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EFFECT OF ACTIVE YEAST AND BIOFERTILIZER ON GROWTH AND CHEMICAL COMPOSITION DATE PALM CV.BARTMOUDA PLANTLETS

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ABSTRACT

This study was developed at central Lab.Res and Deve.Date palm during 2008-2009 seasons to improve the vegetative growth and root system of date palm (*Phoenix dactylifera* L. cv. Bartomuda) plantlets which were produced by *in vitro* culture, and were grown in the green house after six months from acclimatization stage. These plantlets were treated with the combination of active yeast (*Saccharomyces cerevisiae*) at three concentrations 10,20 and 30 cm^3/100 cm^3 water, and biofertilizer (microbien) at 10 g/pots .besides the control treatment (no fertilization). The treatments were added with the irrigation water one time every two weeks for six month in each season. the obtained results showed that of 10 g/pots biofertilizer (microbien) and 20 cm^3 active yeast /100 cm^3 water was significantly raised the height of plantlets and length of roots as well as leaves and roots ,number per plantlet compared to control treatment. Also,a significant increasing in fresh and dry weights of leaves was obtained. The different concentrations of yeast and 10 g/pot biofertilizer were raised the contents of indoles and total sugars in the leaves, as well as nitrogen, phosphorus and potassium content. So this combined treatment coud be recommended to use for best growth of date palm cv.Bartmouda plantlet and cultured them in the open field a the short time.

Key word: yeast, biofertilizer, growth, nitrogen, indoles

INTRODUCTION

Date palm (*phoenix dactylifera L.*) is a diocious monocotyledonous species belonging to the Aracaceae family. Improving the vegetative growth, crop yield and fruit quality , without adversely affecting the environment, a major goal of horticulturist, could be achieved by increasing dependence on biostimulants in crop production, biostimulants were defined by Russo and Berlyn (1990) as being non- fertilizers which benefit plant growth" . They may contain microorganisms or natural products such as cytokinin, amino acid and humic acids. Biostimulant products are said to increase a plant's nutrient and water uptake and resistance to water stress (Russo and Berlyn 1990 and Schmidt, 1990 Humates applied as various commercial Products. Biofertilizing of Anna apple with active dry yeast improved leaf area and shoots number, shoot length and nitrogen content (Mansour, 1998 Omaima 2001 and Kabeel *et al*, 2005 on canino apricot). Active dry yeast, *Azotobacter chroococcum* and *Bacillus megatherium* at 1 L/10 L water significantly increased total sugars in banana fruit also bunch weight was increased at 0.5 % Ahmed 2006 the new shoots, leaf area and their fresh and dry weights as well as , nitrogen, phosphorus, potassium and total sugars contents were increased when the trees were treated with 200, 400 and 600 gm of Microbein Bahaa (2007) on Peach, Tawfik (2007) on grapevine, Taha *(* 2007) on olive, Jen, 2009 on cabbage (*Lettuce* sp) and Adesemoye *et al*.,2009 on tomato). Rhizobacteria accelerated plant growth of *Festuca arundinacea* species, specially roots and root biomass (Huang, 2009). Lipopolysaccharides (LPS) and glucan from Rhizobium leguminosarum strain 2486 increased nitrogen fixation by roots of pea plants (Antipchuk, 2009). Biofertilizer is able to fix 20-200 kg N/ha/year and 30-50 kg P2O5/ha/year in the field crops *such as banana and Apple (Hazarika and Ansari, 2009). Azospirillum brasilense* increased N2 concentration in leaves of *Theobroma cacao* L. (Aguirr *et al*., 2009).

The main objective of this experiment is to enhancing growth of date palm plantlets which produced by tissue culture to developing them by stimulating effect of yeast for plant ing in the open field in a short time.

MATERIALS AND METHODS

This experiment was carried out in the greenhouse of the Central Laboratory for Research and Development of Date palm during 2008 and 2009 seasons The plantlets of *Phoenix dactylifera* cv. Bartomuda, which were produced via tissue culture technique, (10-15 cm in length, 2-3 leaves and 2-3 roots, and planted in peat moss+ sand (2:1) in the plastic pots at average of 30 cm in width and 25 cm in length). These plantlets which fertilized with a complete NPK (19-19-19) at 2.0 g/l were treated with the activate yeast (*Saccharomyces cerevisiae*), which was produced by Biofertilization production Unit , Soil and Water Environmental Research (ARC), at three concentrations: 10,20 and 30 cm^3/100 cm^3 water, in combination with biofertilizer (Microbien at 10 g/pot, which was consisted of bacterial types of a symbiotic nitrogen fixers and phosphorus), besides the control treatment (no fertilization) at three replicates, every one contain three plantlets. The previous treatments were added with the irrigation water one time every two week during the, two seasons of this experiment for six months in each season. The following characteristics were determined at the end of the experiment:

1- Length (cm) and number of leaves per plantlets.
2- Length (cm) and number of roots per plantlet.
3- Fresh and dry weights of leaves (g).
4- Leaves content of Indoles, total sugars, nitrogen, phosphorus and potassium.

Indoles content:

As described by Larsen *et al*., (1962), the concentration was calculated as mg. indole acetic acid /100 g fresh weight.

Total sugars:

According to Dubois *et al.*, (1956) and by means of the standard curve of glucose as a percentage.

N, P and K content:

As described by (Linder, 1944) method as percentages

The complete randomized design was adopted for the experiment according to (Snedecor and Chocran 1980), average were compared using L.s.d. values at 5 % level, Duncan multiple Range test (1955) was used to compare the means of various treatments.

RESULTS AND DISCUSSION

The following parameters discusse the beneficial effect of yeast (*Saccharomyces cerevisiae*) and biofertilizer (microbien) on the plantlets of *Phoenix dactylifera* L. cv. Bartomouda

1-Length (cm) and leaves number / plantlet:

Data in table (1) indicated the significant effect of yeast (*Saccharomyces cerevisiae*) at 20 cm^3/100 cm^3 water and 10g/pot of biofertilizer (microbien) on the length (cm) and leaves number of the plantlets. These two treatments were produced the highest significant means for plant height (25.6 and 38.0 cm in the first and second season respectively) and leaves number per plantlet (4.0 and 5.7 leaves/plantlet in the first and second season, respectively) of the plantlets compared to control treatment (13.5 and 14.4 cm for plant height and 2.7 and 3.0 leaves/plantlet ,in the first and second seasons, respectively).There was not significant differences between the treatments of yeast 10,20 and 30 cm^3/l00cm^3 water in the first season, meanwhile there was significant differences between 20 and 30 cm^3 yeast/100 cm^3 in the second season for the plantlet height. Significant differences were also found between yeast treatments for the number of leaves per plantlet in the second season. The above results were to be concurring with the other scientists, Faissal *et al,* (1995) who stated that shoot length of Anna apple trees was stimulated by spraying active dry yeast at 0.1%. Abou- Taleb *et al,* (2004) reported that number of leaves of olive trees was increased with biofertilizers (*Bacillus megatherium*). Dibut *et al.* (1996) illustrated that plant height and number of leaves of banana plants were raised with 20 l/ha *Azotobacter chrococcum*. Abd- Rabou(2006) mentioned that bio fertilizers (Microbien and Phosphorene) were improved plant height and number of leaves of avocado and mango seedlings. Abedel Aziz *et al*, (2008) found that active yeast treatment at 10 ml/l increased the growth parameters of tomato plants.

2- Root length (cm) and number / plantlet:

Data in Table (1) explore the significant responses of the root length and number per plantlet by the treatment of yeast at, 20 cm^3/100 cm^3 water and biofertilizer at 10 g/pot. (51.7 and 53.6 cm in the first and second seasons, respectively for root length and 13.1 and 13.9 in the first and second seasons, respectively for number of roots), compared to control treatment which was induced 30.5 and 32.5 cm

and 9.5 and 10.2 roots/plantlet for root length and number of roots in the first and second season respectively. In addition, there was a significant differences between yeast treatments for length of roots in the tow seasons, while significant differences were founded between the treatments of 20 and ^{30cm3}/100 cm^3water of yeast for the number of roots in the second season. These results were similar to Haggag and Azzazy (1996) who found that Microbien increased vegetative growth of mango seedlings. Abou El-Khashab (2003) suggested that *Azotobacter* and *Asospirillium* enhancing length and number of roots of olive transplants. Harender and Sharma (2009) found that root length of apple plants was increased with *Azotobacter chrococcum* in the apple nursery. El-Bastawissy *et al*., (2009) stated that length and number of roots of date palm plantlets was increased with yeast extract in MS medium. Harman (2009) showed that root growth and development of *Trichoderma* spp. was enhanced by *Rhizobacteria.* Khalid (2009) postulated that Rhizobacteria inoculation of wheat *in vitro* culture was increased root elongation. The enhancing effects of active yeast to different plants were attributed to its properties as it contain different nutrients, higher percentage of proteins, large amounts of vitamin B and natural plant growth hormones, also enhancing the synthesis of protein and RNA (Afify *et al* , 2004)

3- Fresh and dry weights of leaves (g):

Concerning the effect of yeast treatments on the fresh and dry weights of leaves, all treatments of yeast (10, 20 and 30 cm^3/100 cm^3 water) and 10 g/pot microbien which were founded in Table (1) had a the significant stimulated effect on fresh and dry weights of leaves in the tow seasons, compared to control treatment. The treatment of 20 cm^3 yeast /100 cm^3 water and 10 g/pot microbien recorded the highly significant means of fresh and dry weights of leaves, the highest significant differences within yeast treatments were also obtained in the tow seasons. Similar results were founded by, Akl *et al*., (1997) who revealed that weights of berries of grapevine were increased with dry active yeast and Phosphorein. Osman (2003) proved that bunch weights of Zaghlool date palm were promoting with biofertilizers Moreover El-Shamaa (2001), Hosam El-Deen *et al.*, (2001) and Ahmed *et al.,* (2003) found that the bunch weights of Williams banana cultivars were increased with dry yeast as Foliar spraying. Gkon (2009) stated that *Azospirillum* as a commercial inoculant was

increased dry weights of agriculture crops in the different soils and climatic regions the beneficial effects of the yeast treatments may be dut to its contain of protein ,carbohydrates, lipids, minerals (such as Na,Ca,Fe,Mg,S,Zn,Mn,NI), also thiamine, riboflavin, niacin, pyridoxine, pantothienic acid, biotin, choline, folic acid and vitamin B

(B1+B6+B12). All these components are very important for enhancing growth characters (leaves and root number, shoot and root length) of date palm plantlets.

Table (1): Effect of the different yeast concentrations 10 g/pot microbein on growth characters of date palm plantlets cv. Bart mouda during 2008 and 2009 seasons

Treatmets $Cm^3/100cm^3$ water	Plant height(cm)		Number of leaves per plantlet		Root length (cm)		Number roots per lplantlet		leaves F. w.(g)		leaves d.w (g)	
	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
Cont	13.5 b	14.4 d	2.7 b	3.0 d	30.5 c	32.5 c	9.5 b	10.2 b	2.9 d	3.4 d	1.2 c	1.5 c
10 y+ 10 Bio	20.7ab	27.2 b	3.1 b	4.3 b	44.2 b	45.8 b	12.0 a	13.4 a	3.8 b	4.4 b	2.2 b	2.1 b
10 y+10Bio	25.6 a	38.0 a	4.0 a	5.7 a	51.7 a	53.6 a	13.1 a	14.9 a	4.3 a	5.4 a	1.6 a	2.6 a
30 y+10 Bio	17.5 b	20.0 c	3.1 b	3.5 c	43.0 b	44.3 b	12.0 a	13.1 a	3.2 c	4.0 c	1.4 c	1.7 c
L.s.d	7.6	3.0	0.8	0.4	3.8	4.1	1.4	1.1	0.2	0.4	0.2	0.2

Y=yeast and Bio=Biofertilizer

Means within a column having the same letters are not significantly different according to Duncan's Multiple Range Test at 5% level .

4- Indoles content (mg/100 g f.w):

Indoles which is considered the important factor affect plant growth characters (shoot and root length, number of shoot and roots and fresh and dry weights), was also founded in the yeast content. Data in table (2) showed that the treatments of 20 cm3 yeast /100 cm^3 water and 10 g/pot microbien resulted high significant values of indoles in the leaves of treated plants (5.8, 6.3 mg/100 g f.w. in the tow seasons, respectively) compared to control treatment which gave the lowest values of indoles (2.4 and 2.7mg/100g f.w. in both seasons, respectively), The highly significant differences results of indoles content were occurred by the treatments of yeast. The current results are in agreement with Tiwari (2009) who proved that *Azospirillum*, *Azotobacter, Klebsiella* and *Pseudomonas* sp, were produced highly significant indoles content. In pearl milet leaves Kravchenko (2009) stated that indoles content was raised in the leaves of radish and tomato plants when inoculated with Rhizobacteria,

Biswas *et al*. (2009) showed that indoles was accumulated in the *Oryza sativa* when treated with *Rhizobium leguminosarum*, *Rhizobium* sp and *Bradyrhizobium sp.*

5- Total sugars %:

From results in Table (2) it is clear that total sugars were significantly accumulated in the leaves of the plantlets when treated with yeast at the various levels and 10 g/pot (microbien) in both seasons compared to control treatment. The treatment 10 cm^3

Yeast/100 cm^3 water gave lowest contant of total sugars (56.2 and 68.5% in the tow seasons, respectively). The above results are in accordence with these of Ebrahiem *et al*. (2000) on Balady Mandarine and Abd El-Galil *et al.* (2003) on grapevine as they found that total sugars were accumulated by yeast treatment. Tejera (2009) on *Phaseolus vulgaris*, indicated that the total sugars were accumulated when the plants inoculated with Rhizobium Lirewise,. Mahmoud *et al*. (2008) found that total sugars were increased with biofertilizer treatments nitrobien, phosphorien in the wheat plants.

6- Nitrogen,phosphorus and potassium content % :

Data in the Table (2) exhibit the enhancing stimulating effect of yeast treatments and biofertilizer on the fixation of nitrogen, which was closely correlation to the growth of the plants and production of the biomass, as well as Phosphorus and potassium, which were found in yeast and must found for plant metabolism. The content of nitrogen, phosphorus and potassium were significantly raised with the different levels of the yeast and 10 g/pot microbien, compared to control treatment which gave the lowest averages, which were 2.1 and 2.3 % for nitrogen, 0.1 and 0.2 for phosphorus and 0.5 and 0.6% for potassium in the tow seasons, respectively. The highest records were occurred by 20 cm^3 yeast for N, P and K%. These results are concur with thase of other. Ahmed *et al.* (1997) who mentioned that biofertilizers, mitrobeine, active dry yeast and rhizobacterine were improved nitrogen content in the grapevine plants. Sharma and Bhutani (2000) indicated that nitrogen was accumulated in apple trees with *Azotobacter* and *Glomus fascicultum*. Fayed (2005) reported that biofertilizers increased nitrogen content in peach leaves. Jia (2009) showed that nitrogen and phosphorus were accumulated when *vicia faba* plants was inoculated by *Rhizobium* and *Arbuscular mycorrhiza*l fungi.Furthermore, Adesemoye *et al*. (2009) stated that the inoculation

of Rhizobacteria (PGPR) promoted plant growth of *Zea maiz* (corn) and nitrogen content was significantly enhanced . According to the prvious resultsit could be recommended to use the combination active dry yeast at 20cm^3/100cm^3 water and microbien at 10 g/pot to score the best vegetative and root growth in plantlets of date palm cv. Bartmouda under glasshouse condition .

Table (2): Effect of the different yeast concentrations and 10 g/pot microbein on chemical contents of date palm plantlets cv. Bartmouda during 2008-2009 seasons.

Treatmets Cm^3/100cm3 water	Indoles mg/100gF.w.		Total sugars (%)		N (%)		P (%)		K (%)	
	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
Cont	2.40	2.70	45.1	45.50	2.10	2.30	0.10	0.20	0.50	0.60
10y+10Bio	5.50	6.00	56.2	68.50	6.00	6.30	0.40	0.44	0.90	0.90
20y+10Bio	5.80	6.30	62.1	70.30	6.50	7.00	0.80	0.83	1.10	1.20
30+10Bio	4.60	5.30	60.2	69.10	4.03	5.30	0.20	0.30	0.70	0.80
L.s.d at 5%	0.41	0.33	1.72	2.10	0.19	0.22	0.02	0.02	0.02	0.03

Y=yeast and Bio=Biofertilizer

Fig (1): Effect of the different yeast concentrations and 10 g/pot microbein on growth characters of date palm plantlets cv. Bartmouda

1= con
2= 10 cm^3 yeast+10 g bio
3= 20 cm^3 yeast+10 g bio
4= 30 cm^3 yeast+10 g bio

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تأثير الخميرة النشطة و السماد الحيوى على النمو والتركيب الكيماوى لنبيتات نخيل البلح صنف برتمودا

لبنى محمد عبد الجليل و محمد عبد الرسول

المعمل المركزى للابحاث و تطوير نخيل البلح معهد بحوث البساتين .مركز البحوث الزراعيه. الجيزه- مصر.

تهدف هذه الدراسة والتى اجريت بالمعمل المركزى خلال موسمى 2008-2009 الى زيادة النمو الخضرى و الجذرى لنبيتات نخيل البلح صنف برتمودا ناتج زراعة الانسجة بعد ستة اشهر من مرحلة الاقلمة فى الصوبة. ولقد عوملت هذة النبيتات بالخميرة النشطة بثلاث تركيزات و هم 10 ،20 و 30 سم^3 3 /100 سم^3 ماء وكذالك السماد الحيوى ميكروبين بمعدل 10 جم/اصيص بالاضافة الى معاملة الكنترول (بدون تسميد) ، ولقد اضيفت هذه المواد مع ماء الرى مرة واحدة كل اسبوعين لمدة ستة اشهر لكل موسم على حده ، و لقد أوضحت النتائج المتحصل عليها ان المعاملة 20 سم^3/100 سم ماء من الخميرة النشطة حققت أعلى النتائج فى طول النبيتات و الجذور، و عدد الاوراق و الجذور وبفروق معنويه عند مقارنتها بمعاملة الكنترول ،كما أد ت المعاملة بالخميرة النشطة و كذالك السماد الحيوى الى زيادة معنوية فى محتوى اوراق النبيتات من الاندولات و السكريات الكلية و النيتروجين ،الفوسفور و البوتاسيوم. لذا فانه يمكن التوصيه باستخدام الخميرة النشطة بتركيز 20سم^3/100سم ماء+ السماد الحيوىميكروبين بمعدل 10جم / اصيص لتحقيق أفضل نمو خضرى وجذرى ومحتوى كيماوى داخلى لنبيتات نخيل البلح صنف برتمودا فى أقل وقت ممكن عند رعايتها داخل الصوبه.

الكلمات الدالة: الخميرة، السماد الحيوى، النمو و النيتروجين.