Effect of organic manure, Biofertilizer and foliar spray of Ascorbic acid on vegetative growth and fruit quality of Basheqi cv. of Olive (*Olea europaea* L.)

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Abstract

This experiment was conducted in a private olive orchard located in the village of Kasara, Dohuk governorate, Kurdistan region, Iraq, during the growing season 2021-2022 on 14 years old olive trees CV. Basheqi (*Olea europaewas a* L.) planted at 4x8m apart in (silty clay loam) soil, under drip irrigation system. Three levels of organic manure (poultry manure) at (0, 4 and 8 kg.tree^{-1}) was added to the soil at the second week of December in the 2021 season, and three concentrations of bio-fertilizers (Bio Health) at (0 , 10 and 15 g.l^{-1}) and three concentrations (0, 300 and 600 mg.l^{-1}) of foliar spray of ascorbic acid. Bio-fertilizers and ascorbic acid were carried out two times per season, First: prior flowering, Second: after fruit set in order to investigate their influence on the growth and fruit quality of olive trees. A factorial experiment with three replications was carried out in a randomized complete block design (RCBD), using one tree for each experimental unit. Results indicated that soil application of organic manure (poultry manure) at 8 kg.tree^{-1} significantly increased all studied characters { leaf area, chlorophyll content, leaves protein%, fruit total soluble solid TSS%, total carbohydrate%, anthocyanin content, ascorbic acid (Vit.C), oil content %}. Soil application of biofertilizer (bio health) at 15g.l^{-1}significantly increased all study characters except TSS. Foliar application of ascorbic acid at 600 mg.l^{-1} significantly increased average leaf area, total chlorophyll content, protein% in leaves, ascorbic acid, and oil%. In comparison to other interactions, the interaction of (8 kg Organic manure.tree^{-1}, 15 g.l^{-1} bio fertilizer, and 600 mg.l^{-1}ascorbic acid) appeared to be more efficient in enhancing all characteristics studied in this experiment.

Keywords: Organic Manure, Biofertilizer, Ascorbic Acid, Olive Tree (Basheqi cultiva).

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Introduction:

The olive tree (*Olea europaea* L.) , belongs to Oleaceae family, is a woody plant that is commonly grown in the Mediterranean districts and has great economic value because its fruits are used to produce both table olives and olive oil (13). Olive orchards are one of the main sustainable crops worldwide 25% of the world's total permanent cultivated area is made up of olive trees with 11.6 million hectares spread in 63 countries in the 5 continents and extending over slightly more than 0.25% of the total cultivated grown area of the total global olive orchards areas, 70% spread in rain-fed plantation, while the staying 30% is irrigated (40). Its global cultivated areas 12763184 hectare with a total production annually 23640307 ton and average yield 1.85 ton/hectare. (18).

Organic fertilizers are natural substances, and an excellent media for interactions of microorganisms, supply the plants with nutrients as well as have an indirect roles in nutrition by activity of micro-organisms. Therefore, biofertilizers and organic fertilizers are used instead of the chemical fertilizers might be the manner to produce nature healthy fruits (17). Organic manures tends to result the wastes, the main advantage obtained from the use of organic matter is the supply of N and other nutrients in easily obtainable shapes. In addition, organic matter helps to improve the physical properties of the mineral poor soils that are common in dry environments. Winter organic additions in dry places can lessen the detrimental impacts of drought on plants by enhancing the soil's ability to retain water. (38). Poultry manures are rich in nitrogen contain significant amounts of phosphor and potassium. Poultry manure can be used as a fertilizer to enhance the qualities and fertility of soil due to the development and content of specific nutrients (11). Hassan *et al.,* (20) examined the impact of some combinations of organic fertilizer {sheep and poultry manure} with biofertilizer on yield and fruit properties of olive trees cv. (Manzanillo). Results indicated that Poultry manure 20 Kg + bio-fertilizer (2 liter/tree) was the most effective interaction for increasing fruit set , improve yield and fruit quality. Biofertilizers are substances made up of living cells from various microorganism types that have the capacity to biologically change the form of essential nutrients from unavailable to available (39). Biofertilizers are economical environmentally beneficial (eco-friendly) and may be produced on the farm itself when needed in large quantities. They enhance soil texture, pH, and other soil qualities while also promoting growth and crop yield. (24). the use of synthetic fertilizers can be reduced because of the ability of bio-fertilizers to improve the health and production of plant life. The majority of biofertilizers are made up of bacteria that are involved in the breakdown of minerals into soluble forms that are beneficial to plants and the decomposition of organic materials (4). Abd-Alhamid *et al.* (1) studied the impact of mineral (MF) and biofertilization (BF) on the quality of fruits and yield of cv. Manzanillo olive. The results shows that the (B + MNF) at 75% offered the highest values of yield, fruit quality and also flesh oil content. Nitrate content of olive fruit and peroxide value of olive oil were reduced as a result of using biofertilizer with lower amounts

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of mineral nitrogen fertilization (MNF). When trees treated with (B+ MNF75 %) gave the least acidic oil. Ascorbic acid is a natural and organic anti-oxidant, as well it is an essential compound for plant tissue because, acts as antioxidants, and works as coenzyme in an enzymatic co factor and plant growth regulators (PGR) (19). It enhances the growth, flowering and fruit quantity and quality in a synergistic manner (12). The resonance stabilized anionic form of ascorbic acid is the form that physiologically active (ascorbate). Ascorbic acid applied exogenously can shield proteins and lipids against oxidative enemies brought on by dehydration (28). Ascorbic acid enhances resistance to abiotic stressors by improving growth of the plant, photosynthesis rate, pigments of photosynthetic, transpiration rate, and the potential for oxidative defense (30). It has been evidenced that treatment of plants with Ascorbic acid significantly enhance the characteristics of the quality of fruit such as total sugars, antioxidants, total acidity, TSS, Vit.(C), and enhances crop yield in different horticultural crops (14). El Refaey *et al*., (15) investigate the effect of foliar spray with ascorbic acid (50, and 100mg/L) under waterstress condition on growth, physiological parameters, yield and fruit quality of (Picual) olive trees (*Olea europaea* L.) during the (2018 and 2019) seasons. The result demonstrates that ascorbic acid at (100 mg/L) recorded the highest leaf chlorophyll content and maximum fruit quality. Al- Atrushy and Abdul-Qader (5) studied the impact of spraying olive with three conc. of ascorbic acid (0, 200 and 400 $mg.l^{-1}$) and three conc. of potasium sulfate (0, 5 and 10 $g.l^{-1}$). Results indicate that foliar spraying of Ascorbic acid at (400$mg.l^{-1}$) increased significantly all vegetative growth character, physical and chemical olive fruits properties, except (TSS) %. Hagagg *et al.* (22) studied the influence of foliar applications with different concs. of (putrescine, salicylic acid and ascorbic acid) in two dates of (November & December.). Foliar Spraying of Picual olive trees with (putrescine, salicylic, and ascorbic acid) improve (yield, fruit physical and fruit chemical properties) in both dates. The aim of this study is to improve vegetative growth, fruit quality of local olive cv. Basheqi. , also producing healthy fruit with cheaper costs and preserving the soil and environment from pollution by using environmentally friendly fertilizers.

Materials and Methods:

This experiment was conducted in a private olive orchard located near Kassara village Dohuk governorate, Kurdistan region, Iraq, during growing season 2021-2022, on 14 years olive trees cv. Basheqi. The orchard is Situating at Latitude of 36° 50' 19"N; Longitude of 42° 55' 37"E and at an altitude of 491 m above the sea level. The soil texture is silty clay loam. The olive trees irrigated with drip irrigation and the distance between trees is 4*6 m. The experimental study included three levels of organic manure (poultry manure) at (0, 4 and 8 $kg.tree^{-1}$) were applied at the second week of December on 2021 by make holes around the trees under Branch projections, and then mixed with soil, three levels of Bio-fertilizer (Bio Health): (Trichoderma Strains and Bacillus Subtilis 10% , Humic Acids 75% , Seaweed Extract 5%, humidity 10-12%, organic matters 65%, Potassium soluble in water (K_2O 11%),

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Cation exchange capacity < 400 Meq.100g^{-1}, boron 15 mg.kg^{-1}, The percentage of insoluble substances in water with alkaline properties > 0.1%) at concentrations (0, 10 and 15 g.l^{-1}). Decided concentrations were dissolving in a Liter of water, and the solution was adding to the soil around the tree, and foliar application of ascorbic (20% Vit.C) with three concentration (0, 300 and 600 mg.l^{-1}). Bio-fertilizer (Bio Health) and Ascorbic acid were applied twice per season, First: prior-flowering, Second: after fruit set. Trees were sprayed in the morning until the run off to and (0.1 ml.L^{-1}) of (Tween 20) was added to the solution, the control treatment was sprayed by distilled water with (Tween 20). Normal cultural practices, such as pruning the trees, removing the suckers from the tree, and weed control was conducted at constant rate at the required. The experiment was consisting of twenty seven treatments (3 conc. of organic manure × 3 conc. of Bio-fertilizers × 3 conc. of ascorbic acid), with three replication for each experiment unit, using one tree for each experiment unit, the total number treated trees (81 trees), and were apply as factorial experiment by using (RCBD) design. The collected data subject to analysis of variance and means separate by Duncans Multiple Range Test at the level of 5% (8), and the data, were statistically analyzed by using SAS program (35). The experimental measurements were recorded as following: leaf area (cm^2), total chlorophyll content (SPAD unit), leaves protein %, fruit total soluble solids TSS %, total carbohydrate % (CHO), anthocyanin content (mg.100g^{-1}), ascorbic acid (mg.100ml^{-1}), oil content (%) Soxhlet method.

Results:

Leaf area (cm^2): Table (1) illustrate that increasing levels of soil application of organic manure and biofertilizer, and also foliar spray with ascorbic acid significantly increased leaf area (cm^2), the highest value (5.10, 4.80 and 4.80 cm^2) were obtained in the olive receiving (8 kg O.M.tree^{-1}, 15 g.L^{-1} bio fertilizer and 600 mg.l^{-1} ascorbic acid) respectively when compared with control treatment. Concerning the interactions of organic manure + biofertilizer, organic manure + ascorbic acid and bio fertilizer + ascorbic acid; the data in table (1) obtained that the interaction of 8 kg O.M .tree^{-1} + 15g.L^{-1} biofertilizer, 8 kg O.M.tree^{-1} + 600 mg.l^{-1} ascorbic acid and 15g.L^{-1} biofertilizer + 600 mg.l^{-1} ascorbic acid have higher leaf area (5.36, 5.25 and 4.96 cm^2) respectively. As for the interaction among organic manure, bio fertilizer and ascorbic acid, data also revealed that the highest value (5.54 cm^2) is obtained by the interaction of 8 kg O.M.tree^{-1} + 15g.L^{-1} biofertilizer + 600 mg.L^{-1} ascorbic acid and the lowest value (3.21 cm^2) from the control.

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Table 1. Effect of organic manure, biofertilizer and ascorbic acid and there interactions on leaf area (cm^2) of olive tree cv. Basheqi.

O.M (kg)	Biofertilizer $g.l^{-1}$	Ascorbic acid $mg.l^{-1}$ 0	300	600	O.M * Biofertilizer	Mean effect of O.M
	0	3.21 j	3.65 ij	4.31 f-h	3.72 d	
0	**10**	3.92 hi	3.88 hi	4.04 g-i	3.95 d	3.99 c
	15	4.25 f-h	4.27 f-h	4.33 e-h	4.29 c	
	0	5.10 a-d	4.82 b-f	4.85 b-f	4.92 b	
4	**10**	4.82 b-f	4.72 c-f	4.91 b-e	4.81 b	4.83 b
	15	4.67 c-f	4.56 d-g	5.02 a-d	4.75 b	
	0	5.06 a-d	4.61 c-g	5.05 a-d	4.91 b	
8	**10**	4.92 b-e	4.99 a-d	5.16 a-d	5.02 b	5.10 a
	15	5.20 a-c	5.33 ab	5.54 a	5.36 a	
O.M * Ascorbic acid	**0**	3.79 e	3.94 de	4.23 d	**Mean effect of**	
	4	4.86 bc	4.70 c	4.92 bc		
	8	5.06 ab	4.98 a-c	5.25 a	**Biofertilizer**	
Biofertilizer * Ascorbic acid	**0**	4.46 bc	4.36 c	4.74 ab	4.52 b	
	10	4.55 bc	4.53 bc	4.70 ab	4.59 b	
	15	4.71 ab	4.72 ab	4.96 a	4.80 a	
Mean effect of Ascorbic acid		4.57 b	4.54 b	4.80 a		

Mean within a column, row and their interaction following with the same latter are not significantly different according to Duncan multiple range test at the probability of 0.05 level.

Total chlorophyll content (SPAD): obtained results in table (2) showed that high concentration of soil application of organic manure (8 kg O.M.$tree^{-1}$), biofertilizer (15g.L^{-1}), also foliar spray with ascorbic acid (600 $mg.l^{-1}$) significantly raised chlorophyll content in the leaves (81.30, 79.86 and 80.05 SPAD) respectively compared with control. Regarding the interactions of organic manure + biofertilizer, organic manure + ascorbic acid and biofertilizer + ascorbic acid, data in table (2) revealed that the interaction of 8 kg O.M.$tree^{-1}$ +15 g.L^{-1} biofertilizer, 8 kg O.M.$tree^{-1}$ + 600 $mg.l^{-1}$ ascorbic acid and 15g.L^{-1} biofertilizer + 600 $mg.l^{-1}$ ascorbic acid had higher total chlorophyll content (81.64, 82.21 and 80.81 SPAD) respectively. The table also shows that the maximum chlorophyll content (82.50 SPAD) was obtained by the interaction of 8 kg O.M.$tree^{-1}$ + 10 g.L^{-1} biofertilizer + 600 $mg.l^{-1}$ ascorbic acid when the control recorded minimum value (72.13 SPAD).

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Table 2. Effect of organic manure, biofertilizer and ascorbic acid and there interactions on total chlorophyll content of olive tree cv. Basheqi.

O.M (kg)	Biofertilizer g.l^{-1}	Ascorbic acid mg.l^{-1} 0	300	600	O.M * Biofertilizer	Mean effect of O.M
0	0	72.13 g	72.30 g	73.90 e-g	72.78 c	75.75 c
	10	73.20 fg	77.07 c-e	79.47 a-c	76.58 b	
	15	75.73 d-f	78.30 b-d	79.67 a-c	77.90 b	
4	0	78.87 a-d	80.17 a-c	80.87 a-c	79.97 a	80.01 b
	10	80.60 a-c	79.97 a-c	79.47 a-c	80.01 a	
	15	79.27 a-c	80.43 a-c	80.43 a-c	80.04 a	
8	0	81.03 ab	80.03 a-c	81.80 ab	80.96 a	81.30 a
	10	80.60 a-c	80.80 a-c	82.50 a	81.30 a	
	15	81.23 ab	81.37 ab	82.33 a	81.64 a	
O.M * Ascorbic acid	0	73.69 d	75.89 c	77.68 c	**Mean effect of Biofertilizer**	
	4	79.58 b	80.19 b	80.26 ab		
	8	80.96 ab	80.73 ab	82.21 a		
Biofertilizer * Ascorbic acid	0	77.34 d	77.50 d	78.86 a-d	77.90 b	
	10	78.13 cd	79.28 a-d	80.48 ab	79.30 a	
	15	78.74 b-d	80.03 a-c	80.81 a	79.86 a	
Mean effect of Ascorbic acid		78.07 b	78.94 b	80.05 a		

Mean within a column, row and their interaction following with the same latter are not significantly different according to Duncan multiple range test at the probability of 0.05 level.

Leaves Protein %: Table (3) revealed that increasing concentrations of organic manure, biofertilizer and also foliar spray with ascorbic acid significantly increased leaves protein percentage. The highest value (9.77, 9.55 and 9.10%) were obtained in the olive receiving 8 Kg O.M.tree^{-1}, 15 g.L^{-1} biofertilizer and 600 mg.l^{-1} ascorbic acid respectively. In addition, the binary interaction between the factors showed that the interaction of 8 kg O.M.tree^{-1} +15 g.L^{-1} biofertilizer; 8 kg O.M.tree^{-1} + 600 mg.l^{-1} ascorbic acid and 15 g.L^{-1} biofertilizer + 600 mg.l^{-1} ascorbic acid gave higher protein percentage in the leaves (11.27, 10.14 and 10.09%) respectively. Also, the data demonstrated that the maximum value (12.00%) was obtained by the interaction of 8 kg O.M.tree^{-1} + 10g.L^{-1} biofertilizer + 600 mg.l$^{-1.}$ ascorbic acid was significantly compared to the control that recorded (6.02%)

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Table 3. Effect of organic manure, biofertilizer and ascorbic acid and there interactions on leaves protein % of olive tree cv. Basheqi.

O.M (kg)	Biofertilizers g.l^{-1}	Ascorbic acid mg.l^{-1} 0	300	600	O.M * Biofertilizer	Mean effect of O.M
	0	6.02 e	7.06 de	8.06 b-e	7.05 e	
0	**10**	7.75 b-e	7.40 c-e	7.94 b-e	7.69 de	7.56 c
	15	7.44 c-e	7.88 b-e	8.54 b-d	7.95 c-e	
	0	9.00 b-d	8.21 b-e	7.71 b-e	8.31 b-d	
4	**10**	8.75 b-d	8.29 b-e	9.52 bc	8.85 b-d	8.86 b
	15	8.71 b-d	9.83 b	9.73 bc	9.42 b	
	0	8.75 b-d	9.04 b-d	9.02 b-d	8.94 bc	
8	**10**	9.25 b-d	8.63 b-d	9.40 b-d	9.09 bc	9.77 a
	15	9.88 b	11.94 a	12.00 a	11.27 a	
O.M * Ascorbic acid	**0**	7.07 d	7.44 d	8.18 cd	**Mean effect of**	
	4	8.82 bc	8.78 bc	8.99 a-c		
	8	9.29 a-c	9.87 ab	10.14 a	**Biofertilizer**	
Biofertilizer	**0**	7.92 b	8.10 b	8.26 b	8.10 b	
*** Ascorbic**	**10**	8.58 b	8.10 b	8.95 ab	8.55 b	
acid	**15**	8.67 b	9.88 a	10.09 a	9.55 a	
Mean effect of Ascorbic acid		8.39 b	8.70 ab	9.10 a		

Mean within a column, row and their interaction following with the same latter are not significantly different according to Duncan multiple range test at the probability of 0.05 level.

TSS%**:** Table (4) showed that the soil application of organic manure at 8kg/tree significantly superior in TSS% and gave the highest value (13.85%) when compared to the control treatment while the soil application of biofertilizer and ascorbic acid not affected significantly on TSS%. The interaction between organic manure + biofertilizer, organic manure + ascorbic acid are differed significantly, the maximum value (14.39 and 14.17 %) were obtained by the interaction of 8 kg O.M.tree^{-1} +15g.L^{-1} biofertilizer and 8 kg O.M.tree^{-1} + 600 mg.l^{-1} ascorbic acid respectively, while the interaction between biofertilizer + ascorbic acid had no significant influence on TSS%. Among the interaction of the three studied factors, the maximum value (14.83 %) was recorded when 8 kg O.M.tree^{-1} + 15g.L^{-1} biofertilizer + 600 mg.l^{-1}ascorbic acid were interacted and it was significantly compared to control which gave minimum value (11.17%).

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Table 4. Effect of organic manure, biofertilizer and ascorbic acid and there interactions on TSS% of olive tree cv. Basheqi.

O.M (kg)	Biofertilizer g.l^{-1}	Ascorbic acid mg.l^{-1} 0	300	600	O.M * Biofertilizer	Mean effect of O.M
0	0	11.17 f	12.33 d-f	12.50 c-f	12.00 d	12.46 b
	10	12.33 d-f	13.17 a-e	12.17 ef	12.56 cd	
	15	13.00 b-e	12.67 b-f	12.83 b-f	12.83 cd	
4	0	13.33 a-e	13.00 b-e	13.50 a-e	13.28 bc	12.80 b
	10	12.67 b-f	12.33 d-f	12.67 b-f	12.56 cd	
	15	12.83 b-f	12.67 b-f	12.17 ef	12.56 cd	
8	0	12.83 b-f	13.33 a-e	13.50 a-e	13.22 bc	13.85 a
	10	13.67 a-e	14.00 a-d	14.17 a-c	13.94 ab	
	15	14.00 a-d	14.33 ab	14.83 a	14.39 a	
O.M * Ascorbic acid	0	12.17 c	12.72 bc	12.50 c	Mean effect of Biofertilizer	
	4	12.94 bc	12.67 bc	12.78 bc		
	8	13.50 ab	13.89 a	14.17 a		
Biofertilizer * Ascorbic acid	0	12.44 a	12.89 a	13.17 a	12.83 a	
	10	12.89 a	13.17 a	13.00 a	13.02 a	
	15	13.28 a	13.22 a	13.28 a	13.26 a	
Mean effect of Ascorbic acid		12.87 a	13.09 a	13.15 a		

Mean within a column, row and their interaction following with the same latter are not significantly different according to Duncan multiple range test at the probability of 0.05 level.

Total Carbohydrate (%)**:** The data in table (5) display that the soil application of organic manure and biofertilizer significantly affects total carbohydrate % particularly at the level of 8 kg O. M.tree^{-1} which gave the maximum value (6%) and the level of 15g.L^{-1} Bio fertilizer which gave the high value (5.64%), while foliar spray of Ascorbic acid had no significant effects of carbohydrate %. Results indicated that the interaction between organic manure + biofertilizer, organic manure + ascorbic acid and biofertilizer + ascorbic acid were differed significantly, the most influential interaction were obtained by the interaction of 8 kg O.M.tree^{-1} +15g.L^{-1} biofertilizer, 8 kg O. M.tree^{-1} + 600 mg.l^{-1} Ascorbic Acid and 15g.L^{-1} biofertilizer + 600 mg.l^{-1} ascorbic acid had the higher total carbohydrate percentage (6.35, 6.34 and 5.81 %) respectively. In the same table, the data revealed that the highest value (7.19 %) was obtained by the interaction of 8 kg O.M.tree^{-1} + 15g.L^{-1} biofertilizer + 600 mg.l^{-1} ascorbic acid and the lowest value (3.66%) recorded in interactions among non-treated trees by organic manure and biofertilizer with 300 mg.l^{-1} ascorbic acid.

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Table 5. Effect of organic manure, biofertilizer and ascorbic acid and there interactions on total carbohydrate % (CHO) of olive tree cv. Basheqi.

O.M (kg)	Biofertilizer g.l^{-1}	Ascorbic acid mg.l^{-1} 0	300	600	O.M * Biofertilizer	Mean effect of O.M
0	0	3.71 gh	3.66 h	3.85 f-h	3.74 e	4.44 c
	10	4.09 e-h	4.62 d-h	4.76 c-g	4.49 d	
	15	5.03 b-e	5.29 b-d	4.93 b-f	5.08 c	
4	0	4.76 c-g	5.14 b-e	4.94 b-f	4.95 cd	5.28 b
	10	4.99 b-e	5.87 bc	5.38 b-d	5.41 bc	
	15	5.58 b-d	5.61 b-d	5.31 b-d	5.50 bc	
8	0	5.98 b	5.58 b-d	5.79 bc	5.78 ab	6.00 a
	10	5.71 b-d	5.87 bc	6.05 b	5.88 ab	
	15	5.95 b	5.90 bc	7.19 a	6.35 a	
O.M * Ascorbic acid	0	4.28 e	4.52 e	4.51 e	**Mean effect of Biofertilizer**	
	4	5.11 d	5.54 b-d	5.21 cd		
	8	5.88 ab	5.78 a-c	6.34 a		
Biofertilizer * Ascorbic acid	0	4.82 d	4.79 d	4.86 cd	4.82 c	
	10	4.93 b-d	5.45 a-c	5.40 a-d	5.26 b	
	15	5.52 ab	5.60 a	5.81 a	5.64 a	
Mean effect of Ascorbic acid		5.09 a	5.28 a	5.36 a		

Mean within a column, row and their interaction following with the same latter are not significantly different according to Duncan multiple range test at the probability of 0.05 level.

Anthocyanin content (mg.100g^{-1}): results in table (6) explained that Organic Manure at 8 Kg O.M.tree^{-1} and Biofertilizer at 15g.l^{-1} significantly surpass of anthocyanin content, which gave the highest value (44.58 and 42.20 mg.100g^{-1}) respectively, whereas foliar spray of Ascorbic acid had no significant effects on Anthocyanin content. Tabulated data illustrate that the interaction between Organic Manure + Bio fertilizer, Organic Manure + Ascorbic Acid and Bio fertilizer + Ascorbic Acid significantly affected on anthocyanin content, the maximum value (48.61, 43.67 and 45 mg.100g^{-1}) were obtained by the interaction of 8 Kg O.M.tree^{-1} +15g.L^{-1} Bio fertilizer, 8 Kg O.M.tree^{-1} + 300 mg.l^{-1}Ascorbic Acid and 15g.L$^{-1.}$ Bio fertilizer + 600 mg.l^{-1} Ascorbic Acid respectively. Results of table (6) demonstrate that the triple interactions between Organic Manure + Biofertilizer + Ascorbic Acid indicate significant differences in anthocyanin content, the highest value (52.92) were obtained when the trees treated with Organic Manure (15Kg/tree), Biofertilizer (15g.l^{-1}) and Ascorbic acid (600 mg.l^{-1}) as compared to the control which recorded (26.60 mg.100g^{-1}).

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Table 6. Effect of organic manure, biofertilizer and ascorbic acid and there interactions on Anthocyanin Content (mg.100g^{-1}) of olive tree cv. Basheqi.

O.M (kg)	Biofertilizer g.l^{-1}	Ascorbic acid mg.l^{-1} 0	300	600	O.M * Biofertilizer	Mean effect of O.M
0	0	26.60 h	30.69 gh	34.76 e-g	30.68 d	35.53 c
	10	35.91 d-g	38.50 c-g	37.68 c-g	37.36 c	
	15	34.20 fg	42.31 b-f	39.11 b-g	38.54 bc	
4	0	40.35 b-f	35.91 d-g	42.00 b-f	39.42 bc	39.11 b
	10	37.08 c-g	38.77 c-g	39.54 b-f	38.46 bc	
	15	38.58 c-g	40.79 b-f	38.97 b-g	39.45 bc	
8	0	45.61 a-c	43.25 b-e	40.48 b-f	43.11 b	44.58 a
	10	40.55 b-f	44.20 b-d	41.31 b-f	42.02 bc	
	15	45.38 a-c	47.54 ab	52.92 a	48.61 a	
O.M * Ascorbic acid	0	32.24 d	37.17 c	37.18 c	**Mean effect of Biofertilizer**	
	4	38.67 c	38.49 c	40.17 bc		
	8	43.85 ab	45.00 a	44.91 a		
Biofertilizer * Ascorbic acid	0	37.52 b	36.62 b	39.08 ab	37.74 b	
	10	37.85 b	40.49 ab	39.51 ab	39.28 b	
	15	39.39 ab	43.54 a	43.67 a	42.20 a	
Mean effect of Ascorbic acid		38.25 a	40.22 a	40.75 a		

Mean within a column, row and their interaction following with the same latter are not significantly different according to Duncan multiple range test at the probability of 0.05 level.

Ascorbic acid (mg.100ml^{-1} juice**):** it's clear, from table (7) that the increasing levels of soil applied organic manure, biofertilizer and foliar application of ascorbic acid significantly increased ascorbic acid in olive fruit, the highest value (1.130, 1.005 and 1.159 mg/100ml juice) were obtained in the olive tree treated with 8 kg O.M.tree^{-1}, 15 g.l^{-1} biofertilizer and 600 mg.l^{-1} ascorbic acid respectively and lowest value recorded in control in all individually treatment. Data; in the same table reported that the interaction-between 8 kg O.M.tree^{-1} + 15g.l^{-1} biofertilizer, 8 kg O.M.tree^{-1} + 600 mg.l^{-1}ascorbic acid and 10 g.l^{-1} biofertilizer + 600 mg.l^{-1} ascorbic acid recorded the highest value (1.187, 1.293 and 1.187 mg/100ml juice) respectively and it was significantly compared to control. The interactions among the three studied factors, the data explain that the interaction among 8 kg O.M.tree^{-1}, 0 g.l^{-1} biofertilizer and 600 mg.l^{-1} ascorbic acid give the highest value (1.323 mg/100ml juice), while the lowest value (0.443 mg/100ml juice) was obtained by control treatment (0 kg O.M.tree^{-1} + 0 g/l^{-1} biofertilizer + 0 mg.l^{-1} ascorbic acid).

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Table 7. Effect of organic manure, biofertilizer and ascorbic acid and there interactions on Ascorbic acid (mg.100ml juice^{-1}) of olive tree cv. Basheqi.

O.M (kg)	Biofertilizer g.l^{-1}	Ascorbic acid mg.l^{-1}			O.M * Biofertilizer	Mean effect of O.M
		0	300	600		
0	0	0.443 i	0.773 f-h	1.013 c-f	0.743 e	0.888 b
	10	0.810 e-h	1.033 b-f	1.260 a-c	1.034 bc	
	15	0.717 gh	0.933 d-g	1.010 c-f	0.887 c-e	
4	0	0.680 g-i	0.953 d-g	1.037 b-f	0.890 c-e	0.896 b
	10	0.593 hi	0.930 d-g	1.047 a-f	0.857 de	
	15	0.707 gh	0.940 d-g	1.180 a-d	0.942 cd	
8	0	0.813 e-h	1.127 a-d	1.323 a	1.088 ab	1.130 a
	10	0.957 d-g	1.140 a-d	1.253 a-c	1.117 ab	
	15	1.060 a-e	1.197 a-d	1.303 ab	1.187 a	
O.M * Ascorbic acid	0	0.657 d	0.913 c	1.094 b	**Mean effect of Biofertilizer**	
	4	0.660 d	0.941 c	1.088 b		
	8	0.943 c	1.154 b	1.293 a		
Biofertilizer * Ascorbic acid	0	0.646 f	0.951 cd	1.124 ab	0.907 b	
	10	0.787 e	1.034 bc	1.187 a	1.003 a	
	15	0.828 de	1.023 bc	1.164 ab	1.005 a	
Mean effect of Ascorbic acid		0.753 c	1.003 b	1.159 a		

Mean within a column, row and their interaction following with the same latter are not significantly different according to Duncan multiple range test at the probability of 0.05 level.

Oil content (%): Table (8) showed that raising the levels of organic manure, biofertilizer and foliar application of ascorbic acid significant increased the percentage of oil content, the highest percentage (40.33, 38.95 and 38.44%) respectively were obtained when the olive trees treated with 8 kg O.M.tree^{-1}, 15 g.l^{-1} biofertilizer and 600 mg.l^{-1} ascorbic acid. Regarding to the interactions of organic manure + biofertilizer, organic manure + ascorbic acid and biofertilizer + ascorbic acid,; the data reveals that the interactions of 8 kg O.M.tree^{-1} + 15 g.l^{-1} biofertilizer, 8 kg O. M.tree^{-1} + 600 mg.l^{-1} ascorbic acid and 15g.l^{-1} biofertilizer + 300 mg.l^{-1} ascorbic acid have the highest percentage of oil content in olive fruit, the values were (41.40, 41.35 and 39.23%) respectively. Regarding the interactions among organic manure, biofertilizer and ascorbic acid, there were significantly and the highest value (42.06%) was obtained by the interaction of 8 kg O.M.tree^{-1} +15 g.l^{-1} biofertilizer + 600 mg.l^{-1} ascorbic acid and the lowest value (31.89%) recorded by the control.

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Table 8. Effect of organic manure, biofertilizer and ascorbic acid and there interactions on Percentage of Oil of olive tree cv. Basheqi.

O.M (kg)	Biofertilizer g.l^{-1}	Ascorbic acid mg.l^{-1} 0	300	600	O.M * Biofertilizer	Mean effect of O.M
	0	31.89 f	34.90 ef	35.63 e	34.14 e	
0	**10**	36.21 de	34.84 ef	36.77 c-e	35.94 de	35.77 c
	15	37.64 b-e	36.96 b-e	37.06 b-e	37.22 cd	
	0	36.16 de	37.56 b-e	37.40 b-e	37.04 cd	
4	**10**	37.47 b-e	36.44 c-e	37.82 b-e	37.24 cd	37.50 b
	15	38.57 a-e	38.90 a-e	37.18 b-e	38.22 c	
	0	37.07 b-e	40.19 a-d	40.22 a-d	39.16 bc	
8	**10**	38.50 a-e	40.99 ab	41.77 a	40.42 ab	40.33 a
	15	40.33 a-c	41.82 a	42.06 a	41.40 a	
O.M * Ascorbic acid	**0**	35.25 d	35.57 cd	36.49 b-d	**Mean effect of Biofertilizer**	
	4	37.40 bc	37.63 bc	37.47 bc		
	8	38.63 b	41.00 a	41.35 a		
Biofertilizer * Ascorbic acid	**0**	35.04 b	37.55 a	37.75 a	36.78 b	
	10	37.39 a	37.42 a	38.79 a	37.87 ab	
	15	38.85 a	39.23 a	38.77 a	38.95 a	
Mean effect of Ascorbic acid		37.09 b	38.07 ab	38.44 a		

Mean within a column, row and their interaction following with the same latter are not significantly different according to Duncan multiple range test at the probability of 0.05 level.

Discussion:

For the effect of organic manure in the vegetative characters the table (1, 2 and 3) indicates that the vegetative growth characters (leaf area, total chlorophyll content and leaves protein %) were positively affected by the application of organic manure, evidence supporting this find has been reported by (21 and 7). Leaf area increased with increasing organic manure levels, the reason might be attributed to that the organic manure contain nutrient such as N, P and K, which had a positive role in most of physiological and metabolic process inner the plant, that have a relationship to food synthesis inside the plant, or simulative cell division and elongation and installation of cellular membrane which lead to increase vegetation growth, then increase leaf area (9). For the influence of organic manure on leaves chlorophyll content, the reason of positive influence of organic manures on increasing leaf chlorophyll content may be attributed to that, the organic manures contains (Nitrogen, Phosphor) and other nutrients such as Mg and Fe which have'' an significant role in the structure of chlorophyll molecules (34). Smith, (37) indicated that the applications of organic manure caused an increase in leaf protein %, the reason might be due to the role of organic manure in processing N to the plant, and its role in composition of amino

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acid which is considered one of the building units of protein.

For the effect of organic manure (poultry manure) on fruit quality characters, it was noticed from the obtained results; that organic manure level increased all fruit qualitative characters (TSS, total carbohydrate, Anthocyanin content ascorbic acid and oil content percentage) (tables 4, 5, 6, 7and 8). These results are agreed with those reported by (6 and 7). The influence of (organic manure) on improving the quality of fruits due to the high content of nitrogen and essential nutrients in organic manure, which could result in increasing the biosynthesis, translocation of carbohydrate from leaves to the fruits (5and 6) and the role of these essential nutrients in enhancing carbohydrate ratio in leaves by increasing some enzymes related to "photosynthesis process" which lead to raise (TSS%) in fruits (7). Concerning the effect of biofertilizer on vegetative growth characteristics (leaf area, total chlorophyll content and leaves protein percentage). It is clear from tables (1, 2 and 3) that (leaf area, total chlorophyll content and leaves protein %) were significantly affected by the application of biofertilizer. These results corresponded with that concluded by (25 and 36). Biofertilization supply suitable amount of (N) to the plant. N is the main component of chlorophyll, protoplasm, protein and DNA. Its plays a great role in cell division, and therefore, improves vegetative growth and increases tree size throughout increasing the number of shoot and its length (31). The important role of biofertilizers on enhancing the formation of chlorophyll content in leaves may be attributed to their action on increasing the availability of water and minerals. The results obtained by (33) supported the stimulating effect of biofertilizers on chlorophyll.

For the influence of, biofertilizer on the fruit quality. It was noticed from the obtained results that increasing biofertilizer level increased most fruit quality characteristics (total carbohydrate, Anthocyanin content, ascorbic acid and percentage of oil) (tables 4, 5, 6, 7and 8). These results are agree with those reported by (1 and 16). Khalil and Agah, (26) found that biological fertilizer (biofertilizer) increased significantly anthocyanin concentrations in the fruits.

About the effect of Ascorbic acid, It was noticed from table (1, 2 and 3) that foliar application of Ascorbic acid had a positive impact on the vegetative growth parameters. These increases in leaf area, total chlorophyll content and leaves protein % by using ascorbic acid may be due to that Ascorbic acid act as an antioxidant has an effect as plant growth regulators (PGR) (23) and its role in activating both cell division and cell elongation in meristematic tissues, and also the biosynthesis of organic foods (29). The increments of average leaf area are due to ascorbic acid treatment that may be attributed to the effect of the used treatment on cell division and the cell elongation (32). Increasing chlorophyll content by using ascorbic acid may be due to the role of ascorbic acid in increasing the rates of photochemical reduction, chloroplast structure, photosynthesis, electron transfer as well as photosynthesis (27).

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Tables (4 to 8) showed that Ascorbic acid had a significant impact on the fruit quality. Ascorbic acid increased (TSS %, total carbohydrate%, anthocyanin content mg/100g, ascorbic acid mg/100ml juice, oil content %). These results are obtained by (Abdul Hady and Ibrahim 2001). These effects may be due to the impact of Ascorbic acid on stimulating the bio synthesis of carbohydrate as a result of their influence on (enhancing) vegetative growth (23). Furthermore the vital role of Ascorbic acid on fruit quality could be attributed to it positive action in encouraging the cell division and stimulating the synthesis and translocation of organic products (29). Also, the positive action of Ascorbic acid in fruit quality and chemical characteristics might be attributed to its own auxin and its role in controlling the incidence of various products resulted from photosynthesis process (32). Moreover, the increment of chemical characteristics might be due to the significant increase of photosynthetic products as reflect of the photosynthesis process and this led to an increase in the carbohydrate content (Fayed 2010b). The role of Ascorbic acid in increasing ascorbic acid % in olive fruit may be due to the fact that spraying this acid leads to increasing the content of ascorbic acid by accumulating it in fruit juice.

Conclusion

From the results of above mentioned, we can conclude that soil application of different types of fertilizer such as organic and biofertilizer also foliar spray of ascorbic-acid had a positive effect on increased vegetative growth and fruit quality of Basheqi olive trees, especially (8 kg O. M.tree^{-1}, 15 g.l^{-1} biofertilizer and 600 mg.l^{-1} ascorbic acid) was the best treatment for increase most parameters studied. The interaction treatments between the three factors led to high and positive effects on the vegetative growth and fruit quality.

Conflict of Interest

The authors have no conflict of interest.

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