.320	0.573	0.612
	<b>8</b>	0.294	0.309	0.315	0.337	0.609	0.647
<b>20</b>	<b>0.0</b>	0.266	0.289	0.293	0.310	0.559	0.599
	<b>2</b>	0.273	0.297	0.302	0.322	0.575	0.619
	<b>4</b>	0.280	0.305	0.311	0.332	0.591	0.638
	<b>8</b>	0.291	0.318	0.324	0.346	0.615	0.663
<b>40</b>	<b>0.0</b>	0.272	0.294	0.302	0.323	0.574	0.617
	<b>2</b>	0.278	0.305	0.314	0.333	0.592	0.638
	<b>4</b>	0.285	0.313	0.322	0.343	0.606	0.656
	<b>8</b>	0.297	0.324	0.333	0.359	0.629	0.683
<b>60</b>	<b>0.0</b>	0.280	0.304	0.314	0.338	0.594	0.642
	<b>2</b>	0.290	0.320	0.329	0.352	0.619	0.672
	<b>4</b>	0.301	0.334	0.341	0.359	0.642	0.693
	<b>8</b>	0.316	0.353	0.360	0.384	0.676	0.737
<b>L.S.D. at 5 %</b>	<b>0.007</b>	<b>0.008</b>	<b>0.006</b>	<b>0.005</b>	<b>0.011</b>	<b>0.010</b>	

**Table 10. Effect of farmyard manure rate, seaweed extract rate and their interaction on volatile oil yield per hectare (l) of *Majorana hortensis* plant during both seasons**

*Influence of farmyard manure and seaweed extract on growth, yield of herb and the economic evaluation of (Majorana hortensis, Moench) plants.*

Treatments	Volatile oil yield /hectare (L) on 1 <sup>st</sup> cut		Volatile oil yield /hectare (L) on 2 <sup>nd</sup> cut		Total volatile oil yield /hectare (L) on 1 <sup>st</sup> + 2 <sup>nd</sup> cut		
	2023 season	2024 season	2023 season	2024 season	2023 season	2024 season	
<b>Effect of farmyard manure rate (m<sup>3</sup> / hectare)</b>							
<b>0.0</b>	32.70	34.57	35.31	37.83	68.01	72.40	
<b>20</b>	33.33	36.27	36.90	39.29	70.23	75.56	
<b>40</b>	33.94	37.08	38.12	40.74	72.06	77.82	
<b>60</b>	35.61	39.31	40.33	43.00	75.94	82.31	
<b>L.S.D. at 5 %</b>	<b>0.80</b>	<b>0.81</b>	<b>0.51</b>	<b>0.36</b>	<b>1.17</b>	<b>0.94</b>	
<b>Effect of seaweed extract rate (ml/ l)</b>							
<b>0.0</b>	32.26	34.66	35.50	37.99	67.76	72.65	
<b>2</b>	33.22	36.15	37.01	39.44	70.23	75.59	
<b>4</b>	34.19	37.31	38.17	40.64	72.36	77.95	
<b>8</b>	35.91	39.11	39.98	42.79	75.89	81.90	
<b>L.S.D. at 5 %</b>	<b>0.19</b>	<b>0.36</b>	<b>0.33</b>	<b>0.25</b>	<b>0.41</b>	<b>0.44</b>	
<b>Effect of farmyard manure rate × seaweed extract rate</b>							
<b>0.0</b>	<b>0.0</b>	30.84	32.16	32.88	35.52	63.72	67.68
	<b>2</b>	31.84	33.96	34.68	36.92	66.52	70.88
	<b>4</b>	32.88	35.04	35.84	38.40	68.72	73.44
	<b>8</b>	35.24	37.12	37.84	40.48	73.08	77.60
<b>20</b>	<b>0.0</b>	31.96	34.68	35.16	37.20	67.12	71.88
	<b>2</b>	32.80	35.64	36.24	38.60	69.04	74.24
	<b>4</b>	33.64	36.64	37.28	39.88	70.92	76.52
	<b>8</b>	34.92	38.12	38.92	41.48	73.84	79.60
<b>40</b>	<b>0.0</b>	32.60	35.32	36.28	38.72	68.88	74.04
	<b>2</b>	33.40	36.64	37.68	39.96	71.08	76.60
	<b>4</b>	34.16	37.52	38.60	41.20	72.76	78.72
	<b>8</b>	35.60	38.84	39.92	43.08	75.52	81.92
<b>60</b>	<b>0.0</b>	33.64	36.48	37.68	40.52	71.32	77.00
	<b>2</b>	34.84	38.36	39.44	42.28	74.28	80.64
	<b>4</b>	36.08	40.04	40.96	43.08	77.04	83.12
	<b>8</b>	37.88	42.36	43.24	46.12	81.12	88.48
<b>L.S.D. at 5 %</b>	<b>0.86</b>	<b>1.02</b>	<b>0.77</b>	<b>0.57</b>	<b>1.36</b>	<b>1.21</b>	

### Economic evaluation:

Table 11 displays the marjoram crop field experiment's net return and profit cost ratio (P/C). The highest profit/cost ratio (2.940) was obtained by feeding the soil with 60

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m<sup>3</sup>/hectare of farmyard manure, according to the data. Furthermore, as compared to the control treatment, the highest profit/cost ratio was observed under the 8 ml/l seaweed extract treatment (2.950). The best interaction treatment was 60 m<sup>3</sup>/hectare of farmyard manure combined with 8 ml/l seaweed extract which recorded 3.064 ratio compared to the other interaction treatments under study. In general, it could be said that the highest net return and value for marjoram plants was obtained by applying farmyard manure in combination with seaweed extract. These results are in line with those reported by **El-Hindi and El-Boraie (2005)** on marjoram plant.

**Table 11. Economic evaluation of marjoram production under influences of farmyard manure rate, seaweed extract rate and their interaction (average of both seasons)**

Treatments	Input	Output
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	Investment costs	Operating costs	Total costs cultivation (L.E. /ha.)	Revenue	profit /cost ratio	Order	
<b>Effect of farmyard manure rate (m<sup>3</sup> / hectare)</b>							
<b>0.0</b>	70203.96	42978	113181	320160	2.829	2	
<b>20</b>	70203.96	45977	116181	328620	2.828	3	
<b>40</b>	70203.96	48978	119181	336540	2.824	4	
<b>60</b>	70203.96	51978	122181	359280	2.940	1	
<b>L.S.D. at 5 %</b>	-	<b>126.69</b>	<b>126.69</b>	<b>1553.7</b>	<b>0.010</b>	-	
<b>Effect of seaweed extract rate (ml / l)</b>							
<b>0.0</b>	70203.96	47285	117489	322740	2.746	4	
<b>2</b>	70203.96	47395	117599	332880	2.830	3	
<b>4</b>	70203.96	47505	117709	340920	2.895	2	
<b>8</b>	70203.96	47725	117929	348060	2.950	1	
<b>L.S.D. at 5 %</b>	-	<b>85.99</b>	<b>85.99</b>	<b>727.36</b>	<b>0.005</b>	-	
<b>Effect of farmyard manure rate × seaweed extract rate</b>							
<b>0.0</b>	<b>0.0</b>	70203.96	42785	112989	308640	2.732	14
	<b>2</b>	70203.96	42895	113099	315600	2.790	13
	<b>4</b>	70203.96	43005	113209	324960	2.870	7
	<b>8</b>	70203.96	43225	113429	331440	2.922	3
<b>20</b>	<b>0.0</b>	70203.96	45785	115989	317040	2.733	15
	<b>2</b>	70203.96	45895	116099	325440	2.803	12
	<b>4</b>	70203.96	46005	116209	333120	2.867	8
	<b>8</b>	70203.96	46225	116429	338880	2.911	4
<b>40</b>	<b>0.0</b>	70203.96	48785	118989	322800	2.713	16
	<b>2</b>	70203.96	48895	119099	335520	2.817	10
	<b>4</b>	70203.96	49005	119209	341040	2.861	9
	<b>8</b>	70203.96	49225	119429	346800	2.904	6
<b>60</b>	<b>0.0</b>	70203.96	51785	121989	342480	2.808	11
	<b>2</b>	70203.96	51895	122099	354960	2.907	5
	<b>4</b>	70203.96	52005	122209	364560	2.983	2
	<b>8</b>	70203.96	52225	122429	375120	3.064	1
<b>L.S.D. at 5 %</b>	-	<b>194.87</b>	<b>194.87</b>	<b>19993.2</b>	<b>0.014</b>	-	

**Conclusion:**

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According to the study's findings, the best method for increasing the yield of marjoram herbs was to apply seaweed extract topically at a rate of 8 ml/ liter and combine it with farmyard manure at a rate of 60 m<sup>3</sup>/hectare. The highest essential oil yield was produced as a result of this interaction treatment, which was linked to improvements in vegetative and herb traits. Also economic evaluation of this study, it was found that the highest net return and value of marjoram plants were obtained by applying 60 m<sup>3</sup>/ha of farmyard fertilizer with seaweed extract at a concentration of 8 ml/L, where the profit/cost ratio was recorded as 3.064 compared to other interaction treatments under study.

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