

## EFFECT OF BIOFERTILIZERS APPLICATION ON THE HARDENING AND GROWTH OF MALACABE PLANTLETS PRODUCED BY TISSUE CULTURE TECHNIQUE.

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**ABSTRACT:** *This work was carried out under the greenhouse condition at Central Laboratory of Date Palm Research and Development, Giza, Egypt during 2009 and 2010 seasons to examine the effect of nitrobie and biogien biofertilizers containing Azotobacter chroococcum and Azospirillum sp., respectively at 0, 5,10 and15 gm/plant, alone or in the following combinations between them 5gm nitrobie +5 gm biogien /plantlet,10gm nitrobie +10gm biogien /plantlet and 15gm nitrobie +15gm biogien /plantlet on growth and chemical composition of one- year-old plantlets of date palm(Phoenix dactylifera) cv. Malacabe. Experimental results indicated that all biofertilization treatments significantly increased plant height, number of leaves/ plantlet ,leaflet width ,number of roots/plantlet and root length . Moreover, the content of N,P,K,Zn,Mn,Cu and Fe in the leaves were also increased in both seasons with the superiority of combination between biogien and nitrobie at 15 g/ plant for each. A similar trend was also gained concerning the content of indoles and chlorophyll a,b and carotenoids in the leaves. However, the highest percent of N and P was recorded by the combined treatment of 15gm/ plantlet biogien+15gm/ plantlet nitrobie in the two seasons, but the highest percent of K was recorded by the combined treatment of 10 gm / plantlet biogien+10 gm/plantlet nitrobie . So,It could be recommended to use the combination between 15gm biogien/ plantlet +15gm nitrobie / plantlet every 2 months as a soil drench to obtain the best vegetative growth of date palm cv. Malacabe plantlet.*

**Key wards:** *Phoenix dactylifera, hardening, biofertilizer, nitrobie and biogien.*

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### INTRODUCTION

Date palm (*Phoenix dactylifera* L.) has a great economical importance and agricultural uses throughout human's history . In Egypt distribution of date palm trees, covers a large area extends from Aswan to North Delta, beside the oasis of Siwa, Bahariya, Farafra, Kharga and Dakhla. At present, the importance of palms increases day after day due to their different uses and benefits for both human and environment. Biofertilizers contain micro-organisms, which fix atmospheric nitrogen in a free living state,e.g *Azotobacter* and *Azospirillum* (Darwish, 2002) . Moreover, *Azotobacter*

secretes some growth promoting factors, e.g gibberellin, cytokinin-like substances, auxins, as well as some vitamins such as thiamine, riboflavin, pyridoxine, cyanocobalamin, nicotinic and pantothenic acids (Darwish, 2002). Subba- Rao (1993) indicated that *Azotobacter chroococcum* synthesizes antifungal antibiotics, which gave it additional advantage for the use in the field of bioproduction. In this regard Peacock and Daniel (1992) postulated that inoculation with *Azotobacter* or *Azospirillum* greatly improved growth and quality of tall fescue and bermudagrass sods. El-sayed and El-Feky (2007) declared that biogien at the rate of 10 gm/plant improved vegetative and root growth of *Ficus binnendijkii* (Amstel King) plants, as well as the contents of pigments, N, P and K in the leaves. On the same line, were those results of Attia and Abdel-Azeem (2005) on *Lawsonia inermis* Ahmed *et al* (2005) on *populus nigra* and Sarhan *et al* (2007) on *jojoba*. However Shahin (2005) stated that fertilization combinations containing phosphorene (biofertilizer) slightly enhanced growth density and colour of paspalum turf grown in either sandy or loamy soil. The objective of this trial, is to find out the effect of fertilization with biogien and nitrobien, alone biofertilizers or in combinations on hardinens, growth and chemical composition of date palm cv. malacabe plantlets.

## **MATERIALS AND METHODS**

A trial was conducted under the greenhouse condition at Central Laboratory of Date Palm Research and Development, Giza, Egypt during the two successive seasons of 2009 and 2010 to study the effect of biofertilizers with biogien and nitrobien, individually or in combinations on growth and chemical composition of date palm cv. malacabe plantlets

The following fertilization treatments were applied every two months :

- 1- No fertilization, referred to as control.
- 2- Nitrobien ; a biofertilizer, which contains a specific strain of *Azotobacter chroococcum* bacteria, conc.  $10^{-7}$ - $10^{-9}$ /cell) was added as a soil drench at 5, 10 and 15 gm/plant .
- 3- Biogien; a biofertilizer, which contains a specific strain of *Azospirillum* sp bacteria, conc.  $10^{-7}$ - $10^{-9}$ /cell) was also added as a soil drench at 5, 10 and 15 gm/plant .
- 4- Combinations between nitrobien and biogien at 5+5gm/plantlet, 10+10 gm/plantlet and 15+15gm/plantlet for each one, respectively , as a soil drench. One- year- old plantlets of *p.dactylifera* L.cv. malacabe with average of 10-12 cm height were planted on April, 1<sup>st</sup> for each season in 20- cm diameter plastic pots (one plantlet /pot) filled with peat/sand/ perlite mixed medium (1:1:1, by volume). All plantlets under various treatments were irrigated once every 6 days with 500 ml of fresh water/pot. The

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design used in the two seasons was a completely randomized design as described by Snedecor and Cochran (1972) with 3 replicates, as each one contained 3 plantlets. The obtained data were statistically analyzed using MSTAT Computer Program (1985) and means were compared by Duncan's Multiple Range Test as described by Duncan (1955) to verify differences among means of various treatments. At the end of each season (November, 30<sup>th</sup>) the following data were recorded: plant height (cm), number of leaves /plant, leaf width (cm), number of roots/plantlet and root length (cm). In fresh leaf samples photosynthetic pigments (chlorophyll a, b and carotenoids) as mg/gm F.W. were determined according to Moran (1982), while in dry samples the content of nitrogen using micro-Kjeldahl method described by Jackson (1973), phosphorus colorimetrically as recommended by Hucker and Catroux (1980) and potassium using flame photometer as explained by Cottenie *et al.*, (1982) were measured as mg/g D.W. Indoles content was assessed as described by Larsen *et al* (1962). The concentration was calculated as mg. indole acetic acid /100gm fresh weight. However, phenol content was measured as described by A.O.A.C (1980). The contents of Zn, Fe, Cu and Mn were determined by using operation chart of Shimadzu atomic absorption.

## **RESULTS AND DISCUSSION**

### **I. Effect of biofertilizer treatments on vegetative growth:**

It is clear from data presented in Table (1) that plant height (cm), number of leaves/plant, leaf width (cm), number of roots/plantlet and root length (cm) were significantly increased in most cases of both seasons as a result of treated with the various biofertilization treatments employed in this study, with the superiority of the combined treatment between (biogien 15gm/plantlet + nitrobien 15gm/plantlet) which gave, in general the utmost high means in all vegetative growth parameters. The tallest high (48.89 and 46.72 cm) and number of leaves/plantlet (5.18 and 5.35) in the first and second seasons respectively were, also recorded by the combined treatment between 15 gm/plantlet biogien + 15 gm/plantlet nitrobien and gave the highest leaf width (1.26 and 1.24 cm in the first and second seasons, respectively). Concerning the effect of biofertilizer on number of roots, root length (cm) and root diameter (cm) the results showed that the highest significant increases in number of roots /plantlet (14.67 and 16.00), root length (38.0 and 38.5 cm) and root diameter (0.42 and 0.45 cm) were obtained from plants treated with 15 gm /plantlet biogien + 15 gm/plantlet nitrobien in both seasons, respectively. This may indicate the synergistic effect of biofertilizer, which fixes more atmospheric nitrogen and secretes more vitamins and growth promoting substances. See photo (1).

**Table 1**

## Effect of biofertilizers application on the hardening and growth.....



Photo (1): Effect of biofertilizers on growth of phoenix dactylifera, L.cv. malacabe plantles.

(A) Nitrobien + Biogien, (B) Biogien , (C) Nitrobien , (D) Control.

Similarity were these results of Peacock and Daniel (1992) on tall fescus and Bermudagrass,, Hunter and Butler (2005) on *Agrostis stolonifera*, El-sayed and El-Feky (2007) on *Ficus binnendijkii* (Amstel King). Mahmoud and Mahmoud (1999) on peach seedlings revealed that Microbial biofertilizers led to improvement in plant vigor of peach seedlings. Moreover, they added that adding nitrogen fixing bacterium led to great promotion in all plant characters under study. It was also reported that inoculation with Arbuscular mycorrhizal (AM) fungi significantly increased the growth of *Carrizo citrange* and Sour oranges rootstocks (Graham and Timmer 1985) ; leaf area of *Troyer citrange* Vinayak and Bagy araj1990), plant biomass, plant height, plant girth, leaf number, leaf area of acid lime (Reddy *et al.*,1996 ),shoot growth of Troyer citrange and Black Olympia grape (Yamashita *et al* ,1998) Also, El-sayed (2002) stated that microbial biofertilizer increased shoot length and leaf area of flame seedless grapevines growth characteristics and total leaf area / vine (Ahmed *et al* , 2003 and Abd El-Hady, 2003)

## II. Chemical composition:

According to data averaged in Table (2), it is evident that application of nitrobien and biogien, individually or in combination induced a significant increment in the leaf content of chlorophyll a , b and carotenoids (mg/g F.W )

**Table 2**

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over control plants in the two seasons . the data indicated that the highest value of chlorophyll a (8.04 and 8.01 mg/g F.W.) was recorded in the leaves of plant treated with 10 gm / plantlet biogien+ 10 gm / plantlet nitrobie in the first and second seasons, respectively ,while control treatment gave the lowest values 2.00 and 2.00 mg/gF.W in first and second seasons respectively.

The highest value of chlorophyll b (4.28-4.28 mg/g F.W.) were recorded in the leaves of plantlets treated with 15gm/ plantlet biogien +15gm/plantlet nitrobie in the first and second seasons, respectively. While the lowest value of Chlorophyll b (2.21 and 2.17 mg/g F.W. recorded in leaves of control plantlet in both seasons, respectively).

As for carotenoids content, the best values of carotenoids (8.24 and 8.23 mg/g F.W.) were recorded by the plantlets received 15 gm/plantlet biogien +15 gm /plantlet nitrobie in the first and second seasons respectively. these results are in agreement with those concluded by emphasis ,findings of Eissenstat *et al* (1993) could illustrate the influences of biofertilizers on carbohydrates content photosynthesis of Sour orange.

#### **Indoles content (mg/100 gm F.W.):**

Indoles which is considered the important factor affect plant growth characters (shoots and roots) Data in Table (3) showed that the high significant values of indoles in the leaves resulted from plant treated with 15 gm/ plantlet biogien+15 gm /plantlet nitrobie ( 0.43 and 0.44mg/100gF.W) in the two seasons, respectively followed by nitrobie 15 gm/plant (0.41 and 0.40 gm/100g F.W.) in both seasons, respectively. On the other hand, control treatment gave the lowest value (0.12 and 0.11 gm/100gF.W.) in the first and second seasons respectively .The current results are in agreement with those of Tiwari (2009) who proved that *Azospirillum*, *Azotobacter*, *Klebsilla* and *pseudomonas* sp were produced highly significant indole content.

#### **Total phenols:**

Data in Table (3) showed that the control treatment resultd high significant values of phenol content (1.00mg/100gF.W. for the two seasons) . Whereas 15.0 gm/ pot nitrobie gives the lowest values (0.18 and 0.18mg/100Gf.w. ) in the first and second seasons respectively.

#### **Nitrogen content ( %DW)**

The results presented in Table (4) referring the effect of biofertilizers , biogien and nitrobie on leaf content of N, P and K of malacabe plantlets . Data indicated that the highest percentage of N (1.60 and 1.62 %) was recorded in the leaves of plants treated with 15 gm/plantlet biogien+15 gm /

**Table 3**



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**Table 4**

plantlet nitroben in the first and second seasons respectively, followed by treatment with 5 gm/ plant nitroben (1.14 and 1.04%) respectively in both seasons, whereas the control treatment gave the lowest values ( 0.30 and 0.1% in the first and second seasons, respectively ). The current results are in agreement with Mueller and Kussaw (2005) on creeping bentgrass, Muscolo *et al* (1999) on pinus laricio, Hussein (2004) on iris tingitana cv wedgewood Sarhan *et al* (2007) who mentioned that the highest total N,K,Cu and Mn in the different parts of *jojoba* plant were recorded by spraying Biomagic at 10 gm/l in the presence of *Azotobacter* and *Bacillus* mixture.

#### **Phosphorus content (%) :**

The significant and highest phosphorus percentage resulted by treating with 15g/planlet biogen+15 gm/plantlet nitroben (5.50 and 5.55 % ) in both seasons, respectively. whereas the control treatment gave the least values (1.50 and 2.00%) in the first and second seasons, respectively.

#### **Potassium content (%) :**

Data in Table (4) the effect of biofertilizer treatment as a soil drench at 10 gm /plantlet biogen +10 gm/ plantlet nitroben showed its superiority in the increasing potassium accumulation in the leaves 2.76 and 2.77% in the two seasons, respectively followed by nitroben treatment at 5.0 gm/pot ( 2.22 and 2.20 % in both seasons, respectively) whereas the control treatment gave the lowest value 1.00% in the two seasons Sarhan *et al*(2007) reported that the highest N,K, Cu and Mn in the different parts of *jojoba* plant recorded by spraying biomagic at 10 gm/ l in the presence of *Azotobacter* and *Bacillus* mixture.

#### **Micro-elements content (ppm):**

A considerable variation was recorded in Zn, Mn ,Fe and Cu accumulation in the leaves due to the effect of either biofertilizer used in this study, as shown in Table (5).

#### **Iron content(ppm) :**

A favorable effect from using 10gm/ plantlet biogen +10 gm/ plantlet nitroben was recorded, as this combination gave 89.88 and 88.80 ppm in the first and second seasons, respectively , whereas the control treatment recorded the lowest values (10.33 and 9.99 ppm in the first and second seasons respectively .

#### **Zinc content (ppm) :**

10 gm /plantlet nitroben+10 gm/plantlet biogen showed its superiority in this concern as recorded 99.44 and 97.45 ppm in the first and second seasons, respectively ,whereas the lowest value recorded from control treatment, which were 9.33 and 9.00 in the first and second seasons, respectively.

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**Table 5**

### **Cu content (ppm):**

Referring the effect of nitroben and biogen the treatment of biogen at 10gm /plantlet +10 gm/plantlet nitroben showed its superiority in increasing Cu accumulation in the leaves to 92.89 and 90.89% ppm in the two seasons respectively, compared with control treatment which gave 9.44 and 9.30 ppm in the first and second seasons, respectively.

### **Mn content(ppm):**

The combination of 10 gm/pot nitroben +10gm/plant biogen showed its superiority in Mn accumulation in leaves, as it gave 81.21 and 80.21 ppm in both seasons, respectively ,whereas the control treatment gave the least value ( 10.50 and 9.99 ppm) . All obtained results are in harmony with Russo and Berly (1990) and Eissa (2003) when using various groups of biostimulants and hummats, they found that these substances increased the nutrients uptake.

According to the previous results ,it could be recommended to use the combination of 15 gm /plantlet biogen + 15 gm /plantlet nitroben, every 2 months during the growing season for obtaining the best vegetative growth in plantlets of date palm cv. malacabe undur greenhouse condition.

## **REFERENCES**

- Abd El-Hady, A.M. (2003). Response of Flame seedless vines to application of some biofertilizers. *Minia J. Agric & Develop* . 23(4) 667- 680.
- Ahmed, A. Amany, A.F. Ali and O.F. Dakhly (2005). Response of *opulus nigra* seedling to *Azotobacter vinelandii* transformant isolates and N fertilization. The 6<sup>th</sup> Arab. Conf .Hort .,March 20-22,Fac. Agric., Ismailia, Egypt:391-403.
- Ahmed, A.M., H.A. El-Sayed and M. M. sheib (2003). Effect of bio and organic source of nasa partiol sulstitute for chemical fertilizations on bud behaviour growth and fruiting of flame seedless grapevines. *Minia J. Agric& Dvelop*. 23(3):529-546.
- A.O.A.C. (1980). Official Methods of Analysis of A.O.A.C Tnternational, 16 Ed, Vol.A.O.A.C, Tnternational press , USA, chapter 4,p31
- Attia, Elham M. and H.M. AbdeAzeenHoda (2005). Effect of biofertilization on yield and active materials in *Lawsonia inermis* L .plants at Maryout. Pro 6<sup>th</sup> Arab Conf.Hort. ,March 20-22,Fac. Agric,Ismailia,Egypt;341-358.
- Cottenie, A., M. Velghe and R. Camerlynck (1982). Chmical Analysis of Plant and Soil Laboratory of Analytical and Agrochemical State Univ. Ghent, Belgium.
- Darwish, F.M. (2002). Effect of different fertilization sources and levels on growth, yield and quality of tomato . Ph.D. Thesis, Fac.Agric, Cairo Univ.
- Duncan, D.B. (1955). Multiple range and multiple F-tests .j. Biometrics,11:1-42
- Eissa, F.M. (2003). Effect of some biostimulantS on vegetative growth, yield and furit quality of Kelsey plum. *Egypt J. Appl. Sci.*; `8(5B) :716-735

### Effect of biofertilizers application on the hardening and growth.....

- Eissenstat, D.M., J.H. Graham, J.P. Syvrtsen and D.L. Drauillard (1993). Corban economy of Sour orang in relation to mycorrhizal coldnization and phosphorus status. *Annals of Botany*, 71(1):1-10 Hort. Abst, 63-5568.
- El-sayed , H.A. (2002). Attempts for stimulating the availability of phosphorus in triple calcium superphosphate for flame vines by using some materials. *Annals of Agric.Sc, Moshtohor*, 40 (1) 2403-2414
- El-sayed, A. Boshra and A.E.H. El-Feky (2007). Effect of biofertilization (Rhizobacterene, Nitroben and Biogien) on growth of *Ficus binnendijkii* L. Amstel King plant. *Egypt. J. Appl. Sci.*, 22(10A):157-170
- Graham, J.H. and L.W. Timmer (1985). Rock phosphat as a source of phosphorus for vesicular arbuscular my corrhizal development and growth of citrus in soilless medium. *J. Amer. Soc .Hort. Sci*, 110(4):489-492.
- Hucker, T. and G. Catroux (1980). Phosphorus in sewage ridge and animals wester slurries. *Proceeding of the EEC Seminar Haren (G.R) Groningen, Netherlands*, 12-13 .
- Hunter, A. and T. Burler (2005). Effect of humic acid on growth and development of *Agrostis stolonifera* grass in a sand- based root zone. *Tnter. Turfgrass Soc. Res. J.*, 10 :937-943.
- Hussein, H.S. (2004). physiological studies on iris plant M.Sc Thesis, Fac. Agric, Cairo Univ.
- Jackson, M.L. (1973). *Soil Chemical Analysis*, Prentice-Hall of India Private Ltd. M-97. New Delhi, 498 pp.
- Larsen, P., A. Harbo, KLung Sour and T. Asheim (1962). On the biogenesis of some indole compounds in *Azotobacter linum*. *Physio Plant.*, 15:552-655.
- Mahmoud, H.M. and A.F. Mahmoud Fatma (1999): Studies on effect of some biofertilizers on growth of peach seedlings and root disease incidence. *Egypt. J. Hort.*, 26(1):7-18.
- Moran, R. (1982). Fomula For determination of chlorophyll pigment extracted with N,N- dimethyl formamid . *Plant Physiol*, 69:1376-1381.
- MSTAT Computer Program (1985). software program for Design, Management and Analysis Experimental (Version 4.0), Michigan State Univ.
- Mueller, S.R. and W.R. Kussow (2005). Biostimulat influences on turfgrass microbial communities and creeping bentgrass quality. *HortScience*, 40(6): 1904-1910.
- Muscolo, A., M.R. panuccio and S. Nardi (1999). Effect of two different humic substances on seed germination of pinus laricio, seed Science and Technology, 27(2):799-803.
- Peacock, C.H. and P.E. Daniel (1992). A comparison of turfgrass response to biologically amended fertilization. *HortScience*, 27(8):883-884
- Reddy, B., D.J. Bagyaria and B.C. Mahestia (1996). Selection of efficient VA mycorrhizal Fungi For acid lime. *India J. Microbil.*, 36(1): 13-16 (Hort Abst, 67-1654)
- Russo, R.O. and N. Berly (1990). The use of organic biostimulants to help low input sustainable Agriculture. *J. Sustainabe Agric.*, 1(2): 19-24.

- Sarhan, A.Z., I. EL-Maadawy, Effat and S.S. Surour (2007). Effect of biopromoters and biofertilizer application on growth and chemical composition of jojoba plant. *J. Agric. Sci., Mansoura Univ.*, 32(8):6575-6598.
- Snedecor, G.W. and W.G. Cochran (1972). *Statistical Methods*. 6<sup>th</sup> ed., Iowa State College Press, Ames, Iowa, USA. 507p.
- Subba -Rao, N.S. (1993). *Biofertilizers in Agriculture*. 3<sup>rd</sup> Ed. Oxford & I.B.H publishing co.Ltd., Newyork, Bombai ,Calcutta, P 242
- Tiwari, M. (2009). Associative diazotrophs of pearl millet (*Pennisetum glaucum*) from semi arid region- isolation characterization. *Indian Journal of Biological Science*, 41(4): 341-345.
- Vinayak, K. and D. J. Bagyaraj (1990). Vesicular-arbuscular mycorrhiza screened for *Troyer citrange*. *Biology and Fertility of Soils*, 9(4) : 311-314 (Hort Abst, 61-2369).
- Yamashita, K., H. Tateno and A. Nalchahara (1998). Growth promotion of trifoliolate orange seedlings and grape rooted cuttings through an infection of V.A. mycorrhiza , *Bullet. Fac. Agric Miyazaki Univ.*, 45(1/2):21-26 (Hort Abst, 69-7300).

تأثير إضافة الاسمدة الحيويه على نمو و تقسية نبيتات نخيل البلح صنف  
ملكابى ناتج زراعة الأنسجه

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المخلص العربي

أجريت هذه التجريه فى الصوبه الزجاجيه الخاصه بالمعمل المركزى لاجاث تطوير نخيل البلح ، الجيزه- مصر خلال عامين متتاليين هما ٢٠٠٩ و ٢٠١٠ ولذلك لدراسة تأثير إضافة النيترويين و البيوجين (سمادين حيويين يحتوى الاول منهما على بكتريا *Azotobacter chroococcum* بينما يحتوى الثانى على بكتريا *Azospirillum sp* ) . كلا على حده بمعدل صفر و ٥ و ١٠ و ١٥ جم / نبات تكييفشا للتريه وكذلك التوليفات التاليه بينهما ٥ جم نيترويين + ٥ جم بيوجين / نبات ؛ ١٠ جم نيترويين + ١٠ جم بيوجين و ١٥ جم نيترويين + ١٥ جم بيوجين / نبات وذلك على النمو والتركيب الكيماوى لنبيتات نخيل البلح صنف ماكابى عمر سنه .ولقد اوضحت النتائج المتحصل عليها أن جميع معاملات التسميد ادت الى حدوث زياده مغنويه فى الطول النبيتات (سم) وعددا الاوراق /نبيتته و عرض الورقه و عدد و طول الجذور وكذلك محتوى الاوراق من عناصر النيتروجين و الفسفور و البوتاسيوم. كذلك زياده محتواها من الزنك و المنجنيز والنحاس والحديد فى كلا الموسمين . مع تفوق المعامله المشتركه بين النيترويين بمعدل ١٥ جم/نبات + البيوجين بمعدل ١٥ جم/نبات ولقد امكن الحصول على اتجاه مشابه فيما يتعلق بمحتوى الاوراق من الاندولات وكذلك محتوى الاوراق من كلوروفيللى من ا وب و اكاروتنيويندات .اما اعلى نسبه مئويه من الازوت والفسفورفى كلا الموسمين فقد سجلتها النباتات التى سمدت بالمعامله المشتركه بمعدل ١٥ جم/نبات نيترويين + ١٥ جم/نبات بيوجين بينما اعلى نسبه مئويه من البوتاسيوم سجلتها النباتات التى عوملت ب ١٠ جم نيترويين / نبات + ١٠ جم بيوجين /نبات . من هذه النتائج يمكن التوصيه بالتسميد بالمعامله المشتركه بين السمادين الحيويين بمعدل ١٥ جم نيترويين /نبات + ١٥ جم بيوجين /نبات أرضيا كل شهرين خلال موسم النمو لتحقيق أفضل نمو خضرى وأعلى جوده.

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**Table (1): Effect of biofertilizers(Nitroben and Biogien) on some vegetative growth parameters of *Phoenix dactylifera* L.cv.malacabe plantlets during 2009 and 2010 seasons**

**First season (2009)**

| Treatments                     | No. Leaves | Leaf Length(cm) | Leaf width(cm) | No. Roots per plantlet | Root Length(cm) | Root Diameter(cm) |
|--------------------------------|------------|-----------------|----------------|------------------------|-----------------|-------------------|
| 5.0 g/pot Bio                  | 4.17 c-e   | 31.70 de        | 1.01 a-d       | 8.00 e                 | 20.33 de        | 0.33 d            |
| 10.0 g/ pot Bio                | 3.77 de    | 32.11 de        | 1.20 ab        | 9.00 de                | 22.41 cd        | 0.35 cd           |
| 15.0 g/ pot Bio                | 4.50 bc    | 37.74 bc        | 0.76 bd        | 13.67 ab               | 28.74 bc        | 0.35 b-d          |
| 5.0 g/ pot Nit                 | 3.83 de    | 35.82 c         | 0.83 a d       | 10.00 de               | 24.05 cd        | 0.35 cd           |
| 10.0 g/ pot Nit                | 4.50 bc    | 37.53 bc        | 0.99 ad        | 10.33 cd               | 22.74 cd        | 0.34 d            |
| 15.0 g/ pot Nit                | 4.79 ab    | 40.58 b         | 1.14 abc       | 14.33 ab               | 31.85 ab        | 0.38 b            |
| 5.0 g/ pot Bio+5.0 g pot Nit   | 3.83 de    | 34.58 cd        | 0.83 ad        | 12.67 ab               | 23.42 cd        | 0.37 bc           |
| 10.0 g pot/Bio+10.0 g/ pot Nit | 4.33 b-d   | 29.92 e         | 0.70 cd        | 12.33 bc               | 31.89 ab        | 0.42 a            |
| 15.0 g pot/Bio+15.0 g/ pot Nit | 5.18 a     | 48.89 a         | 1.26 a         | 14.67 a                | 38.00 a         | 0.42 a            |
| Control                        | 3.67 e     | 26.05 f         | 0.57 d         | 4.67 f                 | 14.98 e         | 0.29 e            |

**Second Season (2010)**

|                                |          |          |          |          |          |         |
|--------------------------------|----------|----------|----------|----------|----------|---------|
| 5.0 g/pot Bio                  | 4.00 cd  | 31.66 de | 0.93 abc | 7.33 e   | 21.27 de | 0.32 de |
| 10.0 g/pot Bio                 | 3.50 e   | 33.82 de | 1.19 ab  | 9.33 de  | 22.70 cd | 0.34 d  |
| 15.0 g/pot Bio                 | 4.58 b   | 38.44 bc | 0.76bc   | 14.00 ab | 29.13 bc | 0.35 d  |
| 5.0 g/pot Nit                  | 4.00 cd  | 35.15 cd | 0.82 a-c | 9.33 de  | 25.55 cd | 0.34 d  |
| 10.0 g/pot Nit                 | 4.67 b   | 38.18 bc | 0.98 a-c | 10.67 cd | 23.05 cd | 0.34 d  |
| 15.0 g/pot Nit                 | 4.79 b   | 41.57 b  | 1.13 ab  | 16.00 a  | 32.80 ab | 0.39 c  |
| 5.0 g/pot Bio+5.0 g/ pot Nit   | 3.83 c-e | 34.89 cd | 0.82 abc | 12.33 bc | 22.99 cd | 0.37 c  |
| 10.0 g/ Bio pot+10.0 g/pot Nit | 4.17 c   | 30.48 e  | 0.79 a-c | 12.33 bc | 33.19 ab | 0.42 b  |
| 15.0 g/ Bio pot+15.0 g/pot Nit | 5.35 a   | 46.72 a  | 1.24a    | 16.00 a  | 38.50 a  | 0.45 a  |
| Control                        | 3.67 de  | 26.65 f  | 0.54 c   | 4.67 f   | 15.03 e  | 0.30 e  |

Bio=Biogien

Nit=Nitroben

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

Table (2): Effect of biofertilizers(Nitrobien and Biogien) on chlorophyll a,b and carotenoids (mg/g.F.W) of *phoenix dactylifera* L.cv. malacabe plantlats during 2009 and 2010 seasons.

| First season(2009)            |               |               |             |
|-------------------------------|---------------|---------------|-------------|
| Treatments                    | Chlorophyll a | Chlorophyll b | Carotenoids |
| 5.0 g/pot Bio                 | 2.50 f        | 2.49 d        | 5.48 f      |
| 10.0 g/pot Bio                | 5.02 d        | 3.46 b        | 6.17 e      |
| 15.0 g/pot Bio                | 5.93 c        | 3.3 8 b       | 6.58 d      |
| 5.0 g/pot Nit                 | 5.83 c        | 2.90 c        | 7.64 b      |
| 10.0 g/pot Nit                | 5.23 d        | 2.76 c        | 5.55 f      |
| 15.0 g/pot Nit                | 4.41 e        | 2.28 de       | 5.00 g      |
| 5.0 g/pot Bio+5.0 g/pot Nit   | 4.34 e        | 2.87 c        | 6.97 c      |
| 10.0 g/pot Bio+10.0 g/pot Nit | 8.04 a        | 3.30 b        | 7.45 b      |
| 15.0 g/pot Bio+15.0 g/pot Nit | 6.96 b        | 4.2 8 a       | 8.24 a      |
| Control                       | 2.00 g        | 2.21 e        | 4.33 h      |
| Second Season(2010)           |               |               |             |
| 5.0 g/pot Bio                 | 2.50 f        | 2.48 de       | 5.47 f      |
| 10.0 g/pot Bio                | 5.01d         | 3.44 b        | 6.18 e      |
| 15.0 g/pot Bio                | 5.80 c        | 3.69 b        | 6.57 d      |
| 5.0 g/pot Nit                 | 5.83 c        | 2.89c d       | 7.61 b      |
| 10.0 g/pot Nit                | 5.29 d        | 2.76 d        | 5.51 f      |
| 15.0 g/pot Nit                | 4.48 e        | 2.27e         | 4.99 g      |
| 5.0 g/pot Bio+5.0 g/pot Nit   | 4.34 e        | 2.87 cd       | 6.95 c      |
| 10.0 g/pot Bio+10.0 g/pot Nit | 8.01 a        | 3.27 bc       | 7.44 b      |
| 15.0 g/pot Bio+15.0 g/pot Nit | 6.87 b        | 4.28 a        | 8.23 a      |
| Control                       | 2.00 g        | 2.17 e        | 4.32 h      |

Bio=Biogien

Nit=Nitrobien

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

**Table (3): Effect of biofertilizers(Nitrobien and Biogien) on indoles and phenols content (mg/100gf.w ) in the leaves of *Phoenix dactylifera* L.cv. malacabe plantlet during 2009 and 2010 seasons**

| Treatments                    | Total indols |               | Total Phenols |               |
|-------------------------------|--------------|---------------|---------------|---------------|
|                               | First season | Second Season | First season  | Second Season |
| 5.0 g/pot Bio                 | 0.34 c       | 0.33 c        | 0.70 b        | 0.68 b        |
| 10.0 g/pot Bio                | 0.21 g       | 0.20 f        | 0.52 d        | 0.50 d        |
| 15.0 g/pot Bio                | 0.41 b       | 0.40 b        | 0.50 e        | 0.49 d        |
| 5.0 g/pot Nit                 | 0.32 e       | 0.31 d        | 0.40 h        | 0.38 g        |
| 10.0 g/pot Nit                | 0.41 b       | 0.40 b        | 0.43 g        | 0.42 f        |
| 15.0 g/pot Nit                | 0.41 b       | 0.40 b        | 0.18 j        | 0.18 i        |
| 5.0 g/pot Bio+5.0 g/ pot Nit  | 0.28 f       | 0.27 e        | 0.37 i        | 0.36 h        |
| 10.0 g/pot Bio+10.0 g/pot Nit | 0.33 d       | 0.34 c        | 0.45 f        | 0.44 e        |
| 15.0 g/pot Bio+15.0 g/pot Nit | 0.43 a       | 0.44 a        | 0.61 c        | 0.60 c        |
| Control                       | 0.12 h       | 0.11 g        | 1.00 a        | 1.00 a        |

Bio=Biogien

Nit=Nitrobien

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

Table (4): Effect of biofertilizers(Nitrobien and Biogien) on N,P and K content ( %) of *phoenix dactylifera*,L. cv malacabe plantalet during 2009 and 2010 seasons.

First season 2009

| Treatments                | N%     | P%     | K%     |
|---------------------------|--------|--------|--------|
| 5.0 g/l Bio               | 0.15 i | 2.10 g | 1.59 h |
| 10.0 g/l Bio              | 0.24 h | 3.50 f | 2.10 c |
| 15.0 g/l Bio              | 0.38 f | 3.80 e | 1.94 e |
| 5.0 g/l Nit               | 1.14 b | 3.99 d | 2.22 b |
| 10.0 g/l Nit              | 0.38 f | 4.00 d | 1.67 g |
| 15.0 g/l Nit              | 0.59 d | 4.50 c | 2.02 d |
| 5.0 g/l Bio+5.0 g/l Nit   | 0.75c  | 4.90 b | 1.61 h |
| 10.0 g/l Bio+10.0 g/l Nit | 0.53 e | 4.00 d | 2.76 a |
| 15.0 g/l Bio+15.0 g/l Nit | 1.60 a | 5.50 a | 1.81 f |
| Control                   | 0.30 g | 1.50 h | 1.00 i |

Second season 2010

| Treatments                | N%     | P%     | K%     |
|---------------------------|--------|--------|--------|
| 5.0 g/l Bio               | 0.15 h | 2.50 i | 1.50 h |
| 10.0 g/l Bio              | 0.25 g | 3.45 h | 2.00 d |
| 15.0 g/l Bio              | 0.37 f | 3.77 g | 1.90 e |
| 5.0 g/l Nit               | 1.04 b | 3.97 f | 2.20 b |
| 10.0 g/l Nit              | 0.37 f | 4.20 e | 1.63 g |
| 15.0 g/l Nit              | 0.60 d | 4.55 d | 2.07 c |
| 5.0 g/l Bio+5.0 g/l Nit   | 0.77c  | 4.88 c | 1.61 g |
| 10.0 g/l Bio+10.0 g/l Nit | 0.55 e | 5.00 b | 2.77 a |
| 15.0 g/l Bio+15.0 g/l Nit | 1.62a  | 5.55 a | 1.77 f |
| Control                   | 0.12 h | 2.00 j | 1.00 i |

Bio=Biogien

Nit=Nitrobien

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

Table (5): Effect of biofertilizers(Nitrobien and Biogien) on Fe, Cu,Mn and Zn content (ppm) of *phoenix dactylifera* L.cv. malacab plantalets during 2009and2010 seasons.

First season 2009

| Treatments                    | Fe       | Cu       | Mn       | Zn       |
|-------------------------------|----------|----------|----------|----------|
| 5.0 g/pot Bio                 | 89.55 a  | 16.92 ef | 16.42 e  | 89.55 bc |
| 10.0 g/pot Bio                | 11.41 de | 13.31 g  | 13.51 f  | 10.81 d  |
| 15.0 g/pot Bio                | 17.71 c  | 21.83 d  | 11.31g   | 91.37 b  |
| 5.0 g/pot Nit                 | 13.33 d  | 38.19 b  | 25.69 d  | 11.11 d  |
| 10.0 g/pot Nit                | 18.50 c  | 15.47 f  | 11.05 g  | 10.71d   |
| 15.0 g/pot Nit                | 13.13 d  | 10.95 h  | 69.65 c  | 11.44 d  |
| 5.0 g/pot Bio+5.0 g/pot Nit   | 66.66 b  | 18.45e   | 76.08 b  | 87.43 c  |
| 10.0 g/pot Bio+10.0 g/pot Nit | 89.88 a  | 92.89 a  | 81.21a   | 99.44a   |
| 15.0 g/pot Bio+15.0 g/pot Nit | 18.66 c  | 25.33 c  | 15.33 ef | 11.33 d  |
| Control                       | 10.33 e  | 9.44 h   | 10.50 g  | 9.33 d   |

Second season 2010

|                               |          |         |          |         |
|-------------------------------|----------|---------|----------|---------|
| 5.0 g/pot Bio                 | 88.50 a  | 16.90 e | 16.40 e  | 88.50 b |
| 10.0 g/pot Bio                | 11.39 de | 13.49 f | 13.50 f  | 10.78 d |
| 15.0 g/pot Bio                | 17.70 c  | 21.80 d | 11.30g   | 90.35 b |
| 5.0 g/pot Nit                 | 13.30 d  | 37.10 b | 23.69 d  | 11.10 d |
| 10.0 g/pot Nit                | 18.40 c  | 14.99 f | 11.00 g  | 10.66d  |
| 15.0 g/pot Nit                | 13.19 d  | 10.60 g | 68.60 c  | 11.30 d |
| 5.0 g/pot Bio+5.0 g/pot Nit   | 65.66 b  | 17.45e  | 77.07 b  | 85.40 c |
| 10.0 g/pot Bio+10.0 g/pot Nit | 88.80 a  | 90.89 a | 80.21a   | 97.45a  |
| 15.0 g/pot Bio+15.0 g/pot Nit | 17.60 c  | 24.88 c | 14.90 ef | 10.99 d |
| Control                       | 9.99 e   | 9.30 g  | 9.99 g   | 9.00 d  |

Bio=Biogien

Nit=Nitrobien

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

