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Effect of Yeast and Effective Microorganisms (Em_1) Application on The Yield And Fruit Characteristics of Bartamuda Date Palm Under Aswan Conditions

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Abstract

This study was conducted in a private orchard located at Abo-El- Riesh Village Aswan district, Aswan Governorate during 2004 and 2005 seasons to assess the effects of biofertilization with yeast and effective microorganisms (EM_1) on the yield and fruit quality of tissue culture derived Bartemoda dry date palms. Results showed that yield/ palm, bunch weight and number of fruits/ strand were significantly affected by varying times of yeast or EM_1 application. However, the best results were obtained when the two biofertilizers were applied at the first week of June, July and August, in descending order. Application of EM_1 was superior the use of yeast in this connection. A slight promotion was detected among the higher two levels from yeast (5.0 or 10.0 g/ palm) and EM_1 (1.0 or 1.5 cm^3/ palm). Treating the palms via soil with EM_1 at 1.0 cm^3/ palm gave the best results from economical point of view. Biofertilization with yeast or EM_1 had promotive effect on both physical and chemical characters of the fruits comparing with unbiofertilization. The promotion was associated with increasing levels of yeast and EM_1. Application of EM_1 was superior the application of yeast in promoting fruit quality.

Key words: Bartamuda date palm, Yeast, Effective Microorganisms, Yield, Physical and Chemical Characters.

Introduction

Date palm (*Phoenix dactylifera* L.) is an old and common fruit tree in many countries all over the world because it could be established in a wide range of soil and environmental conditions. Iraq, Iran, Saudi Arabia, Algeria, Libya and Egypt are the leading countries in date palm cultivation and production (FAO, 2007). Dates had higher nutritional value, since about three fourth of the dry matter in dates is sugars (sucrose, glucose and fructose) (Hussein, 1977). Dates are good source of iron and potassium and a fair source of calcium, copper, magnesium and sulphur. Mineral elements are necessary for life as they act as catalytic or structural components of larger molecules with specific functions (Gross *et al.,*

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1983) and the ranges of concentration required for good health and to support life are given in the recommended dietary allowance (RDA) (NAS, 1980).

In Egypt date palm culture extends from north to south, from the relatively cool and humid region of the Mediterranean (Lat. 31 N) to the extremely hot and dry region of Aswan (Lat. 22 N). At present, 2000 or more different cultivars are known to exist allover the world, but only a few important ones have been evaluated for their agronomic performance and fruit quality. The varieties grown include, soft, semi- dry and dry dates, according to the prevalent environmental conditions.

Biofertilization will help bring down the costs of chemical fertilizers particularly nitrogen and phosphorus soil fertility by maintaining the physical conditions of the soil. Biofertilizers consist from rocks and plant residues in the soil and make them available commercially and specific strains are used as biological fertilizers. Fertilization is one of the important tools in increasing crop yield. Nitrogen has a pronounced role in improving production and quality of fruits. Nitrogen fixing cyanobacteria and the effective microorganisms (EM) are used in order to improve soil fertility and trees productivity (Myint, 1999).

The uses of biofertilizers particularly yeast and effective microorganisms are suggested to be one possibility to restore the natural conditions. Mechanisms used by microbes to stimulate plant growth include biofertilization (increasing the supply of mineral nutrients to the plant), biological control (elimination of the plant enemies including microbial pathogens, insects and weeds) and direct plant growth promotion by delivering plant growth hormones to the plants (Lugtenberg *et al*., 1991). Moreover, using natural exudates and extracts of biofertilizers namely yeast and EM instead of chemicals could be the way to improve production in different fruit crops and produce natural clear fruits that free from mineral residues. Using these natural extracts would permit a reduction in the use of agrochemicals. The positive effects of these extracts were attributed to their own contents of the essential nutrients, B vitamins (B_1, B_2, B_6 and B_{12}) and hormones (GA_3 and cytokinins) (Kannaiyan, 2002 and Tung-Yung- Yuan *et al*. 2003). Using organic and bio-forms and release-N as well as potassien, phosphoren and rock phosphate would achieve a beneficial improvement the palm growth vigour, productivity and was useful in saving N fertilization cost and decreasing the environmental pollution problems (Sayed, 2008)

Therefore, this study was conducted to explore the positive action of using the two biofertilizers namely yeast and EM at different levels and times of applications on the yield and fruit

quality of Bartamuda date palm under Aswan conditions.

Materials and Methods

This investigation was conducted in a private orchard located at Abo- El- Riesh Village Aswan district, Aswan Governorate during consecutive seasons of 2004 and 2005 to assess the different effects of biofertilization with yeast and effective micro-organisms (EM_1) at various levels and dates of application on the yield and fruit quality of tissue culture derived date palms growing under Aswan conditions. 45 Bartemoda (dry date) palms were selected for achieving this study. The selected plants were at the same age and uniform in vigour. The palms were 8-years old, good physical conditions, free of insects, damages and diseases. They were irrigated through surface irrigation system. Pruning was performed to maintain bunch number of mature leaves. The number of female spathes per palm was adjusted to 9.0 spathes by ratio of 8: 1 removing excess earliest, latest and small bunches according to Sayed (2002). Pollination of experimental palms was uniformly performed in respect of source, date and method to avoid residues of metaxinia. Pollination was achieved by inserting five male strands into the female bunch using known high activity pollen source throughout 2- 3 days after female spathe cracking To prevent contamination of pollens, every bunch was bagged after inserting the male strands by paper bags which were tied at the ends using a piece of cotton for aeration. The bags were shaken lightly to ensure pollen distribution and were removed after four weeks (Hussein *et al*., 1993 and Dammas, 1998).

Each selected palm was annually manured with about 25 kg of F.Y.M, 5.0 kg ammonium sulphate (20.6 % N), 0.5 kg calcium superphosphate (15.5 % P_2O_5) and 1.0 kg potassium sulphate (48 % K_2O). Phosphate fertilizer was added once during the first week of January with F.Y.M. Nitrogen fertilizer was divided into three equal doses and applied at the first week of March, April and June. Potassium fertilizer was added once immediately after fruit setting Other horticultural practices such as irrigation, pruning and pest control were carried out as usual.

Soil is classified as silty clay in texture with water table depth not less than two meters deep. The results of orchard soil analysis according to Davis and Ferites (1970) and Wilde *et al*. (1985) are given in Table (1).

Table (1): Mechanical, physical and chemical analysis of the tested orchard soil.

Characters	values
Practical size distribution:	
Sand %	10.60
Clay %	31.40
Silt %	58.00
Texture grade	Silty clay
pH (1:2.5 extract)	8.00
E.C (1: 2.5 extract) mm hos/ 20˚C/cm)	0.69
O.M. %	2.09
$CaCO_3$ %	1.22
Available macronutrients:	
Total N %	0.11
P (ppm, Olsen method)	20.00
K (ppm, ammonium acetate)	419.00
Mg (ppm)	79.00
S (ppm)	6.90
B (hot water extractable)	0.27
Available Zn, Fe, Mn and Cu (EDTA extractable, ppm)	
Zn	1.31
Fe	11.00
Mn	10.18
Cu	1.60

This experiment included 15 treatments from two biofertilizers namely yeast and effective microorganisms (EM_1) at different times and levels of application. Two factors were evolved (A& B). The first factor (A) consisted from three times of applications of yeast and EM_1 namely a_1) one addition at the first week of June, a_2) one addition at the first week of July and a_3) one addition at the first week of August. The second factor (B) comprised from five levels and concentrations of both yeast and EM1 namely b_1) non-application (treatment with water), b_2) soil addition of yeast at 5.0 g/ palm, b_3) soil addition of yeast at 10.0 g/ palm, b_4) soil addition of EM_1 at 1.0 cm^3./ palm and b_5) soil addition of EM1 at 1.5 cm^3./ palm. Each treatment was replicated three times, one palm per each.

The pure dry yeast powder was activated by using sources of carbon and nitrogen with ratio of 6:1. This ratio is suitable to get the highest vegetative production of yeast; each ml of activated yeast contained about 12000 yeast cells (Barnett *et al*., 1990). Such technique allowed yeast cells to be grown and multiplied efficiently during conductive aerobic and nutritional conditions. Such technique for yeast

preparation based on 1- Nutritional media of glucose and casein as favourable sources of C, N and other essential elements (P, K, Mg, Fe, Mn, Cu, B and Mo as well as Na and Cl) in suitable balance (Barnett *et al*., 1990). 2- Air pumping and adjusting incubation temperature. The media then subjected to two cycles of freezing and thawing for disruption of yeast tissues and releasing their bioconstituents directly before using

This experiment was set up in a complete randomized block design in split plot arrangement where the three times of yeast and EM1 applications and the five doses of both occupied the main and subplots, respectively. Each treatment was replicated three times, one palm per each.

Generally, the following measurements were determined during the two seasons:

Bunches were picked at the optimum commercial harvesting time under Aswan region in the two experimental seasons. The yield of each palm was recorded in terms of weight in kilograms and then the average weight of each bunch was delivered. Samples of fifty dates from the yield of each palm were taken randomly and the following physical and chemical characters were measured:

Weight of fruit, seed and flesh (g) was also estimated by using a top pan balance of 0.01 g sensitivity. Fruit volume (cc) was determined by water replacement. Fruit dimensions (height and diameter in cm) were estimated using a vernier calliper, percentages of flesh was estimated by dividing weights of flesh by the whole weight of fruit and multiplying the product by 100.

The total soluble solids % of the fruit flesh was determined by hand refractometer. The percentages of total, reducing and non-reducing sugars were determined according to Lane and Eynon volumetric method that outlined in A.O.A.C. (1995).

Thereafter, the obtained data were tabulated and subjected to the proper statistical analysis of variance using New L.S.D. test for recognizing the significance differences among the various treatment means according to the method outlined by Snedecor (1956); Gomez and Gomez (1984) and Mead *et al*., (1993).

Results and Discussion

Effect of times and doses of yeast and EM_1 on the yield, bunch weight and number of fruits/strand.

Data in Tables (2& 3) show the effect of different times of application and doses of yeast and EM_1 on yield, bunch weight and number of fruits/ strand of Bartamoda date palms during 2004 and 2005 seasons.

a) The effect of times:

It is revealed from the obtained data that varying dates of yeast and EM_1 applications were significantly increased the yield, bunch weight and number of fruits/ strand. Application of yeast or EM_1 once at the first

week of June, July and August, in descending order was very effective in improving these parameters. The maximum values were recorded on the palms that received yeast or EM_1 once at the first week of June. Supplying the palms once with yeast or EM_1 at the first week of August effectively minimized these parameters. Similar trend was announced during each season.

b) The effect of doses:

It is clear from the obtained data that application of yeast or EM_1 significantly improved the yield, bunch weight and number of fruits/ strand of Bartamoda date palms comparing with non-application. Significant differences on these parameters were observed among all treatments except among the higher two levels of both yeast (5.0 and 10.0 g/ palm) and EM_1 (1.0 and 1.5 cm^3/ palm). Treating the palms once with EM_1 at 1.0 cm^3/ palm from economical point of view gave the best results with regard to the yield. Similar results were announced during the two seasons.

c) The interaction effect:

The studied interaction between times and doses of yeast or EM_1 had significant influence on the yield, bunch weight and number of fruits/ strand. Soil addition of EM_1 at 1.0 cm^3/ palm once at the first week of June produced the higher yield from economical point of view. Under such promising treatment yield per palm reached 100.8 in both seasons comparing with 87.3 and 75.9 kg produced by untreated palms during both seasons, respectively.

The promotive effect of both yeast and EM_1 on building organic foods as well as enhancing growth and nutritional status of the trees in favor of producing more fruits. In addition, yeast is a natural source for most of nutritional elements as well as, other growth promoting substances and vitamins (Idso *et al*., 1995) could result in improving the yield.

These results regarding the effect of yeast on promoting the yield are in agreement with those obtained by Gobara (2004) on Zaghloul date palms, Sayed (2008) on Saidy date palms, El-Shamaa (2001) and Ahmed *et al*. (2003) on Williams bananas and El-Salhy *et al*. (2006) on Balady mandarin. The same observations were noticed in different mango cvs by Mohamed *et al*. (2008) and Abd El- Motty- Elham *et al*. (2010). These results with regard to the effect of Em_1 on the yield are in harmony with those obtained by Higa and Wididana (1991); Joo *et al.* (1991) and Higa (1995) on Valencia orange trees. The results of Paschoal *et al*. (1999) who worked on Navel orange trees, emphasized the present results.

Effect of times and doses of yeast and EM_1 on some physical and chemical characters of the fruits:

Data in Tables (from 3 to 7) show the effect of different times of application and doses of yeast and EM_1 on weight, volume and dimensions of fruit (height, di-

ameter), percentages of flesh, total soluble solids %, total sugars %, reducing and non- reducing sugars % in the fruits of Bartamoda date palms during 2004 and 2005 seasons.

a) Specific effect of various times of application of yeast and EM_1:

It is clear from the obtained data that varying dates of yeast and EM_1 applications had no significant effect on chemical characters of the fruits namely total soluble solids %, total reducing and non- reducing sugars. However physical characters namely weight, volume, height and diameter of fruit and percentages of flesh were significantly varied among the three dates of application. Physical characters were maximized in response to soil addition of yeast and EM_1 at the first week of June, July and August, in descending order. Supplying the palms once with yeast or EM_1 at the first week of June gave the maximum values of physical characters. The minimum values were recorded when the palms received yeast or EM_1 once at the first week of August. The same observations were noticed during 2004 and 2005 seasons.

b) Specific effect of various doses of yeast and EM_1.

It is evident from the obtained data that application of yeast at 5.0 to 10.0 g/ palm or EM_1 at 1.0 to 1.5 cm^3/ palm significantly improved fruit quality in terms of increasing weight, volume and dimensions of fruit, percentages of flesh, total soluble solids %, total sugars %, reducing and non- reducing sugars % comparing with non- application. The promotion was associated with increasing doses of yeast from 5.0 to 10.0 g/ palm and EM_1 from 1.0 to 1.5 cm^3/ palm. However, a slight and unsignificant promotion on fruit quality was observed among the two doses of yeast and EM_1.

Application of EM_1 surpassed the use of yeast in promoting fruit quality. Economically point of view the best results with regard to quality of fruits were observed when the palms were supplied with 1.0 cm^3/ palm EM_1 once at the first week of June. These results were true during 2004 and 2005 seasons.

c) Interaction effect between different times of application and doses of yeast and EM_1.

The interaction between times and doses of both yeast and EM_1 had significant effect on physical and chemical characters of Bartamoda date fruits during both seasons. The best results with regard to quality of the fruits were obtained when the palms were supplied once at the first week of June with EM_1 at 1.0 cm^3/ palm. These results were true during 2004 and 2005 seasons.

Table (2): Effect of different times of application and doses of yeast and EM_1 on the yield/ palm (kg) and average bunch weight (kg) of Bartamuda date palms during 2004 and 2005 seasons.

Doses of yeast and EM_1 (B)	Yield/ palm (kg)							
	2004				2005			
	Times of application (A)							
	a_1 1st week of June	a_2 1st week of July	a_3 1st week of August	Mean (B)	a_1 1st week of June	a_2 1st week of July	a_3 1st week of August	Mean (B)
b_1- Yeast and EM_1 at 0.0 g/ palm	90.0	86.4	85.5	87.3	77.4	75.6	74.7	75.9
b_2- Yeast at 5.0 g/ palm	93.6	90.9	90.0	91.5	91.8	90.0	88.2	90.0
b_3- Yeast at 10.0 g/ palm	97.2	93.6	88.2	93.0	92.7	90.0	89.1	90.6
b_4- EM at 1.0 cm^3/ palm	99.0	96.3	90.0	95.1	99.9	98.1	96.3	98.1
b_5- EM at 1.5 cm^3/ palm	100.8	99.0	91.8	97.2	100.8	99.9	98.1	99.6
Mean (A)	96.1	93.2	89.1		92.5	90.7	89.3	
New L. S. D at 5%	**A**	**B**	**AB**		**A**	**B**	**AB**	
	1.7	**2.2**	**3.8**		**1.5**	**1.9**	**3.3**	
Character	**Average bunch weight (kg)**							
b_1- Yeast and EM_1 at 0.0 g/ palm	10.0	9.6	9.5	9.7	8.6	8.4	8.3	8.4
b_2- Yeast at 5.0 g/ palm	10.4	10.1	10.0	10.2	10.2	10.0	9.8	10.0
b_3- Yeast at 10.0 g/ palm	10.8	10.4	9.8	10.3	10.3	10.0	9.9	10.1
b_4- EM at 1.0 cm^3/ palm	11.0	10.7	10.0	10.6	11.1	10.9	10.7	10.9
b_5- EM at 1.5 cm^3/ palm	11.2	11.0	10.2	10.8	11.2	11.1	109	11.1
Mean (A)	10.7	10.4	9.9		10.3	10.1	9.9	
New L. S. D at 5%	**A**	**B**	**AB**		**A**	**B**	**AB**	
	0.4	**0.5**	**0.9**		**0.05**	**0.06**	**0.1**	

EM= Effective microorganisms.

Table (3): Effect of different times of application and doses of yeast and EM_1 on the number of fruits per each strand and average fruit weight (g) of Bartamuda date palms during 2004 and 2005 seasons.

Doses of yeast and EM_1 (B)	No. of fruits/ strand							
	2004				2005			
	Times of application (A)							
	a_1 1st week of June	a_2 1st week of July	a_3 1st week of August	Mean (B)	a_1 1st week of June	a_2 1st week of July	a_3 1st week of August	Mean (B)
b_1- Yeast and EM_1 at 0.0 g/ palm	9.7	9.5	9.0	9.4	10.3	9.7	9.5	9.8
b_2- Yeast at 5.0 g/ palm	11.0	10.2	10.0	10.4	13.0	12.0	11.5	12.2
b_3- Yeast at 10.0 g/ palm	11.7	11.0	11.0	11.2	14.0	13.2	12.9	13.4
b_4- EM at 1.0 cm^3/ palm	15.6	14.5	14.0	14.7	17.0	16.5	16.0	16.5
b_5- EM at 1.5 cm^3/ palm	16.0	15.8	15.0	15.6	18.0	17.7	17.0	17.6
Mean (A)	12.8	12.2	11.8		14.5	13.8	13.4	
New L. S. D at 5%	**A**	**B**	**AB**		**A**	**B**	**AB**	
	0.4	**1.0**	**1.7**		**0.4**	**1.3**	**2.2**	
Character	**Average fruit weight (g)**							
b_1- Yeast and EM_1 at 0.0 g/ palm	10.52	10.50	10.00	10.34	10.71	10.17	10.00	10.29
b_2- Yeast at 5.0 g/ palm	10.02	11.60	11.11	11.58	11.99	11.00	10.90	11.30
b_3- Yeast at 10.0 g/ palm	13.05	12.70	12.20	12.65	12.25	12.00	11.71	11.99
b_4- EM at 1.0 cm^3/ palm	13.04	12.82	12.80	12.88	13.00	12.50	12.00	12.50
b_5- EM at 1.5 cm^3/ palm	13.10	13.00	13.00	13.03	13.25	12.82	12.61	12.89
Mean (A)	12.35	12.12	11.82		12.24	11.70	11.44	
New L. S. D at 5%	**A**	**B**	**AB**		**A**	**B**	**AB**	
	0.86	**1.11**	**1.92**		**0.62**	**0.80**	**1.38**	

EM= Effective microorganisms.

Table (4): Effect of different times of application and doses and dates of yeast and EM_1 on the average fruit volume (cm^3) and fruit height (cm.) of Bartamuda date palms during 2004 and 2005 seasons.

Doses of yeast and EM_1 (B)	Fruit volume (cm^3)							
	2004				2005			
	Times of application (A)							
	a_1 1st week of June	a_2 1st week of July	a_3 1st week of August	Mean (B)	a_1 1st week of June	a_2 1st week of July	a_3 1st week of August	Mean (B)
b_1- Yeast and EM_1 at 0.0 g/ palm	10.90	10.87	10.35	10.71	11.11	10.57	1.40	10.69
b_2- Yeast at 5.0 g/ palm	12.40	11.90	11.46	11.92	12.41	11.41	11.32	11.71
b_3- Yeast at 10.0 g/ palm	13.41	13.06	12.57	13.01	12.66	12.41	12.20	12.42
b_4- EM at 1.0 cm^3/ palm	13.40	13.17	13.13	13.23	13.41	12.91	12.38	12.90
b_5- EM at 1.5 cm^3/ palm	13.46	13.34	13.31	13.37	13.69	13.22	13.05	13.32
Mean (A)	12.71	12.47	12.16		12.66	12.10	11.87	
New L. S. D at 5%	**A**	**B**	**AB**		**A**	**B**	**AB**	
	0.22	**0.91**	**1.57**		**0.21**	**0.72**	**1.25**	
Character	**Fruit height (cm.)**							
b_1- Yeast and EM_1 at 0.0 g/ palm	4.53	4.50	4.48	4.50	4.65	4.63	4.62	4.63
b_2- Yeast at 5.0 g/ palm	5.02	5.00	4.97	5.00	5.18	5.15	5.06	5.13
b_3- Yeast at 10.0 g/ palm	5.11	5.05	5.00	5.05	5.29	5.20	5.11	5.20
b_4- EM at 1.0 cm^3/ palm	5.33	5.09	5.00	5.14	5.50	5.40	5.20	5.37
b_5- EM at 1.5 cm^3/ palm	5.41	5.16	5.05	5.21	5.60	5.51	5.29	5.47
Mean (A)	5.08	4.96	4.90		5.24	5.18	5.06	
New L. S. D at 5%	**A**	**B**	**AB**		**A**	**B**	**AB**	
	0.08	**0.11**	**0.19**		**0.09**	**0.12**	**0.21**	

EM= Effective microorganisms.

Table (5): Effect of different times of application and doses of yeast and EM_1 on fruit diameter average (cm.) and percentage of flesh weight of Bartamuda date palms during 2004 and 2005 seasons.

Doses of yeast and EM_1 (B)	Fruit diameter (cm.)							
	2004				2005			
	Times of application (A)							
	a_1 1st week of June	a_2 1st week of July	a_3 1st week of August	Mean (B)	a_1 1st week of June	a_2 1st week of July	a_3 1st week of August	Mean (B)
b_1- Yeast and EM_1 at 0.0 g/ palm	1.53	1.43	1.33	1.43	1.60	1.53	1.50	1.54
b_2- Yeast at 5.0 g/ palm	1.67	1.59	1.50	1.59	1.82	1.71	1.65	1.73
b_3- Yeast at 10.0 g/ palm	1.69	1.61	1.52	1.61	1.85	1.74	1.67	1.75
b_4- EM at 1.0 cm^3/ palm	1.76	1.70	1.65	1.70	1.96	1.82	1.80	1.86
b_5- EM at 1.5 cm^3/ palm	1.77	1.70	1.66	1.71	2.07	2.00	1.92	2.00
Mean (A)	1.68	1.61	1.53		1.86	1.76	1.71	
New L. S. D	A	B	AB		A	B	AB	
at 5%	0.06	0.08	0.14		0.05	0.15	0.26	
Character	Flesh %							
B_1- Yeast and EM_1 at 0.0 g/ palm	88.97	87.71	85.90	87.53	88.91	87.65	85.93	87.50
b_2- Yeast at 5.0 g/ palm	90.68	89.22	87.67	89.19	90.59	89.29	87.70	89.19
b_3- Yeast at 10.0 g/ palm	91.57	90.24	88.85	90.22	91.60	90.30	88.89	90.26
b_4- EM at 1.0 cm^3/ palm	92.33	91.34	90.62	91.43	92.40	91.40	90.67	91.49
b_5- EM at 1.5 cm^3/ palm	92.75	92.31	91.92	92.33	92.80	9.38	91.96	92.38
Mean (A)	91.26	90.16	88.99		91.26	90.20	89.03	
New L. S. D	A	B	AB		A	B	AB	
at 5%	0.91	1.04	1.80		0.82	1.09	1.89	

EM= Effective microorganisms.

Table (6): Effect of different times of application and doses of yeast and EM_1 on the percentages of total soluble solids and total sugars in the fruits of Bartamuda date palms during 2004 and 2005 seasons.

Doses of yeast and EM_1 (B)	Total soluble solids%							
	2004				2005			
	Times of application (A)							
	a_1 1st week of June	a_2 1st week of July	a_3 1st week of August	Mean (B)	a_1 1st week of June	a_2 1st week of July	a_3 1st week of August	Mean (B)
b_1- Yeast and EM_1 at 0.0 g/ palm	69.3	69.4	69.5	69.4	67.5	68.0	68.3	67.9
b_2- Yeast at 5.0 g/ palm	70.0	70.2	70.3	70.2	69.9	70.0	70.2	70.0
b_3- Yeast at 10.0 g/ palm	70.3	70.4	70.5	70.4	70.0	70.4	70.5	70.3
b_4- EM at 1.0 cm^3/ palm	719	72.0	72.0	72.0	72.0	72.0	72.0	72.0
b_5- EM at 1.5 cm^3/ palm	72.0	72.3	72.4	72.2	72.5	72.7	73.0	72.7
Mean (A)	70.7	70.9	70.9		70.4	70.6	70.8	
New L. S. D at 5%	**A**	**B**	**AB**		**A**	**B**	**AB**	
	NS	**0.6**	**1.0**		**NS**	**0.8**	**1.4**	
Character	**Total sugars %**							
b_1- Yeast and EM_1 at 0.0 g/ palm	63.0	63.2	63.3	63.2	62.0	62.3	62.5	62.3
b_2- Yeast at 5.0 g/ palm	64.5	64.8	65.0	64.8	63.9	64.0	64.1	64.0
b_3- Yeast at 10.0 g/ palm	65.0	65.5	65.6	65.4	64.0	64.3	64.5	64.3
b_4- EM at 1.0 cm^3/ palm	66.0	66.2	66.5	66.2	65.9	66.0	66.1	66.0
b_5- EM at 1.5 cm^3/ palm	66.3	66.5	66.6	66.5	66.0	66.2	66.3	66.2
Mean (A)	65.0	65.2	65.4		64.4	64.6	64.7	
New L. S. D at 5%	**A**	**B**	**AB**		**A**	**B**	**AB**	
	NS	**0.7**	**1.2**		**NS**	**0.6**	**1.0**	

EM= Effective microorganisms.

Table (7): Effect of different times of application and doses of yeast and EM_1 on the percentages of reducing and non- reducing sugars in the fruits of Bartamuda date palms during 2004 and 2005 seasons.

Doses of yeast and EM_1 (B)	Reducing sugars %							
	2004				2005			
	Times of application (A)							
	a_1 1st week of June	a_2 1st week of July	a_3 1st week of August	Mean (B)	a_1 1st week of June	a_2 1st week of July	a_3 1st week of August	Mean (B)
b_1- Yeast and EM_1 at 0.0 g/ palm	13.5	13.6	13.7	13.6	13.6	13.6	13.7	13.6
b_2- Yeast at 5.0 g/ palm	14.4	14.5	14.6	14.5	14.8	14.9	15.0	14.9
b_3- Yeast at 10.0 g/ palm	14.4	14.5	14.6	14.5	14.8	14.9	15.0	14.9
b_4- EM at 1.0 cm^3/ palm	14.9	15.0	15.0	15.0	15.1	15.1	15.1	15.1
b_5- EM at 1.5 cm^3/ palm	15.0	15.1	15.2	15.1	15.1	15.2	15.2	15.2
Mean (A)	14.4	14.5	14.6		14.7	14.7	14.8	
New L. S. D at 5%	A	B	AB		A	B	AB	
	NS	0.2	0.3		NS	0.2	0.3	
Character	Non- reducing sugars %							
b_1- Yeast and EM_1 at 0.0 g/ palm	49.5	49.4	49.6	49.5	48.4	48.7	48.8	48.6
b_2- Yeast at 5.0 g/ palm	50.1	50.3	50.4	50.3	49.1	49.1	49.1	49.1
b_3- Yeast at 10.0 g/ palm	50.6	51.0	51.0	50.9	49.2	49.4	49.5	49.4
b_4- EM at 1.0 cm^3/ palm	51.1	51.2	51.5	51.3	50.8	50.9	51.0	50.9
b_5- EM at 1.5 cm^3/ palm	51.3	51.4	51.4	51.4	50.9	51.1	51.1	51.0
Mean (A)	50.5	50.7	50.8		49.7	49.9	49.9	
New L. S. D at 5%	A	B	AB		A	B	AB	
	NS	0.7	1.21		NS	0.5	0.9	

EM= Effective microorganisms.

Such fruit quality improvement due to yeast and EM_1 application may be due to improve the synthesis of protein and nucleic acids which enhanced cell division and enlargement leading to fruit weight and volume increases. In addition, photosynthesis enhanced and hormone promotion, which advanced the fruit maturity.

These results regarding the promoting effect of yeast on quality of the fruits are in agreement with those obtained by Sayed (2008) on Saidy date palms, Ebrahiem *et al*. (2000) and El-Salhy *et al*. (2006) on Balady mandarin fruits; Ahmed *et al*., (2003) on Williams banana fruits and Abd El- Motty- Elham *et al*., (2010) on Keitte mango fruits. The results of Paschoal *et al*., (1999) and Joo *et al.*, (1991) who worked on the effect of Em_1 on Valencia orange trees, supported the present results.

References

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

Ahmed, F. F.; Abdalla, A. S. and Sabour- Asmaa, M. T. (2003): Growth and fruiting of Williams banana as affected by some antioxidant and biofertilizer treatments. Minia J. of Agri. Res. & Develop. 23 (1): 51 – 68.

Association of Official Agricultural Chemists, (1995): Official Methods of Analysis 14th ed. (A. O. A. C.) Benjamin Franklin station, Washington D. E. U.S.A., 490 – 510.

Barnett, J. A.; Payne, R. W. and Yarrow, D. (1990): Yeast, characteristics and identification. Cambridge University Press, London, 999.

Dammas, M. O. (1998): Friut growth and receptivity of pistillate flowers pollination in two date palm cultivars (*Phoenix dactylifera* L.). M. Sc. Thesis, Fac. of Meteorology, Environment and Arid land Agri. King Abdel Aziz Univ., 50 – 57.

Davis, J. and Ferites, F. (1970): Physical and Chemical Methods of Soil and Water Analysis. Soil bull. No. 10, FAO.

Ebrahiem, T. A.; Ahmed, F. F. and Abo El- Komsan, E. A. (2000): Response of Balady mandarin trees grown on sandy soil to spraying active dry yeast and some macronutrients. Assuit J. of Agric. Sci. 31 (5): 41-54.

El-Salhy, A.M.; H.M. Marzouk and T.A. Ali (2006): Physiological studies on the effect of active dry yeast application on Balady mandarin trees. II- Yield and fruit quality. The 3rd Int. Conf. for Develop. and the env. in the Arab World, March 21-23, 615-622.

El-Shamaa, M. S. (2001): Effect of biofertilizers on growth and yield of banana plants (Williams cv.). Assiut J. of Agric. Sci. 32 (1): 157-166.

Food Agricultural Organization (F. A. O.) (2007): Quarterly Bulletin of Statistics 6 No. 113: 32 Year Book Annual 10 Production 46: 155 – 157.

Gobara, A. A. (2004): Effect of Algae extract and yeast on fruiting of Zaghloul date palms. J. agric. Sci. Mansoura Univ., 29 (9): 5209-5220.

Gomez, K. A. and Gomez, A. A. (1984): Statistical Procedures for Agriculture Researches (2nd Ed). Published by John Wiley and Sons, New York. U.S.A., 10-20.

Gross, J.; Harber, O. and Ikan, R. (1983): The carotenoid pigments of the date. Scientia Horticulture. 20 (3): 251 – 257.

Higa, T. (1995): Effective microorganisms, their role in Kyusei in Nature farming and Sustainable agriculture. in J. FR. Parr, S. B. Hornic, and C. E. Whitman (ed) Proc. of the First Inter. Conf. of Kyusei Nature Farming U. S. Dept. of agric. Washington, D. C., USA.

Higa, Y. and Wididana, G N. (1991): changes in the soil micro flora induced by effective microorganisms. pp. 153-162. J. F. Parr; S. B. Harnick and C. E. Whitman (ed.) proc. of the 1st Inter. Conf. of Kyusei Nature Farming M. S. Dept. of Agric., Washington, D.C. U.S.A.

Hussein, F. (1977): Kinds and relative amounts of sugars in some Egyptian date cultivars. Beiträge Zur Tropischen und Subtropischen Landwirst Chaft und Tropenveterinarmedizin 10 (2): 159-162.

Idso, S.B.; K.E. Idro; R.L. Garcia; B.A. Kimball and J.K. Hoober (1995): Effect of atmospheric CO_2 enrichment and foliar methanol application on net photosynthesis of sour orange tree (*Citrus aurantin*, Rutaceae) leaveds. Amer. J. of Botany, 28 (1): 26-30..

James, B. (1994): Chapters from life. Ann. Rev. Physio. Plant. Mol. Biolog 45: 1-23.

Joo, Y. H. L.; Senanayake, Y. D. A. and Sangakkara, U. R. (1999): Effect of EM on the production of crop and waste treatment in Korea. Fifth International Conference on Kyusei Nature Farming Bangkok, Thailand, 23-26 October, 1997. 1999, 151-156.

Kannaiyan, S. (2002): Biotechnology of Biofertilizers. Alpha Sci. Inter. Ltd B.P. Bpx 4067 Pang borne R. 68 U. K. 1-275.

Lugtenberg, B. J. J.; Weger, L. A. De.; Bennett, J. W. and Deweger, L. A. (1991): Microbial stimulation of plant growth and protection from disease- Current Opinion in

Bitechnology 2 (3): 457 – 464.

Mead, R.; Currow, R. N. and Harted, A. M. (1993): Statistical Methods in Agriculture and Experimental Biology. 2nd Ed. Chapman and Hall, London 10-44.

Myint, C.C. (1999): EM nature farming technology, research and extension activities in Myanmar. Sixth International Conference on Kyusei Nature Farming Pretoria, Pretoria South Africa 28-30 October.

Mohamed, M. A.; Gobara, A. A.; Ragab, M. A. and Mouftah, R. T. (2008): Response of Taimour and Zebda mango trees to application of organic and biofertilization along with seaweed extract. 1st Inter. Conf. for Environ. Studies. Menufia Univ. 250-280.

National Academy of Science (NAS) (1980): Recommended Dietary Allowances, 9th Ed. National Academy of Science, Washington, D.C.p. 10.

Paschoal, A. D.; Senanayak, Y. D. A. and Sangakkara, U. R. (1999): Improved soil chemical and physical conditions and their relations to yield and fruit quality of orange in a field under Kuysei Nature Farming and E.M. Technology in Brazil fifth International Conference on Kuysei Nature Farming, Bangkok. Thailand, 23-36 October 1997, 1999, 1765-181.

Sayed, E. F. (2002): The productive capacity of Sewy date palms grown under New Valley conditions in response to leaves/ bunch ratio. M. Sc. Thesis Fac. Agric. Mnia Univ.

Sayed, E.F. (2008): Physiological studies on the behavior of Saidy date palms under some treatments. Ph.D. Thesis, Fac. Agric., Assiut Univ., Egypt, 199.

Snedecor, GW. (1956): Statistical Methods 5st ed. Iowa State College Press , Ames, Iowa 270.

Tisserat, B. (1983): Development of new tissue culture technology to aid in the cultivation and crop improvement of date palm.

Tung-Yung Yuan, H. O.; Quigg, A.; Finkel, Z. U.; Milligan, A. J.; Wyman, K.; Falkowski, P. G and Morel, F. M. M. (2003): The elemental composition of some marine

Wilde, S. A.; Corey, R. B.; Layer, J. G and Voigt, G K. (1985): Soils and Plant Analysis for Tree Culture. Oxford, and IBH, publishing Co., New Delhi, 96-106.

Assiut J. of Agric. Sci., 42 (Special Issue)(The 5th Conference of Young Scientists Fac. of Agric. Assiut Univ. May,8, 2011) (332-349)

تأثير إضافة الخميرة والكائنات الدقيقة الفعالة على المحصول وخصائص الثمار لنخيل البلح برتمودا تحت ظروف محافظة أسوان

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أجريت هذه التجربة في مزرعة نخيل بلح خاصة تقع في قرية ابو الريش بالقرب من مركز أسوان فى محافظة أسوان وذلك خلال موسمين متتاليين هما ٢٠٠٤ ، ٢٠٠٥. وقد تم اختيار ٤٥ نخلة برتمودا ناتجة من زراعة الأنسجة لتنفيذ هذه التجربة. وتهدف الدراسة الى اختبار التأثيرات المختلفة للتسميد الحيوى باستخدام الخميرة والكائنات الدقيقة الفعالة المعروفة باسم EM_1 بمواعيد وجرعات مختلفة على المحصول وخصائص الجودة لثمار نخيل البلح البرتمودا الناتجة من التكاثر بزراعة الانسجة.

كان التصميم الإحصائي المستخدم هو القطاعات الكاملة العشوائية فى توزيع القطع المنشقة مرة واحدة حيث احتلت القطع الرئيسية الثلاثة معاملات من مواعيد اضافة الاسمدة الحيوية اما الخمس معاملات من جرعات الخميرة والكائنات الدقيقة الفعالة فقد احتلت القطع الشقية .

وكان أهم النتائج والتى امكن الحصول عليها خلال موسمي الدراسة علي النحو التالي:

تأثرت كمية محصول النخلة ووزن السوباطة وعدد الثمار علي الشمراخ باختلاف مواعيد اضافة الخميرة والكائنات الدقيقة الفعالة وامكن الحصول علي أفضل النتائج بخصوص هذه الصفات عند استخدام الخميرة أو الكائنات الدقيقة الفعالة مرة واحدة في الأسبوع الأول من يونيو ويوليو وأغسطس مرتبة ترتيبا تنازليا .

أحدث التسميد الحيوي باستخدام الخميرة أو الكائنات الدقيقة الفعالة زيادة جوهرية في محصول النخلة ووزن السوباطة وعدد الثمار علي الشمراخ مقارنة بعدم التسميد الحيوي ولقد تفوق استخدام الكائنات الدقيقة الفعالة عن استخدام الخميرة في هذا الصدد وكان التحسن طفيفا عند رفع الجرعة المستخدمة من الخميرة من ٥ الي ١٠ جرام للنخلة وكذلك الكائنات الدقيقة الفعالة من ١,٠ الي ١,٥ سم^3 للنخلة. وأدي معاملة النخيل من خلال التربة مرة واحدة بالكائنات الدقيقة الفعالة بمعدل ١سم^3 للنخلة الي إعطاء اعلي القيم من وجهة النظر الاقتصادية. أمكن الحصول علي أفضل النتائج عند إضافة ١سم^3 للنخلة من الكائنات الدقيقة الفعالة في الأسبوع الأول من يونيو.

لم يكن لاختلاف مواعيد إضافة الخميرة أو الكائنات الدقيقة الفعالة تأثير علي خصائص الثمار الكيميائية وهي النسبة المئوية للمواد الصلبة الذائبة الكلية وكذلك النسبة المئوية للسكريات الكلية والمختزلة والغير مختزلة بينما كان لها تأثير علي الخصائص الطبيعية للثمار وهي وزن وحجم وأبعاد الثمرة وكذلك النسبة المئوية للب ، وكان التحسن مرتبطا باستخدام الخميرة أو الكائنات الدقيقة

الفعالة مرة واحدة في الأسبوع الأول من شهر يونيو، يوليو ، أغسطس مرتبة ترتيبا تنازليا.

كان للتسميد الحيوي تأثيرا جوهرياً في تحسين الخصائص الطبيعية والكيميائية للثمار وذلك مقارنة بعدم التسميد الحيوي وكان التحسن متوافقا مع زيادة الجرعة المستخدمة من الخميرة والكائنات الدقيقة الفعالة ولقد تفوق استخدام الكائنات الدقيقة الفعالة عن الخميرة في تحسين خصائص الثمرة.

ومن ثم فإنه للحصول علي كمية محصول اقتصادية وتحسين خصائص الجودة لنخيل البلح البرتمودا الناتج من زراعة الأنسجة والنامية تحت الظروف المناخية بمنطقة أسوان فإنه يوصي بإضافة الكائنات الدقيقة الفعالة بمعدل ١سم^{٣} للنخلة مرة واحدة في الأسبوع الأول من يونيو.