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EFFECT OF INOCULATION BY SOME PLANT GROWTH PROMOTING RHIZOBACTERIA (PGPR) ON PRODUCTION OF OLIVE TREES (*Manzanillo cultivar*)

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ABSTRACT

This investigation was carried out during two successive seasons 2008 and 2009 to investigate the effect of inoculation of some growth promoting rhizobacteria (PGPR) with farm fertilization on vegetative growth, flowering and productivity characteristics of *Manzanillo* olive trees .The trees were grown in sandy soil under drip irrigation system in a privat orchard .PGPR treatments (*Bacillus Polymyxa* as Biovine inoculants and *Saccharomyces cervisea* as Yeast) were added to 50%or100% farm fertilization. Biovine and yeast; with 50ml per/ tree plus orchard fertilization every fifteen days during the period from first of February until the end of fruit set were added.

Results showed that the application 100% farm fertilization either with biovine alone or with biovine plus yeast and also with yeast resulted in the highest shoot length in first season.100% farm fertilization with yeast delayed flowering onset by five days comparing with other treatments. Adding Biovine to 100%farm fertilization led to increase density of leaves, leaf area , number of flowers per inflorescences, fruit set as well as modification of sex ratio, yield (kg) per tree ,moisture content (%)in both seasons as compared with control. Biovine with 50% farm fertilizer increased fruit length (cm) , fruit width (cm) ,stone width (cm), stone length (cm), fruit weight (g), stone weight (g), average flesh weight and flesh/stone in both seasons , Biovine and yeast with 100% farm fertilizer increased oil percentage in dry weight, N (%),P(%) Mn (%) and Zn (ppm) and Fe (ppm) contents in both seasons of the study.

The general conclusion to be drawn from these results is that under biovine plus 100% farm fertilization, may promote the uptake of different nutrients, and may activate different physiological processes which reflect eventually on the yield and fruit quality.

Keywords: Olive tree, Manzanillo, Biovine, Yeast, Plant growth promoting rhizobacteria (PGPR).

INTRODUCTION

Olive is one of the most widely cultivated and economically important fruit crop for several Mediterranean countries. In Egypt, olive trees play an important role in new established orchards, especially in the reclaimed soil because of its ability to grow under the stress conditions (El-Sherkawy, *et al*., 2010). The frequent use of mineral fertilizers, pesticides and other chemicals like plant growth regulators in the present day's agriculture production resulted gradually in pronounced increase of nitrate content and health hazards to mankind. (Tzeng, 1996).Diastrophic is considered another formulation (Biovine) improves plant growth (Omar *et al*., 1991). The development of the agricultural systems which make use of the potential biological processes in the soil that may increase agricultural inputs. Technology of effective microorganism is one of these alternatives that have a revising action on human, animals and the nature

environment (Belatus, 2002). In addition, it contains some important nutrients as N, P and K , some common amino acids and natural growth regulators. Yeast applications are probably responsible for facilitating leaf stomata opening. Moreover, soil drench application of yeast are probably promoting the uptake of different nutrient elements through modifying pH value of the soil solution towards acidity medium which was affected on yield; its components and fruit quality. (Gaser, *et al.*, 2006). Soil fertility; provide favoring conditions for nitrogen assimilation in soil. This leads to increase yield and ameliorate quality of crops (Omar, *et al*., 1991) moreover,. soil yeasts not only affect microbial and plant growth,but may also play a role in soil aggregate formation and maintenance of soil structure (Botha,2011)

This work aimed to investigate the effects of some bio-fertilizers (yeast and/ or Biovine) application with farm fertilization on vegetative growth, yield, fruit quality and leaf mineral contents of Manzanillo-olive trees. as an olive table cultivar.

MATERIALS AND METHODS

The experiment was conducted at a private farm (about 45-Kilometer distance North Cairo) during the two successive seasons of 2008 & 2009 to study the effect of different bio-fertilizers with farm fertilization on vegetative growth, physical and chemical characteristics of fruits, stones, leaf mineral contents and pigments of olive Manzanillo cultivar. Forty - two Olive trees were selected as uniform as possible for their vigourity of growth. The trees were about 10 years old planted at a spacing 5X5 meters, free from pathological and physiological disorders grown in a sandy soil under drip irrigation system and received the same culture management i.e. (irrigation,weed, pests and disease control usually applied in the orchard except for the fertilization treatments). Soil physical and chemical properties were determined at the Soils, Water and Environment Research Institute, ARC.

Table (1): Physical and chemical properties of the experimental soils:

	Properties	0 – 60 cm (depth)
1)	Physical	
	Sand %	92.30
	Silt %	2.0
	Clay %	5.70
2)	Chemical	
	Available N (ppm)	0.72
	Available P (ppm)	0.49
	Available K (ppm)	0.358

The experiment consisted of 7 treatments; 2 trees per treatment replicated 3 times in a randomized block design .Guard trees in all directions were left as a pelt for separating the treatments.

The present experiment included the following 7 treatments as follows Control 100%farm fertilization(compost and mineral fertilizations)as recommended by Private Farm

100% farm fertilization +Biovine
50 % farm fertilization +Biovine.
100%farm fertilization +Biovine+Yeast.
50%farm fertilization + Biovine + Yeast
100% farm fertilization +Yeast
50% farm fertilization + Yeast

Farm fertilization (compost and mineral fertilizers) were added on the second week of November and was applied in two parallel ditches of 100×40×30 cm; for length, width and depth, respectively, the ditches surrounded the tree from two directions in the end of the canopy shade

The amount of compost was 50Kg/tree. The rate of mineral fertilizers are 1000 g nitrogen / tree +270g phosphorus/tree + 720g potassium +0.5Kg /tree as MgSo4 (9.6 % mg) /tree +0.25 Kg /tree as sulphur +0.25 Kg /tree as Born. Adding (PGPR) each of Biovine and yeast with 50ml per/ tree to the orchard fertilization each fifteen days during the period from first of February until the end of fruit set. Two sources of Microorganisms i.e. yeast and Biovin were used in the present study as bio fertilizers were supplied from SWERI ,ARC ,at Giza, Egypt. Biovine formula is containing Bacillus polymyxa as nitrogen fixing bacteria 109 cells/ml and used as promoting rhizobacteria.
Analysis of Biovin is shown in Table (2):

Table (2): Analysis of biovine media:

Constituents	Dry	Ash	Protein	Total sugar
Percentage	65	29	20.9	59.7

Yeast (*Saccharomyces cervicisae*) was active, contains 68 to 83 percent of moisture, while bacteria contains 73.3 to 98.3 and molds 84.3 to 88.7 percent, protein, carbohydrate, fat, and ash contents vary , depending on the species of yeast and the conditions under which it was grown
Analysis of Yeast is shown in Table (3):

Table (3): Composition of the Dry matter of yeast:

Constituents	Protein	Fats	Glycogen	Cellulose, gum, etc	Ash
Percentage	52.41	1.72	30.25	6.88	8.74

Measurements:

In both seasons of study fifteen shoots (one year old) were randomly chosen at each tree directions for the vegetative growth measurement.

a) Vegetative growth

At the end of each growing seasons (during the first week of September) the following characteristics were studied.

The lengths of shoots at the end of growing season were determined Leaves density, number, of leaves per shoot then calculated per meter

Leaf area (cm^2) according to (Ahmed *et al.*, 1997) using the following equation: leaf area = 0.53(length× width) +1.66

(b) Flowering characteristics

Flowering dates

Start of flowering: At the opening of 10% of the flowers per inflorescence open.Full bloom: At the opening of more than 70% of the flowers on each inflorescence.End of flowering: the petals of the majority of the flowers darken in color and separate from the calyx.

Twenty shoots of one year old for every replicate were labeled, and measured number of inflorescences per meter.

Inflorescence length (mm): thirty inflorescences were randomly taken from each replicate and the length was calculated.

Sex ratio: the percentage of perfect flowers to the total number of flowers was calculated in previously thirty inflorescences for each replicate.

(c) Fruiting and yield

Fruit set were calculated after 21 days from full blooming, (Mofeed, 2002). Numbers of fruits were recorded on each of the selected shoots and average of yield (kg) per tree was calculated from each treatment.

(**d) Physical and chemical characteristics of Fruits and stones**

Thirty fruits per each tree were randomly selected and used to determine the following physical characteristics: fruit length(cm),fruit diameter(cm),fruit weight(gm) and stones were extracted to determine stone length(cm),stone width(cm),stone weight(g),flesh/fruit weight and flesh/stone ratio .Fruit moisture was calculated as(A.O.A.C,1990) and oil content (%) in dry weight was extracted by Soxelt apparatus from the dry fruit sample of Manzanillo cv. using petroleum ether (60 – 80) as a solvent for 16 hours according to the method described by (A.O.A.C, 1995) .

(e) Leaf mineral contents and pigments:

Leaf mineral contents

At the first week of Augast of each season, leaf samples were taken from mid-shoot, and then washed; air dried at 70ºC till constant weight and then grounded to a five powder for the determination of

N.P.K .as follows, and the contents are expressed as grams per 100 g dry weight.

Nitrogen was determined by the Microkjeldahl method. (Pregl, 1945)

Phosphorous was estimated by the method of (Murphy and Riely, 1962).

Potassium was determined by flame – photometer according to (Brown and Lilleland, 1946).

Calcium was determined by using Atomic Absorption Spectropho-meter Perkin Elmer-3300 (Chapman and Pratt, 1961).

Microelements (Fe, Mn, Zn, Cu): as ppm per 100g dry weight was spectrophoto-meterically determined using atomic absorption (Model, spectronic21D) as described by (Jackson, 1973)

Pigments (Chlorophyll A&B):

Pigments (A&B) were spectrophotomtically determined in samples of mature fresh leaves using the method of (Saric *et al*., 1967).

Statistical analysis:

The obtained data was subjected to analysis of variance (ANOVA) according to (Snedecor and Cochran 1980). Differences between treatments were compared by Duncan's multiple range tests as described in the SAS. (SAS, 1986).

RESULTS AND DISCUSSION

(a)Vegetative growth

Data presented in Table (4) showed that shoot length,(cm), and umber of leaves/ shoot as well as the leaf area (cm2) were affected by treatments during 2008 and 2009 seasons .

Table (4): Length of shoots, leaves density and leaf area of cultivarManzanillo olive during 2008 and 2009 seasons,as affected by different biofertilizers reatments.

Treatments	Shoot Length(cm)		No. of leaves/meter		Leaf area (cm^2)	
	2008	2009	2008	2009	2008	2009
Cont (100%F.)	23.37 b	23.37 d	109.3 d	114.4 d	3.10 cd	3.03 d
100%F.+Biovine	25.33 a	25.33 bc	131.3 a	135.2 a	3.59 a	3.80 a
50%F+Biovine	24.17 b	24.17 b-d	128.1 bc	128.1 bc	3.83 a	3.82 a
100%F.+Biovin+yeast	25.80 a	25.53 ab	119.4 bc	130.8 ab	3.23 b	3.33 b
50%F +Biovin +Yeast	24.33 b	23.46 d	113.8 cd	123.9 c	3.06 d	3.07 d
100%F.+yeast	26.17 a	26.10 a	133.2 a	124.6 c	3.11 cd	3.19 c
50%F+Yeast	2417 b	23.83 cd	123.1 b	134.7 a	3.13 c	3.15 c

Means with the same letter are not different at 5 % level according to Duncan s multiple range test

Shoot length (cm)

Data presented in Table (4) indicated that application of 100%farm fertilization either with biovine or with biovine +yeast and also with yeast recorded the highest significant values (25.33,25.80,26.17cm of shoot length) in the first season respectively , whereas no difference between other treatments were observed .In , the second season the maximum value (26.10) of shoot length was recorded on the trees received100%farmfertilization combined with yeast followed by 100% farm fertilization combined with biovine +yeast, whereas control was the least value.

Leaves density:

It is evident from data in Table (4) that all treatments were significantly improved this parameter as compared with untreated control. Trees treated with 100% farm fertilization + Biovine gave the superior values (131.3, 135.2)per meter in both seasons respectively , as well as, application of Yeast with100% or 50% farm fertilization also, were achieved as significant increments (133.2, 134.7) in both first and second seasons respectively. The rest treatments had in between,values.

Leaf area (cm):

It can be noticed from data of Table (4)that narrow differences were observed in leaf area in both studied Seasons, Biovine with 100% or 50% farm fertilization gave highest significant values (3.59, 3.80,3.83,3.82 cm2) in both season ,respectively while control gave the least one and the rest treatments were in between values .These results are nearly in the same line with those obtained by Singh *et al*. (2003), Abou el-khashab *et al*.(2005). Hegazi *et al*.(2007), El-Sayed (2009),

(b)Flowering characters

Flowering dates

Regarding to data in Table (5) and fig (1) showed that the onset flowering of flowering of Manzanillo .Olive cultivar begin from 20th to25th March in the first season and from 14th to 17th March in the second season, while end of flowering begin from 31st March to 7th April in the first season and from 27th to1st March in the second season, Yeast with 100%or 50%farm fertilization in both seasons was the latest in the onest and end of flowering.

Table (5): Flowering dates of Manzanillo olive cultivar during 2008 and 2009 season's onset as affected by different biofertilizers reatments.

Treatments	Start of flowering		Full bloom		End of flowering	
	2008	2009	2008	2009	2008	2009
Cont(100%F.)	20/3	14/3	27/3	20/3	2/4	27/3
100%F.+Biovine	20/3	14/3	25/3	20/3	31/3	27/3
50%F+Biovine	20/3	14/3	25/3	18/3	31/3	24/3
100%F.+Biovin+yeast	20/3	14/3	27/3	20/3	2/4	27/3
50%F +Biovin +Yeast	20/3	14/3	27/3	20/3	2/4	27/3
100%F.+yeast	25/3	17/3	31/3	23/3	7/4	31/3
50%F+Yeast	25/3	17/3	31/3	23/3	7/4	31/3

Means with the same letter are not different at 5 % level according to Duncan ' s multiple range test.

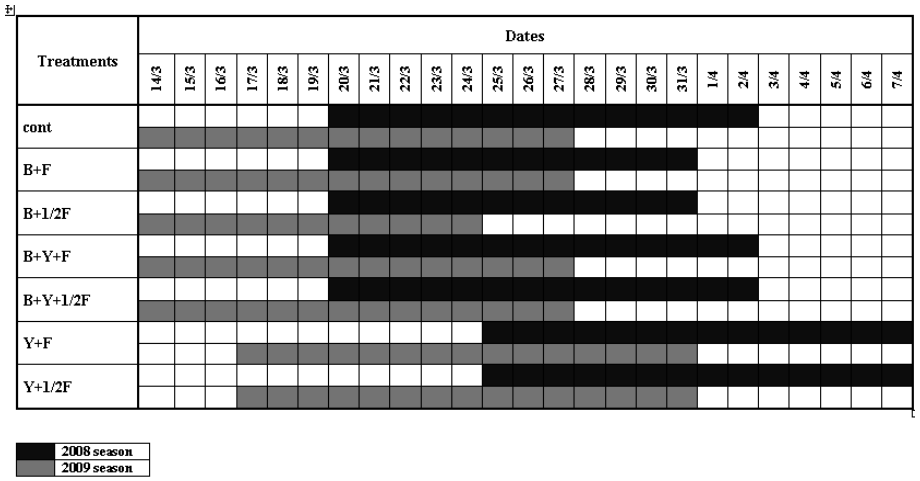

Fig. (1): Flowering Periods Manzanillo olive cultivar during 2008 and 2009 seasons.

Data in Table (6) showed effect on this parameter. It can notice that application of 50%farm fertilization with Biovine and yeast gave the highest length of inflorescence (2.91 and 2.89 mm) in both seasons following by application of Biovine +yeast with 100%farm fertilizers (2.81,2.84 mm) in both season.

Table (6): Inflorescence characteristic of Manzanillo olive cultivar during 2008 and 2009 seasons.

Treatments	Length of inflorescences(mm)		Number of inf./meter		Sex ratio	
	2008	2009	2008	2009	2008	2009
Cont (100%F.)	2.47 d	2.46 d	14.57 f	17.00 c	43.20 e	52.40 d
100%F.+Biovine	2.49 d	2.49 d	19.30 a	26.00 a	71.81 a	77.92 a
50%F+Biovine	2.57 c	2.60 c	17.29 c	24.33 b	69.36 b	77.03 a
100%F.+Biovin+yeast	2.81 b	2.84 ab	15.89 e	24.67 b	65.92 c	66.87 b
50%F +Biovin +Yeast	2.91 a	2.87 a	16.70 d	24.33 b	61.40 d	65.37bc
100%F.+yeast	2.53 cd	2.52 d	18.36 b	25.67 a	67.26 c	77.30 a
50%F+Yeast	2.77 b	2.80 b	16.16 de	24.00 b	63.04 d	64.77 c

Means with the same letter are not different at 5 % level according to Duncan s multiple range test

Flowering density

Flowering density as measured by number of inflorescences per meter, the results revealed that applications of different treatments caused a significant increased flowering density. Highest number of inf., were observed by treatments with100% Farm fertilization +Biovine or with yeast (19.30, 26.00 18.36, 25.67)per meter respectively in 2008 and 2009 seasons .while control trees exhibited the least number of inflorescence (14.57-17.00) remember in both season. No differences between other treatments in the second season, were noticed.

Sex expression ratio Percentage of sex expression ratio of Manzanillo trees were significantly affected by treatments applied and it varied from (43.20 to 71.81) in 2008 season and (52.40 to 77.92) in 2009 season respectively .Data in Table (6) was observed that in the both seasons of study Biovine treatment with 100% or with 50% farm fertilization gave the highest sex expression ratio,(71.81,77.92,69.36,77.03)respectively as well as the application of 100%farm fertilization with yeast recorded the highest value also (77.30)in the second season only while control treatment gave the least one in two studied seasons.

(c) Fruit set and yield /tree

Data in Table (7) showed the fruit set were significantly improved in all treatments over control, biovine plus 100% farm fertilization gave the highest fruit percentage (35.19% and3.47) followed by biovine plus 50% farm fertilization (35.51% and 34..70%) in both seasons and the application of 100% farm fertilizationwith biovine and yeast in second season respectively these results coincide with Ram & Pathah (2007) on guava trees.

Table (7): Fruit set and yield of Manzanillo olive cultivar during 2008 and 2009 seasons as affected by different treatment of fertilization

Treatments	fruit set		Yield	
	2008	2009	2008	2009
Cont (100%F.)	20.16 e	23.58 e	16.61 e	13.44 d
100%F.+Biovine	35.19 a	37.47 a	28.15 a	26.00 a
50%F+Biovine	33.51 b	34.70 b	25.00 b	22.15 b
100%F.+Biovin+yeast	31.65 c	34.55 b	21.00 b	23.71bc
50%F +Biovin +Yeast	27.91 d	29.00 c	18.64 c	20.67 d
100%F.+yeast	28.91 d	28.02 c	19.02bc	24.20 b
50%F+Yeast	27.53 d	25.59 d	18.83 c	27.17 a

Means with the same letter are not different at 5 % level according Duncan's Multiple range test.

Concerning yield/tree in Table (7) and fig. (2) significant increas was observed in both seasons by biovine with 100%farm fertilization in both seasons (28.15 &26.0 kg) and yeast plus 100% farm fertilization (27.17) in second season followed by biovine combined plus 50%farm fertilization (25.00, 22.15kg) in both seasons and biovine +yeast with 100% farm fertilization recorded (21.0 kg) in the first season, while yeast with 100%farm fertilization gave (24.0kg) in the second season. Control treatment gave the lowest yield/ tree in both seasons. These results are in agreement with those reported by El-sayed (2009) in Manzanillo olive cv., Abou El-Khashab *et al.* (2005) in Koroneiki and Aggizi olive cv.

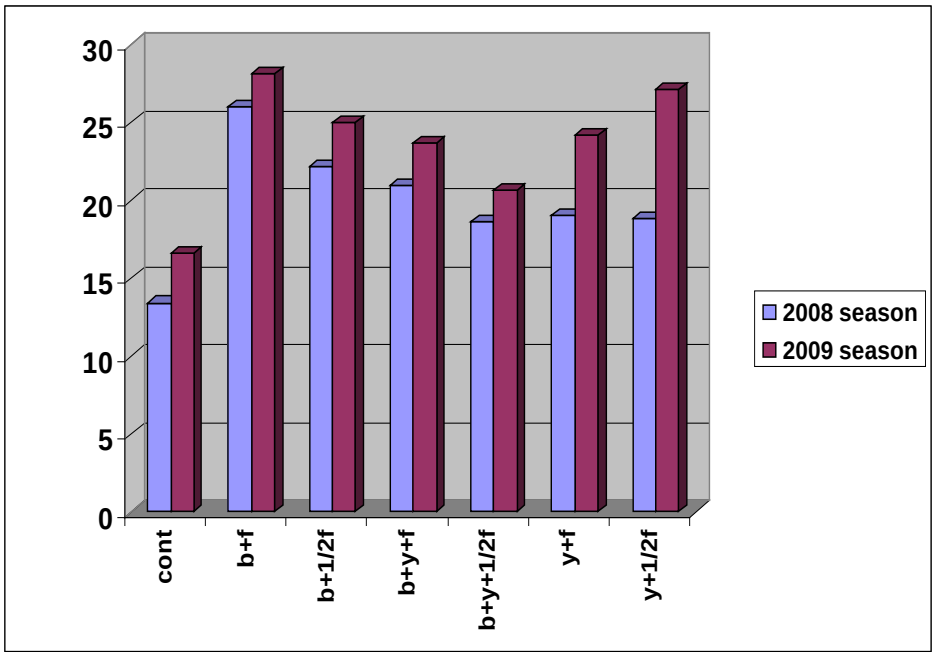

Fig. (2): Yield of Manzanillo olive cultivar during 2008 and 2009 seasons, as affected by different treatments of fertilization.

(d) Fruit characters:

Length, diameter and weight of fruit and stone:

Data presented in tables (8&9) showed that length, diameter, weight of fruit and stone were significantly, affected by all treatments as compared to control. The application of Biovine associated with 50%farm fertilizers gave the highest length, diameter and weight of fruit& stone (2.70, 2.91&6.09, 6.35&2.28, 2.28 &1.98, 1.65& 0.91, 0.95 & 0.94, 0.94)in both seasons respectively. Control treatment gave the lowest values and the other treatments recorded in between.

Table (8): Fruit length ,width and weight of Manzanillo olive cultivar during 2008 and 2009 seasons.

Treatments	Fruit length (cm)		Fruit weight (gm)		Fruit width (cm)	
	2008	2009	2008	2009	2008	2009
Cont (100%F.)	2.36 e	2.34 d	4.45 c	4.56 e	2.05 e	2.00 c
100%F.+Biovine	2.60 b	2.65 b	5.14bc	5.46 bd	2.13cd	2.13 d
50%F+Biovine	2.70 a	2.91 a	6.09 a	6.35 a	2.28 a	2.28 a
100%F.+Biovin+yeast	2.50 c	2.50 bc	5.32ab	5.80 b	2.10 d	2.10 c
50%F +Biovin +Yeast	2.51 c	2.57bc	5.13bc	5.11 d	2.17 b	2.17 b
100%F.+yeast	2.58 b	2.62 b	5.81ab	5.65 bc	2.14 c	2.14 b
50%F+Yeast	2.44 d	2.51bc	5.44ab	5.28cd	2.12cd	2.12 d

Means with the same letter are not different at 5 % level according to Duncan's Multiple range test.

Table (9): Stone length, width and weight of Manzanillo Olive cultivar during 2008 and 2009 seasons as affected by

Treatments	Stone length (cm)		Stone weight (gm)		Stone width (cm	
	2008	2009	2008	2009	2009	2009
Cont (100%F.)	1.44 f	1.50 e	0.87 d	0.78b-d	0.90 d	0.91a-c
100%F.+Biovine	1.70 d	1.53cd	0.90ab	0.85bc	0.93ab	0.93ab
50%F+Biovine	1.98 a	1.65 a	0.91 a	0.95 a	0.94 a	0.94 a
100%F.+Biovin+yeast	1.50 e	1.57 b	0.89a-c	0.85bc	0.92 a-c	0.92a-b
50%F +Biovin +Yeast	1.72 cd	1.54bc	0.87 d	0.84bc	0.90 d	0.91a-c
100%F.+yeast	1.88 b	1.59 b	0.89a-c	0.90ab	0.93ab	0.93a-b
50%F+Yeast	1.78 c	1.53cd	0.90ab	0.83bc	0.93 ab	0.92 a-b

Means with the same letter are not different at 5 % level according to Duncan's Multiple range test.

Flesh weight, flesh/fruit weight % and flesh/stone:

It is obvious from table (10) that the highest flesh weight, flesh /fruit weight and flesh /stone ratio were obtained from application of 50%farm with Biovine (5.183, 5.50 & 85.05, 86.61 & 5.69, 5.77) in both seasons of the study respectively as well as the application of Biovin+Yeast associated with 100% farm fertilizers (5.05 & 86.72 & 5.59) in the second season. Respectively. In general we can note that all treatments significantly induced these parameters over control.

Table (10): Flesh weight, flesh/fruit weight and flesh/stone of Manzanillo olive cultivar during 2008and 2009 seasons as affected by different treatments of fertilization.

Treatments	Flesh weight		Flesh/ fruit weight %		Flesh/stone ratio	
	2008	2009	2008	2009	2008	2009
Cont (100%F.)	3.58 f	3.87 c	80.44 g	85.46 d	4.11 f	4.96 b
100%F.+Biovine	4.25 e	4.71 d	82.94 f	86.26 b	4.71 e	4.53 c
50%F+Biovine	5.183 a	5.50 a	85.05 a	86.61 a	5.69 a	5.77 a
100%F.+Biovin+yeast	4.40 d	5.05 b	83.27 d	86.72 a	4.97 c	5.59 a
50%F +Biovin +Yeast	4.26 e	4.38 c	83.04 e	85.51 d	4.80 d	5.21 b
100%F.+yeast	4.92 b	4.84 c	84.04 b	85.84 c	5.52 b	3.37 d
50%F+Yeast	4.54 c	4.54 e	83.45 c	86.17 b	5.04 c	5.14 b

Means with the same letter are not different at 5 % level of according to Duncan's multiple range test.

Fruit moisture content (%) and oil content (%):

Data presented in Table (11) and Fig (3) revealed moisturethat, fruit moisture content (%) and oil content of fruit (%) as dry weight bases were significantly affected by (PGPR) applications with farm fertilization in both seasons. Application of biovine with 100% farm fertilization gave the highest fruit moisture content(%) as it averaged (70.77%), followed by biovine with 50%farm fertilizations (66.47) and yeast with 100% farm fertilizations(66.19) in both seasons while control treatment was (63.31 & 63.72) in both seasons. Fruit oil content of Manzanillo cv .ranged from (28.18 to 33.46%) as the first season and from (27.51 to 33.46 %) in the second season. Data in table (11) showed that adding biovine and yeast to 100%farm fertilization gave the highest fruit oil content(33.05 & 33.04) as dry weight basis in both seasons, followed by biovine and yeast with 50% farm fertilization(32.53 & 32.04%), while control treatment was the least fruit oil content (28.1 & 27.51%) on dry weight in both seasons. These results are nearly in accordance with those obtained by El-Sayed,(2009) on Manzanillo trees, Abou El-Khashab *et al.* (2005)in Koronaki and Picual trees.

Table (11): Fruit moisture Percent and oil Percent in fresh and dry weight of Manzanillo olive cultivar during 2008 and 2009 seasons, as affected by different treatments of fertilization.

Treatments	moisture Percent		Oil Percent (DW)	
	2008	2008	2008	2009
Cont (100%F.)	63.13 e	63.72 e	28.18 f	27.51 e
100%F.+Biovine	70.77 a	70.77 a	29.27 e	28.81 d
50%F+Biovine	66.47 b	66.47 b	30.55 d	30.77 c
100%F.+Biovin+yeast	64.35 d	64.35 d	33.05 a	33.46 a
50%F +Biovin +Yeast	65.48 c	65.48 c	32.53 b	32.04 b
100%F.+yeast	66.16 b	66.16 b	30.44 d	30.89 c
50%F+Yeast	65.19 c	65.19 c	31.45 c	31.89 b

Means with the same letter are not different at 5 % level according to Duncan's multiple range test.

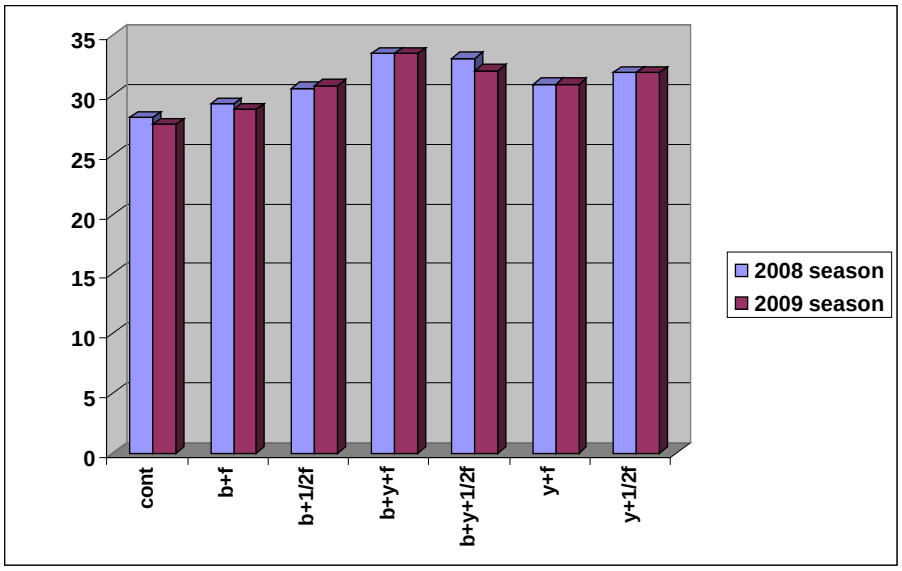

Fig. (3): Percentage of oil content of Manzanillo olive cultivar during 2008 and 2009 seasons as affected by different biofertilizers treatments.

Leaf mineral contents and pigments

Leaf Macro elements content (N, P, K)

Table (12) represented the effect of all treatments on leaf NPK content. It easy to say that all treatments generally resulted in increasing significantly enhances the percentage of leaf content of nitrogen and phosphorus level over control. Leaves nitrogen content under study ranged between(0.94g and1.45g/100g)dry weight for treatments in the first season and (1.026g to 1.53g/100g) dry weight for treatments in the second season The promotion was recorded in the leaves of trees treated with Biovine and yeast with 100% farm fertilization which gave the highest percentage of leaf nitrogen and phosphorus content (1.45, 1.53 & 0.264, 0.253 g/100g) followed by application of Biovine with 50% farm fertilization or yeast with 100%farm fertilization which was preferable in improving only nitrogen content (1.32, 1.39 &1.30, 1.39g/100g) in both seasons. Concerning leaf potassium content was ranged from (0.825& to 1.040 %)in the first season and from 0.770 to 0.992% in the second season, on table (12) narrow fluctuation of potassium content. No, no clear tend can be observed due to treatments in the first season, and in the second season control treatment gave the highest content of potassium in both studied seasons.

These results are in harmony with those obtained by Kabeel *et al*. (2005) and El-Sayed. (2009) who found that different bio-fertilization treatments increased the leaf content of N, P, K as compared with control treatment.

Table (12): Macro elements of Manzanillo olive leaves during 2008 and 2009 seasons (g/100g dw) as affected by different bioferttilizers treatments.

Treatments	N		P		K	
	2008	2009	2008	2009	2008	2009
Cont (100%F.)	0.94 e	1.02 e	0.212 d	0.215 d	1.040 a	0.992 a
100%F.+Biovine	1.11 de	1.206 d	0.202 d	0.235d	0.922 c	0.862 c
50%F+Biovine	1.32 b	1.39 b	0.233 c	0.241c	0.912 c	0.876 c
100%F.+Biovin+yeast	1.45 a	1.53 a	0.264 a	0.253 a	0.951 b	0.933 b
50%F +Biovin +Yeast	1.25 c	1.33 c	0.238 bc	0.228bc	0.941 b	0.916 b
100%F.+yeast	1.30 b	1.39 b	0.255 ab	0.223 bc	0.825 e	0.770 e
50%F+Yeast	1.20 c	1.27 c	0.213 d	0.201 d	0.844 d	0.805 d

Means with the same letter are not different at 5 % level according to Duncan's multiple range test.

Leaf micro element (Mn, Zn, Fe,Cu)

Data in Table (13) showed that, leaf content of micro elements was significantly affected by different treatments in both seasons. The maximum Mn , (131.8, 140.9),Zn (85.39, 90.64) and Fe (226.9, 227.6) were recorded on the trees received application of biovine and yeast with 100% farm fertilization in both. Whereas, the lowest values appeared in control treatment. Concerning Cu content, the highest leaf content was observed with control treatment (44.11& 46.13)ppm, in 2008 and 2009 respectively .These results was agreement with Abd El Wahab (2007) reported that , adding bio-fertilization to organic fertilizer increase leaf mineral content of Zn and Mn. El-Sayed (2009) in olive trees reported that bio- fertilization treatments increase leaf content of Zn, Mn and decrease leaf Cu content.

Table (13): Micro elements of Manzanillo olive leaves during 2008 and 2009 seasons (ppm)/100 grams dry weight as affected by differentbiofertilizers treatments.

Treatments	Mn		Zn		Fe		Cu	
	2008	2009	2008	2009	2008	2009	2008	2009
Cont (100%F.)	63.2 f	81.4 f	61.82 c	64.13 d	219.3 d	220.0 f	44.11 a	46.13 a
100%F.+Biovine	117.6 c	125.8 c	80.15 a	83.62 ab	226.1 a	227.3 a	17.68 d	21.30 d
50%F+Biovine	101.2 d	116.4 d	71.16 b	72.42 c	221.0 c	222.3 d	37.00 b	38.00 b
100%F.+Biovin+yeast	131.8 a	140.9 a	85.39 a	90.64 a	226.9 a	227.6 a	35.00 b	38.09 b
50%F +Biovin +Yeast	127.2a b	135.3a b	75.18 b	80.17 b	224.8 b	225.1 b	27.8 c	31.11 c
100%F.+yeast	98.1 d	107.5 d	73.85b	78.63bc	221.9 c	223.5 c	30.71c	32.3 c
50%F+Yeast	88.6 e	91.4 e	65.96 c	69.21 d	219.7 e	221.3 e	27.52 c	27.16 c

Means with the same letter are not different at 5 % level according to Duncan's multiple range test.

Leaf chlorophyll A&B content:

It is obvious from the present data in Table (14) that varying (PGPR) treatments + farm fertilization had significant influence on total chlorophyll (A&B) content in leaves. Application of Biovine + yeast with 50%of soil fertilizers was accompanied with improving leaf content of chlorophyll (A&b) in both seasons (1.819,1.900& 1.879,1.961) respectively while the application of Biovine with 100%or with 50% farm fertilizers and Biovine + yeast with 50% farm fertilizers

recorded the highest leaf Contents of chlorophyll B as compared with the other treatments (1.741, 1.851 & 1.820, 1.900 & 1.879, 1.961) respectively in both season respectively. These results are in general agreement with those reported by Tayeh (2003) on Washington Navel Oranges trees and El-sayed (2009) on Olive trees who mentioned that, application of Bio-fertilizer resulted in the highest chlorophyll (A&b) contents.

The general conclusion to be drawn from these results is that under biovine plus 100% farm fertilization, may promote the uptake of different nutrients, and may activate different physiological processes which reflect eventually, on the yield and fruit quality.

Table (14): Leaves Chlorphylle A&B of Manzanillo olive cultivar during 2008 and 2009 seasons, as affected by different bio-ferttilizers treatments.

Treatments	Chlorophyll A		Chlorophyll B	
	2008	2009	2008	2009
Cont (100%F.)	1.317 cd	1.428c	1.509 bc	1.620 b
100%F.+Biovine	1.377 c	1.490 c	1.741 a	1.851 a
50%F+Biovine	1.654 b	1.765 b	1.820 a	1.900 a
100%F.+Biovin+yeast	1.291 cd	1.400cd	1.338 d	1.450 c
50%F +Biovin +Yeast	1.819 a	1.900 a	1.879 a	1.961 a
100%F.+yeast	1.291 c d	1.400cd	1.547 b	1.642 b
50%F+Yeast	1.196 d	1.295 d	1.384 cd	1.497c

Means with the same letter are not different at 5 % level according to Duncan's multiple range test.

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تأثير التلقيح ببعض الريزوبكتريياالمنشطة للنموعلى إنتاجية أشجار الزيتون" صنف المنزانيللو "

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أجريت هذه الدراسة خلال موسمي نمو 2008 ، 2009 لدراسة تأثير التلقيح ببعض الريزوبكتريا المنشطة للنمو مع سماد المزرعة على الخصائص المورفولوجية والإنتاجية لأشجار الزيتون صنف المنزانللو النامية في أرض رملية وتحت نظام الري بالتنقيط في مزرعة خاصة.
وتمثلت المعاملات في : البيوفين مخصب حيوى يحتوى على بكتريا باسلس بوليمكسما والخميرة سلالة سكارومايسز سيرفيزا تم إضافتهما إلى 50% ، 100% من سماد المزرعة بمعدل 50 ملليمتر لكل شجرة خلال الفترة من أول فبراير حتى نهاية العقد.
وقد أوضحت النتائج أن كل من بيوفين، بيوفين + خميرة، الخميرة مع 100% من سماد المزرعة أدت الى زيادة طول ا لفرع. بينما إضافة الخميرة عملت على تأخير التزهير 5 أيام بالمقارنة بباقي المعاملات فى حين أن إضافة البيوفين مع 100% من سماد المزرعة أدي إلي زيادة كثافة عدد الأوراق، مساحة الورقة، عدد الأزهار على النورة، النسبة الجنسية، العقد، المحصول، نسبة الرطوبة في كلا الموسمين مقارنة بالأشجار الغير معاملة.
وأظهرت النتائج أن إضافة البيوفين إلي 50% من سماد المزرعة أدي إلي زيادة كل من طول، عرض ووزن الثمرة وكذلك طول، عرض ووزن البذرة، متوسط وزن اللحم، نسبة اللحم/ البذرة في كلا الموسمين وتحسين صفات الجودة فى الثمار القائمة.
ومن ناحية أخرى فإن إضافة البيوفين + الخميرة مع 100% من سماد المزرعة أدي إلي زيادة نسبة الزيت على أساس الوزن الجاف وكذلك محتوي الأوراق من النيتروجين،الفسفور،المنجنيز، الزنك، والحديد في كلا الموسمين ومن النتائج السابقة يمكن التوصية باستخدام البيوفين مع 100% من سماد المزرعة لزيادة المحصول،واستخدام بيوفين +خميرة مع 100%سماد المزرعة لزيادة نسبة الزيت فى الوزن الجاف وهذا يظهر دور البيوفين فى الالعملبات الفسيولوجية من تنشيط الجذور، وتنشيط عملية الامتصاص .

قام بتحكيم البحث

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