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Improving Growth and Productivity of "Sukkary" Mango Trees Grown in North Sinai Using Extracts of Some Brown Marine Algae, Yeasts and Effective Microorganisms 2- Productivity and fruit quality

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ABSTRACT

This experiment was carried out during 2012 and 2013 seasons on Sukkary mango trees grown in sandy soil under drip irrigation system at Baloza district, in North Sinai Governorate, Egypt. The aim of this research is to study the effect of spraying trees with algae extract at (0, 1 and 2%), yeast extract at (0, 0.2 and 0.3%) with or without effective microorganisms (EM) as a soil treatments on yield and fruit quality. The obtained results cleared that spraying with algae at 2% combined with yeast at 0.3% using EM was very effective to improving fruit set, yield, total soluble solids (T.S.S.), vitamin C, total sugar, non-reducing sugar and decrease fruit drop. On the other side, algae at 1% and 2% combined with yeast at 0.3% with EM decreased reduced acidity and reducing sugar.

Keywords: Mango, Algae, yeast, EM and fruit quality.

Introduction

Mango (Mangifera indica L.) the mango is one of the most important fruits in the tropics and subtropics. It is well known that many problems face and affect mango productivity i.e. poor fruit set and high fruit drop percentage at different fruit growth stages especially in the new reclaimed lands. Such trees grow under sandy soil conditions are poorly yielded with low fruit quality due to lacking their mineral constituents. Sucrose has a positive effect on fruit setting, yield and fruit quality Jaswant et al., (1994).

Algae extract have a positive effect on fruit setting, yield and fruit quality (Jaswant *et al*., 1994 and Hegab *et al.,* 2005). The extract of seaweeds has been reported to induce many positive changes in treated plants such as improved crop yield, increased nutrient uptake, resistance to frost and stress conditions, increased postharvest shelf life, increased seed germination and reduced incidence of fungal and insect attack (Metting *et al.,* 1990). Algae extract as a new bio fertilizer containing N, P, K, Ca, Mg, and S as well as Zn, Fe, Mn, Cu, Mo, and Co, some growth regulators, polyamines and vitamins applied to improve, yield and fruit quality in different orchard as well as vineyards (Abd El-Migeed *et al*, 2004; Eman, Abd El-Moniem & Abd-Allah, 2008, Elham, et *al*., 2010 and Spinelli *et al*., 2009). Fornes *et al*.(2002) reported that seaweed extract increased the yield of Clementine mandarin by 11%. Kulk (1995) and Adam (1999) reported the growth promotion in response to application of nitrogen fixer cyanobacterium (*Nostoc muscorn*) could be attributed to the nitrogenase as well as nitrate reductase activities of algae associated with the surface of plants, or the amino acids and peptides produced in algal filtrate and / or other compounds that stimulated growth of crop plants.

The dry bread yeast (*Saccharomyces cerevisiae*) is a kind of the used biofertilizers in soil fertilization or in foliar application to improving productivity of fruit crops as mentioned by Suriabananont (1992) and Stino *et al*. (2009). However, the various positive effects of applying active bread yeast as a newly used bio-fertilizer were attributed to its own component from different nutrients, higher percentage of proteins, massive amount of vitamin B and the natural plant growth hormone (Glick, 1995). Nowadays, Breed yeast (*Saccharomyces cervisiae*) as a natural bio-stimulant appeared to induce an astonished influence on growth of many crops, since it has various basic function, i.e. CO_2 production as well as formation of alcohol, acids and esters (Magoffin and Hoseney, 1974 and Martinez- Anoya *et al*., 1990).In addition, application of active bread yeast was very effective in releasing CO_2, which reflected on improving net photosynthesis (Ferguson *et al*., 1995; Idso *et al*., 1995 and Hashem *et al*., 2008).The possibility of using the active dry yeast for improving growth of fruit crops was mentioned by (Subba Rao, 2008 and Nijjar, 1985).

Active dry yeast at 0.1 % caused a striking improvement in yield and quality of the berries for Red roomy grapes (Ahmed *et a*l., 1997). In apple, dry yeast was very effective in improving yield and quality (Mansour, 1998). In Valencia orange trees, spraying active dry yeast at 0.25 to 0.75% on March and August was favorable in improving fruit set, number of fruits and yield (Hegab *et al*., 1997 and 2005). In Washington Navel orange, spraying yeast extract at 100 & 200 ml/L and some growth regulators were improving fruit set percentage and reducing June drop (Atawia & EL-Desouky, 1997). Ahmed and Ragab (2002) supported the beneficial effect of yeast on nutritional status of Picual olive trees. Elham *et al.,* (2010) showed that spraying Keitte mango trees

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with algae at 2% combined with yeast at 0.2% improving fruit set, yield as number of fruits or weight (kg) / tree and enhanced total soluble solids (T.S.S.). Moreover, it reduced fruit drop comparing with the control.

Effective microorganism was content lactic acid bacteria, yeasts, actinomycetes, photosynthetic bacteria and fungi. (Subba Rao2008). Effective Microorganisms, or EM is one of the most popular microbial technologies being used worldwide now and EM products have been on the market since 1983 in Japan. Added EM with the irrigation water to trees and spraying increase peach crop Abou Yuossef and Abou Hashem (2010). One claim made by its producers is that EM is very useful in farming because it can increase the yield and quality of crops when used as a supplement (Higa & Parr, 1994). Added EM to the soil improved yield, total sugars, TSS and decreased acidity and fruit drop as compared with the untreated of Le-Conte pear tree (Abd-El-Messeih *et al.*, 2005). In addition Jusoh., *et al* (2013) attempted to further examine EM composts and their quality compared to traditional compost and found that EM composts had a higher concentration of nitrogen, potassium, calcium, and iron. (Robertson & Vitousek, 2009; Leigh & Wyn Jones, 1984; Kabata-Pendias & Kabata, 1992). These findings show that the use of EM composts results in richer soils that can improve the quality and yield of crops. On the other hand, Jakubus *et al* (2012) results that effective microorganisms (EM) with organic materials can be added to the soil to stimulates the supply and release of nutrients in the soil.

Generally, bio-fertilization is very safe for human, animal and environment to get lower pollution and reduce soil salinity via decrease mineral fertilizers usage as well as saving fertilization cost.

This study aimed to improving growth and productivity of "Sukkary" mango trees using extracts of some brown marine algae, yeast and adding effective microorganisms to the soil

Materials And Methods

Therefore, this experiment was carried out during the two successive seasons of 2012 and 2013 on grafted mango trees "Sukkary cv" grown in poor sandy soil (Table 1) under drip irrigation system at Baloza district, in North Sinai Governorate, Egypt using extracts of some brown marine algae, yeast and adding effective microorganisms EM to the soil.

Table 1: Some physical and chemical properties of the experimental soil.

Particle size distribution% (%)			Texture soil	Ec ds/m^{1}	Total $CaCo_3$ %	pH	N %	Available nutrients (Cation)				Available nutrients (Anion)			
Sand	Silt	Clay						P(ppm)	K (meq / l)	Ca(meq / l) meg/l	Mg (meq / l) meg/l	CO3	HCO3 meg/l	Cl^-	SO^4
95	5	-	sandy	3.0	5.15	7.9	0.007	0.03	1.0	15.3	3.8	-	3.85	22.3	16.6

Algae extract formulation: Algae extract (oligo-x) obtained from (union for agricultural development) company having the following composition in (table 2).

Table 2: Chemical compositions of Algae extract (union for agricultural development)

Oligosaccharide %	algnic acid %	phytin	menthol %	natural growth regulators			minerals					
				Cytokinin %	indol acetic acid%	Pepsin %	potassium oxide %	phosphorus oxide%	N %	Zn %	Fe %	Mn %
3	5	0.003	0.001	0.001	0.0002	0.02	12	0.5	1	0.3	0.2	0.1

Bread yeast that applied in four rates (0.0, 0.2, 0.3 and 0.2% and sprayed alone or in combination with other treatments at the rate of 5L /tree. Has the chemical composition of shown in Table (3) according to Table (3) according to Nagodawithana(1991).

The selected trees were uniform in vigor as possible. Fertilization program and other agricultural practices were the same for all trees.

The active dry yeast spraying solution was prepared according to the method described by Attala et al. (2000). All trees were sprayed once at the first of March-May-July uses triton B at 0.1 % as a wetting agent.

The experiment was designed as spilt spilt design. Three replicates were used for each treatment and every replicate was represented by three trees with 2x3x3 factorial arrangement of treatments with the following factors and levels: main factor adding EM to soil (with or without), sub main dry yeasts (0% (spraying with water), 0.2% and 0.3%) and sub sub main alga (0% (spraying with water), 1% and 2%).

The following parameters were measured for both seasons:

1. Fruit set%= average no. of fruits per panicle ÷ average no. of perfect flowers per panicle x 100
2. Fruit drop% =total no. of setting fruits –no. of retained fruits) ÷ total no. of setting fruits x 100
3. The tree yield in (Kg) was recorded.
4. Number of fruits per tree was recorded at harvest time (first of August) for all treatments in both seasons.

5. Fruit quality: a sample of 10 ripe fruits of each tree was taken at the harvest time to be used for determining the physical and chemical properties i.e., The total soluble solids percentage (T.S.S.%) was measured by using a hand refractometer and the acidity % as citric acid content using fresh juice with titration against 0.1 Na OH. The total sugars %, reducing sugars %, non-reducing sugars% and content of vitamin C according to A.O.A.C (1985) were determined.

Table 3: Chemical composition of dry yeast

Protein	47%	Nucleic acids	8%
Carbohydrates	33%	Lipids	4%
Minerals	8%		
Approximate composition of vitamins (mg/g):			
Thiamine	6-100	Biotin	1.3
Riboflavin	35-50	Cholin	4000
Niacin	300-500	Folic acid	5-13
Pyridoxine HCl	28	Vit-B12	0.001
Pantothenate	70		
Approximate composition of minerals (mg/g):			
Na	0.12	Cu	8.00
Ca	0.75	Se	0.10
Fe	0.02	Mn	0.02
Mg	1.65	Cr	2.20
K	21.00	Ni	3.00
P	13.50	Va	0.04
S	3.90	Mo	0.40
Zn	0.17	Sn	3.00
Si	0.03	Li	0.17

Statistical analysis:

The data were subjected to analysis of variance and Duncan's multiple range tests was used to differentiate means as described by Duncan (1955).

Results and Discussion

Fruit set:

Results in Table (4) showed that fruit set percentage was significantly affected by all treatments in both studied seasons. However, adding EM to the soil increased fruit set percentage (4.55% and 4.68% in both seasons, respectively) compared with untreated. In addition, spraying extract of yeast at 0.3% gave the highest fruit set percentage (4.33% and 4.48% in both seasons, respectively). Furthermore, spraying extract with algae at 2% was the best fruit set percentage (4.41% in the first season and 4.52% in the second season) compared with control.

In addition, interaction between yeast at 0.3% with adding EM gave the highest fruit set percentage. Moreover, Interaction between algae at 2% using EM was the best to increase fruit set percentage than control in both seasons, respectively. On the other hand, interaction between alga at 2% and yeast at 0.3% affected in fruit set percentage positively in both seasons.

In addition, Interaction between algae at 2% and yeast at 0.3% using EM gave the highest value of fruit set percentage (5.67% and 5.27% in the in the first and second seasons, respectively).

Fruit drop:

Data in Table (5) showed that fruit drop percentage was significantly affected by all treatments in both studied seasons. Adding EM to the soil decreased fruit drop percentage in both seasons compared with untreated. In addition, spraying extract of yeast at 0.3% gave the lowest fruit drop percentage in both seasons. Furthermore, spraying extract of algae at 2% showed the reduction fruit drop percentage compared with control.

While, Interaction between yeast at 0.3% with adding EM to the soil gave the less fruit drop percentage (57.68 % in the first season and 57.05 % in the second season). However, Interaction between algae at 2% using EM was the best than control to decrease fruit drop percentage in first and second seasons. Moreover, Interaction between algae at 2% and yeast at 0.3% affected as a positive to decrease fruit drop percentage compared with control in both seasons.

In addition, the interaction between algae at 2% and yeast at 0.3% with EM gave the lowest fruit drop percentage in first season, while algae at 2% and yeast at 0.2% or 0.3% using EM there are no significant effect in second season. From the above results, it could be concluded that the presence of minerals, some growth regulators, protein, carbohydrates, vitamins, lactic acid bacteria, actinomycetes, photosynthetic bacteria and

fungi in yeast, algae and EM may have a positive effect on increasing fruit set and decreasing fruit drop. This may be due to the improving effect of such treatments on nutritional status of the trees, which reflected on increasing fruit set. In this respect, Kulk (1995) and Adam (1999) reported that the improvement of fruit set percentage could be explained as a result to increase pollen grains germination. The previous results are agreed with those obtained by Abd El-Wahab (2007) and Osthuyes (1993) who reported that spraying mango trees with algae and yeast extracts increased fruit set and reduced fruit drop. (Abd-El-Messeih *et al.,* 2005) says added EM to the soil decreased fruit drop as compared with the untreated Le- Conte pear tree. Anther study with Elham *et al.,* (2010) who recorded that spraying mango trees with algae at 2% combined with yeast at 0.2% improving fruit set and reduced fruit drop.

Yield as (Kg/ tree):

It could be noticed from Table (6) that all treatments significantly increased yield (kg/tree) than the control in both seasons. Adding EM to the soil increased yield weight in both seasons compared with untreated. In addition, yeast at 0.3% gave the highest yield weight in both seasons. Furthermore, algae at 2% were the best yield weight compared with control.

While, the interaction between yeast at 0.3% with adding EM gave the highest yield weight (42.11 kg in the first season and 46.22 kg in the second seasons respectively). Moreover, Interaction between algae at 2% using EM was the best yield weight than control in both seasons. Furthermore, interaction between algae at 2% and yeast at 0.3% gave the highest value of yield weight in both seasons.

In addition, interaction between EM, extract of yeast and algae cleared that spraying trees with 2% algae and yeast at 0.3% using EM gave the best yield weight (48.33 kg and 52.33 kg in the first and second season, respectively) in both season. The obtained results may confirm the previous work done by Fornes *et al.* (2002) and Abada (2002) who reported that yield of mango and orange were increased by algae and yeast extracts. Abou Yuossef and Abou Hashem, (2010) says added (EM) with the irrigation water to trees increase peach crop. (Abd-El-Messeih *et al.,* 2005) Added EM to the soil improved yield as compared with the untreated of Le- Conte pear tree. Elham *et al.,* (2010) who recorded that spraying Keitte mango trees with algae at 2% combined with yeast at 0.2% increased yield weight.

Number of fruits:

Data in Table (7) showed that that all treatments significantly increased number of fruits than the control in both seasons. However, adding EM to the soil increased number of fruits in both seasons compared with untreated. In addition, spraying extract of yeast at 0.3% gave the highest number of fruits in both seasons. Furthermore, spraying extract of algae at the 2% was the best number of fruits compared with control.

On the other hand, Interaction between EM and yeast show that spraying trees with yeast at 0.3% and with adding EM gave the highest number of fruits (127.52 in the first season and 137.87 in the second season respectively). Moreover, Interaction between algae using EM gave the highest number of fruits in both season but no significant differences between algae at 1% and 2% in the first one only. However, the interaction between algae at 2% and yeast at 0.3% gave the highest number of fruits compared with control in both seasons.

Furthermore, interaction between EM, extract of yeast and algae clear that spraying trees with 1%, 2% algae and yeast at 0.3% using EM gave the best number of fruits (140.57, 138.14) in the first season but spraying trees with 2% algae and yeast at 0.3% using EM gave the highest number of fruits in the second season (149.16). These results are in harmony with those obtained by (Robertson & Vitousek, 2009; Leigh & Wyn Jones, 1984; Kabata-Pendias & Kabata, 1992). These findings show that the use of EM composts results in richer soils that can improve the quality and yield of crops. Elham *et al.,* (2010) who recorded that spraying Keitte mango trees with algae at 2% combined with yeast at 0.2% increased number of fruits.

Total soluble solid (TSS):

Results presented in Table (8) indicated that total soluble solids percentage (T.S.S) in Sukarry mango fruits were significantly increased by different treatments compared with the control in the two seasons. However, T.S.S tended to increase gradually through increasing the concentration of algae or yeast in the spraying solution. Added EM to the soil increased total soluble solids in both seasons compared with untreated. In addition, spraying extract of yeast at 0.3% gave the highest total soluble solids (16.20% and 16.51%, respectively) in both seasons. Furthermore, spraying extract with algae at 2% was the best total soluble solids (16.29% and 16.78%, respectively) in both seasons.

Table 4: Effect of EM, extract of yeast, algae and interaction on fruit set of Sukkary mango during 2012 and 2013 seasons

Fruit set %																
A- Specific effect of EM , extract of yeast and algae																
EM				Extract of yeast						Extract of algae						
2012		2013		2012			2013			2012			2013			
without	with	without	with	Cont	0.2%	0.3%	Cont	0.2%	0.3%	Cont	1%	2%	Cont	1%	2%	
3.49 B	4.55 A	3.71 B	4.68 A	3.67 C	4.06 B	4.33 A	3.80 C	4.30 B	4.48 A	3.41 C	4.24B	4.41 A	3.63 C	4.41 B	4.52 A	
B-Interaction between EM and extract of yeast					C-Interaction between EM and extract of algae					D-Interaction between extract of yeast and algae						
EM	2012		2013		EM	2012		2013		yeast	2012			2013		
	without	with	without	with	algae	without	with	without	with	algae	Cont	0.2%	0.3%	Cont	0.2%	0.3%
yeast																
Cont.	3.30 F	4.04 C	3.44 F	4.17 C	Cont	3.10 E	3.72 C	3.24 E	4.02 C	Cont	2.98 H	3.54 G	3.72 F	3.02 G	3.84 F	4.04 E
0.2%	3.52 E	4.60 B	3.75 E	4.84 B	1%	3.64 D	4.84 B	3.87 D	4.94 B	1%	3.90 E	4.29 C	4.54 B	4.09 E	4.50 C	4.62 B
0.3%	3.64 D	5.03 A	3.93 D	5.03 A	2%	3.71 CD	5.10 A	4.00 C	5.08 A	2%	4.12 D	4.35 C	4.74 A	4.30 D	4.55 BC	4.78 A
E-Interaction between EM , extract of yeast and algae																
seasons	2012						2013									
yeast	Cont.		0.2%		0.3%		Cont.		0.2%		0.3%					
EM algae	without	with	without	with	without	with	without	with	without	with	without	With				
Cont.	2.96 l	3.00 l	3.07 l	4.00 g	3.26 k	4.17 f	3.03 l	3.01 l	3.27 k	4.41 f	3.43 j	4.65 e				
1%	3.38 j	4.42 e	3.72 h	4.86 c	3.83 h	5.24 b	3.55 j	4.63 e	3.97 h	5.03 c	4.08 h	5.16 b				
2%	3.54 i	4.70 d	3.77 h	4.93 c	3.82 h	5.67 a	3.73 i	4.88 d	4.02 h	5.09 bc	4.27 g	5.27 a				

Means having the same letter (s) in each Colum, row or interaction are not significantly different at 5% level.

Table 5: Effect of EM, extract of yeast, algae and interaction on fruit drop of Sukkary mango during 2012 and 2013 seasons

Fruit drop %																
A- Specific Effects of EM, extract of yeast and algae																
EM				Extract of yeast						Extract of algae						
2012		2013		2012			2013			2012			2013			
without	with	without	with	Cont	0.2%	0.3%	Cont	0.2%	0.3%	Cont	1%	2%	Cont	1%	2%	
63.97 A	59.47 B	65.80 A	58.91 B	62.74 A	61.03 B	59.89 C	64.05 A	61.96 B	61.06 C	63.56 A	60.58 B	59.62 C	65.77 A	61.15 B	60.15 C	
B-Interaction between EM and extract of yeast					C-Interaction between EM and extract of algae					D-Interaction between extract of yeast and algae						
EM	2012		2013		EM	2012		2013		yeast	2012			2013		
	without	with	without	with	algae	without	with	without	with	algae	Cont	0.2%	0.3%	Cont	0.2%	0.3%
yeast																
Cont.	64.71 A	60.77 D	66.67 A	61.43 D	Cont	65.23 A	61.91 D	67.28 A	64.25 C	Cont	65.62 A	62.83 B	62.25 BC	67.81 A	65.26 B	64.23 C
0.2%	64.11 B	58.96 E	65.67 B	58.26 E	1%	63.71 B	57.25 E	65.31 B	57.00 D	1%	62.68 C	60.18 E	59.57 E	63.12 D	60.39 EF	59.96 E
0.3%	63.11 C	57.68 F	65.08 C	57.05 F	2%	62.98 C	56.91 F	64.82 BC	55.49 E	2%	60.92 D	60.08 E	57.85 F	61.22 E	60.24 EF	59.01 F
E-Interaction between EM, extract of yeast and algae																
seasons	2012						2013									
yeast	Cont.		0.2%		0.3%		Cont.		0.2%		0.3%					
EM algae	without	with	without	with	without	with	without	with	without	with	without	With				
Cont.	65.80 a	65.43 a	65.06 ab	60.59 ef	64.82 ab	59.67 fg	68.00 a	67.62 ab	67.14 ab	63.38 g	66.71 abc	61.75 h				
1%	64.29 bc	59.08 g	63.66 cd	56.70 i	63.167 d	55.98 i	66.33 bcd	59.90 i	65.00 def	55.78 j	64.59 efg	55.33 j				
2%	64.03 bcd	57.81 h	63.56 cd	56.60 i	61.33 e	54.37 j	65.67 cde	56.76 j	64.86 fe	55.62 j	63.94 fg	54.07 k				

Means having the same letter (s) in each Colum, row or interaction are not significantly different at 5% level.

On the other hand, Interaction between yeast at 0.3% with adding EM to the soil gave the highest total soluble solids. In addition, Interaction between spraying trees at 2% algae using EM was the better total soluble solids than control in both seasons. While, interaction between extract of algae at 2% and yeast at 0.3% gave the highest total soluble solids compared with control in both seasons.

Furthermore, interaction between spraying trees with 2% algae and yeast at 0.3% using EM gave the best total soluble solids (19.27 % and 19.55%, respectively) in both seasons. These results are in harmony with those obtained by Gobara *et al.* (2002) and Spinelli *et al* (2009). Added EM to the soil improved TSS as compared with the untreated of Le- Conte pear tree (Abd-El-Messeih *et al*., 2005). Moreover, Elham *et al.,* (2010) who recorded that spraying Keitte mango trees with algae at 2% combined with yeast at 0.2% enhanced total soluble solids (T.S.S.).

Table 6: Effect of EM, extract of yeast, algae and interaction on yield of Sukkary mango during 2012 and 2013 seasons

Yield (kg)																
A- Specific Effect of EM , extract of yeast and algae																
EM				Extract of yeast						Extract of algae						
2012		2013		2012			2013			2012			2013			
without	with	without	with	Cont	0.2%	0.3%	Cont	0.2%	0.3%	Cont	1%	2%	Cont	1%	2%	
20.26 B	37.04 A	22.93 B	40.85 A	24.11 C	29.50 B	32.33 A	26.61 C	33.06 B	36.00 A	20.94 C	31.61 B	33.39 A	23.50 C	34.94 B	37.22 A	
B-Interaction between EM and extract of yeast					C-Interaction between EM and extract of algae					D-Interaction between extract of yeast and algae						
EM	2012		2013		EM	2012		2013		yeast	2012			2013		
	without	with	without	with	algae	without	with	without	with	algae	Cont	0.2%	0.3%	Cont	0.2%	0.3%
yeast																
Cont.	17.67 F	30.56 C	19.44 F	33.78 C	Cont	16.22 E	25.67 C	17.56 E	29.44 C	Cont	15.17 G	22.67 F	25.00 F	16.17 H	26.00 G	28.33 F
0.2%	20.57 E	38.44 B	23.56 E	42.56 B	1%	21.56 D	41.67 B	25.67 D	45.22 B	1%	27.67 D	35.50 C	34.67 B	30.50 E	36.00 C	38.33 B
0.3%	22.56 D	42.11 A	25.78 D	46.22 A	2%	23.00 D	43.78 A	26.56 D	47.89 A	2%	29.50 D	33.33 BC	37.33 A	33.17 D	37.17 BC	41.33 A
E-Interaction between EM, extract of yeast and algae																
seasons	2012						2013									
yeast	Cont.		0.2%		0.3%		Cont.		0.2%		0.3%					
EM algae	without	with	without	with	without	With	without	with	without	With	without	With				
Cont.	14.33 l	16.00 kl	16.67 jkl	28.67 f	17.67 jkk	32.33 e	15.33 l	17.00 kl	18.00 jkl	34.00 f	19.33 jk	37.33 e				
1%	18.67 ij	36.67 d	22.33 gh	42.67 c	23.67 g	45.67 b	20.33 ij	40.67 d	26.00 h	46.00 bc	27.67 gh	49.00 b				
2%	20.00 hi	39.33 d	22.67 g	43.00 bc	26.33 f	48.33 a	22.67 i	43.67 c	26.67 h	47.67 b	30.33 g	52.33 a				

Table 7: Effect of EM, extract of yeast, algae and interaction on no. of fruits of Sukkary mango during 2012 and 2013 seasons

Number of fruits															
A- Specific effect of EM, extract of yeast and algae															
EM				Extract of yeast						Extract of algae					
2012		2013		2012			2013			2012			2013		
without	with	without	with	Cont	0.2%	0.3%	Cont	0.2%	0.3%	Cont	1%	2%	Cont	1%	2%
86.96 B	121.79 A	88.10 B	127.38 A	97.02 C	105.46 B	110.64 A	97.29 C	111.04 B	116.19 A	90.77 C	109.85 B	112.50 A	91.24 C	114.18 B	119.11 A

B-Interaction between EM and extract of yeast					C-Interaction between EM and extract of algae					D-Interaction between extract of yeast and algae						
EM	2012		2013		EM	2012		2013		yeast	2012			2013		
yeast	without	with	without	with	algae	without	with	without	with	algae	Cont	0.2%	0.3%	Cont	0.2%	0.3%
Cont.	83.22 F	110.85 C	81.82 E	112.76 C	Cont	81.34 D	100.20 B	78.18 E	104.29 C	Cont	83.19 F	91.81 E	97.36 D	76.98 F	95.98 E	100.75 D
0.2%	86.96 E	124.00 B	90.57 D	131.51 B	1%	88.47 C	131.23 A	92.15 D	136.21 B	1%	102.32 C	111.87 B	115.36 B	104.14 D	117.53 B	120.87 B
0.3%	90.68 D	127.52 A	94.51 D	137.87 A	2%	91.05 C	133.9 4A	96.57 D	141.64 A	2%	105.56 C	112.74 B	116.19 A	110.75 C	119.61 B	126.96 A

E-Interaction between EM , extract of yeast and algae												
seasons	2012						2013					
yeast	Cont.		0.2%		0.3%		Cont.		0.2%		0.3%	
EM / algae	without	with	without	with	without	with	without	with	without	with	without	With
Cont.	82.04 h	84.35 h	80.36 h	108.18 e	81.63 h	113.08 d	76.74 i	77.22 i	77.97 i	113.99 e	79.85 i	121.66 d
1%	82.73 h	121.87 c	90.06 g	138.76 b	92.58 g	138.14 ab	81.12 i	127.16 c	96.38 g	138.67 bc	98.94 fg	142.80 b
2%	84.86 h	126.26 c	90.48 g	140.00 b	97.35 f	140.57 a	87.60 h	133.39 c	97.36 g	141.87 b	104.75 f	149.16 a

Means having the same letter (s) in each Colum, row or interaction are not significantly different at 5% level.

Acidity:

Data in Table (9) showed that acidity percentage in Sukarry mango fruits were significantly decreased by different treatments compared with the control in the two seasons. However, added EM to the soil decreased acidity percentage in both seasons compared with untreated. In addition, yeast at 0.3% gave the lowest acidity percentage in both seasons. Furthermore, spraying extract of algae at the 2% was the best to decrease acidity percentage compared with control.

Table 8: Effect of EM, extract of yeast, algae and interaction on total soluble solids of Sukkary mango during 2012 and 2013 seasons

Total soluble solids %															
A- Specific effects of EM, extract of yeast and algae															
EM				Extract of yeast						Extract of algae					
2012		2013		2012			2013			2012			2013		
without	with	without	with	Cont	0.2%	0.3%	Cont	0.2%	0.3%	Cont	1%	2%	Cont	1%	2%
14.05 B	16.52 A	14.34 B	17.04 A	14.16 C	15.49 B	16.20 A	14.66 C	15.90 B	16.51 A	13.71 C	15.85 B	16.29 A	14.08 B	16.20 A	16.78 A

B-Interactions between EM and extract of yeast					C-Interaction between EM and extract of algae					D-Interaction between extract of yeast and algae						
EM	2012		2013		EM	2012		2013		yeast	2012			2013		
yeast	without	with	Without	with	algae	without	with	without	with	algae	Cont	0.2%	0.3%	Cont	0.2%	0.3%
Cont.	13.34 F	14.98 C	13.64 E	15.68 C	Cont	12.73 D	14.69 C	13.15 D	15.02 C	Cont	12.00 G	14.48 F	14.65 D	12.50 F	14.70 E	15.05 DE
0.2%	14.22 E	16.77 B	14.49 D	17.31 B	1%	14.59 C	17.11 B	14.76 C	17.65 B	1%	15.18 E	15.79 D	16.58 B	15.47 D	16.23 C	16.92 B
0.3%	14.60 D	17.80 A	14.88 D	18.14 A	2%	14.84 C	17.75 A	15.11 C	18.46 A	2%	15.30 E	16.21 C	17.37 A	16.02 C	16.77 B	17.56 A

E-Interaction between EM, extract of yeast and algae												
seasons	2012						2013					
yeast	Cont.		0.2%		0.3%		Cont.		0.2%		0.3%	
EM / algae	without	with	without	with	without	With	without	with	without	With	without	With
Cont.	11.67 m	12.33l	13.20 k	15.77 fg	13.33 k	15.98 ef	12.00 m	13.00 l	13.54 kl	15.87 fg	13.90 k	16.20 ef
1%	14.17 j	16.20e f	14.60 ij	16.97 d	15.00 hi	18.17 b	14.27 jk	16.67 de	14.83 hij	17.63 c	15.17 ghi	18.67 b
2%	14.20 j	16.40 e	14.85 i	17.57 c	15.47 gh	19.27 a	14.67 ij	17.38 cd	15.09 ghi	18.44 b	15.57 fgh	19.55 a

Means having the same letter (s) in each Colum, row or interaction are not significantly different at 5% level.

Table 9: Effect of EM, extract of yeast, algae and interaction on acidity of Sukkary mango during 2012 and 2013 seasons

Acidity %															
A- Specific effect of EM , extract of yeast and algae															
EM				Extract of yeast						Extract of algae					
2012		2013		2012			2013			2012			2013		
without	with	without	with	Cont	0.2%	0.3%	Cont	0.2%	0.3%	Cont	1%	2%	Cont	1%	2%
0.33 A	0.27 B	0.34 A	0.29 B	0.32 A	0.30 B	0.29 C	0.33 A	0.31 B	0.30 C	0.34 A	0.29 B	0.28 B	0.35 A	0.31 B	0.30 B

B-Interaction between EM and extract of yeast					C-Interaction between EM and extract of algae					D-Interaction between extract of yeast and algae						
EM	2012		2013		EM	2012		2013		yeast	2012			2013		
yeast	without	with	without	with	algae	without	with	without	with	algae	Cont	0.2%	0.3%	Cont	0.2%	0.3%
Cont.	0.35 A	0.30 C	0.35 A	0.32 C	Cont	0.35 A	0.32 B	0.36 A	0.33 B	Cont	0.36 A	0.33 B	0.32 BC	0.37 A	0.34 B	0.33 BC
0.2%	0.33 B	0.27 D	0.34 B	0.29 D	1%	0.33 B	0.26 C	0.33 B	0.28 C	1%	0.31 CD	0.29 E	0.28 EF	0.32 CD	0.30 FG	0.30 FG
0.3%	0.32 B	0.25 E	0.34 B	0.27 E	2%	0.32 B	0.25 C	0.33 B	0.27 D	2%	0.30 D	0.28 EF	0.27 F	0.31 DE	0.30 FG	0.29 G

E-Interaction between EM, extract of yeast and algae												
seasons	2012						2013					
yeast	Cont.		0.2%		0.3%		Cont.		0.2%		0.3%	
EM / algae	without	with	without	with	without	with	without	with	without	with	without	with
Cont.	0.37 a	0.35 ab	0.34 bc	0.30 ef	0.34 bc	0.29 fg	0.38 a	0.36 bc	0.36 bc	0.32 ef	0.35 bc	0.31 fg
1%	0.34 bc	0.28 gh	0.32 de	0.25 i	0.31 de	0.24 ij	0.34 bcd	0.30 gh	0.33 de	0.27 ij	0.33 de	0.26 jk
2%	0.33 cd	0.27 h	0.31 de	0.24 ij	0.35 ab	0.23 j	0.34 bcd	0.29 hi	0.33 de	0.27 ij	0.33 de	0.25 k

Means having the same letter (s) in each Colum, row or interaction are not significantly different at 5% level.

While, Interaction between spraying trees with yeast at 0.3% with adding EM to the soil gave the less acidity percentage (0.35 % in first season and 0.35 % in second seasons). In addition, Interaction between

spraying trees at 2% with algae using EM was better than control to decrease acidity percentage in first and second seasons (0.25% and 0.27%), respectively. Moreover, Interaction between algae at 2% and yeast at 0.3% affected as a positive to decrease acidity percentage compared with control in both seasons.

On the other hand, interaction between spraying trees with the algae at 2% or 3% and yeast at 0.3% with EM gave the lowest acidity percentage in first and second seasons. The previous results are agreed with those obtained by (Abd-El-Messeih *et al*., 2005) indicated that added EM to the soil improved decreased acidity as compared with the untreated of Le-Conte pear tree. In addition,(Elham *et al.,* (2010) who recorded that spraying Keitte mango trees with algae at 2% combined with yeast at 0.2% decrease acidity percentage.

Vitamin C:

Results presented in Table (10) indicated that vitamin C in Sukarry mango fruits were significantly increased by different treatments compared with the control in the two seasons. Moreover, vitamin C was increase gradually through increasing the concentration of algae or yeast in the spraying solution. However, added EM to the soil increased vitamin C in both seasons compared with untreated. In addition, spraying extract of yeast at 0.3% gave the highest vitamin C in both seasons. Furthermore, spraying extract of algae at the 2% was the best vitamin C.

Moreover, Interaction between spraying trees with yeast at 0.3% and adding EM to the soil gave the highest vitamin C. On the other hand, Interaction between algae at 2% using EM was the best vitamin C in both seasons. In addition, interaction between algae at 2% and yeast at 0.3% gave the highest vitamin C in both seasons.

Furthermore, interaction between spraying trees with 2% algae and yeast at 0.3% using EM gave the best vitamin C (34.00% and 34.66%) in both seasons, respectively. This result may be due to enhanced level of leaf chlorophyll in the treated mango resulted in increased rate of photosynthesis and accumulation of carbohydrate reserves in the mango trees. These results are in harmony with those obtained by Elham *et al.,* (2010) who recorded that spraying Keitte mango trees with algae at 2% combined with yeast at 0.2% increased vitamin C.

Total sugar %:

Results presented in Table (11) indicated that total sugar in Sukarry mango fruits were significantly increased by different treatments compared with the control in the two seasons. Added EM to the soil increased total sugar in both seasons compared with untreated. In addition, spraying extract of yeast at 0.3% gave the highest total sugar in both seasons. Furthermore, spraying extract of algae at 2% was the best total sugar.

While, Interaction between EM and yeast show that spraying trees with yeast at 0.3% and with adding EM to the soil gave the highest total sugar (15.91% in the first season and 16.68% in the second season) as compared with control (9.89% and12.04% in both seasons respectively).On the other hand, Interaction between spraying trees at 2% algae using EM was the better total sugar than control in both seasons. In addition, interaction between algae at 2% and yeast at 0.3% gave the highest total sugar in both seasons.

Moreover, interaction between spraying trees with 2% algae and yeast at 0.3% using EM gave the better total sugar (17.29% and 17.74%) in both season, respectively as compared with control (8.35% and10.79% in both seasons). These results are in harmony with those obtained by Gobara *et al.* (2002) who recorded that the increases in the total sugar contents have been reported in Red Roomy grapevines with foliar application of yeast extract. Moreover, a similar results obtained in apple by Spinelli *et al.,* (2009). Added EM to the soil improved total sugars as compared with the untreated of Le- conte pear trees (Abd-El-Messeih *et al.,* 2005). Moreover, Elham *et al.,* (2010) who recorded that spraying Keitte mango trees with algae at 2% combined with yeast at 0.2% increased total sugar.

Reducing sugar %:

Data in Table (12) showed that added EM to the soil decreased reducing sugar in both seasons compared with untreated. In addition, spraying extract of yeast at 0.3% gave the lowest reducing sugar in both seasons. Furthermore, spraying extract of algae at the 1% and 2% was the best to decrease reducing sugar.

While, Interactions between EM and yeast show that there was no significant effect with spraying trees with yeast at 0.2% and 0.3% with adding EM in the first season. Moreover, spraying trees with yeast 0.3% with adding EM gave the less reducing sugar in the second season. In addition, Interaction between EM and algae indicated that there was no significant effect with spraying trees with 1% and 2% with algae using EM in the first season. While, spraying trees with 2% with algae using EM was the best to decrease reducing sugar in the

second one. On the other hand, Interaction between algae at 1% and 2% with yeast at 0.3% affected as a positive to decrease reducing sugar compared with control in both seasons.

In addition, interaction between spraying trees with the algae at 2% and yeast at 0.3% with EM gave the lowest reducing sugar (0.91% and 0.96% in both seasons, respectively).

Non Reducing sugar %:

Results presented in Table (13) indicated that non reducing sugar percentage (T.S.S) in Sukarry mango fruits were significantly increased by different treatments compared with the control in the two seasons. However, non reducing sugar to increase gradually through increasing the concentration o f algae or yeast in the spraying solution. Added EM to the soil increased non reducing sugar in both seasons compared with untreated. In addition, spraying extract of yeast at 0.3% gave the highest non reducing sugar (12.03% and 13.55% in both seasons, respectively). Furthermore, spraying extract of algae at 2% was the best non reducing sugar compared with control.

While, Interaction between spraying trees with yeast at 0.3% and with adding EM to the soil gave the highest non reducing sugar. Moreover, Interaction between spraying trees with algae at 2% using EM was the better non reducing sugar than control in both seasons. On the other hand, interaction between extract of yeast and algae results presented non reducing sugar affected as positive effect. Algae at 2% and yeast at 0.3% gave the higher non reducing sugar than the control in both seasons.

Furthermore, interaction between spraying trees with 2% algae and yeast at 0.3% using EM gave the best non reducing sugar (16.38% and16.78% in both seasons, respectively).

Table 10: Effect of EM, extract of yeast, algae and interaction on vitamin C of Sukkary mango during 2012 and 2013 seasons

Vitamin C mg/100g pulp																
A- Specific effect of EM, extract of yeast and algae																
EM				Extract of yeast						Extract of algae						
2012		2013		2012			2013			2012			2013			
without	with	without	with	Cont	0.2%	0.3%	Cont	0.2%	0.3%	Cont	1%	2%	Cont	1%	2%	
24.60 B	29.52 A	25.58 B	30.29 A	24.97 C	27.55 B	28.70 A	25.96 C	28.44 B	29.14 A	23.56 C	28.43 B	29.23 A	24.86 C	29.10 B	29.85 A	
B-Interaction between EM and extract of yeast					C-Interaction between EM and extract of algae					D-Interaction between extract of yeast and algae						
EM	2012		2013		EM	2012		2013		yeasts	2012			2013		
yeast	without	with	without	with	algae	without	with	without	with	algae	Cont	0.2%	0.3%	Cont	0.2%	0.3%
Cont.	23.15 F	26.79 C	24.08 F	27.85 C	Cont	21.60 E	25.52 D	22.82 E	26.90 CD	Cont	20.34 H	24.61 G	25.72 F	21.72 H	26.11 C	26.76 F
0.2%	24.86 E	30.23 B	26.00 E	30.87 B	1%	25.85 D	31.01 B	26.74 D	31.46 B	1%	26.74 E	28.79 G	29.76 B	27.66 E	29.47 C	30.18 B
0.3%	25.85 D	31.54 A	26.68 D	32.17 A	2%	26.41 C	32.04 A	27.19 C	32.52 A	2%	27.83 D	29.25 BC	30.60 A	28.51 D	29.72 BC	31.33 A
E-Interaction between EM, extract of yeast and algae																
seasons	2012						2013									
yeast	Cont.		0.2%		0.3%		Cont.		0.2%		0.3%					
EM / algae	without	with	without	with	without	with	without	with	Without	With	without	With				
Cont.	20.01 m	20.67 m	21.67 l	27.55 fg	23.11 k	28.33 f	21.00 l	22.45 k	23.25 j	28.97 e	24.22 i	29.29 e				
1%	24.11 j	29.37 e	26.21 h	31.37 c	27.23 g	31.30 b	25.11 h	30.21 d	27.31 f	31.63 c	27.81 f	32.55 b				
2%	25.33 i	30.33 d	26.71 gh	31.78 bc	27.02 g	34.00 a	26.12 g	31.88 d	27.44 f	32.01 bc	28.00 f	34.66 a				

Means having the same letter (s) in each Colum, row or interaction are not significantly different at 5% level.

Table 11: Effect of EM, extract of yeast, algae and interaction on total sugar of Sukkary mango during 2012 and 2013 seasons

Total sugar%																
A- Specific effect of EM, extract of yeast and algae																
EM				Extract of yeast						Extract of algae						
2012		2013		2012			2013			2012			2013			
without	with	without	with	Cont	0.2%	0.3%	Cont	0.2%	0.3%	Cont	1%	2%	Cont	1%	2%	
10.82 B	14.51 A	12.89 B	15.72 A	11.32 C	12.84 B	13.83 A	13.17 C	14.52 B	15.21 A	10.66 C	13.32 B	14.02 A	12.63 C	14.89 B	15.39 A	
B-Interaction between EM and extract of yeast					C-Interaction between EM and extract of algae					D-Interaction between extract of yeast and algae						
EM	2012		2013		EM	2012		2013		yeast	2012			2013		
yeasts	without	with	without	with	algae	without	with	without	with	algae	Cont	0.2%	0.3%	Cont	0.2%	0.3%
Cont.	9.89 F	12.73 C	12.04 F	14.30 C	Cont	9.21 E	12.10 C	11.47 E	13.79 C	Cont	8.60 H	11.40 G	11.97 F	10.94 I	13.28 H	13.68 G
0.2%	10.83 E	14.87 B	12.88 E	16.16 B	1%	11.28 D	15.34 B	13.30 D	16.47 B	1%	12.37 E	13.18 D	14.40 B	14.11 F	14.88 D	15.69 B
0.3%	11.75 D	15.91 A	13.74 D	16.68 A	2%	11.97 C	16.06 A	13.89 C	16.88 A	2%	12.98 D	13.96 C	15.13 A	14.46 E	15.41 C	16.28 A
E-Interaction between EM, extract of yeast and algae																
Seasons	2012						2013									
yeast	Cont.		0.2%		0.3%		Cont.		0.2%		0.3%					
Em / algae	without	with	without	with	without	With	without	with	without	With	without	With				
Cont.	8.35 p	8.85 o	9.33 n	13.48 g	9.97 m	13.97 f	10.79 n	11.07 m	11.51 l	15.04 ef	12.10 k	15.25 e				
1%	10.33 l	14.40 e	11.18 k	15.18 d	12.32 i	16.17 b	12.43 j	15.79 d	13.14 i	16.60 c	14.33 g	17.04 b				
2%	10.99 k	14.96 d	11.96 j	15.95 c	12.96 h	17.29 a	12.89 i	16.04 d	13.97 h	16.85 bc	14.81 f	17.74 a				

Means having the same letter (s) in each Colum, row or interaction are not significantly different at 5% level.

The increase in fruit quality content that clearly obvious from the previous results could be due to the effective components of algae and yeast such as major and minor elements, growth regulator, Cytokinins content, and the high content of vitamin B5 and minerals. Moreover, yeast composition might be playing a considerable role in orientation and translocation of metabolites from leaves to the productive organs. However, its enhanced cell division, metabolism and other biological reactions, in addition to the activation effect of these

components on photosynthesis and promoting protoplasm formation including RNA and DNA that important for cell division and it play a role in the synthesis of protein, and nucleic acid**.** Moreover, algae extract as a new bio fertilizer containing N, P, K, Ca, Mg, and S as well as Zn, Fe, Mn, Cu, Mo, and Co, some growth regulators, polyamines and vitamins is applied to improve yield in different orchard as well as vineyards. In addition, effective microorganism (EM) that contains lactic acid bacteria, yeasts, actinomycetes, photosynthetic bacteria and fungi play the same role in improving fruiting and fruit quality. These idea goes in parallel with those of Adnan Yaqup Yousif (2011), Fagiria (1997), Natio *et al*, (1981), (Abd El-Migeed *et al*, (2004), Eman Abd El-Moniem & Abd-Allah, (2008), Elham, *et al*., (2010), Subba Rao (2008), Gobara *et al.* (2002) and Spinelli *et al* (2009).

Table 12: Effect of EM, extract of yeast, algae and interaction on reducing sugar of Sukkary mango during 2012 and 2013 seasons

Reducing sugar %																
A- Specific effect of EM, extract of yeast and algae																
EM				Extract of yeast						Extract of algae						
2012		2013		2012			2013			2012			2013			
without	with	without	with	Cont	0.2%	0.3%	Cont	0.2%	0.3%	Cont	1%	2%	Cont	1%	2%	
2.62 A	2.01 B	2.61 A	1.79 B	3.16 A	1.99 B	1.80 B	2.99 A	1.94 B	1.66 C	3.57 A	1.67 B	1.72 B	3.34 A	1.68 B	1.59 B	
B-Interaction between EM and extract of yeast				C-Interaction between EM and extract of algae						D-Interaction between extract of yeast and algae						
EM	2012		2013		EM	2012		2013		yeast	2012			2013		
yeast	without	with	without	with	algae	without	with	without	with	algae	Cont	0.2%	0.3%	Cont	0.2%	0.3%
Cont.	3.27 A	3.04 A	3.42 A	2.56 B	Cont	4.10 A	3.03 B	4.14 A	2.53 B	Cont	5.37 A	2.84 B	2.49 C	5.34 A	2.46 B	2.22 BC
0.2%	2.47 B	1.52 C	2.32 BC	1.57 D	1%	1.77 D	1.56 E	1.91 C	1.44 DE	1%	2.02 D	1.47 EF	1.51 EF	2.02 BCD	1.57 DEF	1.45 EF
0.3%	2.13 B	1.47 C	2.09 C	1.24 E	2%	2.00 C	1.43 E	1.78 CD	1.39 F	2%	2.09 D	1.67 E	1.40 F	1.61 DEF	1.81 CDE	1.33 F

E-Interaction between EM , extract of yeast and algae													
seasons	2012						2013						
yeast	Cont.		0.2%		0.3%		Cont.		0.2%		0.3%		
EM / algae	Without	with	without	with	without	with	without	with	without	With	without	with	
Cont.	5.45 a	5.28 a	3.89 b	1.80 efgh	2.97 c	2.02 de	5.81 a	4.86 b	3.50 c	1.41 hi	3.10 d	1.33 i	
1%	2.11 de	1.93 def	1.65 fgh	1.29 i	1.54 ghi	1.47 hi	2.51 e	1.53 ghi	1.74 fg	1.39 hi	1.48 ghi	1.41 hi	
2%	2.25 d	1.92 def	1.86 efg	1.47 hi	1.89 efg	0.91 j	1.93 f	1.30 i	1.71 fgh	1.91 f	1.70 fgh	0.96 j	

Means having the same letter (s) in each Colum, row or interaction are not significantly different at 5% level.

Table 13: Effect of EM, extract of yeast, algae and interaction on non reducing sugar of Sukkary mango during 2012 and 2013 seasons

Non reducing sugar%																
A- Specific effect of EM, extract of yeast and algae																
EM				Extract of yeast						Extract of algae						
2012		2013		2012			2013			2012			2013			
Without	with	without	with	Cont	0.2%	0.3%	Cont	0.2%	0.3%	Cont	1%	2%	Cont	1%	2%	
8.20 B	12.50 A	10.28 B	13.93 A	8.16 C	10.85 B	12.03 A	10.18 C	12.58 B	13.55 A	7.09 C	11.65 B	12.30 A	9.29 C	13.21 B	13.80 A	
B-Interaction between EM and extract of yeast				C-Interaction between EM and extract of algae						D-Interaction between extract of yeast and algae						
EM	2012		2013		EM	2012		2013		yeast	2012			2013		
yeast	without	with	without	with	algae	without	with	without	with	algae	Cont	0.2%	0.3%	Cont	0.2%	0.3%
Cont.	6.62 E	9.69 C	8.62 E	11.74 C	Cont	5.11 F	9.07 E	7.33 E	11.26 D	Cont	3.23 I	8.56 H	9.48 G	5.60 H	10.82 G	11.46 F
0.2%	8.36 D	13.35 B	10.56 D	14.59 B	1%	9.51 D	13.78 B	11.39 D	15.03 B	1%	10.35 F	11.71 D	12.89 B	12.09 E	13.31 CD	14.24 B
0.3%	9.62 C	14.44 A	11.65 C	15.44 A	2%	9.97 C	14.63 A	12.11 C	15.49 A	2%	10.89 E	12.29 C	13.73 A	12.85 D	13.60 C	14.95 A

E-Interaction between EM , extract of yeast and algae													
seasons	2012						2013						
yeast	Cont.		0.2%		0.3%		Cont.		0.2%		0.3%		
EM / algae	without	with	without	with	without	with	without	with	without	With	without	With	
Cont.	2.90 o	3.57 n	5.44 m	11.68 f	7.00 l	11.95 f	4.98 n	6.22 m	8.01 l	13.63 ef	9.00 k	13.92 e	
1%	8.22 k	12.47 e	9.53 i	13.89 c	10.78 g	14.70 b	9.92 j	14.26 de	11.40 i	15.21 bc	12.85 gh	15.63 b	
2%	8.74 j	13.04 d	10.10 h	14.48 b	11.07 g	16.38 a	10.96 i	14.74 cd	12.26 h	14.94 bcd	13.11 fg	16.78 a	

Means having the same letter (s) in each Colum, row or interaction are not significantly different at 5% level.

References

A.O.A.C., 1985. Official methods of analysis. Association of Official Agricultural Chemists,14th ed: Benjamin Franklin station Washington, DC, USA, pp: 490-510.

Abada, M.A., 2002. Effect of yeast and some micronutrient on the yield and quality of Red Roomy grapevines. M. Sc., Thesis Fac. of Agric., Minia Univ., Egypt.

Abd El-Wahab, A.M., 2007. Effect of some sodium azide and algae extract treatments on vegetative growth, yield and berries quality of early superior grapevine cv. M. Sc. Thesis Fac. Of Agric., Minia Univ., Egypt.

Abd-El-Messeih, W.M., Amal M El-Seginy and H. Kabeel, 2005. Effect of the Em Biostimulant on Growth and Fruiting of Le Conte Pear Trees in Newly Reclaimed Areas. Alex. Sci. Exchange Journal, 26(2).

Abd El-Migeed, A.A., A.B. El-Sayed and H.S. Hassan, 2004. Growth enhancement of olive transplants by broken cells of fresh green algae as soil application. Minufia J. Agric. Res., 29(3): 723-737.

Abou Yuossef, M.F. and A. Abou Hashem, 2010. Effect of the interaction between effective microorganisms and ash refuse on productivity of sandy soil. Egypt. J. of Appl. Sci., 25(2A): 74-88.

Adam, M.S., 1999. The promotive effect of Cyanobacterium (*Nostoc muscorum*) on the growth of some crop plants. Acta Microbiologica Polonica., 48(2): 163-171.

Ahmed, F.F. and M.M. Ragab, 2002. A new trial to stimulate growth and nutritional status of Picual olive transplants. The First International Conf. on olive cultivation, protection and processing, 25-27 Sept. El- Arish, Egypt, pp: 19-35.

Atawia, A.A.R. and S.A. EL-Desouky, 1997. Trials for improving fruit set, yield and fruit quality of Washington navel orange by application of some growth regulators and yeast extract as a natural source of phytohormones. Annals of Agric. Sc. Moshtohor., 35(3): 1613-1632.

Attala, E.S., A.M. El-Seginy and G.I. Eliwa, 2000. Response of " Le- Conte" pear trees to foliar applications with active Dry Yeasts. J. Agric. Sci. Mansoura Univ., 25(12): 7835-7841.

Duncan, D.B., 1955. Multiple range and multiple F Test.Biometrics, 11: 1-42.

Effect of different chemicals on yield and fruit quality of "Le Cont" pear. Acta. Hort., 367: 210-213.

Elham, Z., Abd El-Motty. Mohamed F.M. Shahin, Mohamed El-Shiekh and Mahmoud M.M. Abd-El- Migeed, 2010. Effect of algae extract and yeast application on growth, nutritional status, yield and fruit quality of Keitte mango trees Agric. Biol. J. N. Am. 1(3): 421-429.

Eman, A., Abd El-Moniem and A.S.E. Abd-Allah, 2008. Effect of green algae cells extract as foliar spray on vegetative growth, yield and berries quality of superior grapevines. Am. Euras. J. Agric. and Environ. Sci., 4(4): 427-433.

Ferguson, J.J., W.T. Aving, L.H. Allen and K.E. Koch, 1995. Growth of Co2 Enriehed sour orange seedlings treated with gibberellic acid and cytokinins. Proc. Florida-State Hort. Soc., 99: 37-39.

Fornes, F., M. Sanchez and J.L. Guardiola, 2002. Effect of a seaweed extract on the productivity of " de Nules" Clementine Mandarin and Navelina orange. Botanica Marina., 45(5): 487-489.

Glick, B.R., 1995. The enhancement of plant growth by free living bacteria. Cand. J. Microbiology, 41: 109-117.

Gobara, A.A., A.M. Aki, A.M. Wassel and M.A. Abada, 2002. Effect of yeast and some micronutrients on the yield and quality of Red Roomy grapevines. 2nd Inter.Conf. Hort. Sci., 10-12 Sep., Kafr El-Sheikh, TantaUniv., Egypt, pp: 709-718.

Hashem, M., Y.M. Omran and M. Nashwa Sallam, 2008. Efficacy of yeasts in the management of root-knot nematode (Meloidogyne incognita) in flame seedless grape vines and the consequent on the productivity of the vines. Biocontrol Science and Technology, 18(4): 357-375.

Hegab, M. Y., F.F. Ahmed and A.H. Ali, 1997. Influence of spraying active dry yeast on growth and productivity of Valencia orange (*Citrus sinensis*). Producing of the 1st Scientific Conference of Agricultural Sciences, Faculty of Agric. Assuit Univ., Assuit, December 13- 14 vol. 1.

Hegab, M.Y., A.M.A. Sharawy, S.A.G. El-Saida, 2005. Effect of algae extract and mono potassium phosphate on growth and fruiting of Balady orange trees (Citrus sinensis). Proc. First Sci. Conf. Agric. Sci. Fac. of Agric., Assuit Univ., (1): 73-84.

Higa, T. & J.F. Parr, 1994. "Beneficial and Effective Microorganisms for a Sustainable Agriculture and Environment." International Nature Farming Research Center, Atami, Japan.

Idso, S.B., R.L. Garcia, B.A. Kimball and J.K. Hoober, 1995. Effect of atmosphere Co2 enrichment and foliar methanol application on net photosynthesis of orange trees (*Citrus aurantium*) leaves. Amer. Botany, 82(1): 26-30.

Jakubus, M., P. Gajewski and Z. Kaczmarek, 2012. Evaluation of the impact of effective microorganisms (EM) on the solubility of microelements in soil. journal of Zeszyty Naukowe Uniwersytetu Przyrodniczego we Wrocławiu - Rolnictwo, 103(589): 93-102.

Jaswant, S., K.K. Sharma, S.S. Mann, R. Singh and G.P.S. Grewal, 1994. Effect of different chemicals on yield and fruit quality of "Le Cont" pear. Acta. Hort., 367: 210-213.

Jusoh, M.L., L.A. Manaf & P.A. Latiff, 2013. "Composting of rice straw with effective microorganisms (EM) and its influence on compost quality." Iranian Journal of Environmental Health Science Engineering, 10(1): 17.

Kabata-Pendias, A., F. Kabata, 1992. Trace element in solid and plant. Florida: CRC Press.

Kulk, M.M., 1995. The potential for using Cyanobacteria (blue-green algae) and algae in the biological control of plant pathogenic bacteria and fungi. European J. of Plant Pathol., 101(6): 585-599.

Leigh, R.A., and R.G. Jones, 1984. "A Hypothesis Relating Critical Potassium Concentrations for Growth to the Distribution and Functions of This Ion in the Plant Cell." New Phytologist, 97: 1-13.

Magoffin, C.D. and R.C. Hoseney, 1974. A review of fermentation. Baker"s Dig. 48(12): 22.

Mansour, A.E., 1998. Response of Anna apples to some biofertilizers. Egypt. J. Hort. 25, No.2.

Martinez-Anoya, M.A., B. Pitarch, P. Bayarri and C. Beneditode barber, 1990. Microflora of the sour doughs wheat flour bread interaction between yeast and lactic acid bacteria in wheat doughs and their effects on bread quality. Cereal Chem. 6: 85.

Metting, B., W.J. Zimmerman, I. Crouch and J. Van Staden, 1990. Agronomic uses of seaweed and microalgae. In: Akatsuka, I. (ed.), Introduction to Applied Phycology, pp: 589–628. SPB Academic Publishing, The

Hague
Natio, K., S. Nagama, K. Furye and H. Suzuki, 1981. Effect of benzyl adenine on RNA and protein synthesis in intact bean leaves at various stages of agein. Plant Physiol., 52: 342-348.
Nagodawithana, W.T., 1991. Yeast technology. Universal Foods Corporation. Milwaukee, Wisconsin, Published by Van Nostrand Reinhold, New York, pp: 273.
Nijjar, G.S., 1985. Nitrogen of fruit trees. Mrs. Usha. Raji Kumar, Kalyani, New Delhi, India, pp: 306-308.
Osthuyes, S.A., 1993. Effect of spraying application of KNO3, Urea and growth regulators on the yield of Tommy Atkins mango. South Affrican Mango Growers Association (Year book) 13: 58-62.
Robertson, G.P., & P.M. Vitousek, 2009. "Nitrogen in agriculture: balancing the cost of an essential resource." Annual Reviews of Environment and Resources, 34: 97-125.
Spinelli, F., F. Giovanni, N. Massimo, S. Mattia and C. Guglielmo, 2009. Perspectives on the use of a sea weed extract to moderate the negative effects of alternate bearing in apple trees. J. Hort. Sci. Biotechn., 17(1): 131-137.
Stino, R.G., A.T. Mohsen, M.A. Maksoud, M.M.M. Abd el- migeed, A.M. Gomaa and A.Y. Ibrahim, 2009. Bio-organic fertilization and its impact on Apricot young trees in newly reclaimed soil. Amer-Eurasian J. Agric. and Environ. Sci., 6(1): 62-69.
Subba Rao, N.S., 2008. Biofertilizer in Agriculture. Oxford IBH Company, New Delhi.
Suriabananont, V., 1992. Fertilizer trails on mangoes (*Mangifera indica*) var. Nan Dok Mai in Thailand. Acta Hort. (321): 529-534.