THE USE OF SOME ORGANIC AND BIO-FERTILIZERS FOR MANZANILLO OLIVE TREES FERTILIZATION (B) FRUITING AND FRUIT QUALITY

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ABSTRACT

The application of some organic fertilizers (fish scrap, goat manure and olive pomace) either superficially or in trenches and supporting with biofertilizer (Nitrobein or Rhizobacterein) for Manzanillo olive trees were studied. Fish scrap fertilizer gave the highest values of different parameters (blooming duration, No. of flowers per inflorescence, perfect flower per inflorescence, fruit set and yield per tree). Moreover, the three organic fertilizers failed to induce any significant effect on biennial bearing index. The application of organic fertilizer in trenches and enriching with Rhizobacterein increased the positive effect in this concern. Concerning fruit quality, fish scrap, surpassed olive pomace and goat manure in improving fruit quality whether the fruit physical properties (fruit weight, length, diameter, flesh weight, pit weight and moisture content) or fruit chemical properties (oil content, palmatic acid, archidic acid, oleic acid, linoleic acid, and linolenic acid), while the reverse was true with olive pomace or goat manure. The positive effect of organic fertilizer was increased with trench application and Rhizobacterein fertilization.

INTRODUCTION

Currently, an increased attention has been given to pollution of soil and water by chemicals as mineral fertilizers and pesticides in agricultural production and its association with health risks. As a result of misuse of chemical fertilizer, the natural biological balance in the soil is disturbed. The soils of the desert are well supplied with mineral nutrients, except for the very sand ones, which are low in organic matter and nitrogen.

Organic manure fertilizer and biofertilizer are the best alternative for chemical fertilizer. Continuous and judicious use of manure improves the physical and chemical properties of nearly all soils, particularly those that are shallow, coarse textured, of low organic matter and the potential for degradation of soil, air, and water resources is greatly reduced. More specifically, manure provide essential elements for crop growth and improves soil nutrients (Madiston *et al.*, 1986). Furthermore, Biofertilizer can release nutrient substances from rocks and plant residues or organic matter in the soil and make them available for economical plants, as well as protecting the plants from the soil borne pathogens.

Thus, the present work was designed to study the effect of organic fertilizer materials such as animal byproducts (fish scarp), excreta (goat manure) and plant residues (olive pomace) as well as the method of organic fertilizer application, i.e. surface or trench besides, materials of N-fixing bacteria namely Rhizobacterein and Nitrobein on fruiting and fruit quality of Manzanillo olive trees.

MATERIALS AND METHODS

This study was carried out during the two consecutive seasons of 2000 and 2001 at the Experimental Station of the Faculty of Environmental Agricultural Sciences, El-Arish, Norrth Sinai Governorate, Egypt. Twelve-year-old "Manzanillo" olive trees *(Olea europea L.,)* of moderate vigour and productivity grown in loamy sand soil, (mechanical and chemical analyses are shown in Table 1-a). The trees were planted at 6x7 m apart and received the common horticultural practices except mineral fertilization, under drip irrigation system (water quality is shown in table 1-b).

Three factors (organic fertilizer source, method of application and biofertilizer) were considered during the present investigation as follows:

1-Organic fertilizer source

According to the recommendation of Water and Soils Research Institute, Ministry of Agriculture, Egypt, the actual nitrogen (g/tree/year) required to olive tree older than 6 years is 500g N/tree/year. Then, half the required amount of

nitrogen (250g N/tree/year) was suggested to be satisfied through one of the organic fertilizer materials according to its nitrogen content (Table 1-c) as follows:

Fish scrap (9.0% N) about 2.77 kg/tree Goat manure (1.25% N) about 20 kg/tree.

Olive pomace (2.5% N) about 10 kg/tree

2-Methods of organic fertilizer application

Two methods of organic fertilizers were selected as follows:

Table (1-a): Mechanical and chemical Properties of the soil

Parameters	Value
Mechanical analysis	
Sand (%)	71.8
Salt (%)	12.0
Clay (%)	16.2
Texture class	Sandy loam
Chemical analysis	
Organic mater (%)	0.02
Ca CO_3 (%)	19.92
PH	8.2
E.C (d Sm^{-1})	0.62
Cations (meq/L)	
Ca^{2+}	3.00
Mg^{2+}	2.00
Na^{+}	1.68
K^{+}	0.18
Anions (meq/ L)	
Cl^{-}	1.60
CO_3^{2-}	-
HCO_3^{-}	2.50
SO_4^{2-}	2.76

Table (1-b): Chemical analysis of water used for irrigation

Parameter	Artesian well water
E.C (dSm^{-1})	4.8
Conc (ppm)	3089
PH	8.4
SAR	8-6
Cl: SO_4	10.0
Cations (meq/L)	
Ca^{2+}	6
Mg^{2-}	18
Na^{+}	30
K^{-}	0.2
Anions (meq/L)	
Cl^{-}	30
Co_3^{2-}	-
CHO^{3-}	21.20
$SO4^{2-}$	3.0
Water quality	
Total salinity	C4
Sodicity	S1

Table (1-c): Chemical analysis of tested organic fertilizer materials:

Material	Total N %	Total P_2O_5	Total K_2O %	Total CaO %	Total M_gO %
Animal byproducts					
(Fish scrap)	9.0	7.1	-	8.5	0.5
Excreta					
(Goat manure)	1.25	1.4	3	2	0.1
Plant residues					
(Olive pomace)	2.5	1.5	1.5	0.5	0.5

a- Surface application

In mid-December of each season, the three organic fertilizers were applied superficially and digged in the soil during deep hand hoeing practice.

b- Trench application

Two trenches (100 cm length X 30 cm width X 15 cm depth) were digged on both sides of tree at 1 m apart from the tree trunk, then the estimated amount of each organic fertilizer was divided equally and applied in the two trenches and covered with soil.

3-Biofertilizers (N-fixing bacteria)

The remaining N-requirement for each tree was assumed to be partially satisfied through using N-fixing fertilizers. Rhizobacterein fertilizer is a mixture of nitrogen fixing bacteria (*Azotobacter chroococcum* and *Azospirillum brasilense)* while Nitrobein fertilizer contaning *Azospirillum spp* and *Azotobacter chroococcum.* Such products are produced by the General Organization for Agric. Equalization Fund, Ministry of Agric., Egypt. In early March of each season, the biofertilizer (50 g from Nitrobein or Rhizobacterein/tree) were applied in trenches (40 cm length X 20 cm width X 5 cm depth).

These treatments were arranged in a randomized complete block design with four replicates for each treatment and each replicate was represented by two trees. Consequently this experiment is considered as a factorial design consists of three organic fertilizer materials X 2 methods of organic fertilizer application X 2 biofertilizers X four replicates.

The effect of organic fertilizers, method of organic fertilizer application and biofertilizer as well as their interaction on tree yield and fruit quality were studied as follows:

Tree flowering and fruit set

Date of inflorescence emergence was recorded as soon as the first of inflorescence parts were seen. Time of bloom was recorded when 10 and 80% of the total flowers were opened. The end of blooming was recorded at the date in which all flowers were completely opened. Sample of 30 inflorescence were taken at random before the onset of flowering. Perfect flowers per inflorescence and calculated as percentage to total flowers.

Thirty (one-year-old) shoots were labeled on each tree during full bloom (late April) to count number of inflorescences per shoot, number of flowers per inflorescence, fruitlets and fruits. The percentage of fruit set, was also calculated.

Tree yield and fruit quality

Olives were harvested (late October) at the normal time and ripening stage for the area when about 75% of the olives reached violet colour (the suitable stage for olive extraction) to estimate the yield per tree and a sample of 25 fruits was taken from tree to determine fruit weight, length, diameter, flesh weight, pit weight and pit /flesh ratio as well as moisture content.

Oil was extracted by pressing the fruits and stored for a week at 4°C then oil quality was determined by certain physico-chemical parameters such as fatty acid fractions (Association of official Analytical Chemists, 1980).

The obtained data were subjected to analyses of variance according to Duncan multiple range test (Waller and Duncan, 1980).

RESULTS AND DISCUSSION

1- Tree flowering and fruiting

Tree flowering and fruiting (blooming duration, No. of inflorescences, No. of flowers per inflorescence, perfect flowers per inflorescence, fruit set percentage, yield per tree and biennial bearing index are present in tables (2 and 3).

Effect of organic fertilizer material

Data in table (2) show that fish scrap fertilized trees had the highest blooming duration, No. of inflorescences, No. of flowers per inflorescence, percentage of perfect flowers per inflorescence, fruit set percentage, and yield per tree, while goat or olive pomace fertilizer gave the least values in this respect. All the tested treatments did not significantly affect biennial bearing index.

Effect of application method

The same table relieves that using trench application for the three studied organic fertilizers induced the highest stimulative effect on all the tested fruiting parameters of Manzanillo olive trees compared with surface application, except for biennial bearing index which took an opposite trend in this concern.

Effect of biofertilizers

Data in table (2) indicate that Rhizobacterein caused a remarkable increase in blooming duration, No. of inflorescences, No. of flowers/inflorescence, percentage of perfect flowers/inflorescence, fruit set percentage, and yield/tree as well as achieving lower values in alternate bearing index of Manzanillo olive trees as compared with analogous ones inoculated with Nitrobein.

Effect of the interaction between organic fertilizer source, application method and biofertilizer

Data in table (3) indicate that the combination of fish scrap applied in trenches and provided with Rhizobacterein gave the highest values of blooming duration. No. of inflorescences/shoot, No. of flowers/inflorescence,

percentage of perfect flowers per inflorescence, fruit set percentage and yield/tree while the least values were observed in goat manure or olive pomace X surface application X Nitrobein in this concern. The other interactions came in between. Besides the combination of olive pomace or fish scrap X trench X Rhizobacterein reduced the tendency towards alternation of bearing.

The enhancement of fruiting as a result of using organic fertilizer in general and fish scrap fertilizer in particular may be due to the organic materials which improve soil physiochemical conditions and they release much more of less available elements (F, Zn and Mn) as well as they increase the soil content of IAA and cytokenins (Li *et al.,* 1998). Vigorous vegetative growth produced a high photosynthetic efficiency which promotes an increment of reproductive growth and yield (Maksoud, 2000). The results of tree flowering and fruiting are in line with that of Akl *et al.,* (1997), Mansour, (1998) and Maksoud (2000).

The improvement of fruiting as a result of applying organic matter to soil is mainly due to the improvement in structure and it increases the soil's ability to hold water, thus the organism quickly multiply and destroyed it under trench conditions rather than surface application. Organic matter, in decomposing, may liberate plant foods from minerals in the soil (Cook, 1982).

Similar observations were reported by Goed (1993). The improvement of fruiting as a result of leaf fertilizer may be due to the production of some growth regulators as well as N-fixation (Rao and Dass 1989, and Akl *et al.,* 1997). Similar results were reported by Mansour (1998).

2- Fruit quality:

2.1 Fruit physical properties

Fruit physical properties (fruit weight, length, diameter, flesh weight, pit weight, pit/flesh and moisture content) of Manzanillo olives in response to specific and interaction effect of organic fertilizer source, application method and biofertilizer during 2000 & 2001 seasons are presented in tables 4 and 5.

Effect of organic fertilizer materials

Data presented in table (4) show that fish scrap fertilized trees had the highest values of fruit weight, length, diameter, flesh weight, pit weight, and moisture content, while the least values were observed in goat manure. Besides olive pomace fertilizer induced intermediate effect in this concern. Olive pomace fertilized trees had the highest value of pit/flesh.

Effect of application method

Table (4) shows that the application of organic fertilizer in trenches increased fruit weight, length, flesh weight and moisture content but had no effect on fruit diameter, pit weight and pit/flesh.

Effect of biofertilizer

Overall, fruit physical parameters (fruit weight, length, diameter, flesh weight, pit weight, pit/ flesh and moisture content were relatively increased due to Rhizobacterein compared with Nitrobein.

Effect of the interaction between organic fertilizer source, application method and biofertilizer

Data in table (5) indicated that the interaction among fish scrap, trench or surface and Rhizobacterein induced the highest values of fruit weight, length, diameter, flesh weight, pit weight and moisture content while the lowest values were in the interaction between goat manure or olive pomace X surface X Nitrobein. The other interactions induced intermediate effect in this respect. On the other hand, pit/flesh took an opposite trend in this concern.

The improvement of fruit physical properties as a result of using organic fertilizer, application method and biofertilizer in general and fish scrap X trench X Rhizobacterein in particular may be due to the supported organic materials in trench application with Rhizobacterein which led to improve soil structure and release some available element such as N, P, K, Fe, Zn and Mn as well as the soil content from plant growth regulators (Li *et al.,* 1998). Similar observations were reported by Das *et al.,* (1996).

2.2 Fruit oil content and chemical oil properties

Fruit oil content and oil properties, (palmatic acid, archidic acid, oleic acid, linolenic acid) of Manzanillo olives in response to the specific and interaction effect of organic fertilizer source, application method and biofertilizer during 2000 & 2001 seasons are presented in tables 6 and 7.

Effect of organic fertilizer material

Data in table (6) show that the fruits of fish scrap fertilized trees had the highest values of oil content, palmatic acid, archidic acid, oleic acid linolic acid and linolenic acid, while the trees which

Table (2): Specific effect of organic fertilizer materials, application method and biofertilizer on some fruiting parameters of Manzanillo olive trees (2000 & 2001 seasons)

Treatment	Blooming duration (day)		No. of inflorescences per shoot		No. of flowers per inflorescence		Perfect flowers per inflorescence (%)		Fruit set (%)		Yield per tree (kg)		Biennial bearing index
	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001	
Effect of organic fertilizer material													
Fish scrap	22.2 a	24.3 a	16.9 a	18,0 a	9.8 a	10.8 a	37.5 a	40.0 a	2.32 a	3.57 a	25.2 a	33.9 a	14.75 a
Goat manure	19.3 b	21.3 b	14.1 c	14.7 b	8.9 b	9.0 b	34.4 b	35.0 b	2.31 b	2.67 b	22.1 c	29.1 c	14.17 a
Olive pomace	19.5 b	21.7 b	14.6 b	15.0 b	8.7 b	8.9 b	34.7 b	35.1	2.23 c	2.53 c	27.7 b	27.7 b	13.5 a
Effect of application method													
Surface	19.8 b	22.o b	14.6 b	15.0 b	8.7 b	8.5 b	34.5 b	35.6 b	2.25 b	2.52 b	21.7 b	30.0 b	16.16 a
Trench	20.9 a	22.8 a	15.8 a	16.8 a	9.6 a	10.6 a	36.6 a	37.8 a	2.99 a	3.32 a	25.0 a	31.8 a	12.16 b
Effect of biofertilizer (N-fixing bacteria)													
Nitrobein	19.0 b	21.2 b	14.1 b	14.6 b	8.5 b	8.3 b	33.8 b	34.9 b	2.23 b	2.35 b	20.4 b	28.2 b	16.00 a
Rhizobacterein	21.7 a	23.7 a	16.3 a	17.2 a	9.8 a	10.7 a	37.2 a	38.5 a	3.01 a	3.50 a	26.3 a	33.6 a	12.27 b

Means followed by the same letter(s) within each column are not significantly different at 5% level

Table (3): Effect of the interaction between organic fertilizer materials, application method and biofertilizer on some fruiting parameters of Manzanillo olive trees (2000 & 2001 seasons)

Interaction			Blooming duration (day)		No. of inflorescences per shoot		No. of flowers per inflorescence		Perfect flowers per inflorescence (%)		Fruit set (%)		Yield per tree (Kg)		Biennial bearing index
Organic fertilizer material	Application method	Biofertilizer	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001	
Fish scrap	Surface	Nitrobein	20.3 cd	21.6 cd	15.3 cde	16.3 cde	9.3 bcd	7.6 e	34.6 cd	36.6 d	2.7 d	2.8 f	21.6 g	30.3 e	16.33 ab
		Rhizobacterein	22.3 b	25.6 a	16.6 b	18.3 bc	9.6 bc	11.6 b	37.3 b	40.3 b	2.9 c	3.4 d	25.6 d	35.3 b	16.00 b
	Trench	Nitrobein	21.6 bc	23.3 b	15.3 cde	16.6 bcd	8.6 cde	10.3 cd	35.3 c	38.6 c	2.8 cd	3.1 e	23.0 ef	32.3 d	16.00 b
		Rhizobacterein	24.6 a	26.6 a	20.3 a	21.0 a	11.6 a	13.6 a	42.6 a	44.6 a	4.7 a	4.8 a	30.3 a	37.6 a	10.67 c
Goat manure	Surface	Nitrobein	18.3 ef	20.3 e	13.3 f	13.3 fg	8.3 de	7.3 e	32.6 e	33.3 g	1.9 fg	1.8 j	17.3 i	25.3 h	18.67 a
		Rhizobacterein	20.0 d	21.6 cd	14.3 ef	15.3 def	8.6 cde	7.6 e	34.3 cd	35.3 e	2.1 e	2.7 g	22.3 fg	30.6 e	15.67 b
	Trench	Nitrobein	17.3 f	20.6 de	13.3 f	14.3 efg	8.3 de	10.3 cd	33.3 e	33.6 fg	2.0 ef	2.4 h	20.3 h	27.3 f	15.00 b
		Rhizobacterein	21.6 bc	22.6 bc	15.6 bcd	16.0 de	10.3 b	10.6 bc	37.3 b	37.6 cd	3.1 b	3.6 c	28.6 b	33.3 c	7.33 d
Olive pomace	Surface	Nitrobein	18.3 ef	20.6 de	13.3 f	12.6 g	8.0 e	7.3 e	33.3 e	33.6 fg	1.8 g	1.7 k	19.6 h	26.3 g	14.67 b
		Rhizobacterein	19.6 de	22.3 bc	14.6 de	14.3 efg	8.3 de	9.3 d	34.6 cd	34.6 ef	1.9 fg	2.5 h	23.6 e	32.3 d	15.33 b
	Trench	Nitrobein	18.3 ef	20.6 de	14.3 ef	14.3 efg	8.3 de	7.3 e	33.6 de	33.6 fg	2.0 ef	2.1 i	20.3 h	27.6 f	15.33 b
		Rhizobacterein	22.0 b	23.3 b	16.3 bc	18.3 b	10.3 b	11.6 b	37.3 b	38.6 c	3.1 b	3.7 b	27.3 c	32.6 cd	8.66 cd

Means followed by the same letter(s) within each column are not significantly different at 5% level

Table (4): Specific effect of organic fertilizer materials, application method and biofertilizer on some fruit physical parameters of Manzanillo olive trees (2000 & 2001 seasons)

Treatment	Fruit weight (g)		Fruit length (cm)		Fruit diameter (cm)		Fruit flesh weight (g)		Stone weight (g)		Stone : flesh ratio		Moisture content (%)	
	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001
Effect of organic fertilizer material														
Fish scrap	4.89 a	4.15 a	2.74 a	2.45 a	1.82 a	1.81 a	4.25 a	3.49 a	0.63 a	0.66 ab	0.14 b	0.18 c	57.4 a	57.7 a
Goat manure	3.80 c	3.22 b	2.38 b	2.47 a	1.80 a	1.62 b	3.18 c	2.59 b	0.58 a	0.63 b	0.17 a	0.24 b	52.5 b	51.0 c
Olive pomace	3.86 b	3.19 b	2.40 b	2.32 b	1.80 a	1.75 a	3.25 b	2.47 c	0.61 a	0.71 a	0.18 a	0.28 a	52.7 b	51.8 b
Effect of application method														
Surface	3.98 b	3.47 b	2.37 b	2.41 a	1.80 a	1.72 a	3.37 b	2.81 b	0.60 a	0.65 a	0.17 a	0.23 a	54.0 a	53.38 b
Trench	4.39 a	3.58 a	2.46 a	2.40 a	1.82 a	1.73 a	3.75 a	2.88 a	0.61 a	0.68 a	0.16 a	0.24 a	54.5 a	53.72 a
Effect of biofertilizer (N-fixing bacteria)														
Nitrobein	3.90 b	3.42 b	2.35 b	2.32 b	1.75 b	1.64 b	3.32 b	2.77 b	0.56 b	0.65 a	0.16 a	0.24 a	53.5 b	53.50 a
Rhizobacterein	4.47 a	3.62 a	2.48 a	2.51 a	1.87 a	1.81 a	3.80 a	2.93 a	0.65 a	0.68 a	0.17 a	0.23 a	55.0 a	53.61 a

Means followed by the same letter(s) within each column are not significantly different at 5% level

Table (5): Effect of the interaction between organic fertilizer materials, application method and biofertilizer on some fruit physical parameters of Manzanillo olive trees (2000 & 2001 seasons)

Interaction			Fruit weight (g)		Fruit length (cm)		Fruit diameter (cm)		Fruit flash weight (g)		Stone weight (g)		Stone: flash ratio		Moisture content (%)	
			2000	2001	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001
Fish scrap	Surface	Nitrobein	4.01 e	4.10 b	2.33 cd	2.33 de	1.76 bc	1.66 bc	3.56 d	3.47 b	0.53 c	0.63 ab	0.14 fg	0.18 ef	56.6 a	56.3 b
		Rhizobacterein	5.06 b	4.16 b	2.46 b	2.56 b	1.86 b	1.86 ab	4.33 b	3.53 ab	0.73 a	0.63 ab	0.16 de	0.17 f	57.6 a	58.0 a
	Trench	Nitrobein	4.83 c	4.06 b	2.43 c	2.43 cd	1.76 bc	1.76 abc	4.20 c	3.33 c	0.63 abc	0.73 a	0.14 ef	0.22 cdef	57.6 a	58.0 a
		Rhizobacterein	5.56 a	4.30 a	2.66 a	2.50 bc	1.96 a	1.96 a	4.93 a	3.63 a	0.63 a	0.66 ab	0.12 g	0.17 f	57.6 a	58.0 a
Goat manure	Surface	Nitrobein	3.46 h	3.06 ef	2.26 d	2.33 de	1.76 bc	1.73 bc	2.90 f	2.53 ef	0.56 bc	0.53 b	0.19 ab	0.21 cde	51.0 d	52.3 cd
		Rhizobacterein	3.86 f	3.23 d	2.43 bc	2.70 a	1.83 bc	1.66 bc	3.16 e	2.56 ef	0.60 bc	0.66 ab	0.18 bc	0.25 abcd	54.0 b	50.6 e
	Trench	Nitrobein	3.73 g	3.16 de	2.36 bcd	2.33 de	1.73 c	1.33 d	3.13 e	2.50 ef	0.53 c	0.66 ab	0.16 cd	0.26 abcd	52.3 bcd	50.6 e
		Rhizobacterein	4.16 e	3.43 c	2.46 b	2.53 bc	1.86 b	1.76 abc	3.53 d	2.76 d	0.63 abc	0.66 ab	0.17 bcd	0.23 bcde	53.3 bc	50.6 e
Olive pamace	Surface	Nitrobein	3.56 h	3.03 f	2.33 cd	2.23 e	1.73 c	1.63 c	3.10 e	2.33 g	0.53 c	0.70 a	0.17 bcd	0.29 ab	51.6 cd	52.3 cd
		Rhizobacterein	3.83 fg	3.23 d	2.43 bc	2.33 de	1.83 bc	1.76 abc	3.16 e	2.46 fg	0.66 ab	0.76 a	0.20 a	0.31 a	53.3 bc	50..6 e
	Trench	Nitrobein	3.73 g	3.13 def	2.36 bcd	2.26 e	1.76 bc	1.73 bc	3.06 e	2.46 fg	0.60 bc	0.66 ab	0.19 ab	0.27 abcd	52.0 cd	51.3 de
		Rhizobacterein	4.33 d	3.36 c	2.46 b	2.46 bc	1.86 b	1.86 ab	3.66 d	2.63 e	0.66 ab	0.73 a	0.17 bcd	0.27 abcd	54.0 b	53.0 c

Means followed by the same letter(s) within each column are not significantly different at 5% level

Table (6): Specific effect of organic fertilizer materials, application method and biofertilizer on fruit oil content and some oil chemical parameters of Manzanillo olive trees (2000 & 2001 seasons)

treatment	Oil content F.wt basis (%)		Palmatic acid (16: 0) (%)		Archidic acid (18:1) (%)		Oleic acid (18:1) (%)		Linoleic acid (18:2) (%)		Lenolenic acid (18:3) (%)	
	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001
Effect of organic fertilizer material												
Fish scrap	21.7 a	21.9 a	14.6 a	14.3 a	6.7 a	6.9 a	65.3 a	69.6 a	6.5 a	6.6 a	6.5 a	6.9 a
Goat manure	20.2 c	20.1 b	12.8 c	13.2 b	6.2 c	6.9 a	55.5 c	58.3 b	5.5 b	5.8 c	6.2 b	6.4 b
Olive pomace	20.4 b	20.2 b	13.9 b	13.9 a	6.3 b	6.6 a	56.5 b	57.8 b	5.4 c	6.0 b	6.3 b	6.3 b
Effect of application method												
Surface	20.1 b	20.3 b	13.2 b	13.6 b	6.3 b	6.7 b	57.4 b	60.1 b	5.7 b	5.9 b	6.2 b	6.5 a
Trench	21.4 a	21.2 a	14.4 a	14.0 a	6.5 a	6.9 a	60.8 a	63.7 a	6.0 a	6.4 a	6.4 a	6.6 a
Effect of biofertilizer (N-fixing bacteria)												
Nitrobein	19.6 b	19.8 b	13.1 b	13.1 b	6.2 b	6.6 b	56.5 b	58.6 b	5.5 b	5.8 b	6.1 b	6.4 a
Rhizobacterein	21.9 a	21.7 b	14.4 a	14.5 a	6.6 a	7.1 a	71.7 a	65.2 a	6.1 a	6.5 a	6.5 a	6.6 a

Means followed by the same letter(s) within each column are not significantly different at 5% level

Table (7): Effect of the interaction between organic fertilizer materials, application method and biofertilizer on some fruit chemical parameters of Manzanillo olive trees (2000 & 2001 seasons):

Interaction			Oil content (%)		Acidity (%)		Palmatic acid (16: 0) (%)		Archidic acid (18:1) (%)		Oleic acid (18:1) (%)		Linoleic acid (18:2) (%)		Lenolenic acid (18:3) (%)	
Organic fertilizer material	Application method	Biofertilizer	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001	2000	2001
Fish scrap	Surface	Nitrobein	20.0 f	19.6 ef	1.26 a	1.25 ab	13.8 d	13.3 cde	6.36 efg	6.46 f	63.0 c	65.3 de	6.0 d	6.1 d	6.23 cde	6.63 ab
		Rhizobacterein	21.7 d	22.3 b	1.16 c	1.16 cd	14.1 c	14.6 ab	6.66 b	7.10 b	65.1 b	70.3 b	6.7 b	6.6 b	6.36 bc	7.23 a
	Trench	Nitrobein	20.5 e	21.3 bcd	1.21 abc	1.20 abc	13.8 d	13.6 bcd	6.46 cde	6.83 cd	63.3 c	68.3 c	6.2 c	6.4 c	6.40 bc	6.83 ab
		Rhizobacterein	24.5 a	24.5 a	1.10 d	1.13 d	16.7 a	15.6 a	7.33 a	7.56 a	70.0 a	74.6 a	7.0 a	7.4 a	7.06 a	6.90 ab
Goat manure	Surface	Nitrobein	19.1 g	19.7 ef	1.24 ab	1.21 abc	12.0 g	12.3 e	6.13 h	6.56 ef	52.6 g	55.3 g	5.3 fg	5.4 f	6.16 def	6.23 b
		Rhizobacterein	20.1 ef	20.3 def	1.22 abc	1.19 bc	12.3 f	13.6 bcd	6.26 g	7.16 b	54.6 f	57.6 f	5.5 e	5.8 e	6.26 cd	6.46 a
	Trench	Nitrobein	19.3 g	19.3 f	1.25 ab	1.17 cd	12.2 f	12.6 de	6.03 h	7.03 bc	53.3 g	56.0 g	5.4 ef	5.7 e	6.03 f	6.36 b
		Rhizobacterein	22.2 c	21.1 cd	1.19 bc	1.20 abc	14.8 b	14.3 bc	6.56 c	7.13 b	61.6 d	64.3 e	6.1 d	6.4 c	6.40 bc	6.63 ab
Olive pomace	Surface	Nitrobein	19.4 g	19.3 f	1.25 ab	1.26 a	13.0 e	13.3 cde	6.06 h	6.46 f	52.6 g	53.3 h	5.1 g	5.4 f	6.06 ef	6.33 b
		Rhizobacterein	20.2 ef	20.6 cde	1.23 ab	1.20 abc	14.0 c	14.3 bc	6.43 def	6.9 bc	56.3 e	58.6 f	5.4 ef	6.1 d	6.46 b	6.20 b
	Trench	Nitrobein	19.5 g	19.6 ef	1.24 ab	1.21 abc	13.8 d	13.3 cde	6.33 fg	6.53 ef	54.3 f	53.6 h	5.2 g	5.8 e	6.13 def	6.33 b
		Rhizobacterein	22.6 b	21.5 bc	1.20 abc	1.20 abc	14.8 b	14.6 ab	6.50 cd	6.70 de	62.6 c	65.6 d	6.0 d	6.5 bc	6.53 b	6.63 ab

Means followed by the same letter(s) within each column are not significantly different at 5% level

fertilized with goat manure their fruits had the lowest values in this respect.

Effect of application method

Table (6) reveals that the application of organic fertilizers in trenches increased all the tested chemical properties as compared with surface application.

Effect of biofertilizer

It is obvious from table (6) that, Rhizobacterein inoculated trees produced fruits had higher values of oil content, palmatic acid, archidica acid oleic acid, lenoleic acid and lenolenic acid when compared with fruits of Nitrobein – inoculated trees.

Effect of the interaction between organic fertilizer source, application method and biofertilizer

Data in table (7) show that the interaction of fish scrap X trench X Rhizobacterein gave the best fruit chemical properties (oil content, palmatic acid, archidic acid, oleic acid, lenoliec acid and linolenic acid while the interaction of goat manure or olive pomace X surface X Nitrobein gave the lowest values except for fruit acidity in this respect. The other interactions came in between.

This increase in the concidered parameters can be explained in the light of the vital role of organic fertilizer specially fish scrap or olive pomace fertilizer which improve the physical and chemical properties of soil and provides essential elements, while the application of organic matter in trenches, may liberate plant foods from minerals by the activation of microorganisms in the soil which use the organic matter as a source of energy. Besides, biofertilizer (Azotobacter or Azosperillum) has capability to fix atmospheric nitrogen and convert it to inorganic form (Mineralization of nitrogen). Such increase in N amount led to increase chlorophyll, hence it changes the energy of sunlight to form carbohydrates and fats from carbon dioxide and water (Nijiar 1990). There results are also in harmony with those of Goede 1993 and Mansour (1998).

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استخدام بعض الأسمدة العضوية والحيوية لتسميد أشجار الزيتون المنزانيللو
ب - الإثمار وصفات جودة الثمار

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تم دراسة تأثير ثلاث أسمدة عضوية هي فتات الأسماك وسماد الماعز وتفل الزيتون وطريقتين للإضـــافة همـــا السطحية والخندقية، ومصدرين للأسمدة الحيوية هى النيتروبين والريزوباكتيرين على الاثمار وجودة الثمـــار لأشـــجار الزيتون صنف منزانيللو بمزرعة كلية العلوم الزراعية البيئية بالعريش وذلك خلال عامى ٢٠٠٠ و ٢٠٠١م.

أوضحت النتائج أن أفضل تأثير على الإثمار والمحصول وصفات جودة الثمار لأشجار الزيتون المنزانيللو عنـــد التسميد بسماد فتات الاسماك او تفل الزيتون وافضل طريقة لاضافة الاسمدة هى الطريقة الخندقية وافضل سماد حيوي هو الريزوباكترين . وعموما فان تسميد الأشجار بسماد فتات الأسماك أو تفل الزيتـــون فـــي خنـــادق مـــزودا بســـماد الريزوباكترين قد أدى إلي تحسين واضح في طول مدة التزهير وعدد النورات / فرخ وعدد الأزهار / نـــوره ونســـبة العقد والمحصول / شجرة وجعلها اقل ميلا لتبادل الحمل السنوى وكذلك قد حسّن من صفات جودة الثمـــار الطبيعيـــة ووزن الثمرة وطول وعرض الثمرة ووزن اللحم ووزن النواة ونسبة النواة للحم ومستوى الرطوبة.

بالإضافة إلي الصفات الكيماوية للحمض البالمتيك وحمض الاركيديك وحمـــض الأوليـــك وحمـــض النيوليـــك والنيولينيك.