Effect of NPK and Growing Media on Growth and Chemical Composition of Fishtail Palm (*Caryota mitis* Lour)

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Abstract: This study was carried out, to investigate the effect of NPK and growing media on growth and chemical composition of fishtail palm (*Caryota mitis*. Lour). The results revealed that using CPN significantly increased plant height and stem diameter. Treating the plants grown in CPN or in peat moss media with 4 gm NPK at monthly dose gave the best seedling growth. Plants grown in CPN resulted in the tallest plants, the thickest shoots from using 2 or 4 gm NPK, plants grown in CPN or peat moss gave the highest number of leaves .Using sand medium affected more than clay on the response of the plants to NPK . Using composted peanut (CPN) resulted in the largest leaves, clay medium was the last effective. The highest NPK rate (4g) resulted in the greatest value for leaf area. The greatest value of fresh and dry weight of shoots was recorded for plants grown in CPN, while clay medium gave the lowest values. Applying NPK at 4gm was the most effective on increasing the fresh and dry weight of roots. The highest content of chl.-a had been determined in plants grown in peat moss followed by composted peanut (CPN).While Ch-b was the highest in that grown in peat moss or in clay . NPK rates affected significantly on increasing Chl.-a&b contents but decreased carotine contents. The content of carotine, was the lowest in seedlings grown in CPN. Caryota seedlings grown in CPN medium contained the highest value of total carbohydrates in the leaves; using NPK at any rate significantly enhanced the accumulation of carbohydrates in the leaves. Fertilization of the plants; grown in clay with 4 gm NPK , decreased indoles content .Growing The plants in peat moss without NPK treatments (control) increased the content of indoles in the leaves. Generally, plants grown in sand or clay, under the same level of NPK rate, contained more phenolic compounds than those grown in peat moss or CPN media. Caryota seedlings grown in CPN medium and fertilized with4 gm NPK, contained the highest values of N and P- content in leaves, whereas that grown in clay medium and fertilized with NPK at any rate contained the highest value of K.

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1. Introduction:

Caryota mitis. Lour is a popular palm tree known as fishtail palm or Burmese fishtail palm, belongs to Fam. Aracaceae. It is an evergreen shrub or small tree, the leaves are compound, the leaflets are rather thick and waxy, and it is the only palm with leaves that are subdivided twice. The shape of the leaflets gives it its common name. It also has a unique way of flowering: the first flowering mop-like cluster emerges from the top of a mature palm; subsequent clusters emerge below and so on. The palm also reproduces numerous suckers growing from the base. Fruits are roundish which turn purplish when they ripen. It has multiple trunks and the bark is smooth. It grows slowly to a height of 4-6 m with a crown diameter of 3.0 m. and fragrant purple flowers, produced in large clusters in late winter and early spring (Zona 2006). Caryota used as a specimen ornamental plant in private and public gardens, due to its showy leaves and flowers; it will do well either in sun or in light shade as well as in high pH soils and can tolerate other types of soils. Anderson (2004) stated that fishtail palms are used in the toughest interior environments where most other plants won't survive. These plants can bring the graceful tropical look to all but the darkest, driest, and coolest locations in the home, office, or shopping center. Palms are best, however, in bright interiors, where their unusual form with slim smooth trunks and large pendulous leaves contrast with the typical tree and shrub form of other interior plants. The ability of most palms to tolerate adverse conditions makes them ideal for interior environments. Palm species vary in size so they can be used as large or small specimens planted individually in containers or in groups in large beds. Some species branch freely from the base to form large clumps of shorter plants, while other species grow singly to form arborescent individuals.

Successful greenhouse and nursery production of container-grown palms is largely dependent on the chemical and physical properties of the growing media. The media should be well drained and yet retain sufficient water to reduce the frequency of watering, Anderson (2004) stated that well drained media of most types: peat, bark, soil, sand, or other components are acceptable and comparable for palm production and maintenance. The frequency of water and fertilizer applications depends upon the type of media used and the growth rate of the palms. Selection of the proper media components is critical to the successful production of palms. Peat is a very common component in both nursery and

greenhouse mixes. Peat is usually included in a mix to increase the water-holding capacity or to decrease the weight. Nowadays, several organic materials became the most important materials required to substitute of peat moss for cheap production of many plants, in this respect, Borscht (2006) stated that palms grown in containers are susceptible to nutrient deficiencies, Container substrates are generally have greater nutrient holding capacity than soils. Thus leaching and insolubility of nutrients are much less of a problem. Also, container-grown palms are often fertilized with more complete fertilizers, to avoid most deficiencies. Most potting substrates consist largely of organic components such as bark or peat that have high carbon to nitrogen ratios. This means that the microbes that break down these components need a supplementary source of N in order to do so. These soil microbes will therefore be competing with plant roots for N, Which is the most important limiting element in container production. Fertilization of container-grown palms with high in N such as 18N-6P2O5-12K2O work well for container-grown palms. Borji, *et al*., (2012) stated that date-palm peat (with or without fermentation period) has suitable physical properties, availability, low cost and efficiency and could be a new substrate that was introduced for replacing with other media.

Plant-based composts in some areas provide a low-cost media amendment. Particle sizes for plant-based compost can be either too large or too fine depending on the source material and composting process critical issues to consider are the availability and consistency of the product and the particle size. Rice hulls are available in different forms. Cotton gin trash is another organic waste product can increase the water- and nutrient-holding (CEC = 200 meq/100 gm) properties of media and has a pH of 5.5 to 6.0. Peanut shells as remained wastes of cultivating peanut at increasing area has considerable volume, which its compost can be used as available sources of ornamental plants medium. Alidoust, *et al*. (2012) on dracaena plant conducted a research to evaluate the possibility of using peanut shells compost as appropriate medium in the cultivation of ornamental plants using a 2:1 ratio of peat to perlite and peat was used as control treatment and peat was replaced by 15, 30, 45, 60,and 100 % v/v of peanut shells compost. Peanut shells compost affected on growth properties, like; height and dry weight of leaf as compared to control. It was found that peanut shells compost increased the growth of plant but their effect on plant growth was promoted when accompanied with nutritional solution.

Medium to coarse sands (0.25 to 2 mm).Can be used as soil amendment for its properties. Calcareous sands or sands from the ocean that are obviously saline in nature should be avoided. Soil or clay is still occasionally used in a container mix primarily because of its local availability or to add weight to a predominantly organic-based mix.

Application of N, P, or K, fertilizers can simply be applied to the surface of the potting substrate. Kent *et al*. (2007) on *Cordyline fruticosa* stated that an N-P-K ratio of 1:1:1 was recommended for soil-based media, whereas a ratio of 3:1:2 was suggested for soilless media. Watfa (2009) on Aleppo pine seedlings found that application with NPK (1:1:1) had a remarkable effect on increasing height of Aleppo pine seedlings. All NPK fertilization treatments significantly increased the stem diameter, number of leaves and root length and fresh weights of leaves, stems and roots. All NPK ratios increased the content of carbohydrates in the leaves. The highest N content was recorded by using NPK at ratio of 1:1:1 and 2:1:1, while potassium content in stems it was at (1:1:1).

2. Materials and Methods

This study was carried out in the greenhouse of the Ornamental Hort. Dept. Fac. of Agric. Cairo Univ., Giza, during the two seasons of 2008/2009 and 2009/2010 ,to investigate the effect of NPK and some growing media on growth and chemical composition of ***Caryota mitis*** Lour seedlings.

The seedlings of ***Caryota mitis*** Lour. Were planted on 10 th January, 2008 in 40 cm. plastic pots filled with clay or sand or peat moss or composted peanut (CPN). NPK fertilizer (Polyfeed, NPK: 14:7:37) at the rate of 0, 1, 2 and 4 g /pot. Had been applied as soil drench after a month from planting at monthly intervals for 16 months. The plants received regular agricultural practices of irrigation. The chemical and physical prosperities of the media are shown in Table (A&B)

Table (A): The chemical characteristics of the organic media.

Organic media	O.C. %	Total N%	C/N Ratio	pH 1:2.5	EC dS/m	Available nutrients ppm		DTPA-extractable (ppm)			
						P	K	Fe	Mn	Zn	Cu
peatmoss	45	0.56	80.35	6.30	0.32	20	780	9.60	5.54	4.86	0.60
composted peanut	36.1	1.40	25.84	6.50	0.62	160	980	30.0	9.00	11.60	1.10

Table (B): Mechanical and Chemical analysis of soil

pH	E.C ds/m	Sand		Silt	Clay	Texture class	Cations				Anions		
		Course	Fine				Ca^{++}	Mg^{++}	Na^{+}	K^{+}	HCO_3+CO_3	Cl^{-}	SO_4^{-}
7.3	0.8	4.4	25.5	32.9	37.2	Clay-loamy	3.2	0.6	2.5	1.3	1.9	1.3	4.4

The following data were recorded at the end of experiment, for each season: plant height, stem diameter, leaf area, number of leaves / plant, fresh and dry weights of shoots and roots. Chemical determinations: Chlorophyll a, b and total carotenoids were determined according to Saric *et al. (*1967), total carbohydrates in dried leaves were determined according to Herbert *et al. (*1971). The contents of N, P and K were determined using the wet digestion procedure. Minerals contents (N, P and K) were determined in a known weight (0.50 gm) of the dried sample of leaves, at 65 ^{O}C for 48 hrs to be then ground and wet digested using H_2SO_4: H_2O_2 method described by (Cotteine, 1980).

Total nitrogen content was determined using Nesslar method; phosphorus content was determined according to Troug and Meyer, (1939). The content of potassium was determined by using operation chart of Shimadzu Atomic Absorption Flame Spectrophotometer. Phenols and indoles contents (mg/g F.W) were determined in fresh Samples (2g) of leaves, which were crushed and extracted with 80% ethanol at 0^{O}C for 72 hours, the ethanol being changed every 24 hours, as described by Selim *et al*. (1978).

The different treatments were replicated 3 times havin3 plants (pots)/ replicate. The layout of the experiment was a split in a complete randomized design. The means of the different treatments were compared by using L.S.D test at 5% probability, according to Sendecor and Cochran, (1980).

3. Results and Discussion

A. Effect on vegetative growth

1. Plant height

Data in Table (1) showed that the different growing media as well as NPK treatments affected significantly on the height of caryota seedlings, in both seasons. In the first season, growing the plants in peat moss or composted peanut (CPN) resulted in the tallest plants (93.82 and 113.20 cm, respectively), whereas in the second season, the values were 101.4 and 118.5 cm, respectively. In this reared, Saleh.(2000) on *Ficus benjamina* found that peat moss media resulted in higher yield and yield components than the other planting media. Garcia, *et al*. (2001) observed that the best plant productivity and quality of Epipremnum and Spathiphyllum plants were obtained in substrates based on either coconut coir dust or peat than soil-based medium. Singh *et al.* 2002. On Maranta bicolor, stated that obtained the maximum plant height when plants were grown in cocopeat and leafmould mixture (1:1) or cocopeat alone. Davis *et al.* (2009) found that western larch seedlings performed best when grown in either of 100% peat medium or the peat: bark medium.

Concerning the effect of NPK, the data revealed that raising NPK rate significantly increased the seedling height and the highest rate (4gm / seedling) resulted in the tallest plants (122.2cm). The combined effect of media and NPK treatments indicated that, the application of NPK at 4 gm/seedling to plants grown in CPN resulted in the tallest plants (150.19 cm) in the first season and (152.73cm) in the second one. In this regard, Watfa (2009) found that application of NPK (1:1:1) had a remarkable effect on increasing height of Aleppo pine seedlings. Cicek *et al.* (2010) reported that NPK -fertilization had a large and positive effect on the diameter and height of Fraxinus angustifolia.

2- Stem diameter

Data in Table (1) illustrated that growing the plants in CPN significantly increased the thickness of stem, in both seasons, as compared with the other growing media (18.25 and 19.51 mm, respectively). NPK at (4gm) seedling significantly increased the stem thickness to the highest values 18.09 and 18.52 mm, respectively), against 10.82 and 10.51 mm for control plants, respectively. Similar findings were reported by Watfa (2009) found that all NPK fertilization treatments significantly increased the stem diameter of *Aleppo pine* seedlings,

Boughalleb,*et.al.(*2011) on *Citrus limon* and *C.sinensis,* concluded that raising N rates increased stem diameter. The combined effect of media and NPK treatments revealed that, the application of NPK at 2or 4 gm/seedling to plants grown in CPN resulted in the thickest shoots, in the first and second seasons.

3-Number of leaves/plant

The different growing media and NPK rates affected on the number of leaves of Caryota seedling to shown in Table (1). Concerning the response to media, it was found that growing plants in CPN followed by peat moss medium, significantly increased the formation of leaves, in both seasons, as compared with the other growing media, plants grown in CPN formed 6.74 and 7.33 leaves / seedling in the first and second seasons respectively. Saleh(2000) on *Ficus benjamina* stated that peat moss media resulted in higher yield and yield components than the other planting media whereas,Idun *,et al* (2011)on *Ixora coccinea* and *Ficus benjamina* revealed that 50% teak sawdust+50% coconut coir was the best soilless medium, that produced the highest number of leaves to the highest values7.77 and 8.21 leaves /seedling, respectively),. All NPK treatments at 4 gm increased significantly the formation of leaves as compared with the control. Against 4.77 and 5.13 in the two seasons, respectively, for the control. These findings are in line with Cicek *et al. (*2010). Who found that NPK -fertilization had a

large and positive effect on diameter and height of *Fraxinus angustifolia*, during the first 3 years of growth. Boughalleb,*et.al.(*2011) on *Citrus limon* and *Citrus sinensis* .The combined effect of media and NPK treatments revealed that, the application of NPK at 2or 4 gm/seedling grown in CPN or peat moss resulted in the highest number of leaves ,in the first and second seasons. Also, the data indicated that plants grown in sand medium showed more response to the application of NPK than growing in clay. Al-Menaie *et al.* (2012) revealed that Cassia trees exhibited maximum plant height and number of leaves when N: P: K was applied at 1g/l in a growing medium comprising of sand: peat moss: humus (1:1:1 v/v).

4- Leaf area

Data in Table (1) indicated that growing the plants in composted peanut (CPN) resulted in the largest leaves (746.4 and 751.9 cm2, respectively), in both seasons, whereas growing the plants in peat moss resulted in larger leaves than those grown in sand or clay in both seasons. Davis *et al.* (2009) stated that western larch seedlings performed best when grown in either the 100% peat medium or the peat: bark medium. Raising NPK rate significantly increased the leaf area of caryota seedlings, giving the largest leaves (749.5 and 759.1 cm2) at the (4gm / seedling) in the first and second seasons, respectively. Similarly, Treder, *et al.* (1999), found that seedlings of *Ficus benghalensis* and *F. lyrata* grown in peat had greater leaf surface area than plants grown in peat + rockwool. Cicek *et al.* (2010) concluded that NPK -fertilization had a large and positive effect on diameter and height *Fraxinus angustifolia*, during the first 3 years of growth. Regarding the combined effect of media and NPK treatments on leaf area, the data indicated that, the application of NPK at 4 g/seedling to plants grown in CPN resulted in the tallest plants, giving (981.0 and 895.0 cm2) in the first season and second seasons, respectively. In both, the smallest leaves were obtained on plants grown in clay medium without NPK fertilization (control), giving the values of 361.5 and 381.6 cm2 , in the first and second seasons, respectively.

5- Fresh and dry weights of shoots

Data shown in Table (2) revealed that, growing plants in CPN significantly increased the fresh weight shoots, in both seasons, as compared with the other growing media(306.90 and 321.90 gm , respectively) .In both seasons, plants grown in clay medium gave the lowest values of the fresh weight of shoots. In this regard, Sanjay, *et al.* (2008) on *Acacia catechu, Azadirachta indica and Pongamia pinnata*. Observed that tree species exhibited fast growth and high biomass as well as favorable seeding quality in growing media containing 80% compost. Application of NPK at the rate of (4gm) affected significantly on increasing the fresh weight of shoots giving to the highest values (305.7 and 322.2 gm, respectively), against 138.6 and 147.1gm, respectively, for the control plants. Using NPK at 4 gm/seedling to plants grown in CPN resulted in the heaviest shoots (405.7 and 411.8 gm) in the first and second seasons, respectively .The dry weight of shoots , in both seasons, followed the same trend of shoots fresh weight . Watfa (2009) on Aleppo pine seedlings stated that NPK fertilization increased fresh weights of stems and roots.

6- Fresh and dry weights of roots

The effect of NPK treatments and growing media on fresh and dry weights of roots of Caryota seedling is shown in Table (2). Concerning the response to media, the obtained data indicated that growing plants in CPN followed by sand medium, significantly increased the fresh weight of roots, in both seasons, as compared with other growing media, Karakir *et al.* (1994) stated that root growth of fig plants was best in a mixture of sand + perlite. Whereas, Zaghloul *et al* .(1996).found that growing *Philodendron domesticum* in peat alone or peat + sand (1:1) gave the greatest plant height and root fresh weights for plants grown in CPN which gave 109.2 and 104.1 gm fresh roots / seedling, in the first and second seasons, respectively. In this regared, Osaigbovo and Nwaoguala (2011) on seedlings of *Dialium guineense*, stated that sand or top soil was the best for shoot and root dry weights. In both seasons, plants grown in clay medium gave the lowest values of roots fresh weight. Concerning the effect of NPK, data in Table (2) revealed that applying NPK at 4g/seedling was the most effective on increasing the fresh weight of roots, which increased significantly to the highest values (103.8 and 91.97 gm, in the first and second seasons, respectively). The dry weight of roots , in both seasons, followed the same trend of fresh weight of roots. Bumgarner *et al.* (2008) *on Quercus rubra* seedlings stated that fertilization increased aboveground biomass production and nutrient content, but decreased root dry weight.

B-Effect on chemical constuitents

7- Pigments content

The data in Table (3) showed that chlorophyll a & b and carotene contents in the leaves of Caryota seedlings grown in peat moss followed by composted peanut (CPN) resulted in the highest content of chl.-a (0.987 and 0.960 mg/gm F.W, respectively) in the first season, whereas in the second season, growing the plants in composted peanut (CPN) resulted in the highest content of chl.-a (1.050 mg/g F.W.).In this concern, El-Sallami (1996) revealed that the leaf contents of chlorophyll showed a positive relationship with growth for the mix of pea t+ clay. Concerning the

effect of NPK, the data revealed that NPK at the highest rate (4gm / seedling) resulted in the highest content of chl.-a (1.508 and 1.567 mg/gm F.W, in the first and second seasons, respectively). The combined effect of media and NPK treatments indicated that, the application of NPK at 4 gm to seedling grown in CPN resulted in the highest content of chl.-a in both seasons. Regarding the response of chlorophyll-b content to the different NPK rates and growing media as shown in Table (2), the results showed that, in the first season, growing the plants in peat moss; followed by clay gave the highest content of chl.-b, whereas in the second season, growing the plants in clay resulted in the highest content of chl.-b. Raising the rate of NPK significantly increased the content of Chl.-b and NPK at the highest rate (4gm) resulted in the highest content of chl.-b in both seasons. Rathore *et al.* (1985) mentioned that higher nitrogen and phosphorus application rates increased leaf chlorophyll contents .The application of NPK at 4 gm to seedlings grown in peat moss resulted in the highest content of chl.-b, in both seasons. As shown in Table (2), the content of carotene, in both seasons, was the lowest in seedlings grown in CPN .All rates of NPK decreased the content of carotene as compared with the control. The application of NPK at 4 gm to seedling grown in peat moss resulted in the highest content of chl.-b in both seasons.

8**. Total carbohydrates content**

It is obvious from Table (4) that, seedlings grown in CPN medium, in both seasons, contained the highest value of total carbohydrates content in the leaves, as compared with the other growing media. Also, data indicated that using NPK at any rate significantly enhanced the accumulation of carbohydrate percentage in leaves of Caryota seedlings, as compared to the control. The rate of (4gm) produced the highest values in plants grown in CPN followed by those grown in peat moss. In this regard, Watfa (2009) found that application of NPK rates increased the content of carbohydrates in the leaves of *Aleppo pine* seedlings

9- Indoles and phenols contents

Considerable variations were recorded on indoles content in the leaves of Caryota due to using the different media as well as NPK treatments, as shown in Table (4). In this concern, receiving the plants grown in clay and fertilized with 4 gm NPK, decreased indoles content to as 0.53 mg/1g F.W. compared with control 1.80 mg/1g F.W. in the first season, but in the second season, growing plants in peat moss without NPK treatments (control) increased the indoles in plants to the highest value (1.63 mg/1g F.W.) .Concerning phenols content, generally, it could be concluded from Table (3), that plants grown in sand or clay, under the same level of NPK, contained more phenol compounds in comparison to those grown in peat moss or CPN media. Hanafy, *et al.* (2000). Mentioned that high nitrogen fertilization decreased soluble phenols in *Eruca vesicaria* foliage plant.

10- N, P and K contents

Data in Table (5) indicated that, seedlings grown in CPN medium and fertilized with 4 gm NPK, in both seasons, contained the highest value of N- content in the leaves, as compared with the other growing media. Also, data indicated that using NPK at any rate significantly increased the accumulation of nitrogen percentage in the leaves of Caryota seedlings, as compared to the control. The rate of (4gm) produced the highest values. Regarding the effect of media on P-content, the data showed that, seedlings grown in CPN medium and fertilized with NPK at 3 or 4 gm, in both seasons, contained the highest value of P- content in the leaves, comparing with the other growing media. Application of any NPK Fertilization rate caused an increment in leaf P- percentage in comparison with e control. It was evident from Table (5) that, in most cases, seedlings grown in clay medium and fertilized with NPK at any rate, in both seasons, contained the highest value of K-content in leaves, comparing with the other growing media. Using NPK at any rate significantly increased the accumulation of potassium percentage in the leaves of Caryota seedlings, as compared to the control. The rate of (2 and 4gm) produced the highest values, in this respect. Alidoust *et al. (*2012) used peanut shells compost as a growing medium for Dracaena plants, they concluded that the highest nitrogen of leaf was related to 15% treatment of peanut shells compost in the growing mix with nutritional solution. The lowest nitrogen obtained in 30% peanut shells compost without nutritional solution. The lowest extent of phosphorus concentration was related to 45% treatment of peanut shells. The highest K %was recorded for 30% peanut shells compost treatment with nutritional solution. El-Sallami (1996) revealed that the leaf contents of N, P, K, Mg showed a positive relationship with growth for th a mix of peat + clay which gave the best growth. Bumgarner,*et al.* (2008)stated that fertilization increased aboveground biomass production and nutrient content, but decreased root dry weight. Watfa (2009) on Aleppo pine seedlings found that using NPK at ratio of 1:1:1 and 2:1:1. Gave the highest values of N and K content in leaves. Boughalleb,*et.al*.(2011) on *Citrus lemon and Citrus sinensis* mentioned that percentages of N in the leaves were increased in proportion to the amount of N added while the percentage of P and K were decreased.

Table (1): Effect of growing media and chemical fertilization on Plant height(cm), Plant diameter(mm), Number of leaves/plant and Leaf area (cm^2) of *Caryota mitis* Lour seedling during 2008/2009 and 2009/2010 season .

Plant height (cm)										
Treatments	First season					Second season				
	Sand	Clay	Peat	CPN	Mean	Sand	Clay	Peat	CPN	Mean
Control	60.05	53.38	65.30	78.65	64.30	62.31	55.72	69.50	80.23	66.94
NPK 1g	85.70	75.30	89.08	100.66	87.68	90.12g	88.71	93.76	110.71	95.82
NPK 2g	99.10	90.18	101.52	123.28	103.50	105.30	91.34	112.34	130.30	109.80
NPK 4g	110.18	109.02	119.40	150.19	122.20	117.10	110.82	130.10	152.73	127.70
Mean	88.76	81.97	93.82	113.20	------	93.71	86.65	101.40	118.50	------
LSD at 5%	A= 1.215 B= 1.215 AB=2.431					A= 1. 152 B= 1. 152 AB= 2.305				
Stem diameter (mm)										
Treatments	First season					Second season				
	Sand	Clay	Peat	CPN	Mean	Sand	Clay	Peat	CPN	Mean
Control	11.08	09.10	10.30	12.79	10.82	10.69	09.16	10.60	11.57	10.51
NPK 1g	12.32	11.57	15.60	18.92	14.60	11.45	10.45	16.20	21.05	14.79
NPK 2g	13.77	16.97	16.00	21.27	16.94	12.56	17.80	17.90	22.48	17.86
NPK 4g	13.77	19.07	19.50	20.01	18.09	13.94	18.93	18.30	22.93	18.52
Mean	12.67	14.18	15.35	18.25	--------	12.16	14.09	15.75	19.51	--------
LSD at 5%	A= 0.3428 B=0.3428 AB= 0.6855					A= 0.2924 B= 0.2924 AB= 0.5848				
Number of leaves/plant										
Treatments	First season					Second season				
	Sand	Clay	Peat	CPN	Mean	Sand	Clay	Peat	CPN	Mean
Control	4.30	4.30	5.16	5.33	4.77	4.99	4.55	5.31	5.68	5.13
NPK 1g	6.43	4.50	6.19	6.66	5.94	6.58	5.64	6.91	7.00	6.53
NPK 2g	6.59	4.93	6.23	6.00	5.93	7.43	4.95	7.78	7.33	6.87
NPK 4g	7.43	6.31	8.35	9.00	7.77	7.90	6.63	8.96	9.33	8.20
Mean	6.18	5.01	6.48	6.74	---------	6.72	5.44	7.24	7.33	------
LSD at 5%	A= 0.1537 B=0.1537 AB= 0.3075					A= 0.07910 B= 0.07910 AB= 0.1582				
Leaf area (cm^2)										
Treatments	First season					Second season				
	Sand	Clay	Peat	CPN	Mean	Sand	Clay	Peat	CPN	Mean
Control	410.1	361.5	489.0	510.7	442.8	413.8	381.6	499.0	560.9	463.8
NPK 1g	501.3	465.5	516.5	713.3	549.2	581.8	473.1	591.4	760.0	601.6
NPK 2g	565.6	445.1	610.5	780.4	600.4	573.4	481.0	671.0	791.6	629.3
NPK 4g	619.2	633.9	763.8	981.0	749.5	697.4	662.1	781.7	895.0	759.1
Mean	524.0	476.5	595.0	746.4	---------	566.6	499.5	635.8	751.9	--------
LSD at 5%	A= 3.421 B= 3.421 AB= 6.841					A= 2.164 B= 2.164 AB= 4.327				

Composted peanut = (CPN)

Table (2): Effect of growing media and chemical fertilization on fresh and dry weight of shoots and roots (gm) of *Caryota mitis* Lour seedling during 2008/2009 and 2009/2010 seasons

Fresh weight of shoots (gm)										
Treatments	**First season**					**Second season**				
	Sand	**Clay**	**Peat**	CPN	**Mean**	**Sand**	**Clay**	**Peat**	CPN	**Mean**
Control	122.1	90.8	130.7	210.7	138.6	135.3	93.5	138.9	220.7	147.1
NPK 1g	173.6	129.3	183.9	275.5	190.6	185.4	135.2l	196.9	297.5	203.8
NPK 2g	200.0	195.3	205.6	335.5	234.1	207.3	197.9	225.4	357.9	247.1
NPK 4g	287.5	230.0	299.5	405.7	305.7	298.0	266.5	312.5	411.8	322.2
Mean	195.8	161.4	204.9	306.9	-----	206.5	173.3	218.4	321.9	-----
LSD at 5%	A=2.654 B= 2.654 AB= 5.310					A= 0.773 B=0.773 AB=1.546				
Dry weight of shoots (gm)										
Treatments	**First season**					**Second season**				
	Sand	**Clay**	**Peat**	CPN	**Mean**	**Sand**	**Clay**	**Peat**	CPN	**Mean**
Control	33.7	23.4	36.8	63.9	39.4	35.8	26.2	42.9	72.1	44.2
NPK 1g	44.7	33.5	51.7	86.6	54.1	49.6	38.9l	56.8i	91.6	59.2
NPK 2g	52.3	46.8	57.9	104.3	65.3	67.5	50.6	71.0	119.0	77.0
NPK 4g	70.1	60.6	84.0	122.4	84.2	79.9	74.3	101.1	135.3	97.6
Mean	50.2	41.0	57.6	94.3	----	58.2	47.5	67.9	104.5	----
LSD at 5%	A=0.988 B=0.988 AB= 1.975					A=0.947 B= 0.947 AB=1.895				
Fresh weight of roots (gm)										
Treatments	**First season**					**Second season**				
	Sand	**Clay**	**Peat**	CPN	**Mean**	**Sand**	**Clay**	**Peat**	CPN	**Mean**
Control	68.0	33.6	63.0	80.0	61.1	50.0	35.8	50.6	81.9	54.5
NPK 1g	79.0	46.5	79.2	95.9	75.1	66.0	40.5	65.0	93.0	66.1
NPK 2g	86.0	49.3	68.3	110.0	78.4	66.3	53.8	83.8	110.7	78.6
NPK 4g	98.0	66.8	99.7	150.7	103.8	80.0	68.3	89.0	130.6	91.9
Mean	82.7	49.0	77.5	109.2	--	65.5	49.6	72.1	104.1	---
LSD at 5%	A= 0.942 B= = 0.942 AB= 1.886					A= 6.051 B= 6.051 AB= 1.227				
Dry weight of roots (gm)										
Treatments	**First season**					**Second season**				
	Sand	**Clay**	**Peat**	CPN	**Mean**	**Sand**	**Clay**	**Peat**	CPN	**Mean**
Control	12.7	5.8	10.9	13.6	10.7	9.3	10.8	8.54	14.2	10.7
NPK 1g	15.8	8.3	13.5	15.9	13.4	12.3	13.5	10.8	16.4	13.2
NPK 2g	16.3	8.6	11.7	18.8	13.8	15.6	11.7	14.7	19.6	15.4
NPK 4g	18.3	11.9	15.6	26.6	18.1	15.8	15.6	15.6	22.3	17.3
Mean	15.7	8.6	12.9	18.7		13.2	12.9	12.4	18.1	--
LSD at 5%	A= 0.288 B= 0.288 AB= 0.577					A= 0.158 B= 0.158 AB= 0.316				

Composted peanut = (CPN)

Table (3): Effect of growing media and chemical fertilization on the contents of chlorophyll a,b and caroteniods (mg /gm F.W) in the leaves of *Caryota mitis* Lour seedling during 2008/2009 and 2009/2010 seasons.

Chlorophyll a (mg /gm F.W)										
Treatments	**First season**					**Second season**				
	Sand	**Clay**	**Peat**	CPN	**Mean**	**Sand**	**Clay**	**Peat**	CPN	**Mean**
Control	0.310	0.350	0.410	0.490	0.390	0.360	0.300	0.310	0.400	0.3425
NPK 1g	0.600	0.890	0.400	0.500	0.597	0.590	0.950	0.550	0.560	0.6625
NPK 2g	1.030	0.880	1.510	0.900	1.080	1.010	0.910	0.850	0930	0.9250
NPK 4g	0.820	1.630	1.630	1.950	1.508	1.120	1.060	1.780	2.310	1.567
Mean	0.690	0.937	0.987	0.960	---------	0.770	0.805	0.872	1.050	---------
LSD at 5%	A= 0.210 B= 0.210 AB= 0.421					A= 0.0263 B= 0.0263 AB= 0.0527				
Chlorophyll b (mg /gm F.W)										
Treatments	**First season**					**Second season**				
	Sand	**Clay**	**Peat**	CPN	**Mean**	**Sand**	**Clay**	**Peat**	CPN	**Mean**
Control	0.20	0.17	0.21	0.22	0.20	0.19	0.18	0.20	0.26	0.20
NPK 1g	0.24	0.51	0.51	0.31	0.39	0.25	0.51	0.56	0.30	0.24
NPK 2g	0.46	0.71	0.62	0.41	0.55	0.59	0.75	0.57	0.59	0.46e
NPK 4g	0.60	0.78	0.91	0.78	0.77	0.64	0.95	0.98	0.97	0.60
Mean	0.38	0.54	0.56	0.43	---	0.42	0.60	0.58	0.53	0.38
LSD at 5%	A= 0.026 B= 0.026 AB= 0.053					A= 0.027 B= 0.027 AB=0.052				
Caroteniods (mg /gm F.W)										
Treatments	First season					Second season				
	Sand	**Clay**	**Peat**	CPN	**Mean**	**Sand**	**Clay**	**Peat**	CPN	**Mean**
Control	0.35	0.40	0.45	0.36bc	0.39a	0.30de	0.41ab	0.40ab	0.35bcd	0.37a
NPK 1g	0.41	0.40	0.26	0.22g	0.32bc	0.43a	0.39abc	0.36bcd	0.30de	0.37a
NPK 2g	0.40	0.36	0.29	0.29ef	0.34b	0.36bcd	0.33cd	0.41ab	0.35bcd	0.36a
NPK 4g	0.30	0.31	0.35	0.25fg	0.30c	0.39abc	0.31de	0.41ab	0.26e	0.34a
Mean	0.37	0.37	0.34b	0.28c	---	0.37ab	0.36b	0.40a	0.32c	---
LSD at 5%	A=0.027 B= 0.027 AB= 0.053					A= 0.026 B= 0.026 AB= 0.052				

Table (4): Effect of growing media and chemical fertilization on the contents of total carbohydrates content (%D.W),the indoles and phenols (mg /g F.W) in the leaves of *Caryota mitis* Lour seedling during 2008/2009 and 2009/2010 seasons.

Total carbohydrates content (%D.W),										
Treatments	First season					Second season				
	Sand	Clay	Peat	CPN	Mean	Sand	Clay	Peat	CPN	Mean
Control	10.80	11.70	12.00	13.50	12.00	11.00	10.90	12.70	12.80	11.85
NPK 1g	11.00	13.60	15.10	25.70	16.35	11.93	12.50	13.40	23.90	15.02
NPK 2g	13.40	14.30	19.00	28.90	18.90	14.00	13.10	18.30	27.30	18.17
NPK 4g	13.00	15.70	20.70	30.70	20.02	13.91	19.80	21.90	33.60	22.30
Mean	12.05	13.82	16.70	24.70	----	12.71	14.07	16.58	23.98	----
LSD at 5%	A=0.442 B=0.442 AB=0.884					A= 0.874 B= 0.874 AB= 1.747				
Indoles (mg /g F.W)										
Treatments	First season					Second season				
	Sand	Clay	Peat	CPN	Mean	Sand	Clay	Peat	CPN	Mean
	1.00	1.80	1.41	1.13	1.34	1.13	1.60	1.63	1.00	1.34
NPK 1g	1.81	1.46	1.15	1.06	1.37	1.60	1.35	1.60	1.01	1.39
NPK 2g	0.97	0.87	0.95	0.69	0.87	0.69	0.79	0.93	0.81	0.81
NPK 4g	0.83	0.53	0.85	0.73	0.74	0.68	0.43	0.86	0.69	0.67
Mean	1.15	1.65	1.09	0.90	----	1.03	1.04	1.26	0.88	------
LSD at 5%	A=0.037 B=0.037 AB= 0.075					A= 0.059 B= 0.059 AB=0.112				
Phenols (mg /g F.W)										
Treatments	First season					Second season				
	Sand	Clay	Peat	CPN	Mean	Sand	Clay	Peat	CPN	Mean
Control	1.93	1.60	1.50	1.53	1.64	1.69	1.95	1.45	1.61	1.68a
NPK 1g	1.86	1.90	1.69	1.03	1.62	1.80	1.83	1.60	1.13	1.59b
NPK 2g	1.06	2.10	0.83	0.91	1.23	1.35	2.68	1.06	0.66	1.44c
NPK 4g	1.19	0.91	0.96	0.86	0.98	1.10	0.89	0.99	0.70	0.92d
Mean	1.51	1.63	1.25	1.08	----	1.49	1.84	1.28	1.02	---
LSD at 5%	A= 0.046 B= 0.046 AB= 0.091					A= 0.046 B= 0.046 AB= 0.091				

Composted peanut = (CPN)

Table (5): Effect of growing media and chemical fertilization on the contents of nitrogen, phosphorus and potassium (%D.W) in the leaves of *Caryota mitis* Lour seedling during 2008/2009 and 2009/2010 seasons.

Nitrogen (%D.W)										
Treatments	**First season**					**Second season**				
	Sand	**Clay**	**Peat**	CPN peat	**Mean**	**Sand**	**Clay**	**Peat**	CPN	**Mean**
Control	1.20	1.30	1.36	1.49	1.34	1.21	1.36	1.40	1.53	1.38
NPK 1g	1.54	1.70	1.93	2.01	1.80	1.35	1.28	1.91	2.30	1.71
NPK 2g	1.98	2.01	2.01	2.23	2.06	1.73	2.17	2.11	2.19	2.05
NPK 4g	1.95	2.30	2.30	2.50	2.26	2.03	2.63	2.10	2.50	2.32
Mean	1.67	1.83	1.90	2.06	---	1.58	1.86	1.88	2.13	---
LSD at 5%	A= 0.037 B= 0.037 AB= 0.075					A= 0.037 B= 0.037 AB=0.075				
Phosphorus (%D.W)										
Treatments	**First season**					**Second season**				
	Sand	**Clay**	**Peat**	CPN	**Mean**	**Sand**	**Clay**	**Peat**	CPN	**Mean**
Control	0.14	0.16	0.18	0.19	0.17	0.14	0.14	0.18	0.18	0.16
NPK 1g	0.24	0.25	0.31	0.41	0.30	0.19	0.26	0.39	0.36	0.30
NPK 2g	0.41	0.42	0.43	0.44	0.43	0.38	0.41	0.56	0.37	0.43
NPK 4g	0.35	0.37	0.51	0.46	0.42	0.33	0.39	0.49	0.43	0.41
Mean	0.29	0.30	0.35	0.38	----	0.26	0.30	0.41	0.34	----
LSD at 5%	A=0.026 B=0.026 AB=0.053					A=0.026 B=0.026 AB= 0.053				
Potassium (%D.W)										
Treatments	**First season**					**Second season**				
	Sand	**Clay**	**Peat**	CPN	**Mean**	**Sand**	**Clay**	**Peat**	CPN	**Mean**
Control	1.00	1.00	0.93	1.06	1.00	1.03	1.05	0.83	1.10	1.00
NPK 1g	1.69	2.37	1.93	2.31	2.08	1.96	2.29	1.28	2.00	1.88
NPK 2g	1.93	2.26	1.63	2.03	1.96	2.06	2.29	1.41	1.19	1.74
NPK 4g	2.13	2.28	2.05	1.91	2.09	2.19	2.23	2.31	2.13	2.22
Mean	1.69	1.98	1.64	1.83	--	1.81	1.97	1.46d	1.61	--
LSD at 5%	A= 0.026 B= 0.026 AB= 0.053					A= 0.037 B= 0.037 AB=0.075				

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References

1. Alidoust, M., Mohammadi Torkashvand, A. and Mahboub Khomami, A.2012.The effect of growthmedium of peanut shelles compost and nutrient solution on the growth of *Dracaena*. Annals of Biological Research, 3 (2):789-794.
2. Al-Menaie, H.S. Ouhoud A., Al-Shatti,A. Mathew, M. and Nisha, S. 2012. Effect of Fertilizer Concentration on the Growth Performance of Cassia nodosa Buch.-Ham. ex Roxb. and Cassia fistula L. Seedlings under Greenhouse Conditions of Kuwait. International Research Journal of Plant Science (ISSN: 2141-5447) Vol. 3(2) pp. 019-022, February, 2012.
3. Anderson, R.,G. 2004: Plants for Your Home and Office :Palms. Cooperative Extension service Univ. of Kentucky .Hort Facts, 71-04 . www.ca.uky.edu
4. Borji, H.; Mohammad ghesareh, A.and Jafarpour, M. 2012. Effect of date-palm and perlite substrates on nutrients content and quality of tomato grown in soilless culture. Research on Crops, 13: 1,258-261. Gaurav Society of Agricultural Research Information Centre.
5. Boughalleb, F., Mahmoud M. and Hajlaoui, H. (2011). Response of young citrus trees to NPK fertilization under greenhouse and field conditions. 2011, Volume: 6 ,Issue: 3 Page No.: 66-73.
6. Broschat, T.K. 2006. Effects of phosphorous and phosphoric acids on growth and phosphorus concentrations in container-grown tropical ornamental plants. HortTechnology 16:105-108
7. Broschat, T.K. 2011.Nutrition and fertilization of palms in containers. ENH1010, one of a series of the Environmental Horticulture Department, Florida Cooperative Extension Service, University of Florida. website at http://edis.ifas.ufl.edu.
8. Bumgarner, M.L., K. Francis Salifu and Douglass F. Jacobs1 (2008): Subirrigation of Quercus rubra seedlings:Nursery stock quality,

media chemistry, and early field performance. HortScience, Dec. 2008 vol. 43 no. 72179-2185.
9. Cicek,E, Faruk, Y. and Murat, Y.(2010).Effect of N and NPK fertilizers on early field performance narrow-leaved ash, Fraxinus angustifolia. Journal of Environmental Biology, 31, 109-114 (2010).
10. Cotteine A: 1980. Soil and plant testing as a basis of fertilizer recommendation. F.A.O. Soil Bulletin 6. F.A.O. Rome, Italy. 100pp.
11. Davis A.S, Kent Eggleston, Jeremy and R. Pinto. 2009. Evaluation of Three Growing Media Substrates for Western Larch Seedling Production at the USDA Forest Service Coeur d'Alene Nursery R. Kasten Dumroese USDA Forest Service Proceedings RMRS-P-58. 2009
12. El-Sallami-I.H.1996. Response of Ficus benjamina L. to different potting media and doses of nutrient solution. Assiut-Journal-of-Agricultural-Sciences. 27: 3, 61-76; 31 ref.2001.Substrate
13. Garcia,C.O; Alcantar,G.G; Cabrera,R.I.; Gavi, R.F. and; Volke-H-V evaluation for container production of Epipremnum aureum and Spathiphyllum wallisii. Terra. 2001, 19: 3, 249-258; 27 ref
14. Garcia,C.; Alcantar,G.; Cabrera,R.; Gavi,R. and Volke, H.(2001): Substrate evaluation for container production of *Epipremnum aureum* and *Spathiphyllum wallisii* Terra. 2001, 19: 3, 249-258.
15. Hanafy .A.H., A. H.; Khalil, M.K. and Farrag, Amal.. 2000. Nitrate accumulation, growth, yield and chemical composition of Rocket (Eruca vesicaria subsp. Sativa) plant as affected by NPK fertilization, Kinetin and Salicylic Acid. ICEHM 2000, Cairo University, Egypt, September, 2000, page 495- 508
16. Herbert,D., Philipps,J. and Strange, R 1971. Determination of total Carbohydrates . Methods in Microbiology,58: 209- 344.
17. Idun, I. A.; Kumah, P.and Adzraku, H. V. 2011. Rooting and vegetative growth responses of *Ixora coccinea* and *Ficus benjamina* cv. 'starlight' to different stem cutting types and soilless media. African Journal of Plant Science; 2011. 5: 15, 773-780. 13 ref.
18. Karakir-N; Misirli-A; Seferoglu-G; and Kara-S.1994. Research on the rooting of fig (cv. Sarilop) cuttings. I. Effect of different media. Ege-Universitesi-Ziraat-Fakultesi-Dergisi. 31: 2-3, 79-84; 12 ref
19. Kent, K., J., Andrew K.and Glenn S..2007. Production of Hawaiian Ti plants. Ornamentals and Flowers Mar. 2007 OF-33
20. Osaigbovo, A. U. and Nwaoguala, C. N. C. (2011): Growth response of black velvet tamarind (Dialium guineense Willd) seedling to different potting media. Journal of Applied and Natural Science. 3: 2, 166-170. 23 ref.
21. Rathore SVS, DK Dera, and Chand U (1985) Studies on nitrogen nutrition through foliar spray of urea on the performance of African marigold. Udyarika 5: 37-40
22. Saleh,S.I.2000 Effect of different planting media on the growth and chemical composition of Ficus benjamina "Starlight" plants grown under two locations "outdoor and plastichouse" conditions. Egyptian-Journal-of-Horticulture. 27: 4, 543-568; 20 ref
23. Sanjay, S. N. P. S. Nain and S. P. Tripathi (2008) Growing tropical tree planting stock in root trainers: Cell volume, seedling density and growing media. Annals of Tropical Research 30[2]: 44-55(2008), Leyte, Philippines
24. Saric, M., Curic, R. and Cupina, T. 1967. Chlorophyll determination. Umverrit etU Noven Sadu Praktikum iz fiziologize Biljaka, Biograd, Anjiga,P.215.
25. Selim, H. H. A.; Fayek, M. A. and Sweidan, A. M (1978). Reproduction of Bricher apple cultivar by layering. Annals of AGRIC. Moshtohor, 9:157-166.
26. Singh,P; Sidhu, G.S; Misra,R.L.and Sanyat, M. 2002. Effect of potting media on the growth of pot plants. Proceed. National. Sym. Indian-floriculture. Bangalore, 355-356.
27. Snedecor, C.W. and Cochran, W.G. 1980. Statistcal Methods.6th ed. Iowa State Univ., Press, Iowa, USA.
28. Treder,J; Matysiak,B; Nowak,J.S.; Nowak,J. and Papadopoulos, A.P.1999. The effects of potting media and concentration of nutrient solution on growth and nutrient content of three Ficus species cultivated on ebb-and-flow benches . Acta-Horticulturae. No. 481, 433-439; 12.
29. Troug, R. and Mayer, A. H. (1939): Improvement in deinses colorimetric method for phosphorus and arsencic. Indian of Eng. Chem. Annual., 1: 136-139.
30. Watfa, R.A. 2009. Effect of soil media, nutrition and mycorrhiza fungi on growth and chemical composition of carob and *Aleppo pine* seedlings. M.Sc. Thesis, Fac. Agri. Cairo Univ., Egypt, 171p.
31. Zaghlol,M.; Atta-Alla,H; Waly,A.K and Khattab,S.H.1996. Micropropagation of some ornamental plants. 2. In vitro culture, establishment and effect of potting mixture and NPK fertilization on ex vitro of Philodendron domesticum L. Annals-of-Agricultural-Science,-Moshtohor. 1996, 34: 2, 711-725; 3 pl.; 29 ref.
32. Zona, S. (2006). Cyanogenesis in hearts of palm (Arecaceae). Tropical Science. In press.