EFFECT OF SPRAYING WITH SOME GROWTH STIMULATORS ON PRODUCTIVITY AND QUALITY OF OLIVE FRUITS UNDER RAINY CONDITIONS

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This study was carried out on 54 trees of "Coratina" olive trees (*Olea europea*) during the two successive seasons of 2022 and 2023 at El Raml valley, Matrouh Governorate, Egypt. The study's objective was to find out how garlic extract and the biostimulant biomagic could enhance the quality and fruit production of the olive variety "Coratina". All the treatments were subjected to the same agricultural practice. The foliar treatments were used, tap water (T1), garlic extract 4% (T2), garlic extract 6% (T3), biomagic at 7.5 m/l (T4), biomagic at 9.5 m/l (T5), garlic extract 4% + biomagic 7.5 m/l (T6), garlic extract 4% + biomagic 9.5 m/l (T7), garlic extract 6% + biomagic 7.5 m/l (T8), and garlic extract 6%+biomagic 9.5 m/l (T9). According to the results, spraying fruit trees with garlic extract and biomagic, then each treatment's concentration alone in both seasons, had an impact on all the treatments. T9 gave the best fruit oil percentage, the lowest acidity, the highest vegetative development, and the best physical and chemical characteristics of the fruit. it improves the macro and micro elements in leaves.

Keywords: olive, bio-fertilization, biomagic, garlic

INTRODUCTION

Olives (*Olea europaea* L.) are particularly common in the vast cultivated areas of the Mediterranean basin. Egypt produces 1,056,548 tons of olives a year from olive trees planted in 244,643 feddan (FAO, 2021). Mostly being grown using rainfed production methods. The sector is threatened by the current unfavorable environmental conditions and even more so by the potential future climate change scenarios, despite the species' ability to withstand hard conditions (IPCC, 2013). Environmental stressors have been shown to reduce agricultural yields and numerous studies have demonstrated

the importance of stepping up efforts to adapt plants to these unfavorable circumstances.

Rain-fed irrigation is utilized to irrigate olive trees because the rough terrain of traditional olive-growing regions creates conditions that make irrigation systems difficult to build or economically unsustainable. In light of the current climate changes, drought, and lack of rainfall, it has been found that during droughts, they experience water shortages that inhibit plant growth and photosynthesis. Many physiological changes occur when plants experience drier conditions. Cell expansion is most affected by water shortages. In many plants, reduced water supply inhibits branch growth and leaf expansion but stimulates root elongation. Water shortages and droughts affect plant physiological processes and reduce growth rates (Wang and Frei, 2011). Therefore, in this study we used spraying trees with organic and Bio-fertilization was used to compensate for the plant's inability to absorb elements and nutrients from the soil as a result of the lack of rain and dry soil.

Biological preparations that contain a sufficient number of microorganisms, mainly patent strains, are known as bio-fertilization. These microorganisms undoubtedly contribute positively to plant growth. They may be used in the field with ease and safety, which has increased their effectiveness in raising crop yields and lowering the expenses of some farming methods. It is important to note that while bio-fertilizers greatly decrease the rate at which mineral fertilizers are applied, they do not completely replace them (Ishac, 1989 and Saber, 1993). Biofertilizers are extremely safe for the environment, animals and people. The substantial pollution caused in the environment occurred because they reduced to a lesser degree. Bio-fertilizers are essential for soil and plant production because they improve fruit quality, yield and vegetative growth in plants such as sweet oranges (Chokha et al., 2000; El-Geuoshy, 2011 and Bakry et al., 2013), olives (Ahmed and Morsy, 1999 and Osman et al., 2010) and guava and bananas (Soliman, 2001). Additionally, Shaban and Mohsen (2009) demonstrated that all bio-fertilizers improved the nutritional quality and vegetative growth of transplanted sweet oranges.

Bio-fertilizers are important for soil and plant production because they increase the vegetative growth, yield and fruit quality of sweet orange plants (Chokha et al., 2000; El-Geuoshy, 2011 and Bakry et al., 2013), olive plants (Ahmed and Morsy, 1999 and Osman et al., 2010) and guava and banana plants (Soliman, 2001). All bio-fertilizers improved the nutritional value and vegetative development of sweet orange transplants; claim Shaban and Mohsen (2009). Khamis et al. (2014) found that bio-fertilizers increased the amount of photosynthetic pigments (carotenoids, chlorophyll A and B) in leaves.

Biomagic products are microbial biological promoters that include a variety of biological components that affect plant development. This product is made up of amino acids, which are necessary building blocks for proteins.

Macro and microelements are involved in all cellular and metabolic activities, vitamins are essential for plant growth and aid in plant development by providing essential nutrients and amino acids are required for the overall growth and development of plants (Suman et al., 2017). As a result, this increases photosynthesis, facilitates the uptake of nutrients and water from the soil and extends the time frame for vegetative development and production (El-Sibaie, 1995). Amino acids, the building blocks necessary for the synthesis of proteins, make up this material. Chokha et al. (2000) found that the use of biomagic enhanced growth metric s for Volkamryana lemon and Mosambi sweet orange. Researchers found that the potential application of natural, harmless compounds such as biomagic is very desirable; as mentioned by Ismail (2002) on peas, Abdel-Aziz (1997) on tomatoes and Igbokwe et al. (1990) on tomatoes.

A microbial biological promoter that incorporates a range of biological products that affect plant development is called a biomagic product. This material is composed of amino acids, which are necessary building blocks for proteins. Approximately 200 biological components, including vitamins, antioxidants and numerous vital enzymes, are present in the very nutritious extract from garlic (*Allium sativum*) (Mohamed and Akladious**,** 2014 and El-Saadony et al., 2017). Among other volatile substances, it contains high levels of trisulfide, diallyl, allylpropyl, ajoene, aliin and sulfur, vinyldithiines, sallylcysteine and sallylmercaptocystein.

Pekowska and Skupień (2009) stated that garlic is considered a rich source of other non-volatile phytonutrients, particularly flavonoids, phenolic compounds, nitrogen oxides, proteins, amides and saponins and sapogenins, which have important medicinal and therapeutic qualities. Garlic is also considered an antioxidant and source of vitamins (particularly B complex and C) and minerals (particularly P, K and Se). The purpose of this study was to find out how the bio stimulant biomagic and garlic extract affected the quality and fruit production of the olive variety "Coratina".

MATERIALS AND METHODS

This study was implemented through the project (Sustainable development of fruit trees affected by some environmental stress in Matrouh governorate) funded by Regional Development Centers (RDC), Academy of Scientific Research and Technology (ASRT) (Call no. 2/2019/ASRT-RDC). It was conducted on healthy “Coratina” olive trees (*Olea europea*) that were planted 7 by 7 meters apart and were about 12 years old throughout two consecutive seasons in 2022 and 2023. At a private olive grove in the Matrouh Governorate of Egypt, trees were cultivated on sandy loam soil that was rain-fed. Table (1) displays some of the experimental soil's characteristics in 2022, the annual rainfall in the Marsa Matruh area (encompassing Wadi El Raml) was approximately 122 mm, while in 2023 it remained close to that historic

average (around 120-130 mm) (Climate-data.org, 2024). Olive plantations, require around 300-400 mm of water annually; thus, an additional 180–280 mm supplied via supplemental irrigation during the season to meet their water needs.

Table (1). Analysis of experimental soil.

Depth (cm)	Particle size distribution (%)				Soil texture Class
	Coarse Sand	Fine sand	Silt	Clay	
0-30	26.64	51.17	16.28	5.91	Sandy loam
30-60	45.72	42.33	7.29	4.66	Loamy sand
60-90	33.03	50.97	12.92	3.08	Loamy sand

Depth (cm)	pH	ECsp (dS/m)	Soluble Cations (meq/l)				Soluble Anions (meq/l)			
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	HCO_3^-	CO_3^{--}	Cl^-	SO_4^{--}
0-30	7.9	1.08	2.17	1.46	6.78	0.39	nil	1.5	7.4	2.0
30-60	8.0	0.46	1.71	0.33	2.43	0.13	nil	1.0	2.2	1.4
60-90	8.1	0.398	1.25	0.46	2.13	0.14	nil	0.9	2.2	0.9

Fifty-four healthy trees, nearly the same size and shape and productivity, were given the same horticultural practices. They were given the following ten treatments: tap water (T_1), garlic extract 4% (T_2), garlic extract 6% (T_3), biomagic at 7.5 m/l (T_4), biomagic at 9.5 m/l (T_5), garlic extract 4% + biomagic 7.5 m/l (T_6), garlic extract 6% + biomagic 9.5 m/l (T_7), garlic extract 6% + biomagic 7.5 m/l (T_8) and garlic extract 6% + biomagic 9.5 m/l (T_9). In all seasons, all treatments were sprayed once every month starting at full bloom (in early April) until the harvest time.

One litter of distilled water was used to mix 40 and 60 grams of fresh mature garlic cloves, freeze and thaw them twice, filter and dilute them with distilled water to create the 4 and 6% garlic aqueous extract (El-Desouky et al., 1998). Table (2) lists some of the chemical components of garlic cloves. Data in Table (3) show the chemical composition of biomagic.

Table (2). Some chemical constituents of garlic cloves according to Arid Land Agricultural Research Unit.

Components	Concentration	Components	Concentration
GA_3	1.64 mg/l00 g F.W.	Mg	1.231%
IAA	Trace amount	$S0_4$	0.182%
ABA	Trace amount	Mn	94.3 ppm
Ca	1.362%	Zn	66.6 ppm

Table (3). The analysis of biomagic (El Massiry, 2009).

Biomagic			
Amino acids (2.07%)	**Vitamens (0.04%)**	**Macroelements (mg/l)**	**Microelements (3.7% mg/l)**
Arginine	Thiamine	1125 N	45 Mg
Cystine	Biotene	550 P_2O_5	160 Fe
Glycine	Choline	625 k_2O	124 Zn
Histidine	Folic acid		100 Mn
Leucine	Niacine		45 Cu
Lysine	Pantothinic		14 B
Phenylalanine	Pyrodxine		12 Mo
Theronine	Rhiboflavin		8 Co
Tryptophane			
Tyrosine			
Valine			

The three replicates, each consisting of two trees, were used in the experiment in complete block randomized design. Fifty four trees every season are produced by multiplying nine treatments by three replicates, each of which has two trees.

1. First, Vegetative Growth Traits

The following vegetative growth features were identified during the final week of November:

1.1. Shoot length

Shoot length was measured using a ruler and reported in centimetres (cm). The leaf blade area (cm^2) was calculated at the last week of November using the equation outlined by Ahmed and Morsy (1999) and referenced by Shaheen et al. (2011). Samples of 20 adult leaves/treatments were randomly selected from the middle section of each year's growth of selected shoots. As explained by Moran and Porath (1985), leaf area is equal to 0.53 (leaf length x leaf width) + 1.66.

1.2. Total chlorophyll

Total chlorophyll was calculated using Moran and Porath (1985) methodology.

1.3. Nutrient content of leaves

The semi-micro Kjeldahl method was used to calculate the total nitrogen (Bremner, 1965). Chapman and Pratt (1961) approach was used to estimate phosphorus. Jackson (1958) stated that the flame-photometer was used to determine potassium. After wet ashing, minerals were identified using 6N HCl. The atomic absorption spectrophotometer was used to measure magnesium, iron, manganese and zinc using the procedures outlined in the A.O.A.C. (2005).

1.4. Fruit quality (physical and chemical characteristics of the fruit)

1.4.1. Physical characteristics of fruit: **Dimensions of fruit (cm)**

A Verner Caliper was used to measure the average fruit length (cm) and fruit diameter (cm) of 20 fruits per tree.

1.4.2. Fruit Weight

A digital balance is used to determine the average fruit weight (g).

1.4.3. Fruit yield

Each tree's fruits were picked separately at the two-season maturity stage (November), weighed and the yield was estimated in kilograms per tree.

1.4.4. Seed and flesh weight

A digital balance was used to measure the weight of the fruit stone and flesh for each of the 20 fruits on each tree.

1.4.5. The percentage of oil in flesh fruit

According to Banat et al. (2013), the Soxhlet oil extraction apparatus with hexane 60-80°C boiling point was used to calculate the oil content in the fruit flesh on a dry weight basis.

1.4.6. Acidity

The percentage of fruit oil acidity Dieffenbacker and Pocklington (1992) were followed in making the decision.

2. Analysis of Statistics

Using a completely randomized block design (RCBD), the experiment was set up. Nine treatments were used in the trial. Three duplicates of each treatment were used, with two trees in each replicate. Snedecor and Cochran (1982) analysis of variance was used to statistically evaluate the data. The mean values of the treatments were compared using Duncan's multiple range test (Duncan, 1955) at the 5% level.

RESULTS AND DISCUSSION

1. Shoot Length (cm), Leaf Area (cm^2) and Leaf Chlorophyll Content (mg/ 100 g F.W.)

As shown in Table (4), the “Coratina” olive tree's shoot length, leaf area and leaf chlorophyll content were all positively affected by the tested concentrations of garlic extract, biomagic and their combinations as compared to the control treatment in both seasons. Overall, “Coratina” olive tree's shoot length, leaf area and chlorophyll content were all improved by the garlic extract and biomagic combinations more than by the respective treatments using just the garlic extract and biomagic.T_9 had the best shoot length (21.4 cm in the first season and 23.82 cm in the second), leaf area (7.23 and 7.31 cm^2 in both seasons) and leaf chlorophyll content (2.85 mg/100 g F.W. in the first season and 2.88 mg/100 g F.W. in the second season, respectively). However, in both seasons, T_1 trees produced the lowest shoot length, leaf area and chlorophyll content.

Table (4). Effect of spraying garlic extract, biomagic, and their combination on shoot length and leaf area, and chlorophyll of "Coratina" olive trees in north coast region in 2022 and 2023 seasons.

Treatment	Shoot length (cm)		Leaf area (cm^2)		Chlorophyll content (mg/100 g F.W.)	
	1st season	2nd season	1st season	2nd season	1st season	2nd season
T_1	11.24 i	11.72 i	4.73 i	4.81 i	2.19 i	2.21 i
T_2	12.56 h	13.27 h	5.14 h	5.26 h	2.24 h	2.28 h
T_3	13.69 g	14.34 g	5.61 g	5.74 g	2.33 g	2.38 g
T_4	14.93 f	15.95 f	5.94 f	6.17 f	2.41 f	2.43 f
T_5	16.78 e	17.65 e	6.68 e	6.85 e	2.48 e	2.51 e
T_6	18.25 d	19.77 d	6.75 d	6.96 d	2.56 d	2.59 d
T_7	19.76 c	20.52 c	6.96 c	7.14 c	2.65 c	2.67 c
T_8	20.63 b	22.42 b	7.09 b	7.22 b	2.75 b	2.77 b
T_9	21.40 a	23.82 a	7.23 a	7.31 a	2.85 a	2.88 a

Control (T_1), garlic extract 4% (T_2), garlic extract 6% (T_3), biomagic at 7.5 m/l (T_4), biomagic at 9.5 m/l (T_5), garlic extract 4% + biomagic 7.5 m/l (T_6), garlic extract 4% + biomagic 9.5 m/l (T_7), garlic extract 6% + biomagic 7.5 m/l (T_8), and garlic extract 6% + biomagic 9.5 m/l (T_9). Means having the same letter (s) in each column is not significantly different at 5% level

Along with specific micronutrients, growth regulators and vitamins that support metabolism, cell division and other biological processes, it might also be due to the biomagic qualities of proteins, amino acids, vitamins and hormones.

In addition to their activation effect on photosynthesis and promotion of protoplasm formation, which includes RNA and DNA that are necessary for cell division; these materials also reduce stress on plants (Ibrahim, 2006; El Massiry, 2009; El-Hifny and El-Sayed, 2011and Hashem, 2016). Biomagic increased growth, according to Ibrahim (2006), El Massiry (2009) and Khedr and Farid (2000). Additionally, the addition of bio-fertilizers raised mango vegetative growth metrics (Abd El-Hamied, 2014 a and b). Additionally, biomagic increased the fig tree's shoot length, leaf area, and leaf total chlorophyll, claimed by Abd El-Hamied (2019). Biomagic affected the growth characteristics of the "wonderful" pomegranate (Amin and Abd El-Hamied, 2022). Sara and Aljabary (2024) discovered a notable rise in leaf area and total chlorophyll content when fig trees sprayed with garlic extract were compared to control trees.

2. Leaf Mineral Content

2.1. Nitrogen %, phosphor% and potassium % in leaves

Table (5) shows that, in contrast with the control trees in 2022 and 2023 seasons; all investigated treatments had a positive impact on the

percentages of nitrogen, phosphorus and potassium in "Coratina" olive leaves. In addition, T_9 has the highest N%, P%, and k% in its leaves, followed by T_8. On the other hand, untreated trees (control) had lower leaf percentages of nitrogen, phosphorus and potassium. In conclusion, biomagic sprays and garlic treatments alone showed intermediate levels of microelements in this regard.

Table (5). Effect of spraying garlic extract, biomagic and their combination on nitrogen, phosphor and potassium in leaves of "Coratina" olive trees in north coast region in 2022 and 2023 seasons.

Treat.	N%		P%		K%	
	1st season	2nd season	1st season	2nd season	1st season	2nd season
T_1	1.56 i	1.53 i	0.10 i	0.11 h	1.29 i	1.31 i
T_2	1.59 h	1.55 h	0.12 g	0.14 g	1.32 h	1.34 h
T_3	1.61 g	1.60 g	0.15 g	0.16 f	1.35 g	1.37 g
T_4	1.64 f	1.62 f	0.17 f	0.20 e	1.38 f	1.41 f
T_5	1.67 e	1.65 e	0.19 e	0.21 e	1.40 e	1.42 e
T_6	1.69 d	1.68 d	0.22 d	0.23 d	1.43 d	1.45 d
T_7	1.71 c	1.73 c	0.25 c	0.27 c	1.46 c	1.48 c
T_8	1.73 b	1.75 b	0.27 b	0.31 b	1.49 b	1.50 b
T_9	1.76 a	1.78 a	0.30 a	0.33 a	1.52 a	1.53 a

Control (T_1), garlic extract 4% (T_2), garlic extract 6% (T_3), biomagic at 7.5 m/l (T_4), biomagic at 9.5 m/l (T_5), garlic extract 4% + biomagic 7.5 m/l (T_6), garlic extract 4% + biomagic 9.5 m/l (T_7), garlic extract 6% + biomagic 7.5 m/l (T_8), and garlic extract 6% + biomagic 9.5 m/l (T_9). Means having the same letter (s) in each column is not significantly different at 5% level

2.2. Iron (ppm), zinc (ppm) and manganese (ppm)

Table (6) indicates that, in comparison to the control treatment in the first and second seasons, all trial concentrations of garlic extract, biomagic and their combination sprays had a positive impact on the levels of iron (ppm), zinc (ppm) and manganese (ppm) of "Coratina" olive tree leaves in the north coast region. Additionally, in both seasons under study, T_9 presented the highest levels of iron (ppm), zinc (ppm) and manganese (ppm) in the leaves of "Coratina" olive trees, respectively this followed by other treatments, either alone or in combination, in a statistically declining sequence. Conversely, T_1 showed the lowest values in this regard.

These outcomes could be the result of applying garlic clove extract spray, which has a significant function in boosting the plant's crucial activities and consequently, its ability to absorb mineral elements. This, in turn, increases the vegetative growth of trees (Ahmed et al., 2014). These findings are consistent with those of Ahmed et al. (2014), who reported that spraying

the Superior grapevine with 5% garlic clove extract dramatically boosted the components of nitrogen, phosphorus and potassium. Al-Hadethi et al. (2016) studied the effect on apple trees and Abd El-Hamied and Al-Amary (2015) on pear trees. Additionally, Sara and Aljabary (2024) found that when garlic extract was sprayed on fig leaves, the minerals (NPK) content significantly increased in comparison to the control.

Table (6). Effect of spraying garlic extract, biomagic, and their combination on iron, zinc and manganese in leaves of "Coratina" olive trees in north coast region in 2022 and 2023 seasons.

Treatment	Fe (ppm)		Zn (ppm)		Mn (ppm)	
	1st season	2nd season	1st season	2nd season	1st season	2nd season
T_1	67.80 h	66.50 h	58.90 h	57.10 i	46.30 i	45.50 i
T_2	69.40 g	68.90 g	60.30 g	58.70 h	47.40 h	46.80 h
T_3	70.90 f	70.40 f	61.70 f	59.90 g	48.50 g	49.10 g
T_4	72.70 e	73.60 e	62.80 e	61.50 f	49.90 f	50.70 f
T_5	74.90 d	75.60 d	63.30 e	62.60 e	51.60 e	52.30 e
T_6	76.80 c	77.40 c	64.50 d	63.80 d	53.70 d	54.00 d
T_7	77.90 b	79.50 b	66.30 c	65.70 c	55.80 c	56.60 c
T_8	79.90 a	80.80 a	68.10 b	67.90 b	57.70 b	58.30 b
T_9	80.30 a	81.30 a	69.80 a	70.20 a	59.40 a	60.20 a

Control (T_1), garlic extract 4% (T_2), garlic extract 6% (T_3), biomagic at 7.5 m/l (T_4), biomagic at 9.5 m/l (T_5), garlic extract 4% + biomagic 7.5 m/l (T_6), garlic extract 4% + biomagic 9.5 m/l (T_7), garlic extract 6% + biomagic 7.5 m/l (T_8), and garlic extract 6% + biomagic 9.5 m/l (T_9). Means having the same letter (s) in each column is not significantly different at 5% level

3. Fruit Length (cm), Fruit Diameter (cm), Fruit Weight (g)

As shown in Table (7), the garlic extract, biomagic and their combination had a substantial impact on the "Coratina" fruit length (cm), fruit diameter (cm) and fruit weight (g) as compared to the untreated control treatment. When compared to other treatments, T_9 generally improved fruit length (cm), fruit diameter (cm) and fruit weight (g). These were 2.29 (cm), 1.78 (cm) and 4.16 (g) in the first season and 2.70 (cm), 1.95 (cm) and 5.04 (g) in the second. However, the same trend of data was observed in both seasons for additional combined treatments of garlic extract, biomagic and solo treatments, with statistically significant changes in both seasons. T_1 on the other hand indicated low levels of the fruit parameters that were tested, recording 1.52 (cm), 1.10 (cm) and 2.85 (g) in the first season and 1.55 (cm), 1.17 (cm) and 2.96 (g) in the second season.

Table (7). Effect of spraying garlic extract, biomagic and their combination on fruit length (cm), fruit diameter (cm) and fruit weight (g) of "Coratina" olive trees in the north coast region in 2022 and 2023 seasons.

Treatment	Fruit length (cm)		Fruit diameter (cm)		Fruit weight (g)	
	1st	2nd	1st	2nd	1st	2nd
T_1	1.52 h	1.55 h	1.10 f	1.17 f	2.85 I	2.96 h
T_2	1.75 g	1.78 g	1.19 e	1.21 f	2.99 h	3.08 gh
T_3	1.81 f	1.84 g	1.28 d	1.31 e	3.12 g	3.19 g
T_4	1.89 e	1.91 f	1.27 d	1.38 e	3.34 f	3.52 f
T_5	1.93 e	2.05 e	1.40 c	1.47 d	3.67 e	3.80 e
T_6	2.08 d	2.17 d	1.64 b	1.67 c	3.84 d	4.03 d
T_7	2.14 c	2.29 c	1.73 a	1.78 b	3.98 c	4.28 c
T_8	2.21 b	2.44 b	1.75 a	1.90 a	4.07 b	4.76 b
T_9	2.29 a	2.70 a	1.78 a	1.95 a	4.16 a	5.04 a

Control (T_1), garlic extract 4% (T_2), garlic extract 6% (T_3), biomagic at 7.5 m/l (T_4), biomagic at 9.5 m/l (T_5), garlic extract 4% + biomagic 7.5 m/l (T_6), garlic extract 4% + biomagic 9.5 m/l (T_7), garlic extract 6% + biomagic 7.5 m/l (T_8), and garlic extract 6% + biomagic 9.5 m/l (T_9). Means having the same letter (s) in each column is not significantly different at 5% level.

4. Yield (kg/tree)

The effects of garlic extract, biomagic and their mixtures on the yield/tree (kg) of "Coratina" olive trees are shown in Table (8). During the two studied seasons, the maximum yields per tree were observed by olive trees sprayed with T_9. All applied treatments were successful in increasing the yield/tree values compared to untreated ones. In the first and second seasons, the treatments T_9 yielded 32.55 and 34.6 kg/tree, respectively. Additionally, in this regard, every other combination of garlic extracts and biomagic was more noticeable. Garlic extract-treated olive trees produce the least amount per tree, followed by untreated trees. In both seasons under investigation, intermediate results were produced by other concentrations of all the elements specified.

These outcomes could be attributed to the biomagic properties of some micronutrients, proteins, amino acids, vitamins and hormones. The beneficial elements of garlic extract, including enzymes, B vitamins, proteins, minerals, saponins, flavonoids, sulphur and allyl groups (H_2CHCH_2), particularly diallyl disulfide, may also be to blame. Additionally, a phytoalexin known as allixin has been discovered (Pandya et al., 2011).

Table (8). Effect of spraying garlic extract, biomagic and their combination on yield /tree (kg) of "Coratina" olive trees in the north coast region in 2022 and 2023 seasons.

Treatment	Yield (kg/tree)	
	1st season	2nd season
T_1	24.55 i	25.5 g
T_2	25.91 h	26.7 f
T_3	26.6 g	27.2 f
T_4	27.16 f	28.1 e
T_5	28.49 e	29.5 d
T_6	29.87 d	30.3 c
T_7	30.94 c	32.2 b
T_8	31.47 b	33.3 b
T_9	32.55 a	34.6 a

Control (T_1), garlic extract 4% (T_2), garlic extract 6% (T_3), biomagic at 7.5 m/l (T_4), biomagic at 9.5 m/l (T_5), garlic extract 4% + biomagic 7.5 m/l (T_6), garlic extract 4% + biomagic 9.5 m/l (T_7), garlic extract 6% + biomagic 7.5 m/l (T_8), and garlic extract 6% + biomagic 9.5 m/l (T_9). Means having the same letter (s) in each column is not significantly different at 5% level.

These results are in harmony with those obtained by Abd El-Razek et al. (2011), "Canino" apricot trees that were grown in mild winter climates responded favourably to a 4% garlic extract spray by increasing fruit quality and productivity. Previous research has revealed similar findings, stating that "applying extracts from garlic (*Allium sativum* L.) or past prepared from fresh garlic to grapevine, apple and peach improves productivity and fruit quality" (Serag El-Deen, 2002; Botelho, et al., 2007 and Ahmed, et al., 2009). According to Chowdhury et al. (2007), garlic extracts improved the number of fruits, TSS and yield of mango trees.

Garlic extracts increased yield and decreased the occurrence of mango anthracnose (Chowdhury, 2005). Furthermore, Abd El-Razek et al. (2013) reported that the productivity and fruit quality of 'Le Conte' pear trees planted in Egypt's warm winters can be enhanced by spraying garlic extract at 8% in combination with GA at 100 ppm. According to Abd El-Hamied (2019), biomagic has a significant impact on the final crop's output (number of fruits and fruit weights). According to Amin and Abd El-Hamied (2022), biomagic had an impact on the "wonderful" pomegranate's production fruit physical attributes. Comparing trees sprayed with garlic extract to control, Sara and Aljabary (2024) found a substantial increase in fig weight and size as well as average fruit weight. Furthermore, according to Abd El-Hamied (2019), biomagic increased the fig tree's fruit yield, weight, height and diameter.

5. Fruit Flesh Weight (g) and Seed Weight (g)

Table (9) demonstrates that, in comparison to the control trees in both seasons under investigation, the fruit flesh weight (g) and seed weight (g) of "Coratina" olive fruit were increased by all evaluated sprayed garlic extract, biomagic and their combination treatments. In contrast, T_9 produced the lowest seed weight and the maximum fruit flesh weight throughout the first and second seasons. Conversely, some treatments showed declining values for seed weight (g) and fruit flesh weight (g). Conversely, control trees showed highest values for seed weight (g) and lowest value of fruit flesh weight (g) in this regard.

Table (9). Effect of spraying garlic extract, biomagic and their combination on flesh weight and seed weight of "Coratina" olive trees in north coast region at 2022 and 2023 seasons.

Treatment	Flesh weight (g)		Seed weight (g)	
	1st season	2nd season	1st season	2nd season
T_1	1.99 i	2.06 h	0.86 a	0.89 a
T_2	2.15 h	2.34 g	0.84 ab	0.84 b
T_3	2.29 g	2.36 g	0.83 ab	0.82 bc
T_4	2.53 f	2.72 f	0.81 abc	0.81 cd
T_5	2.89 e	3.02 e	0.78 bcd	0.78 de
T_6	3.09 d	3.27 d	0.75 cde	0.76 e
T_7	3.25 c	3.52 c	0.73 de	0.76 e
T_8	3.99 b	4.03 b	0.72 de	0.72 f
T_9	4.15 a	4.33 a	0.70 e	0.70 f

Control (T_1), garlic extract 4% (T_2), garlic extract 6% (T_3), biomagic at 7.5 m/l (T_4), biomagic at 9.5 m/l (T_5), garlic extract 4% + biomagic 7.5 m/l (T_6), garlic extract 4% + biomagic 9.5 m/l (T_7), garlic extract 6% + biomagic 7.5 m/l (T_8), and garlic extract 6% + biomagic 9.5 m/l (T_9). Means having the same letter (s) in each column is not significantly different at 5% level

6. Flesh Oil Percentage and Acidity Percentage

According to Table (10), in the first and second seasons, all trial concentrations of garlic extract, biomagic and their combination sprays had a positive impact on the fruit oil percentage and acidity percentage of "Coratina" olive fruits when compared to the control treatment. Additionally, in both seasons under investigation, T_9 produced the highest concentration of fruit oil and the lowest concentration of fruit acidity (26.25% in the first season and 28.74% in the second), followed by other treatments, either alone or in combination, in a significant descending order. However, in both seasons, T_1 increases the concentration of fruit acidity and decreases the concentration of oil fruit.

Table (10). Effect of spraying garlic extract, biomagic and their combination on percentage of flesh oil and acidity of "Coratina" olive trees in north coast region in 2022 and 2023 seasons.

Treatment	Oil %		Acidity %	
	1st season	2nd season	1st season	2nd season
T_1	20.21 i	20.47 h	0.36a	0.34a
T_2	21.55 h	22.03 g	0.35a	0.33a
T_3	22.45 g	23.13 f	0.33b	0.31b
T_4	23.87 f	24.22 e	0.31c	0.29c
T_5	23.99 e	24.28de	0.30c	0.27d
T_6	24.58 d	24.95 d	0.28d	0.26d
T_7	25.97 c	25.76 c	0.27d	0.24e
T_8	25.09 b	27.02 b	0.25e	0.22e
T_9	26.25 a	28.74 a	0.23f	0.21f

Control (T_1), garlic extract 4% (T_2), garlic extract 6% (T_3), biomagic at 7.5 m/l (T_4), biomagic at 9.5 m/l (T_5), garlic extract 4% + biomagic 7.5 m/l (T_6), garlic extract 4% + biomagic 9.5 m/l (T_7), garlic extract 6% + biomagic 7.5 m/l (T_8), and garlic extract 6% + biomagic 9.5 m/l (T_9). Means having the same letter (s) in each column is not significantly different at 5% level.

These results may be due to foliar application of garlic extract enhances olive tree health, boosts photosynthesis and indirectly improves oil quality by increasing antioxidant compounds. Foliar spraying with plant-based biostimulants such as biomagic has proven to be an effective agronomic strategy for enhancing olive tree health and improving olive oil quality. According to Zouari et al. (2020), these foliar applications significantly improved the uptake of macro- and micronutrients, increased levels of antioxidant phenolic compounds, chlorophylls and carotenoids in olive fruits. These changes were strongly associated with better oxidative stability and enhanced sensory attributes (flavour and aroma) of the resulting virgin olive oil.

These results agree with Abd El-Hamied (2019), who demonstrated that biomagic has a significant impact on the fig tree's fruit chemical properties. Amin and Abd El-Hamied (2022) discovered that the "wonderful" pomegranate's fruit chemical quality was impacted by biomagic.

CONCLUSION

In light of the earlier findings, it would appear appropriate to suggest that an environmentally friendly treatment for "Coratina" olive trees (*Olea europea*) in the El Raml Valley of the Matrouh Governorate, Egypt, would be to spray them with garlic extract 6% + biomagic 9.5 cm/l. Furthermore, because of its great potential and nutritional value, this therapy could be applied to other crops in addition to fruit orchards.

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تأثير الرش ببعض محفزات النمو على إنتاجية وجودة ثمار الزيتون تحت الظروف المطرية

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نُفِّذت هذه الدراسة على ٥٤ شجرة زيتون كوراتينا (*Olea europea*) خلال موسمي ٢٠٢٢ و٢٠٢٣ المتتاليين في وادي الرمل - محافظة مطروح - مصر. هدفت الدراسة إلى دراسة تأثير مستخلص الثوم والمحفز الحيوي "بيوماجيك" في تحسين إنتاجية وجودة ثمار الزيتون "كوراتينا". خضعت جميع المعاملات لنفس الممارسات الزراعية. تم استخدام المعاملات الورقية، ماء الصنبور (T_1)، مستخلص الثوم ٤٪ (T_2)، مستخلص الثوم ٦٪ (T_3)، بيوماجيك بتركيز ٧,٥ مل / لتر(T_4)، بيوماجيك بتركيز ٩,٥ مل / لتر(T_5)، مستخلص الثوم ٤٪ + بيوماجيك ٧,٥ مل / لتر(T_6)، مستخلص الثوم ٦٪ + بيوماجيك ٩,٥ مل/ لتر(T_7)، مستخلص الثوم ٦٪ + بيوماجيك ٩,٥ مل / لتر(T_8)، ومستخلص الثوم ٦٪ + بيوماجيك ٩,٥ مل / لتر (T_9). أظهرت النتائج التي تم الحصول عليها أن جميع المعاملات تأثرت برش أشجار الزيتون بمستخلص الثوم مع بيوماجيك، تليها التركيزات الفردية لكل معاملة في كلا الموسمين. في الوقت نفسه، أعطت T_9 أفضل نمو خضري وخصائص فيزيائية وكيميائية للثمار وأعطت أفضل نسبة مئوية لمحتوى الثمار من الزيت وأقل حموضة كلية. كما أنها تعزز العناصر الكبرى والصغرى في الأوراق.