The Use of Biofertilizerto Enhance Fruit Quality and Productivity Zaghloul and Samani Date Palms

H. M. Elkhayat* and S.M. Elnoam
Horticulture Research Institute, Egypt
*Corresponding Author:Elkhayat_H_M66@Yaho

Received on: 27/5/2013 *Accepted:28/7/2013*

ABSTRACT

The present study was conducted during the two growing seasons 2010 and 2011 at Edko Province, Behera Governorate, Egypt to investigate the effect of mineral (ammonium nitrate) and bio- (Nitrobeen) fertilization, applied either alone or in combinations, on leaf mineral content and fruit quality of Zaghloul and Samani date palms trees. The obtained results indicated that Zaghloul cultivar had significantly higher values of fruit set ,fruit length, fruit flesh weight ,seed length and fruit total sugar as compared with Samani, whereas Samani had significantly higher fruit diameter and fruit tannins content. Furthermore, Zaghloul had significantly higher fruit phosphorous & nitrogen and leaf potassium and phosphorous. In addition, Samani had significantly higher fruit potassium and leaf nitrogen content. In general the plants treated with 720g ammonium nitrate plus 200 g Nitrobin treatment had significantly higher fruit total sugars, fruit weight, fruit flesh weight, fruit and leaf nitrogen and phosphorous. In addition 300g ammonium nitrate plus 300 g nitrobin increased fruit set, seeds length and fruit tannins. Furthermore, 600g ammonium nitrate plus 200 g nitrobin increased fruit length, fruit diameter ,seeds length, tannins ,leaf phosphorous and potassium. Moreover, all treatments caused a significant increase in fruit weight, fruit set, fruit and seeds length ,fruit diameter, fruit and leaf potassium than control in both seasons.

Key words: Bio-fertilizer – Zaghloul –Samani- mineral composition – fruit quality.

INTRODUCTION

Date palm is one of the oldest cultivated fruit trees in the world, known as tree of life because of its resilience, its need for limited water inputs, its long term productivity and its multiple purpose qualities. According to FAO, 2009, Egypt is considered the first country of the ten date producer (1,130,000 Tons). Zaghloul and Samani ultivars seem to be the most predominant soft date cultivars grown in Egypt, Its fruits are highly desired and demanded in the local and international market .The efficiency of fertilizers to increase crop yield is an important goal in all agriculture systems as well as the influence of the different types of fertilizers on human health. Therefore, now a days the use of bio fertilzers is recommended as a safe fertilization method to increase productivity and quality of many fruit species. Bio fertilizers such as Nitrobin and Phosphorin have been used as a source of nitrogen and phosphorus, respectively and to substitute for the application of their chemical form. Micro-organisms in bio-fertilizers maximize the availability of nutrients in the soil and improve their uptake and utilization (Frankenberger and Arshed,1995, Abd–Elmoniem and Radwan, 2003). The azotobacter produces growth regulators like IAA and GA and hence positively influenced plant growth (Sharma an Kumar, 2008). Aforementioned, the present investigation was conducted in order to study the influence of some bio-fertilizer (Nitrobin) on both fruit quality and productivity and leaf & fruit mineral composition of Zaghloul and Samani date palms.

MATERIALS AND METHODS

The present study was carried out during 2010 and 2011 seasons on 15 year old Zaghloul and Samani date palms (*Phoenix dactylifera a*,L.) grown at Edko Province, Behera Governorate, Egypt. The soil of the experimental orchard was sandy loam with pH of 7.29 and the soil analysis is presented in Table (1).

Table1: Soil analysis of the experimental orchard

Soil depth (cm)	Texture *	EC dS/m	pH	Cations (meq/l)				Anions (meq/l)		
				K^+	Na^+	Ca^{++}	Mg^{++}	HCO_3^-	Cl^-	SO_4^-
0-30	SL	1.5	7.29	0.69	6.96	5.34	2.99	3.8	5.46	6.86
30-60	SL	1.42	7.3	0.42	8.16	3.25	2.66	1.4	5.78	7.72
60-90	SL	1.21	7.1	0.37	14.72	2.45	3.02	1.3	8.24	7.83

*SL Sandy loam

Palm trees were selected as uniform as possible and were subjected to seven fertilization treatments. Ammonium nitrate (33.5%N) as the mineral (MN), and Nitrobin produced by General Organization for Agriculture Equalization Fund (GOAEF), Ministry of Agriculture, Egypt as the bio-fertilizer (BN). Ammonium nitrate was divided into two equal doses applied in March and May of both seasons. The full does of mineral N fertilizer (100%) was 1200 g ammonium nitrate/palm. Bio-fertilizers were applied once in May and palms were subjected to the following treatments:

1- Control (farm treatments was 1200g ammonium nitrate per palm.)
2- 300g ammonium nitrate (MN)+200 Nitrobin(BN).
3- 300g ammonium nitrate (MN)+300 g Nitrobin(BN).
4- 600g ammonium nitrate (MN)+200 g Nitrobin(BN).
5- 600g ammonium nitrate (MN)+300 g Nitrobin(BN).
6- 720g ammonium nitrate (MN)+200 g Nitrobin(BN).
7- 720 g ammonium nitrate (MN)+300 g nitrobin(BN).

Treatments were arranged in a randomized complete block design with three replications for each treatment and five palms for each replicate (7 treatments x3 replicates x five palms= 105 palms) for each cultivar. Mineral fertilizers were broadcasted on the soil surface and trees were irrigated after application. The pollen was from the same source. During the last week of June in each season fruit set percentage was determined by the following formula:

$$\text{Fruit set \%} = \frac{\text{The total number of fruits /spike}}{\text{The total number of flower position in the same spike}} \times 100$$

In addition, a sample of 10 fruits was randomly taken from each replicate at harvest time (15, October) to determine fruit physical and chemical characteristics. Average fruit weight (g), fruit length and diameter (cm), flesh and seed weight (g) was recorded. Total sugars were determined according to the method described by Malik and Singh (1980) and soluble tannins according to Swain and Hillis (1959). In addition, a sample of 3 leaves (leaflets, pinnae) was taken from the middle part of the leaf of each replicate in both seasons in order to determine leaf nutrients content pinnae and fruit samples were washed with tap then distilled water, weighed and oven dried at 65-70°C to a constant weight. The dried samples were ground and digested with sulphuric acid and hydrogen peroxide as mentioned by Evenhius and Dewaard (1980). Suitable aliquots were taken for the determination of nitrogen and phosphorous (%) colorimetrically according to Evenhuis (1976) and Murphy and Riley (1962) and leaf mineral composition (N, P and K %) were determined. Leaf and fruit potassium content were measured by a flame photometer.

Finally, all data obtained were statistically analyzed according to Snedecor and Cochran (1980) using SAS(1989). The least significant differences (L.S.D) was used to compare the means at 0.05 level.

RESULTS AND DISCUSSION

1. Fruit Quality

With regard to the date cultivars, the data presented in Tables (2, 3, 4, 5 & 6) showed that Zaghlol cultivar had significantly higher values of fruit set, fruit length, fruit flesh weight, seed length and fruit total sugar as compared with Samani. Whereas Samani had significantly higher fruit diameter and fruit tannins content.

The data in Table (2) indicated that fruit set of Zaghloul was significantly higher under the application with 300g ammonium nitrate+ 300 g nitrobin.as compared with 720 g ammonium nitrate +200 g Nitrobin and control. in the first season. Moreover, 600 g ammonium nitrate +300 g Nitrobin caused a significant increase in fruit set as compared with 720g ammonium nitrate + 200 g Nitrobin, 720 g ammonium nitrate + 300 g Nitrobin and control in the second season. However, fruit weight was significantly increased by 720 g ammonium nitrate + 200 g in the first season and 600g ammonium nitrate + 300 g Nitrobin in the second season as compared with 300 g ammonium nitrate + 200 g Nitrobin, 300 g ammonium nitrate + 300 g Nitrobin and control .

The data in Table (3) indicated that the 720g ammonium nitrate +300 g Nitrobin. treatment caused a significant increase in fruit length as compared with 300g ammonium nitrate +200 g Nitrobin, 720g ammonium nitrate +200 g Nitrobin and control in the first season .Whereas, plams treated with 600g ammonium nitrate +200 g Nitrobin had significantly higher fruit length when compared with 300g ammonium nitrate +300 g Nitrobin, 720g ammonium nitrate + 200 g Nitrobin, 720g ammonium nitrate + 300 g Nitrobin and control in the second season. Meanwhile, applying 600g ammonium nitrate + 200 g Nitrobin led to a significant increase in fruit diameter as compared with 300g ammonium nitrate + 200 g Nitrobin, 720g ammonium nitrate + 200 g Nitrobin and control in the first season, but in the second season. In addition, 720g ammonium nitrate +200 g Nitrobin significantly caused an increase in fruit diameter than 600g ammonium nitrate +200 g Nitrobin and control.

Table 2: The effect of fertilization treatments on fruit set (%) and fruit weight(gm) of Zaghloul and Samani date palms in 2010 &2011 season.

Treatments	Fruit set%						Fruit weight(gm)					
	First season			Second season			First season			Second season		
	Zaghloul	Samani	Means	Zaghloul	Samani	Means	Zaghloul	Samani	Means	Zaghloul	Samani	Means
Control(1200 g MN)	57.80	50.50	54.15	62.26	48.00	55.13	20.38	16.74	18.56	22.00	19.52	20.76
300g MN +200 g BN	61.23	56.97	59.10	78.50	56.55	67.53	24.6	19.1	21.85	31.95	21.25	26.60
300g MN+300 g BN	70.05	54.30	62.18	76.50	54.60	65.55	24.25	18.42	21.33	30.46	21.48	25.97
600g MN +200 g BN.	64.10	56.92	60.51	78.25	54.20	66.23	26.00	18.57	22.29	33.65	21.86	27.76
600g MN+300g BN.	64.50	57.52	61.01	78.75	57.34	68.05	29.43	19.47	24.45	38.25	21.10	29.68
720g MN+200g BN.	60.35	54.32	57.34	73.00	56.36	64.68	29.87	19.05	24.46	37.30	20.93	29.12
720 gMN +300 g BN.	66.50	56.20	61.35	66.50	54.10	60.27	27.000	19.56	23.28	33.53	21.40	27.47
Means between varieties	63.50	55.25		73.39	54.67		25.93	18.70		32.45	21.08	
L.S.D 0.05	1.78		3.34	1.34		2.52	1.30		2.44	1.49		2.78

Table 3: The effect of fertilization treatments on fruit length and fruit diameter (cm) of Zaghloul and Samani date palm in 2010 &2011 season.

Treatments	Fruit length(cm)						Fruit diameter (cm)					
	First season			Second season			First season			Second season		
	Zaghloul	Samani	Means	Zaghloul	Samani	Means	Zaghloul	Samani	Means	Zaghloul	Samani	Means
Control(1200 g MN)	5.56	4.45	5.01	5.49	4.92	5.21	2.16	2.15	2.16	2.31	2.35	2.33
300g MN +200 g BN	5.6	5.20	5.43	7.40	5.20	6.31	2.40	2.88	2.64	2.40	2.97	2.69
300g MN+300 g BN	6.45	5.00	5.73	7.33	4.9	6.13	2.52	3.03	2.78	2.33	2.89	2.61
600g MN +200 g BN.	5.77	5.20	5.48	8.13	5.2	6.67	2.64	3.00	2.82	2.15	3.00	2.58
600g MN+300g BN.	6.02	5.27	5.65	7.50	5.23	6.37	2.57	2.96	2.77	2.71	2.86	2.79
720g MN+200g BN.	5.60	5.17	5.39	6.80	4.95	5.88	2.50	2.80	2.65	2.70	3.96	2.83
720 gMN +300 g BN.	6.30	5.27	5.79	6.70	5.08	5.89	2.47	2.87	2.67	2.63	2.91	2.77
Means between varieties	5.91	5.08		7.05	5.08		2.47	2.82		2.46	2.85	
L.S.D 0.05	0.173		0.324	0.211		0.395	0.087		0.163	0.129		0.241

With regard to fruit flesh weight, Table(4) indicated that 720g ammonium nitrate+ 200 g resulted in significantly higher fruit flesh weight than 300g ammonium nitrate + 200 g Nitrobin , 300g ammonium nitrate +300 g Nitrobin and control. In the second season, plams treated 600g ammonium nitrate +300 g Nitrobin and720g ammonium nitrate +200 g Nitrobin had significantly higher fruit flesh weight as compared with control. For seed length, 300g ammonium nitrate + 300 Nitrobin g treatment caused a significant increase in seed length as compared with 300g ammonium nitrate + 200 g Nitrobin, 720g ammonium nitrate +200 g Nitrobin, 720g ammonium nitrate + 300 g Nitrobin and control in the first season. Plams treated with 600g ammonium nitrate + 200 g Nitrobin had significantly greater seed length as compared with 300g ammonium nitrate + 200 g Nitrobin and control in the second season.

Concerning fruit total sugar, Table (5) revealed that all treatments except 720g ammonium nitrate +300 g Nitrobin increased significantly fruit total sugar as compared with control in the first season. Moreover, applying 720g ammonium nitrate +200 g Nitrobin led to a significant increase in fruit total sugar compared with 600g ammonium nitrate +300 g Nitrobin and control in the second season. These results were similar to those found by Gabr and Nour -EL-Dein ,2005on apple. They found that leaf total soluble sugars of plants inoculated with N-bio-fertilization were higher than non inoculated ones.

Fruit tannins were also increased significantly with 300g ammonium nitrate + 300 g Nitrobin than relative to treatments. While fruits with 600g ammonium nitrate +200 g Nitrobin contained significantly higher fruit tannins content as compared with 600g ammonium nitrate +300 g Nitrobin, 720g ammonium nitrate +200 g Nitrobin and control in the first season. All treatments except control gave a significant increase in fruit tannins content than 600g ammonium nitrate +300 g Nitrobin in the second season.

In general, all treatments resulted in a significant increase in fruit weight, fruit set, fruit length and fruit diameter than control in both seasons. The obtained results were in agreement with those reported by Akl et al (1997)on grapevines who found that Phosphorin and active dry yeast caused highly increase in berry set .Also ,Mansour ,1998. reported that bio-fertilizers were very effective in improving yield of Anna apple, Abdle –Hamid, 2002, reported that bio-fertilization and bio-stimulant gave the highest fruit volume and weight for olive, Mostafa (2002) on Washington navel orange, Salama (2002) on Balady mandarin and Osman (2003)working on Zaghloul date revealed that bio-fertilizer treatment was the best one regarding yield and fruit characteristics for Zaghloul cv. under Alexandria conditions.

2. Mineral content.

Results of fruit and leaf mineral content as influenced by various applied treatments were presented in Tables (7, 8 & 9) showed that Zaghloul cv. had significantly higher content of fruit phosphorous, nitrogen and leaf potassium in both seasons and phosphorous in the second season than that of "Samani". In addition, Samani had significantly higher fruit potassium and leaf nitrogen content in second season than Zaghlol.

As for the different fertilization treatments, the obtained data in Tables (7, 8&9) indicated that 720g ammonium nitrate + 200 g Nitrobin caused a significant increase in fruit nitrogen content in both seasons as compared with 600g ammonium nitrate + 300 g Nitrobin and 720g ammonium nitrate + 300 g Nitrobin and the control in both seasons. Furthermore, 300g ammonium nitrate +200 g Nitrobin in the first season and 300g ammonium nitrate +200 g Nitrobin and 300g ammonium nitrate + 300 g Nitrobin treatments in the second season significantly increased fruit nitrogen in comparison with the control. A significant increase in fruit phosphorous content was obtained by 300g ammonium nitrate +200 g Nitrobin, 600g ammonium nitrate +200 g Nitrobin, 600g ammonium nitrate + 300 g Nitrobin and 720g ammonium nitrate +200 g Nitrobin treatments in the first season and 300g ammonium nitrate +200 g Nitrobin and720g ammonium nitrate +300 g Nitrobin treatment in the second seasons than the control. In addition, 600g ammonium nitrate + 300 g Nitrobin treatment resulted in a significant increase in fruit potassium as compared with 300g ammonium nitrate + 200 g Nitrobin, 300g ammonium nitrate + 300 g Nitrobin,720g ammonium nitrate + 300 g Nitrobin and control. Meanwhile, 600g ammonium nitrate +200 g Nitrobin gave a significant increase in fruit potassium than 300g ammonium nitrate +200 g Nitrobin and control. As for leaf phosphorous, plams treated with 600g ammonium nitrate +200 g Nitrobin had significantly greater leaf phosphorous in the first season as compared with all treatments except 720g ammonium nitrate + 300 g Nitrobin and in the second season when it compared with 300g ammonium nitrate + 300 g Nitrobin, 600g ammonium nitrate +300 g Nitrobin and control. Plams treated with 300g ammonium nitrate +200 g Nitrobin ,720g ammonium nitrate +200 g Nitrobin had significantly greater leaf phosphorous when it compared with the control in the second season . In addition, 720g ammonium nitrate +200 g Nitrobin significantly increased leaf nitrogen in the first season than 300g ammonium nitrate +300 g Nitrobin and control and in the second season as

Table 4: The effect of fertilization treatments on fruit flesh weight and seeds weight (gm) of Zaghloul and Samani date palm in 2010 &2011 season .

Treatments	Fruit flesh weight gm						Seeds weight gm					
	First season			second season			First season			second season		
	Zaghloul	Samani	Means	Zaghloul	Samani	Means	Zaghloul	Samani	Means	Zaghloul	Samani	Means
Control(1200 g MN)	19.04	15.93	17.49	23.73	23.3	23.52	1.35	0.940	1.15	1.60	0.963	1.28
300g MN +200 g BN	21.46	17.98	19.72	30.16	20.19	25.18	1.47	1.13	1.3	1.91	1.08	1.5
300g MN+300 g BN	18.34	17.48	17.91	28.56	20.27	24.42	1.73	0.933	1.33	1.90	1.20	1.55
600g MN +200 g BN.	24.46	18.12	21.29	31.55	20.85	26.20	1.53	0.950	1.24	2.09	1.01	1.55
600g MN+300 g BN.	27.89	18.58	23.24	36.24	20.12	28.18	1.55	0.967	1.26	2.04	0.973	1.51
720g MN+200 g BN.	28.42	18.14	23.28	35.53	19.97	27.75	1.45	0.903	1.18	1.75	0.953	1.35
720 gMN +300 g BN.	25.41	18.47	21.94	31.92	20.37	26.15	1.59	0.91	1.25	1.73	0.950	1.34
Means between varieties	23.57	17.81		31.10	20.73		1.53	0.962		1.86	1.02	
L.S.D 0.05	1.34		2.5	2.11		3.95	0.05		0.094	0.08		0.149

Table 5:The effect of fertilization treatments on seeds length (cm)and fruit total sugar(% on dry weight basis) of Zaghloul and Samani date palm in 2010 &2011 season.

Treatments	Seeds length(cm)						Fruit total sugar % on dry weight					
	First season			Second season			First season			Second season		
	Zaghloul	Samani	Means	Zaghloul	Samani	Means	Zaghloul	Samani	Means	Zaghloul	Samani	Means
Control(1200 g MN)	1.25	1.18	1.22	1.35	1.28	1.32	34.86	25.45	30.16	38.20	34.74	36.47
300g MN +200 g BN	1.72	1.34	1.53	1.94	1.40	1.67	46.65	30.25	38.45	47.24	33.30	40.27
300g MN+300 g BN	1.98	1.29	1.64	2.26	1.36	1.81	43.32	33.85	38.58	42.29	37.25	39.77
600g MN +200 g BN.	1.82	1.35	1.59	2.47	1.40	1.94	45.25	28.63	36.94	44.66	38.19	41.43
600g MN+300 g BN.	1.85	1.33	1.59	2.43	1.43	1.93	46.24	29.27	37.76	50.72	25.25	37.99
720g MN+200 g BN.	1.71	1.33	1.52	2.06	1.40	1.73	50.67	31.47	41.07	55.73	33.36	44.55
720 gMN +300 g BN.	1.75	1.33	1.54	2.09	1.39	1.74	35.9 4	34.95	35.45	40.16	37. 52	38.84
Means between varieties	1.73	1.30		2.09	1.38		43.27	30.55		45.57	34.23	
L.S.D 0.05	0.048		0.091	0.113		0.212	3.17		5.93	3.09		5.79

Table 6: The effect of fertilization treatments on fruit tannins (% on dry weight basis)) of Zaghloul and Samani date palm in 2010 &2011 season .

Treatments	Fruit tannin s% on dry weight					
	First season			second season		
	Zaghloul	Samani	Means	Zaghloul	Samani	Means
Control(1200 g MN)	0.675	0.683	0.679	0.740	0.770	0.755
300g MN +200 g BN	0.581	0.877	0.729	0.584	1.05	0.817
300g MN+300 g BN	0.785	1.16	0.971	0.864	0.793	0.829
600g MN +200 gBN.	0.725	0.886	0.806	0.653	0.906	0.779
600g MN+300g BN.	0.592	0.729	0.661	0.553	0.802	0.677
720g MN+200g BN.	0.629	0.746	0.688	0.734	0.835	0.785
720 gMN +300 g BN.	0.770	0.754	0.762	0.780	0.788	0.784
Means between varieties	0.679	0.833		0.701	0.849	
L.S.D 0.05	0.059		0.110	0.051		0.096

Table 7: The effect of fertilization treatments on fruit nitrogen and phosphorous(% on dry weight basis) of Zaghloul and Samani date palm in 2010 &2011 season.

Treatments	Fruit nitrogen						Fruit phosphorous					
	First season		Means	second season		Means	First season		Means	second season		Means
	Zaghloul	Samani		Zaghloul	Samani		Zaghloul	Samani		Zaghloul	Samani	
Control(1200MN)	0.911	0.878	0.895	0.996	0.899	0.948	0.199	0.162	0.181	0.207	0.207	0.207
300g MN +200 g BN	1.55	1.33	1.44	1.62	1.2	1.41	0.251	0.399	0.325	0.265	0.398	0.332
300g MN+300 g BN	1.44	1.24	1.34	1.58	1.19	1.39	0.214	0.193	0.204	0.197	0.240	0.219
600g MN +200 gBN.	1.46	1.04	1.25	1.23	0.920	1.07	0.279	0.324	0.302	0.270	0.264	0.267
600g MN+300g BN.	1.19	1.02	1.10	1.29	1.15	1.22	0.252	0.277	0.265	0.277	0.257	0.267
720g MN+200g BN.	1.86	1.42	1.64	2.03	1.07	1.55	0.216	0.349	0.283	0.311	0.187	0.249
720 gMN +300 g BN.	0.888	0.960	0.924	0.975	1.36	1.17	0.256	0.249	0.253	0..315	0.264	0.290
Means between varieties	1.33	1.13		1.39	1.11		0.238	0.279		0.263	0.260	
L.S.D 0.05	0.276		0.516	0.166		0.311	0.039		0.073	0.036		0.068

Table 8: The effect of fertilization treatments on fruit potassium and Leaf nitrogen (% on dry weight basis) of Zaghloul and Samani date palm in 2010 &2011 season .

Treatments	fruit potassium						Leaf nitrogen					
	First season		Means	second season		Means	First season		Means	second season		Means
	Zaghloul	Samani		Zaghloul	Samani		Zaghloul	Samani		Zaghloul	Samani	
Control(1200MN)	0.89	1.42	1.15	1.04	1.81	1.43	0.915	1.13	1.02	1.13	1.83	1.48
300g MN +200 g BN	2.35	2.07	2.21	2.85	2.25	2.55	1.41	1.33	1.37	1.55	1.66	1.61
300g MN+300 g BN	2.45	1.94	2.20	3.83	2.87	3.35	1.03	1.36	1.2	1.13	1.50	1.32
600g MN +200 gBN.	2.92	3.81	3.37	2.87	4.20	3.54	1.34	1.36	1.35	1.47	1.78	1.63
600g MN+300g BN.	3.21	4.13	3.67	2.35	4.36	3.36	1.44	1.40	1.42	1.58	2.04	1.81
720g MN+200g BN.	2.75	3.67	3.21	3.02	3.62	3.32	1.76	1.84	1.80	2.10	2.19	2.15
720 gMN +300 g BN.	2.35	3.03	2.69	2.60	4.20	3.40	1.32	1.82	1.57	1.40	1.96	1.68
Means between varieties	2.42	2.87		2.65	3.33		1.32	1.46		1.48	1.85	
L.S.D 0.05	0.511		0.956	0.488		0.913	0.272		0.509	0.266		0.498

Table 9: the effect of fertilization treatments on Leaf phosphorous and potassium (% on dry weight basis) of Zaghloul and Samani date palm in 2010 &2011 season.

Treatments	Leaf phosphorous						Leaf potassium					
	First season		Means	second season		Means	First season		Means	second season		Means
	Zaghloul	Samani		Zaghloul	Samani		Zaghloul	Samani		Zaghloul	Samani	
Control(1200MN)	0.175	0.147	0.161	0.206	0.180	0.194	1.02	1.08	1.05	1.30	1.17	1.24
300g MN +200 g BN	0.218	0.157	0.188	0.280	0.207	0.244	1.83	1.35	1.59	2.09	1.47	1.78
300g MN+300 g BN	0.196	0.169	0.183	0.216	0.186	0.201	1.44	1.14	1.29	2.23	1.25	1.74
600g MN +200 gBN.	0.203	0.301	0.252	0.224	0.283	0.254	2.09	1.11	1.60	3.06	1. 27	2.17
600g MN+300g BN.	0. 222	0.146	0.184	0.241	0.161	0.201	1.73	1.41	1.57	1.56	1.71	1.64
720g MN+200g BN.	0.244	0.185	0.215	0.268	0.214	0.241	1.47	1.06	1.27	1.62	1.14	1.38
720 gMN +300 g BN.	0.216	0.225	0.221	0.226	0.247	0.237	1.54	1.18	1.36	1.69	1.30	1.50
Means between varieties	0.211	0.190		0.237	0.211		1.58	1.19		1.94	1.33	
L.S.D 0.05	0.019		0.035	0.025		0.047	0.114		0.212	0.112		0.210

compared with 300g ammonium nitrate +200 g Nitrobin, 300g ammonium nitrate +300 g Nitrobin ,600g ammonium nitrate +200 g Nitrobin and control. In addition, leaf potassium was significantly greater by 600g ammonium nitrate +200 g Nitrobin and 300g ammonium nitrate +200 g Nitrobin than 300g ammonium nitrate +300 g Nitrobin, 720g ammonium nitrate +200 g Nitrobin, 720g ammonium nitrate +300 g Nitrobin and control in the first season and 600g ammonium nitrate +200 g Nitrobin gave a significant increase in leaf potassium than all other treatments in the second season.

In general all treatments led to a significant increase in fruit and leaf potassium than control in both seasons. These results were in harmony with those obtained by Solaiman et al (2003) working on Balady orange, they pointed that inoculation treatment had always greater nutrient element content at the same level of mineral fertilization, Usha et al (2003) working on mandarin, who concluded that Azotobacter application was beneficial for Kinnow trees through the release of higher concentrations of malic, citric, furmaric and shikimic acids that improve the availability of soil nutrients ,Mohamed (2005) working on different citrus citrus rootstocks, Sharawy (2005) working on Balady lime, Abd EL-Migeed et al (2007) working on Washington Navel orange, Ali et al (2007) on Valencia orange, Wassel et al (2007) on Balady mandarin, Shaban and Mohsen (2009) on citrus rootstocks and El-Sisy et al (2011) working on guava. They all reported that the combination of bio fertilizers with mineral fertilizers increases leaf mineral composition .Also bio-fertilizer application gave higher leaf mineral composition than completely via mineral sources. Furthermore, Frankenberger and Arshed,1995, Abd –Elmoniem and Radwan, 2003. reported that, Micro-organisms in bio-fertilizers maximize the availability of nutrients in the soil and improve their uptake and utilization.

CONCLUSIONS

In conclusion, all treatments caused a significant increase in fruit weight, fruit set, fruit length ,fruit diameter, fruit and leaf potassium as compared with the control in both seasons and the 720g ammonium nitrate +200 g Nitrobin treatment gave the higher values. Furthermore, Zaghloul cultivar had significantly higher fruit set, fruit length, fruit flesh weight, seed length and fruit total sugar as compared with Samani. In general bio-fertilizer combination with nonorganic fertilizer increased N and P content and improve fruit quality.

REFERENCES

Abdel-Hameed,. A.A.(**2002**). Response of *Manzanillo Olive* Trees to Nitrogen and Bio-fertilizer Under Northen Western CoastbConditions pp.84-88. M,Sc. Thesis. Fac. AGRIC, Cairo .Univ ,Egypt.

Abd EL-Migeed,M.M,;. M.S. Saleh and E.A.M Mostafa. (**2007**). The beneficial effect of minimizing mineral nitrogen fertilization on Washington Navel orange trees by using organic and bio-fertilizers. World Journal of Agriculture Sciences.**3(1)**: 80-85

Abd EL-Moniem, Eman A.A .and S.M.A. Radwan (**2003**). Response of Willliams banana plants to bio fertilization in relation to growth, productivity and fruit quality. Arab Univ. J. Agric. Sci,. Ain Shams Univ.,Cairo,**11(2)**:751-763

Ali, Nadia A.A.; B.M,. Soliman and M.A Hassan. (**2007**). Effect of Azotobacter and different sources of organic matter on growth and nutrition of Valencia seedling in new soil. J. Agric. Sci. Mansoura Univ.,**32(10)**: 8553-8573.

Akl, A. M.; F.F.Ahmed.; F.M .El-Morsy and M.A Ragab .(**1997**). The beneficial effects of bio-fertilizer on Red Roomy grapevines (Vitis vinifera,L.)2-The effect of berry set, yield and quality of berries Annals of Agric. Sci, Moshtohor, **35**:497-502.

EL-Sisy, Wafaa. A.; Mervat , Souror and Eman .EL-Said (**2011**). Effect of using bio and mineral fertilizers on growth, yield and fruit quality of Guava cv. Seedling Montkab. Alexandria Science Exchange Journal, **32 (1)**pp:76-83.

Evenhuis, B. (**1976**). Nitrogen Determination. Dept. Agric. Res. Royal Tropical Inst., Amsterdam.

Evenhuis, B. and P.W. Deward (**1980**). Principles and Practices in Plant Analysis. FAO Soil Bull. **38**:152-163

FAO.**1994**. Fertilizer Year –Book ,44

.Frankenberger, W.T and M.J.R. Arshed. (**1995**). Phytohomones solid (Microbial production and function). Marcel Dekker, Inc. Publisher, 270 Madison Avenue , New York ,USA

Gabr, M.A and M.Nour EL-Dein (**2005**). Effect of microbial bio-fertilization on reducing chemical fertilizers, vegetative growth, nutritionals status, yield and fruit quality of apple.

Malik, C.P. and M.B. Singh (**1980**). Plant enzymology and histoenzymology. A Text Manual. Kalyani Publisher, New Delhi.

Mansour,A.E.M. (**1998**). Response of Anna apples to some bio-fertilizers. Egypt. J. Hort., **25(2)**:241-251

Mohamed, H.S.A. (**2005**). Studies on the physiological effect ofof bio-fertilization and growing media on some citrus rootstocks. M.Sc. Thesis, Fac .Agric., EL-Fayoum, Cairo University ,Egypt.

Moustafa. M.A. (**2002**). Studies on fertilization of Washington navel orange trees. Ph.D. Dissertation Fac.of Agric. Moshtoher, Zagazig Uni, Benha Branch, Egypt.

Murphy, J. and J.P. Riley (**1962**). A modified single solution method for determination of phosphate in natural water. Anal.Chem.Acta **27**:31-36.

Osman, S.M.(**2003**). Effect of bio- fertilizer on fruit physical and chemical properties of Zaghloul date palm. Annals Agric.Sci,Ain Shams Univ,Cairo, **48 (1)**: 297-305.

Salama. A.S.M. (**2002**) .Response of some fruit species transplant and trees to organic fertilization. Ph.D. thesis, Fac. Agric, Moshtoher, Zagazig Uni, Benha Branch, Egypt.

SAS Institute, (**1989**). SAS/STAT Users guide, version 8.1. SAS Institute, Carey, NC

Shaban ,A.E.A. and A.T.Mohsen (**2009**). Response of citrus rootstocks and transplants to bio-fertilizers. J. Hort .Sci.& Omamen. Plants, **1(2)**:39-48.

Sharawy, A.M.A(**2005**). Response of Balady lime trees to organic and bio-fertlization .Minia J.of Agric .Res.&Develop.Vol.(**25**)No.1pp:1-18.

Sharma, S.D. and P. .Kumar (**2008**). Relationship of arbuscularmycorrhizal fungi and Azotobacter with plant growth ,fruit yield,soil and leaf nutrient status of mango orchards in North - Western Himalayan region of India. Journal of Applied Horticulture, **10(2)**:172-178

Snedecor, G.W and W.G Cochran.(**1980**). Statistical Methods, 7thEdn, Ames. Iowa, USA State univ. Press 507pp.

Solaiman, B.M; Nadia .A.A. Ali and S.M. Ahmed. (**2003**). Response of Balady orange trees productivity and some microbial activity to bio-fertilizer in reclaimed soil. Eleventh Conference of the Egyptian Society of Applied Microbiology Cairo, **12-14** October Eleventh Conference of the Egyptian Society of Applied Microbiology Cairo, **12-14** October.

Swain .T and W.E Hillis. (**1959**).The phenolic constituents of *Prunus domestica* L.1. The quantitative analysis of phenolic constituents. J.Sci.Food Agric;**10**:63-68.

Usha, K.; A. Saxena. and B. Singh. (**2003**). Rhizospheredynamics influenced by arbuscula rmycorrhizal fungus (GlomusDeserticola) and related changes in leaf nutrient status and yield of Kinnow mandarin King (Citrus nobilis)x Willow leaf (Citrus Deliciosa) Australian Journal of Agricultural Research **55**,1-6.

Wassel, A.H.; M.A Mohamed.; M.A .Ragab: R.A .Sayed and Y.A Hussein. (**2007**). Influence of bio-fertilization and method of potassium application on the growth and yield of Balady (Citrus reticulate, Blanco).1 Inter. Conf. Desert Cultivation Problems & Solutions, Minia University, **27-29**March

الملخص العربى

استخدام التسميد الحيوى لزيادة جودة وانتاجية نخيل البلح صنفى الزغاول والسمانى

هالة محمد الخياط، صفاء محمد النوام

مركز البحوث الزراعية – معهد البساتين

اجريت الدراسة الحالية خلال موسمى الدراسة ٢٠٠٩ و٢٠١٠بمزرعة الادكاوى ادكو بمحافظة البحيرة لدراسة تاثير معدلات التسميد المعدنى(نترات امونيوم) والتسميد الحيوى(نيتروبين) بمفردها او مختلطة على المحتوى المعدنى وصفات جودة الثمار نخيل البلح صنفى الزغاول والسمانى واظهرت النتائج الاتى:

١. اعطى صنف زغاول نسبة مرتفعة من العقد وطول الثمار ووزن اللاب وطول البذرة والسكريات الكلية مقارنة بصنف السمانى فى حين احتوت ثمار السمانى على نسبة مرتفعة من التانينات وقطر الثمار٠
٢. اعطى صنف الزغلول اعلى نسبة من الفسفور والنيتروجين فى الثمار والبوتاسيوم فى الاوراق فى الموسمين٠
٣. ايضا احتوى السمانى على اعلى نسبة من البوتاسيوم فى الثمار والنيتروجين فى الاوراق مقارنة بصنف الزغلول٠
٤. المعاملة ب٣٠٠ نترات امونيوم +٢٠٠جرام نيترؤبين ادت الى زيادة ومحتوى النيتروجين والفوسفور فى الثمار والبوتاسيوم فى الاوراق بالمقارنة بالكنترول٠
٥. المعاملة ب٣٠٠نترات امونيوم +٣٠٠جرام نيترؤبين سببت زيادة نسبة العقد وطول البذرة والتانينات بالمقارنة بالكنترول٠
٦. المعاملة ب٦٠٠نترات امونيوم +٢٠٠جرام نيترؤبين سببت زيادة وطول وقطر الثمار وطول البذرة والتانينات والفسفور والبوتاسيوم فى الاوراق بالمقارنة بالكنترول٠
٧. المعاملة ب٦٠٠نترات امونيوم +٣٠٠جرام نيترؤبين ادت الى زيادة محتوى البوتاسيوم فى الثمار وعقد الثمار بالمقارنة بالكنترول٠
٨. المعاملة ب٧٢٠ نترات امونيوم +٢٠٠جرام نيترؤبين سببت زيادة قطر الثمار ووزن اللاب والسكريات الكلية والنيتروجين ومحتوى الفوسفور والنيتروجين فى الاوراق فى كلا الموسمين والفسفور فى الثمارفى الموسم الاول بالمقارنة بالكنترول٠
٩. االمعاملة ب٧٢٠ نترات امونيوم +٣٠٠جرام نيترؤبين ادت الى زيادة قطر الثمار ووزن اللاب ومحتوى الفوسفور والنيتروجين فى الاوراق الثمارفى الموسم الاول بالمقارنة بالكنترول٠
١٠. سببت كل المعاملات زيادة نسبة العقد ووزن الثمار وطول وقطر الثمار محتوى البوتاسيوم فى الاوراق والثمار مقارنة بالكنترول فى كلا الموسمين٠