Middle East Journal of Applied Sciences
ISSN 2077-4613
Volume : 08 | Issue :01 |Jan.-Mar.| 2018
Pages: 43-56

Influence of Different Growing Media and Kristalon Chemical Fertilizer on Growth and Chemical Composition of Areca Palm (*Dypsis cabadae* H. E. Moore) Plant

Mohamed, Y.F.Y.

Department of Horticulture, Faculty of Agriculture, Benha University, Egypt

Received: 07 Nov. 2017 / Accepted: 28 Dec. 2017 / Publication date: 20 Jan. 2018

ABSTRACT

A pot experimental trial was carried out during 2015/2016 and 2016/2017 seasons to study the effect of 18 treatments was represented by the combination between six different growing media, i.e. clay + sand, clay + sand + compost, clay + sand + peat moss, clay + sand + perlite, clay + sand + compost+ peat moss +perlite and compost + peat moss + perlite (1:1:1 by volume) and three chemical fertilization rates of kristalon fertilizer at 0.0, 4 and 8g/pot on the growth and chemical composition of *Dypsis cabadae* palm plants. Results showed that growing *Dypsis cabadae* palm plants in a mixture medium contained compost + peat moss + perlite (1:1:1 by volume) supplemented with kristalon fertilizer at 8g/pot produced the tallest plant, the highest values of fresh and dry weights of leaves and stem /plant, stem length, root length (cm) and fresh and dry weights of roots/plant, the highest leaf total chlorophylls, total nitrogen, phosphorus, potassium and total carbohydrates content as well as the highest leaf auxin and gibberellins content. Besides, the highest values of number of leaves/plant, stem diameter, plant width, No. of root / plant and cytokinins contents as well as the lowest leaf abscisic acid content. In addition, the greatest show value of *Dypsis cabadae* palm was recorded by using the mixture media of clay + sand + compost + peat moss + perlite and Kristalon fertilizer at 8g/pot (8g/pot) in both seasons. Conclusively, growing *Dypsis cabadae* palm plants in a medium contained compost + peat moss + perlite or a medium composed of clay + sand + compost+ peat moss +perlite and supplemented with kristalon fertilizer at 8g/pot produced the best growth and quality of this plant.

Key words: *Dypsis cabadae*, growing media, kristalon fertilizer, growth and chemical constituents.

Introduction

Areca palm (*Dypsis cabadae* H. E. Moore) belongs to Arecaceae family, Synonym (*Chrysalidocarpus cabadae* H. E. Moore), has commonly known name as the blue areca palm, blue cane palm, cabadae palm, cabada palm and local name (green areca palm). It needs a substrate with good drainage and aeration, and it can be grown as pot plans. The areca palm is an important indoor foliage plant, often produced in full sun or very light shade should be selected, with well-drained soil. These palms look best when regularly watered, but can survive extended periods of drought once they are established. It originates in Madagascar and has a similar clumping habit. *Dypsis cabadae* palm is a feather palm, they have ringed stems which gives them a bamboo appearance. *Dypsis cabadae* is a clumping species that features dark green stems punctuated by nearly-white ring like leaf scars. Over time it can reach 30 to 40 ft. in height and about 3 in. in diameter. (Meerow and Broschat, 1996).

Media as well as nutritional requirements are the most important factors affecting ornamental pot plants well-being. Since, there are many plants which spend their life cycle in pots and they need a medium which provides them with their different needs completely, so it is necessary to find suitable medium consists of a number of necessary components in order to achieve this purpose. The purpose of a container medium is to physically support the plant and to supply an adequate oxygen, water and nutrients for proper root functions. The plant must be held upright in the medium and the medium must be heavy enough to stabilize the container and keep it in an upright position. A balance between available water and aeration in the growth medium is essential for production of quality plants in containers. There must be an adequate small pore spaces to hold water for plant uptake and enough large pores to allow exchange of air in the medium to maintain critical oxygen concentrations.

Corresponding Author: Mohamed, Y.F.Y., Department of Horticulture, Faculty of Agriculture, Benha University, Egypt. E-mail: yosry.mohamed@fagr.bu.edu.eg

Anaerobic conditions (without oxygen) do not allow the roots to obtain energy from the respiratory process and encourage disease development. Energy is required for root growth, proper hormone balance and nutrient uptake as well as maintenance of cell and organelle membranes. The optimal container medium will minimize the amount of management required for quality plant production. The production of ornamental pot plants involves a number of cultural inputs, among these, perhaps the most important is the type of growing medium used. The composition of a growing medium should be well drained. low insoluble salts and with an adequate exchange capacity. Since, innumerable amendment combinations can produce a growing medium with these characteristics, it is important to consider the economic, cultural optimums, transportation, labor and handling. It can be said that sand, clay, peat moss, perlite, vermiculite and organic matter are the basic components of the special medium of planting (Hartmann *et al.*, 2002). Clay has a relatively high cation exchange and water holding capacity. Sand is the least expensive and the heaviest of all inorganic amendments. When composted leaves are added to the growing media, it leads to decrease soil pH which in turn increases solubility of nutrients for plant uptake. In some cases, organic materials may act as low release fertilizers. Also, they improve soil fertility, and stimulate root development, induce active biological conditions and enhance activities of micro-organisms especially those involved in mineralization (Suresh *et al.,* 2004). Peat moss is the most desirable organic matter for the preparation of growing media and is the most widely used substrate for potted plant production in nurseries and it accounts for a significant portion of the material used to grow potted plants (Ribeiro *et al.,* 2007) perlite has a very high water holding capacity, excellent ex-change, buffering capacities and aid in aeration and drainage it is less durable than sand (El-Khateeb *et al.,* 2006). In this respect, Youssef (2014) reported that growing *Beaucarnea recurvata* plants in a mixture medium contained composted leaves+ peat moss+ vermiculite or medium contained clay+ sand + peat moss (1:1:1 by volume) induced the best growth and chemical constituents of this plant. Fertilizing plants causes them to grow more rapidly and efficiently, just like ensuring a manufacturing plant has all the raw materials it needs for a production line. Fertilizers are essential to produce out the best features of ornamental potted plants. For natural plants to grow and thrive they need a number of chemical elements, but the most important are nitrogen, phosphorus and potassium. Most packaged fertilizers contain these three macronutrients. Nitrogen is especially important, and every amino acid in plants contains nitrogen as an essential component for plants to manufacture new cells (Marschner, 1997). Phosphorus which has been called the key to life is essential for cell division and for development of meristematic tissues and it is very important for carbohydrate transformation due to multitude of phosphorylation reaction and to energy rich phosphate bond (Lambers *et al*., 2000). Potassium is also important for growth and elongation probably due to its function as an osmoticum and may react synergistically with IAA. Moreover, it promotes CO_2 assimilation and translocation of carbohydrates from the leaves to storage tissues (Mengel and Kirkby, 1987). In this concern, Youssef (2014) on *Beaucarnea recurvata* indicated that treating plants with kristalon chemical fertilizer (NPK) at 8 g/plant improved the growth and chemical composition as compared with un-treated plants.

Thereupon, this study was conducted to evaluate the effect of different growing media mixture i.e. clay + sand (control), clay +sand + compost, clay + sand + peat moss, clay + sand + perlite, clay + sand + compost+ peat moss+ perlite and compost + peat moss + perlite and kristalon fertilizer on growth and chemical composition of *Dypsis cabadae* palm plant.

Materials and Methods

A pot experimental study was carried out at the Floriculture Nursery of the Horticulture Department, Faculty of Agriculture, Benha University, during 2015/2016 and 2016/2017 seasons to evaluate the effect of some different mixture media and kristalon chemical fertilizer as well as their combinations on growth and chemical composition of *Dypsis cabadae* palm plants. Uniform *Dypsis cabadae* palm seedlings having 2-3 leaves and 23-25 cm height were selected for achieving this study. The plants were obtained from Floriculture Nursery of the Horticulture Department, Faculty of Agriculture, Benha University. The seedlings were repotted in plastic pots of 30 cm diameter (one plant / pot) packed with the six chosen growing media, mention later, and placed in a partial shade under lath house condition (with about 12000 - 14000 lux light intensity) on 1st March, in both seasons (2015/2016 and 2016/2017).

Procedure and Layout of the Experiment

Two factors were involved in the present study, the first was the growing medium and the second was chemical fertilization. Six growing media mixtures were chosen i.e. clay + sand (1:1 by volume), clay +sand + compost, clay + sand + peat moss, clay + sand + perlite (1:1:1 by volume), clay + sand + compost+ peat moss+ perlite (1:1:1:1:1 by volume) and composted + peat moss + perlite (1:1:1 by volume). All media were analyzed for their chemical characteristics (Table, 1).

Table 1: Chemical characteristics of the six chosen growing media.

Media (1:1:1 by volume)	pH	EC ($dS.m^{-1}$)	Organic matter (%)	Available nitrogen (mg/Kg)	Available phosphorus (mg/Kg)	Available potassium (mg/Kg)
(Control) Clay +sand	7.6	1.16	1.39	3665	522	744
Clay+ sand + compost	6.6	1.11	3.30	5587	680	884
Clay+ sand + peat moss	6.5	0.96	3.25	5125	650	866
Clay+ sand + perlite	7.1	0.66	2.33	3878	530	780
Clay+ sand+ compost + peat moss + perlite	6.9	0.69	3.38	5960	692	910
compost + peat moss + perlite	6.2	0.72	3.88	6284	712	975

Chemical fertilization:

The kristalon chemical fertilizer rates of 0.0, 4 and 8 g/pot were applied monthly as a dressing application for ten times throughout the growing seasons. The kristalon chemical fertilizer NPK (20:20:20) was used. The application of fertilization treatments started from 15 April in both seasons (2015/2016 and 2016/2017) until reaching the end of experiment. Kristalon fertilizer analysis: Nitrogen 20%, P2O5 20%, K2O 20%, chelated Zinc 0.0014%, chelated Iron 0.0070%, chelated Manganese 0.0042%, chelated Cupper 0.0016%, chelated Magnesium 0.0120%, Molybdenum 0.0014% and Boron 0.0022%. The layout of the experiment was designed to provide a factorial experiment in randomized complete blocks. The study contained 18 treatments (6 growing media x 3 rates of kristalon chemical fertilizer) with three replicates. Each replicate contained 5 pots. The experimental treatments were started in both seasons on 30th March and ended in the same date of next year. The usual other cultural practices for areca palm were applied.

Recorded data

1-Growth parameters

Plant height, number of leaves/plant, fresh and dry weights of leaves/plant, fresh and dry weights of stem/plant, length and diameter of stem, plant width, show value; as plant width / plant height ratio according to Berghage *et al.,* (1989), root number / plant, root length (cm) and fresh and dry weights of roots/plant.

2- Leaf chemical composition determinations

Photosynthetic pigments: total chlorophylls were calorimetrically determined in leaves of areca palm plants according to the method described by A.O.A.C (1990) and calculated as mg/100g fresh weight.

Total nitrogen, phosphorus, potassium and total carbohydrates were determined in dried leaves according the methods described by Horneck and Miller (1998), Hucker and Catroux (1980), Horneck and Hanson (1998) and Herbert *et al*., (1971), respectively.

3 - Endogenous phytohormones:

Endogenous phytohormones were quantitatively determined in *Dypsis cabadae* palm leaves in the second season using High- Performance Liquid Chromato-graphy (HPLC) according to Koshioka *et al.,* (1983) for auxin (IAA), gibberellins and abscisic acid (ABA), while cytokinins were determined according to Nicander *et al.,* (1993).

All recorded data of endogenous phytohormones of *Dypsis cabadae* palm were taken at the end of experiment.

Statistical analysis:

All obtained data in both seasons of study were subjected to analysis of variance as factorial experiments in a complete randomized block design.L.S.D. method was used to differentiate between means according to Snedecor and Cochran (1989). The differences between the mean values of various treatments were compared by Duncan's multiple range test (Duncan's, 1955).

Results and Discussion

I- Effect of some growing media and Kristalon chemical fertilizer on

I- growth parameters.

I-1-Plant height

Data in Table (2) indicated that the different growing media induced significantly positive affection plant height, especially using a medium of 1part composted leaves: 1 part peat moss: 1 part perlite compared with the other media of *Dypsis cabadae* palm plants in both seasons. As for kristalon chemical fertilizer treatment the statistical analysis revealed that increasing kristalon fertilizer levels from 0.0 to 8g/pot caused a gradual increment in this parameter in both seasons. The interaction effect between growing media and kristalon fertilizer showed a positive effect on plant height hence produced the tallest plants (69.02 and 86.22 cm) were obtained on plants grown in a mixture medium involving compost + peat moss + perlite at a ratio of 1:1:1 by volume which received Kristalon fertilizer at 8g /pot, in the first and second seasons, respectively. On contrary, the lowest values of plant height (42.49 and 52.96 cm) were scored by using a medium contained clay and sand (control) (1:1 by volume) and receiving no Kristalon fertilizer in the first and second seasons, respectively.

Table 2: Effect of growing media and kristalon chemical fertilizer treatments on plant height and No. of leaves of *Dypsis cabadae* palm plants during 2015/2016 and 2016/2017 seasons.

Parameters / Treatments	Plant height (cm)				No. of leaves /plant			
	Fertilizer (kristalon)							
	0g/pot	4g/pot	8g/pot	Mean	0g/pot	4g/pot	8g/pot	Mean
	1st season							
Clay +sand(Control)	42.49^{j}	46.58^{i}	50.53^{h}	46.53^{f}	4.67^{k}	6.33^{ij}	7.33^{hi}	6.11^{e}
Clay+ sand + compost	51.81^{g}	57.66^{e}	60.92^{d}	56.80^{c}	8.34^{gh}	9.67^{def}	11.00^{bc}	9.67^{b}
Clay+ sand + peat moss	50.66^{h}	53.96^{f}	57.51^{e}	54.05^{d}	8.00^{gh}	8.67f^{g}	10.00^{cde}	8.89^{c}
Clay+ sand + perlite	45.81^{i}	50.00^{h}	52.59^{g}	49.47^{e}	5.67^{jk}	6.67^{ij}	8.33^{gh}	6.89^{d}
Clay+ sand+ compost + peat moss + perlite	56.85^{e}	63.29^{c}	66.22^{b}	62.12^{b}	8.67^{fg}	11.67^{ab}	12.67^{a}	11.00^{a}
compost + peat moss + perlite	57.70^{e}	66.89^{b}	69.02^{a}	64.54^{a}	9.00^{efg}	10.67^{bcd}	11.67^{ab}	10.44^{a}
Mean	50.89^{c}	56.40^{b}	59.47^{a}		7.39^{c}	8.94^{b}	10.17^{a}	
	2nd season							
Clay +sand(Control)	52.96^{m}	71.74^{g}	74.25^{f}	66.32^{f}	6.67^{k}	8.33^{j}	10.33^{h}	8.44^{f}
Clay+ sand + compost	60.96^{j}	77.66^{e}	81.55^{d}	73.39^{c}	10.33^{h}	12.00e^{fg}	13.67^{d}	12.00^{c}
Clay+ sand + peat moss	58.87^{k}	74.63^{f}	77.63^{e}	70.38^{e}	9.33^{i}	11.33^{g}	12.67^{e}	11.11^{d}
Clay+ sand + perlite	56.59^{l}	77.64^{e}	81.05^{d}	71.67^{d}	8.67^{ij}	10.33^{h}	11.33^{g}	10.11^{e}
Clay+ sand+ compost + peat moss + perlite	62.07^{i}	82.85^{c}	85.37^{a}	76.76^{b}	12.33^{ef}	15.33^{b}	16.68^{a}	14.78^{a}
Compost + peat moss + perlite	64.22^{h}	83.92^{b}	86.22^{a}	78.12^{a}	11.67^{fg}	14.33^{cd}	15.00^{bc}	13.67^{b}
Mean	59.28^{c}	78.07^{b}	81.01^{a}		9.83^{c}	11.94^{b}	13.28^{a}	

I-2-Number of leaves /plant .

Table (2) declares that all tested growing media and Kristalon fertilizer treatments as well as their interactions increased the number of leaves/plant in both seasons. In this concern, the increment in No. of leaves were in parallel to applied concentration of fertilization levels, so the highest level of fertilization significantly scored the highest number of leaves / plant when compared with control in both seasons. However, the highest number of leaves/plant (12.67 and 16.68) was recorded by the plants grown in a medium contained clay+ sand+ compost + peat moss + perlite and received Kristalon fertilizer at 8g /pot, in the first and second seasons, respectively .

I-3- Fresh and dry weights of leaves /plant .

Data in Table (3) illustrated that the medium contained compost + peat moss + perlite (1:1:1by volume) gave the highest values of fresh and dry weights of leaves /plant, followed descendingly by the growing medium the mixture of clay + sand + compost + peat moss + perlite (1:1:1:1:1by volume) of Dypsis cabadae palm plants in both seasons. Also, all tested applications of Kristalon fertilizer significantly increased the values of these parameters, especially using the highest level (8g/pot) as compared with un-treated plants in both seasons. As for the interaction effect between growing media and kristalon fertilizer, data in Tables (3) revealed that all resulted combinations between growing media and Kristalon fertilizer at 4 or 8 g/pot succeeded in increasing the values of these parameters, with superiority for the combination of Kristalon fertilizer at 8g/pot in both seasons. However, the heaviest fresh weight of leaves/plant (225.3 and 365.3 g) and the heaviest dry weights of leaves /plant (36.36 and 59.96g) were recorded by the plants grown in a medium contained compost + peat moss + perlite and received Kristalon fertilizer at 8g /pot, in the first and second seasons, respectively .

Table 3: Effect of growing media and kristalon chemical fertilizer treatments on fresh and dry weights of leaves of *Dypsis cabadae* palm plants during 2015/2016 and 2016/2017 seasons.

Parameters / Treatments	Fresh weight of leaves(g)				Dry weight of leaves(g)			
	Fertilizer (kristalon)							
	0g/pot	4g/pot	8g/pot	Mean	0g/pot	4g/pot	8g/pot	Mean
	1st season							
Clay +sand(Control)	110.0^{q}	135.1^{m}	158.0^{i}	134.4^{f}	19.22^{m}	25.33^{j}	28.37^{g}	24.30^{f}
Clay+ sand + compost	130.7^{n}	179.5^{f}	196.0^{c}	168.7^{c}	24.74^{j}	29.74^{f}	33.25^{c}	29.24^{c}
Clay+ sand + peat moss	124.7^{o}	167.3^{h}	185.3^{e}	159.1^{d}	22.18^{k}	27.25^{h}	30.92^{e}	26.79^{d}
Clay+ sand + perlite	115.3^{p}	156.4^{j}	171.7^{g}	147.8^{e}	21.29^{l}	26.36^{i}	30.22^{ef}	25.96^{e}
Clay+ sand+ compost + peat moss + perlite	139.1^{l}	185.7^{e}	210.4^{b}	178.4^{b}	26.36^{i}	30.14^{ef}	34.85^{b}	30.45^{b}
compost + peat moss + perlite	146.0^{k}	191.4^{d}	225.3^{a}	187.5^{a}	28.77^{g}	32.33^{d}	36.36^{a}	32.49^{a}
Mean	127.6^{c}	169.2^{b}	191.1^{a}		23.76^{c}	28.53^{b}	32.33^{a}	
	2nd season							
Clay +sand(Control)	181.4^{p}	221.1^{n}	261.1^{k}	221.2^{f}	30.72^{m}	36.15^{l}	41.18^{ij}	36.02^{f}
Clay+ sand + compost	252.2^{l}	295.8^{g}	338.5^{c}	295.5^{c}	41.99^{i}	51.18^{e}	56.02^{c}	49.73^{c}
Clay+ sand + peat moss	246.0^{m}	281.8^{i}	328.9^{d}	285.5^{d}	38.96^{k}	46.07^{g}	52.11^{e}	45.71^{d}
Clay+ sand + perlite	211.3^{o}	251.7^{l}	285.2^{h}	249.4^{e}	35.66^{l}	40.92^{j}	47.92^{f}	41.50^{e}
Clay+ sand+ compost + peat moss + perlite	261.7^{k}	311.4^{f}	359.0^{b}	310.7^{b}	43.85^{h}	51.96^{e}	57.55^{b}	51.12^{b}
Compost + peat moss + perlite	271.4^{j}	318.6^{e}	365.3^{a}	318.4^{a}	45.78^{g}	54.52^{d}	59.96^{a}	53.42^{a}
Mean	237.3^{c}	280.1^{b}	323.0^{a}		39.49^{c}	46.80^{b}	52.46^{a}	

I-4-Plant width

Data in Table (4) exhibit that the mixture of growing media of clay + sand + compost + peat moss + perlite showed to be the most effective one for producing the widest plant as compared with the other mixtures media in both seasons. Additionally, all tested Kristalon fertilizer significantly increased these parameters, especially using the highest level (8g/pot) as compared with un-treated plants in both seasons. Moreover, the interaction effect between growing media and Kristalon fertilizer reveal that plants grown in clay + sand + compost + peat moss + perlite and receiving

chemical fertilizer at 8 g /pot induced the highest values of plant width (46.89 and 68.96 cm) in the first and second seasons, respectively.

I-5- Show value

Data in Table (4) illustrated that, the greatest show value of *Dypsis cabadae* palm was recorded by using the mixture media of clay + sand + compost + peat moss + perlite as compared with the other mixtures media in the two seasons. However, all tested Kristalon fertilizer significantly increased show value, especially using the highest level (8g/pot) as compared with un-treated plants in both seasons. Moreover, the interaction effect between growing media and Kristalon fertilizer reveal that plants grown in clay + sand + compost + peat moss + perlite and receiving chemical fertilizer at 8 g /pot induced the highest values of show value (0.708 and 0.827) followed descendingly by the interaction treatments of medium contained clay + sand + compost + peat moss + perlite and fertilized with Kristalon fertilizer the high level at 4 g /pot(0.692 and 0.818) of areca palm in the first and second seasons, respectively. On the reverse, the lowest values of show value (0.526 and 0.701) were scored by using a medium contained clay and sand (control) (1:1 by volume) and receiving no Kristalon fertilizer in the first and second seasons, respectively.

Table 4: Effect of growing media and kristalon chemical fertilizer treatments on plant width (cm) and show value of *Dypsis cabadae* palm plants during 2015/2016 and 2016/2017 seasons.

Parameters / Treatments	Plant width (cm)				Show value (plant width/height ratio)			
	Fertilizer (kristalon)							
	0g/pot	4g/pot	8g/pot	Mean	0g/pot	4g/pot	8g/pot	Mean
	1st season							
(Control) Clay +sand	22.33^{k}	28.11^{j}	28.81^{ij}	26.41^{f}	0.526^{ij}	0.604^{de}	0.570^{gh}	0.567^{d}
Clay+ sand + compost	29.03^{hij}	35.22^{e}	36.55^{d}	33.60^{c}	0.561^{h}	0.611^{cd}	0.600^{de}	0.590^{c}
Clay+ sand + peat moss	28.35^{j}	31.96^{g}	33.29^{f}	31.20^{d}	0.560^{h}	0.592^{ef}	0.579^{fg}	0.577^{d}
Clay+ sand + perlite	28.18^{j}	30.03^{h}	32.63^{fg}	30.28^{e}	0.615^{cd}	0.601^{de}	0.620^{c}	0.612^{b}
Clay+ sand+ compost + peat moss + perlite	33.03^{f}	43.41^{b}	46.89^{a}	41.24^{a}	0.581^{fg}	0.692^{b}	0.708^{a}	0.661^{a}
Compost + peat moss + perlite	29.77^{hi}	35.70^{de}	38.63^{c}	34.70^{b}	0.516^{j}	0.534^{i}	0.560^{h}	0.537^{f}
Mean	28.34^{c}	34.14^{b}	36.13^{a}		0.560^{b}	0.605^{a}	0.606^{a}	
	2nd season							
Clay +sand(Control)	45.29^{k}	51.11^{i}	53.77^{gh}	50.06^{e}	0.701^{ij}	0.740^{de}	0.751^{d}	0.731^{d}
Clay+ sand + compost	48.92^{j}	59.03^{e}	62.00^{c}	56.65^{b}	0.683^{k}	0.780^{bc}	0.779^{bc}	0.748^{c}
Clay+ sand + peat moss	48.92^{j}	57.63^{f}	60.26^{d}	55.60^{c}	0.695^{jk}	0.794^{b}	0.793^{b}	0.761^{b}
Clay+ sand + perlite	48.96^{j}	54.81^{g}	60.33^{d}	54.70^{d}	0.725^{fg}	0.728^{ef}	0.766^{c}	0.740^{c}
Clay+ sand+ compost + peat moss + perlite	53.07^{h}	65.33^{b}	68.96^{a}	62.45^{a}	0.707^{hig}	0.818^{a}	0.827^{a}	0.784a
Compost + peat moss + perlite	49.75^{j}	57.73^{f}	59.25^{de}	55.58^{c}	0.636^{l}	0.710^{ghi}	0.718^{fgh}	0.688e
Mean	49.15^{c}	57.61^{b}	60.76^{a}		0.691^{c}	0.762^{b}	0.773^{a}	

I-6-Length and diameter of stem

Data in Table (5) demonstrated that highest stem length was scored by using a mixture medium of compost + peat moss + perlite, whereas the highest stem diameter was gained by using a medium contained clay + sand + compost + peat moss + perlite as compared with the other growing media of *Dypsis cabadae* palm plants in the two seasons. In addition, both Effect of different growing media and kristalon fertilizer significantly increased the length and diameter of stem, particularly the high level when compared with un-fertilized plants in both seasons. Referring to the interaction effect between growing media and kristalon fertilizer, data in the same Table, declare that all resulted interactions increased the length and diameter of stem in both seasons. However, the highest stem length (15.70 and 21.86 cm) and the highest stem diameter (1.47 and 2.40 cm) were registered by using the mixture media of compost + peat moss + perlite and clay + sand + compost + peat moss + perlite and both receiving kristalon fertilizer at 8g/pot, in the first and second seasons, respectively.

Table 5: Effect of growing media and kristalon chemical fertilizer treatments on stem length and diameter of stem of *Dypsis cabadae* palm plants during 2015/2016 and 2016/2017 seasons.

Parameters / Treatments	Stem length (cm)				Stem diameter (cm)			
	Fertilizer (kristalon)							
	0g/pot	4g/pot	8g/pot	Mean	0g/pot	4g/pot	8g/pot	Mean
	1st season							
Clay +sand(Control)	9.55^{i}	10.40^{h}	11.17f^{g}	10.37^{f}	0.83^{g}	0.94e^{fg}	0.93^{efg}	0.90^{d}
Clay+ sand + compost	11.37^{f}	13.07^{d}	14.29^{c}	12.91^{c}	0.87^{fg}	1.20^{bc}	1.13^{bcd}	1.07^{b}
Clay+ sand + peat moss	10.63^{gh}	12.41^{e}	12.88^{de}	11.98^{d}	0.83^{g}	1.07^{cde}	1.17^{bcd}	1.02^{bc}
Clay+ sand + perlite	9.64^{i}	11.66^{f}	12.53^{de}	11.28^{e}	0.97^{efg}	0.97^{efg}	0.93^{efg}	0.96^{cd}
Clay+ sand+ compost + peat moss + perlite	11.10^{fg}	15.15^{ab}	14.63^{bc}	13.63^{b}	0.93^{efg}	1.23^{bc}	1.47^{a}	1.21^{a}
compost + peat moss + perlite	12.33^{e}	14.37^{c}	15.70^{a}	14.13^{a}	1.03^{def}	1.23^{bc}	1.27^{b}	1.18^{a}
Mean	10.77^{c}	12.84^{b}	13.53^{a}		0.91^{b}	1.11^{a}	1.15^{a}	
	2nd season							
Clay +sand(Control)	15.22^{k}	16.59^{ghi}	17.14^{fgh}	16.32^{c}	1.47^{j}	1.63^{gh}	1.67^{fg}	1.95^{e}
Clay+ sand + compost	15.40^{jk}	19.11^{d}	20.55^{bc}	18.35^{b}	1.53^{ij}	1.90^{de}	1.93^{d}	1.79^{d}
Clay+ sand + peat moss	16.14^{ij}	18.13^{e}	21.22^{ab}	18.50^{b}	1.67^{fg}	1.90^{de}	2.13^{c}	1.90^{c}
Clay+ sand + perlite	15.33^{jk}	16.34^{hi}	18.11^{e}	16.59^{c}	1.57^{hi}	1.73^{f}	1.97^{d}	1.76^{d}
Clay+ sand+ compost + peat moss + perlite	16.07^{ijk}	17.70^{ef}	20.78^{bc}	18.18^{b}	1.83^{e}	2.23^{b}	2.40^{a}	2.16^{a}
Compost + peat moss + perlite	17.40^{efg}	20.22^{c}	21.86^{a}	19.83^{a}	1.53^{ij}	2.07^{c}	2.27^{b}	1.96^{b}
Mean	15.93^{c}	18.01^{b}	19.94^{a}		1.60^{c}	1.91^{b}	2.06^{a}	

I-7-Fresh and dry weights of stems/plant

It is obvious from Table (6) that using a mixture medium contained compost + peat moss + perlite was more effective in increasing the fresh and dry weights of stems/plant as compared with the other growing media in both seasons. Besides, fresh and dry weights of stems/plant were greatly increased by both levels of kristalon fertilizer, especially the high level in both seasons. As for the interaction effect between growing media and NPK fertilization, data in Table (6) showed that areca palm plants grown in medium contained compost + peat moss + perlite and fertilized with Kristalon fertilizer at 8 g /pot produced the heaviest fresh and dry weights of stems/pot in both seasons, followed descendingly by the interaction treatments of medium contained clay + sand + compost + peat moss + perlite and fertilized with Kristalon fertilizer the high level at 8 g /pot.

Table 6: Effect of growing media and kristalon chemical fertilizer treatments on fresh and dry weights of stems of *Dypsis cabadae* palm plants during 2015/2016 and 2016/2017 seasons.

Parameters / Treatments	Fresh weight of stems(g)				Dry weight of stems (g)			
	Fertilizer (kristalon)							
	0g/pot	4g/pot	8g/pot	Mean	0g/pot	4g/pot	8g/pot	Mean
	1st season							
Clay +sand(Control)	30.96^{l}	37.48^{i}	40.70^{g}	36.38^{e}	7.59^{g}	8.44^{f}	9.31^{e}	8.45^{e}
Clay+ sand + compost	36.92^{i}	43.77^{e}	51.03^{b}	43.91^{b}	8.96^{e}	11.53^{c}	12.07^{b}	10.85^{b}
Clay+ sand + peat moss	35.59^{jk}	42.18^{f}	45.77^{d}	41.18^{c}	8.44^{f}	11.12^{c}	10.51^{d}	10.02^{c}
Clay+ sand + perlite	34.77^{k}	35.93^{j}	42.05^{f}	37.58^{d}	8.22^{f}	8.99^{e}	9.38^{e}	8.86^{d}
Clay+ sand+ compost + peat moss + perlite	36.00^{j}	44.40^{e}	50.81^{b}	43.74^{b}	8.99^{e}	11.51^{c}	12.26^{b}	10.92^{b}
Compost + peat moss + perlite	38.70^{h}	48.37^{c}	55.07^{a}	47.38^{a}	9.43^{e}	11.51^{c}	12.97^{a}	11.31^{a}
Mean	35.49^{c}	42.02^{b}	47.57^{a}		8.61^{c}	10.52^{b}	11.08^{a}	
	2nd season							
Clay +sand(Control)	69.56^{k}	75.66^{j}	81.03^{g}	75.42^{e}	12.25^{j}	13.74^{gh}	14.70^{f}	13.56^{e}
Clay+ sand + compost	74.96^{j}	84.74^{d}	86.51^{c}	82.07^{b}	12.92^{ij}	16.90^{c}	18.03^{b}	15.96^{c}
Clay+ sand + peat moss	70.07^{k}	80.25^{g}	82.11^{f}	77.48^{c}	13.33^{hi}	15.66^{de}	15.55^{e}	14.85^{d}
Clay+ sand + perlite	70.05^{k}	79.11^{h}	80.22^{g}	76.46^{d}	12.24^{j}	15.52^{e}	16.26^{cd}	14.67^{e}
Clay+ sand+ compost + peat moss + perlite	74.85^{j}	83.74^{e}	88.30^{b}	82.29^{b}	14.25^{fg}	17.81^{b}	18.48^{b}	16.85^{b}
Compost + peat moss + perlite	76.59^{i}	86.38^{c}	92.29^{a}	85.09^{a}	14.27^{fg}	19.18^{a}	19.51^{a}	17.65^{a}
Mean	72.68^{c}	81.65^{b}	85.08^{a}		13.21^{c}	16.47^{b}	17.09^{a}	

I-8- Number and length of roots/ plant

Table (7) illustrates that the highest number of roots of *Dypsis cabadae* palm plants were scored by using a mixture medium of clay + sand + compost + peat moss + perlite, whereas the tallest root was gained by using the medium of compost + peat moss + perlite as compared with the other growing media in the two seasons. Furthermore, the high level of Kristalon fertilizer (8g/pot) recorded the highest values of these parameters when compared with un-fertilized plants in both seasons. Referring to the interaction effect between growing media and kristalon fertilizer, data in Table (7), stated that all resulted interactions increased number and length of roots in the two seasons. However, the highest roots number and the tallest root of areca palm were registered by using the mixture media of clay + sand + compost + peat moss + perlite and compost + peat moss + perlite with Kristalon fertilizer at 8g/pot in the first and second seasons, respectively .

Table 7: Effect of growing media and kristalon chemical fertilizer treatments on length and number of roots of *Dypsis cabadae* palm plants during 2015/2016 and 2016/2017 seasons.

Parameters / Treatments	No. of roots / plant				Root length (cm)			
	Fertilizer (kristalon)							
	0g/pot	4g/pot	8g/pot	Mean	0g/pot	4g/pot	8g/pot	Mean
	1st season							
Clay +sand(Control)	13.67^{i}	16.33^{g}	18.67^{f}	16.22^{e}	38.77^{j}	45.63^{h}	47.18^{g}	43.86^{e}
Clay+ sand + compost	16.33^{g}	19.00^{f}	20.33^{e}	18.56^{d}	43.59^{i}	54.59^{e}	58.07^{c}	52.08^{c}
Clay+ sand + peat moss	15.30^{h}	18.33^{f}	21.29^{d}	18.33^{d}	43.96^{i}	54.88^{e}	55.92^{d}	51.59^{d}
Clay+ sand + perlite	16.30^{g}	21.33^{d}	22.31^{c}	20.00^{c}	43.74^{i}	55.96^{d}	54.58^{e}	51.43^{d}
Clay+ sand+ compost + peat moss + perlite	18.31^{f}	22.32^{c}	25.67^{a}	22.12^{a}	46.62^{g}	56.00^{d}	60.92^{b}	54.51^{b}
compost + peat moss + perlite	18.28^{f}	21.67^{cd}	23.33^{b}	21.11^{b}	49.11^{f}	58.37^{c}	61.85^{a}	56.44^{a}
Mean	16.39^{c}	19.83^{b}	21.94^{a}		44.30^{c}	54.24^{b}	56.42^{a}	
2nd season								
Clay +sand(Control)	22.33^{k}	25.33^{j}	31.67^{g}	26.44^{f}	79.97^{h}	81.07^{h}	81.07^{h}	80.70^{f}
Clay+ sand + compost	25.32^{j}	30.30^{h}	31.29^{g}	29.00^{e}	81.18^{h}	85.66^{g}	87.14^{ef}	84.66^{e}
Clay+ sand + peat moss	25.67^{j}	31.31^{g}	32.67^{f}	29.89^{d}	85.14^{g}	88.00^{de}	88.81^{cd}	87.32^{d}
Clay+ sand + perlite	28.30^{i}	33.32^{e}	34.67^{d}	32.11^{c}	84.92^{g}	88.66^{cd}	91.00^{b}	88.19^{c}
Clay+ sand+ compost + peat moss + perlite	31.34^{g}	35.32^{c}	38.32^{a}	35.00^{a}	86.22^{fg}	90.77^{b}	89.79^{bc}	88.92^{b}
Compost + peat moss + perlite	30.31^{h}	34.67^{d}	36.00^{b}	33.67^{b}	86.96^{ef}	90.98^{b}	93.22^{a}	90.38^{a}
Mean	27.22^{c}	31.72^{b}	34.11^{a}		84.07^{c}	87.52^{b}	88.50^{a}	

I-9-Fresh and dry weights of roots/plant:

Data in Table (8) showed that using a mixture medium contained compost + peat moss + perlite was more effective in increasing the fresh and dry weights of roots/plant as compared with the other growing media in both seasons. Hence, fresh and dry weights of roots/plant were greatly increased by both levels of kristalon fertilizer, especially the high level (8 g /pot) in the two seasons. As for the interaction effect between growing media and NPK fertilization, Table (8) clear that areca palm plants grown in medium contained compost + peat moss + perlite and fertilized with Kristalon fertilizer at 8 g /pot is being the most effective one in inducing the heaviest fresh and dry weights of roots/pot in both seasons, followed descendingly by the interaction treatments of medium contained clay + sand + compost + peat moss + perlite and fertilized with Kristalon fertilizer the high level at 8 g /pot. Whereas the interaction treatments of medium contained compost + peat moss + perlite and fertilized with Kristalon fertilizer the medium level at 4 g /pot ranked the third results of these parameters in this concern. The positive action of growing media on supplying the plants with their requirements from aeration, water and nutrients could explain the present results. The aforementioned results of growing media are in conformity with those reported by Aklibasinda *et al*., (2011) on *Pinus sylvestris,* Abouzar (2012) on *Ficus benjamina*, Yousif and Kako (2012) on *Hyacinthus orientalis* L., Kakoei and Salehi (2013) on *Spathiphyllum wallisii* Regel, Herath *et al*., (2013) on Ophiopogon sp. ,Tahir *et al*., (2013) on *Antirrhinum majus* L. Youssef (2014) growing *Beaucarnea recurvate.*

Plants in medium contained composted leaves+ peat moss+ vermiculite or medium contained clay+ sand + peat moss (1:1:1 by volume) is necessary for improving the growth, quality and nutritional status of the plants. and Mohamed (2016) who mentioned that it is preferable to treat *Cupressus macrocarpa* cuttings with IBA at 4000 ppm and planting it at medium contained (peat moss + perlite) to obtain the highest rooting percentage and improving the growth parameters.
The abovementioned results of chemical fertilization are in harmony with those attained by Youssef and Gomaa (2007) on *Iris tingitana*, Abou El-Ella (2007) on *Acanthus mollis*, El-Naggar and El-Nasharty (2009) on *Hippeastrum vittatum*, Hussein (2009) on *Cryptostegia grandiflora*, Abd El-All (2011) on *Aspidistra elatior*, Habib (2012) on *Caryota mitis* Lour, Wanderley *et al.,* (2012) on areca bamboo palm (*Dypsis lutescens*), Youssef and Abd El-Aal (2014) on *Hippeastrum vittatum*, Youssef (2014) fertilized *Beaucarnea recurvata* with kristalon fertilizer at 6 g /pot is necessary for improving the growth, quality and nutritional status of the plants and Mazhar and Eid (2016) Showed that Kristalon at 80 mg/m ^{2}+ 80 ml/ m^{2}gave the maximum values of all growth parameters of *Gladiolus grandiflorus* in both seasons compared with untreated plants. Also, Sakr (2017) showed that, the combination of ½ NPK + compost tea+ sheep manure tea was the best treatment examined for improving vegetative) as compared to the control (NPK treatment) in most cases of *Calendula officinalis* plant.

Table 8: Effect of growing media and kristalon chemical fertilizer treatments on fresh and dry weights of roots of *Dypsis cabadae* palm plants during 2015/2016 and 2016/2017 seasons.

Parameters / Treatments	Fresh weight of roots/plant(g)				Dry weight of roots/plant(g)			
	Fertilizer (kristalon)							
	0g/pot	4g/pot	8g/pot	Mean	0g/pot	4g/pot	8g/pot	Mean
	1st season							
Clay +sand(Control)	25.96^{k}	31.63^{i}	36.11^{g}	31.23^{e}	4.59^{l}	5.85^{ghi}	6.45^{f}	5.63^{e}
Clay+ sand + compost	30.07^{j}	38.11^{f}	38.96^{f}	35.71^{d}	5.23^{jk}	6.26^{fgh}	7.63^{de}	6.37^{d}
Clay+ sand + peat moss	31.15^{i}	40.07^{e}	44.58^{d}	38.60^{c}	5.05^{kl}	7.26^{e}	7.92^{d}	6.74^{c}
Clay+ sand + perlite	32.86^{h}	44.75^{d}	46.81^{b}	41.48^{b}	5.77^{hij}	8.70^{ab}	8.52^{bc}	7.66^{b}
Clay+ sand+ compost + peat moss + perlite	33.59^{h}	44.28^{d}	47.25^{b}	41.71^{b}	5.44^{ijk}	8.03^{cd}	9.22^{a}	7.56^{b}
compost + peat moss + perlite	36.04^{g}	45.62^{c}	49.25^{a}	43.64^{a}	6.38^{fg}	8.52^{bc}	9.24^{a}	8.05^{a}
Mean	31.61^{c}	40.74^{b}	43.83^{a}		5.41^{c}	7.44^{b}	8.16^{a}	
	2nd season							
Clay +sand(Control)	54.89^{l}	62.96^{h}	66.11^{g}	61.32^{f}	9.88^{h}	10.39^{fg}	10.84^{e}	10.37^{f}
Clay+ sand + compost	57.88^{k}	69.26de^{f}	69.87^{cd}	65.67^{d}	10.18^{gh}	10.81^{e}	11.18^{d}	10.72^{e}
Clay+ sand + peat moss	57.70^{k}	66.41^{g}	68.30^{f}	64.14^{e}	10.03^{h}	11.30^{d}	11.51^{cd}	10.95^{d}
Clay+ sand + perlite	60.89^{i}	68.63^{ef}	70.58^{c}	66.70^{c}	10.41^{fg}	11.29^{d}	11.85^{c}	11.18^{c}
Clay+ sand+ compost + peat moss + perlite	59.01^{j}	69.61^{cde}	73.66^{b}	67.42^{b}	10.48^{efg}	11.55^{cd}	12.57^{b}	11.53^{b}
Compost + peat moss + perlite	61.69^{i}	73.74^{b}	76.80^{a}	70.74^{a}	10.62^{ef}	12.66^{b}	13.23^{a}	12.17^{a}
Mean	58.68^{c}	68.43^{b}	70.88^{a}		10.27^{c}	11.33^{b}	11.86^{a}	

II- Chemical constituents.

II-1- Leaf N, P and K contents:

Data in Table (9) indicated that all used growing media and Kristalon fertilizer as well as their interactions showed a pronounced positive effect on increasing leaf N, P and K contents of *Dypsis cabadae* palm plants in both seasons. However, the highest values of these parameters were scored by using the mixture medium of compost + peat moss + perlite which received chemical fertilizer at 8 g /pot as compared with the other treatments in both seasons. Whereas the interaction treatments of medium contained clay + sand + compost + peat moss + perlite and fertilized with Kristalon fertilizer the highest level at 8 g /pot ranked the next results of these parameters in this respect in both seasons.

II-2- Leaf total chlorophylls and total carbohydrates content.

Table (10) indicates that all tested growing media increased leaf total chlorophylls and total carbohydrates contents as compared with un-treated plants in both seasons. Also, the increments of

leaf total carbohydrates and total chlorophylls contents were in parallel to the increasing of Kristalon fertilizer level to reach the maximum increasing at the high level in both seasons.

Table 9. Effect of growing media and kristalon chemical fertilizer treatments on leaf N, P and K contents of roots of *Dypsis cabadae* palm plants during 2015/2016 and 2016/2017 seasons.

Parameters / Treatments	N%				P%				K%			
	Fertilizer (kristalon)											
	0g/pot	4g/pot	8g/pot	Mean	0g/pot	4g/pot	8g/pot	Mean	0g/pot	4g/pot	8g/pot	Mean
	1st season											
Clay + sand (Control)	2.20^{i}	2.35^{gh}	2.38^{gh}	2.31^{d}	0.191^{h}i	0.198^{h}	0.220^{g}	0.203^{e}	1.36^{h}	1.84^{e}	1.88^{e}	1.70^{d}
Clay+ sand + compost	2.44f^{g}	2.85^{e}	2.94^{bcde}	2.74^{bc}	0.195^{hi}	0.268^{bc}	0.274^{abc}	0.246^{b}	1.45^{fgh}	2.39^{d}	2.49^{bc}	2.11^{b}
Clay+ sand + peat moss	2.34^{h}	2.88^{de}	2.90^{cde}	2.71^{c}	0.195^{hi}	0.250^{e}	0.264^{cd}	0.236^{c}	1.39^{gh}	2.40^{cd}	2.34^{d}	2.04^{c}
Clay+ sand + perlite	2.43^{fg}	2.87^{de}	2.98^{abc}	2.76^{abc}	0.184^{i}	0.237^{f}	0.251^{de}	0.224^{d}	1.42^{fgh}	2.32^{d}	2.37^{d}	2.03^{c}
Clay+ sand+ compost + peat moss + perlite	2.50^{f}	2.88^{de}	2.99^{ab}	2.79^{ab}	0.196^{hi}	0.284^{a}	0.278^{ab}	0.253^{ab}	1.47^{fg}	2.36^{d}	2.60^{a}	2.14^{b}
compost + peat moss + perlite	2.44f^{g}	2.96a^{bcd}	3.04^{a}	2.81^{a}	0.198h	0.281^{ab}	0.285^{a}	0.255^{a}	1.49^{f}	2.50^{b}	2.66^{a}	2.22^{a}
Mean	2.39^{c}	2.80^{b}	2.87^{a}		0.193^{c}	0.253^{b}	0.262^{a}		1.43^{c}	2.30^{b}	2.39^{a}	
	2nd season											
Clay +sand (Control)	2.30^{j}	2.45^{i}	2.54^{h}	2.44^{e}	0.213^{i}	0.226^{gh}	0.232^{g}	0.264^{d}	1.62^{h}	1.93^{g}	2.16^{f}	1.90^{e}
Clay+ sand + compost	2.52^{hi}	2.88^{g}	2.98^{def}	2.79^{d}	0.220^{ghi}	0.289^{ab}	0.294^{ab}	0.268^{a}	1.60^{hi}	2.73^{bc}	2.59^{d}	2.31^{bc}
Clay+ sand + peat moss	2.48^{hi}	2.95^{efg}	3.03^{cde}	2.82^{cd}	0.217^{hi}	0.274^{cd}	0.263^{de}	0.252^{b}	2.52^{i}	2.59^{d}	2.66^{cd}	2.26^{c}
Clay+ sand + perlite	2.55^{h}	2.91^{fg}	3.10^{bc}	2.85^{bc}	0.213^{i}	0.249^{f}	0.255^{ef}	0.239^{c}	1.41^{j}	2.37^{e}	2.45^{e}	2.08^{d}
Clay+ sand+ compost + peat moss + perlite	2.52^{hi}	3.00^{def}	3.16^{ab}	2.89^{ab}	0.223^{ghi}	0.282^{bc}	0.291^{ab}	0.265^{a}	1.55^{hi}	2.71^{bc}	2.78^{b}	2.35^{ab}
Compost + peat moss + perlite	2.55^{h}	3.06^{cd}	3.21^{a}	2.94^{a}	0.220^{ghi}	0.288^{ab}	0.298^{a}	0.269^{a}	1.60^{hi}	2.60^{d}	2.91^{a}	2.37^{a}
Mean	2.49^{c}	2.88^{b}	3.00^{a}		0.218^{b}	0.268^{a}	0.272^{a}		1.55^{c}	2.49^{b}	2.59^{a}	

Table 10: Effect of growing media and kristalon chemical fertilizer treatments on leaf total chlorophylls and total carbohydrates content of roots of *Dypsis cabadae* palm plants during 2015/2016 and 2016/2017 seasons.

Parameters / Treatments	Total chlorophylls/ mg/100g F.wt.				Total carbohydrates %			
	Fertilizer (kristalon)							
	0g/pot	4g/pot	8g/pot	Mean	0g/pot	4g/pot	8g/pot	Mean
	1st season							
Clay +sand) Control)	211.4^{l}	217.3^{j}	230.7^{g}	219.8^{e}	11.98^{k}	13.04^{i}	13.27^{hi}	12.76^{d}
Clay+ sand + compost	215.5^{k}	239.9^{d}	243.6^{b}	233.0^{b}	12.21^{k}	14.96^{ef}	17.40^{a}	14.86^{a}
Clay+ sand + peat moss	215.3^{k}	230.3^{g}	239.7^{d}	228.4^{d}	12.29^{jk}	13.77^{gh}	15.03^{de}	13.70^{c}
Clay+ sand + perlite	217.9^{j}	237.9^{e}	240.7^{cd}	232.2^{c}	12.88^{ij}	14.36^{fg}	15.45^{cde}	14.23^{b}
Clay+ sand+ compost + peat moss + perlite	219.8^{i}	235.7^{f}	241.2^{c}	232.2^{c}	12.33^{jk}	15.89^{c}	16.74^{b}	14.98^{a}
compost + peat moss + perlite	221.3^{h}	239.7^{d}	246.2^{a}	235.7^{a}	12.22^{k}	15.62^{cd}	17.35^{ab}	15.06^{a}
Mean	216.9^{c}	233.5^{b}	240.4^{a}		12.32^{c}	14.61^{b}	15.87^{a}	
	2nd season							
Clay +sand(Control)	221.6^{j}	235.3^{g}	250.9^{f}	236.0^{e}	12.47^{k}	15.02^{g}	15.92^{e}	14.47^{c}
Clay+ sand + compost	230.9^{h}	255.6^{e}	260.3^{cd}	248.9^{b}	12.99^{ijk}	17.11^{b}	17.92^{a}	16.00^{a}
Clay+ sand + peat moss	229.6^{h}	250.9^{f}	259.8^{d}	246.8^{c}	12.92^{jk}	15.22^{fg}	16.67^{bc}	14.94^{b}
Clay+ sand + perlite	227.8^{i}	251.1^{f}	251.1^{f}	243.3^{d}	13.18^{ij}	15.77^{ef}	16.03^{de}	14.99^{b}
Clay+ sand+ compost + peat moss + perlite	231.0^{h}	261.5^{c}	265.6^{b}	252.7^{a}	13.88^{h}	17.03^{bc}	16.99^{bc}	15.97^{a}
Compost + peat moss + perlite	230.6^{h}	259.9^{d}	267.6^{a}	252.7^{a}	13.51^{hi}	16.51^{cd}	18.47^{a}	16.17^{a}
Mean	228.6^{c}	252.4^{b}	259.2^{a}		13.16^{c}	16.11^{b}	17.00^{a}	

In general, all the interaction effect between growing media and Kristalon fertilizer treatments statistically increased the values of these parameters as compared with control in both seasons. However, the highest values of leaf total chlorophylls (246.2 and 267.6 mg/100g F.W) and leaf total carbohydrates (17.41 and 18.47 %) contents were recorded by the mixture medium of compost + peat moss + perlite which received chemical fertilizer at 8 g /pot, in the first and second seasons, respectively. Furthermore, the interaction treatments of medium contained clay + sand + compost and fertilized with Kristalon fertilizer the highest level at 8 g /pot ranked the second results of these parameters in this respect in the two seasons.

II-3-Endogenous phytohormones content **.**

Endogenous phytohormones of *Dypsis cabadae* palm leaves during 2016/2017 season were significantly affected by different growing media and chemical fertilization treatments as shown in Table (11). According to the obtained results i.e. all promoters (auxins, gibberellins and cytokinins) were increased by using different growing media and chemical fertilization as well as their combination, whereas abscisic acid was decreased. However, the highest value of leaf gibberellins contents (98.55 µg/g F.W) and auxins contents (26.64 µg/g F.W) were recorded by growing *Dypsis cabadae* palm plants in medium contained compost + peat moss + perlite that received chemical fertilization at 8g/pot, Whereas the highest value of leaf cytokinins content (12.99 µg/g F.W) as well as the lowest leaf abscisic acid content (0.29 µg/g F.W) were recorded by using the medium contained clay + sand + compost + peat moss + perlite and fertilized with Kristalon fertilizer the highest level at 8 g /pot. These data could also be of great influence upon different vegetative growth and nutritional status of the plants. The stimulated effect of kristalon fertilizer may be due to the role of kristalon fertilizer on supplying the plants with their nutrients i.e. with more carbohydrates and proteins production which are necessary for vegetative, roots growth and chemical composition of areca palm plants (Marschner, 1997). Generally, increments of cytokinins, auxins and gibberellins obtained in the present study could interpret the obtained results of vegetative growth (Tables, 2-7), as well as chemical constituents (Tables, 8&9). Cytokinins are known as shooting hormones (Salisbury and Ross, 1974). For example, increasing cytokinins could favor increasing number of leaves/plant, stem diameter, plant width, show value, root number / plant. Also, of interest is to note that these treatments were accompanied with a significant increase in plant height that is being expected when related with the obtained increases in endogenous auxin and gibberellins levels. Whereas, increasing gibberellins and auxins could favor increasing plant height, fresh and dry weights of leaves/plant, fresh and dry weights of stem/plant, length of stem, root length (cm) and fresh and dry weights of roots/plant.

Table 11. Effect of growing media and kristalon chemical fertilizer treatments on leaf endogenous phytohormones contents of roots of *Dypsis cabadae* palm plants during 2015/2016 and 2016/2017 seasons.

Plant hormones / Treatments	Promoters						Inhibitors					
	Gibberellins (GA_3) mg/g F.wt.			Auxins (IAA) mg/g F.wt.			Cytokinins mg/g F.wt.			Abscisic acid(ABA) mg/g F.wt.		
	Fertilizer (kristalon)											
	0g/pot	4g/pot	8g/pot	0g/pot	4g/pot	8g/pot	0g/pot	4g/pot	8g/pot	0g/pot	4g/pot	8g/pot
Clay +sand (Control)	65.66	76.39	80.22	14.55	19.67	22.48	6.88	8.66	9.44	0.66	0.58	0.51
Clay+ sand + compost	76.99	88.55	94.66	17.88	25.55	22.66	8.55	10.88	11.88	0.55	0.39	0.34
Clay+ sand + peat moss	72.66	84.77	88.74	15.77	20.33	21.33	7.44	10.90	10.66	0.60	0.55	0.40
Clay+ sand + perlite	69.44	78.45	81.23	13.77	18.66	20.44	6.33	8.44	9.88	0.62	0.54	0.46
Clay+ sand+ compost + peat moss + perlite	76.55	86.77	96.12	19.66	24.44	25.33	10.22	12.33	12.99	0.50	0.35	0.29
Compost + peat moss + perlite	77.66	88.66	98.55	18.78	22.88	26.64	10.33	11.96	12.25	0.51	0.38	0.33

The aforementioned results of growing media concerning chemical constituents are in conformity with those reported by Habib (2012) on *Caryota mitis* Lour, Aklibasinda *et al.,* (2011) on *Pinus sylvestris*, Abouzar (2012) on *Ficus benjamina*, Alidoust *et al.*, (2012) on Dracaena and Waseem *et al.,* (2013) on *Matthiola incana.* Youssef (2014) on *Beaucarnea recurvata* plants and Mohamed (2016) on *Cupressus macrocarpa*

The abovementioned results of fertilization are in harmony with those attained by Youssef and Goma (2007) on *Iris tingitana*, El-Naggar and El-Nasharty (2009) on *Hippeastrum vittatum*, Abd El-All (2011) on *Aspidistra elatior*, Rodrigo *et al.,* (2011) on *Pinus nigra* and *Betula papyrifera*, Habib (2012) on *Caryota mitis* Lour, Wanderley *et al.,* (2012) on areca bamboo palm (*Dypsis lutescens*), Youssef and Abd El-Aal (2014) on *Hippeastrum vittatum*, Youssef (2014) on *Beaucarnea recurvata* and Mazhar and Eid (2016) on *Gladiolus grandiflorus*

Conclusively, growing *Dypsis cabadae* palm plants in medium contained compost + peat moss + perlite or medium contained clay + sand + compost + peat moss + perlite and fertilized with kristalon fertilizer at 8 g /pot is necessary for showed an enhancement in growth, quality of areca palm plants.

References

A.O.A.C., 1990. Official Methods of Analysis (15th Ed.). Association of Official Analytical Chemists, Washington, DC, USA.

Abd El-All, S.G., 2011. Response of cast-iron plant (*Aspidistra elatior* Blume) to foliar nutrition with greenzit and GA_3. M.Sc. Thesis, Fac. Agric., Benha Univ. Egypt.

Abou El-Ella, E.M., 2007. Physiological studies on *Acanthus mollis* plant. M.Sc., Thesis, Hort. Dept. Fac. Agric., Benha Univ Egypt.

Abouzar, A., S. Rouhi, A. Eslami and B. Kaviani, 2012. Comparison of the effect of different soilless growing media on some growth characteristics of Benjamin tree (*Ficus benjamina*). Int. J. Agric. Biol., 14: 985–988.

Aklibasinda, M., T. Tunc, Y. Bulut and U. Sahin, 2011. Effects of different growing media on scotch pine (*Pinus sylvestris*) production. The Journal of Animal & Plant Sciences, 21(3), 535-541.

Alidoust, M., M. Torkashvand and M.A. Khomami, 2012. The effect of growth medium of peanut shelles compost and nutrient solution on the growth of Dracaena. Annals of Biological Research, 3 (2):789-794.

Berghage, R.D., R.D. Heins, M. Karlsson, J. Erwin and W. Carlson, 1989. Pinching technique influences lateral shoot development in poinsettia. J. Amer. Soc. Hort. Sci. 114(6): 909- 914.

Duncan's DB., 1955. Multiple range and multiple F. test. Biometrics.;11:11-24.

El-Khateeb, M.A., E.E. El-Maadawy and A.B. El- Attar, 2006. Effect of growing media on growth and chemical composition of *Ficus alii* plants. Annals of Agric. Sc., Moshtohor, Vol. 44(1): 175-193.

El-Naggar, A.H. and A.B. El-Nasharty, 2009. Effect of growing media and mineral fertilization on growth, flowering, bulbs productivity and chemical constituents of *Hippeastrum vittatum*, Herb. American-Eurasian J. Agric. & Environ. Sci., 6 (3): 360-371.

Habib, A., 2012. Effect of NPK and growing media on growth and chemical composition of fishtail palm (*Caryota mitis* Lour). Life Science Journal;9(4), 3159- 3168.

Hartmann, H.T., D.E. Kester, F.T. Davies and R.L. Geneve, 2002. Plant Propagation Principles and Practices. Prentice Hall, Upper Saddle River, New Jersey, USA. 702 pp.

Herath H.E., S.A. Krishnarajah and J.W. Damunupola 2013. Effect of two plant growth hormones and potting media on an ornamental foliage plant, *Ophiopogon sp*. Int. Res. J. Biological Sci., Vol. 2(12), 11-17.

Herbert, D., Phipps, P.J. and R.E. Strange, 1971. Determination of total carbohydrates, Methods in Microbiology, 5 (8): 290-344.

Horneck, D.A. and D. Hanson, 1998. Determination of potassium and sodium by flame Emission spectrophotometry. In hand book of reference methods for plant analysis, e.d Kolra, Y. P.(e.d). 153-155.

Horneck, D.A. and R.O. Miller, 1998. Determination of total nitrogen in plant hand book of reference methods for plant analysis, (e.d) Kolra,Y.P73.

Hucker, T. and G. Catroux 1980. Phosphorus in sewage ridge and animal's wastes slurries. Proceeding of the EEC Seminar, Haren (Gr): Gromingen Netherlands 12, 13 June.

Hussein, M.M.M, 2009. Effect of gibberellic acid and chemical fertilizers on growth and chemical composition of *Cryptostegia grandiflora*, R. Br. Plants. T. Hort. Sci. & Ornamen. Plants, 1(2): 27- 38.

Kakoei F. and H. Salehi, 2013. Effects of different pot mixtures on spathiphyllum (*Spathiphyllum wallisii* Regel) growth and development. Journal of Central European Agriculture, 14(2), p.140-148.

Koshioka, M., J. Harda, M. Noma, T. Sassa, K. Ogiama, J.S. Taylor, S.B. Rood,R.L. Legge and R.P. Pharis, 1983. Reversed – phase C18 high performance liquid chromatography of acidic and conjugated gibbberellins. J. Chromatgr., 256:101-115.

Lambers, H., F.S. Chapin and T.L. Pons, 2000. Plant Physiology Ecology. Springer – Verleg New Yourk.Inc., 540 pp.

Marschner, H., 1997. Mineral Nutrition of Higher Plants. Second Printing, Academic press INC. San Diego, 889 pp.

Mazhar, Azza A. M. and Rawia A. Eid, 2016. Effect of various doses of chemical fertilizer (kristalon) individually or in combination with different rates of biofertilizer on growth, flowering, corms yield and chemical constituents of *Gladiolus grandifloras*: International Journal of PharmTech Research, Vol.9, No.12, pp 139-145.

Meerow, A. W. and T. K. Broschat, 1996. Container production of palms. Florida: University of Florida; Institute of Food Annual Agricultural Sciences, (CIR 1163).

Mengel, K. and A. Kirkby, 1987. Principles of Plant Nutrition. 4th Ed. International, Potash, Institute, Bern, Switzerland, 849 pp.

Mohamed, T. M.H., 2016. Physiological studies on propagation of *Cupressus Sp.* Plant: M.Sc. Thesis, Fac. Agric., Benha Univ Egypt.

Nicander, B., U. Stahl, P. Bjorkman and E. Tillberg, 1993. Immyno affinity co-purification of cytokinins and analysis by high-performance liquid chromatography with ultra violet spectrum deterction . Planta, 189: 312-320.

Ribeiro, H.M., A.M .Romero, H. Pereira; P. Borges, F. Cabral and E. Vaconcelos, 2007. Evaluation of a compost obtained from forestry wastes and solid phase of pig slurry as a substrate for seedlings production. Bioresource Technology, Vol.98, 3294-3297.

Rodrigo A.C., P. Bonello and D.A. Herms, 2011. Effect of the growth regulator paclobutrazol and fertilization on defensive chemistry and herbivore resistance of austrian pine *(Pinus nigra*) and paper birch (Betula papyrifera.). Arboriculture & Urban Forestry 2011. 37(6): 278–287.

Sakr, Weaam R.A., 2017. Chemical and Biological Fertilization of *Calendula officinalis* Plant Grown in Sandy Soil :Journal of Horticultural Science & Ornamental Plants 9 (1): 17-27.

Salisbury, F.B. and C.W. Ross, 1974. Plant Physiology. Publishing Inc. Belmont. California, 2nd ed., pp. 422.

Snedecor, G.W. and W.G. Cochran, 1989. Statistical methods. 7th Ed. Iowa State Univ.Press. Ames Iowa, USA, 503 pp.

Suresh, K.D.; G. Sneh. K.K. Krishn and C.M. Mool, 2004. Microbial biomass carbon and microbial activities of soils receiving chemical fertilizers and organic amendments. Arch. Agron. Soil Sci., 50: 641-647.

Tahir, M.; W. Ahmad, K.S. Ahmad, J. Shafi, M.A. Shehzad and M.A. Sarwar, 2013. Comparative effect of different potting media on vegetative and reproductive growth of Floral Shower (*Antirrhinum majus* L.). Universal Journal of Plant Science 1(3): 104-111.

Wanderley, C.S., R.T. Faria and M.U. Ventura, 2012. Chemical fertilization, organic fertilization and pyroligneous extract in the development of seedlings of areca bamboo palm (*Dypsis lutescens*). Maringá, V. 34, N. 2, p. 163- 167.

Waseem, K., A. Hameed,M.S. Jilani; M. Kiran, M. Rasheed, S. Javeria and T.A. Jilani 2013. Effect of different growing media on the growth and flowering of stock (*Matthiola incana*) under the agro-climatic condition of Dera Ismail Khan. Pak. J. Agri. Sci., Vol. 50(3), 523-527.

Yousif, A.A. and S.M. Kako, 2012. Effect of growing media on growth and flowering of different hyacinth cultivars (*Hyacinthus orientalis* L.). Journal of Agricultural Science and Technology., B 2, 1100-1108.

Youssef, A.S.M., 2014. Effect of different growing media and chemical fertilization on growth and chemical composition of ponytail palm (*Beaucarnea recurvata*) plant: Annals of Agric. Sci., Moshtohor, Vol. 52(1) (2014), 27– 38.

Youssef, A.S.M. and A.O. Gomaa, 2007. Effect of some horticultural treatments on growth, flowering, bulb production and chemical composition of *Iris tingitana* cv. Wedgwood. The Third Conf. of Sustain. Agric. and Develop. Fac. of Agric., Fayoum Univ., 12-14 Nov., p:299-326.

Youssef, A.S.M. and M.M.M Abd El-Aal, 2014. Effect of kinetin and mineral fertilization on growth, flowering, bulbs productivity, chemical composition and histological features of *Hippeastrum vittatum* plant. J. plant production, Mansoura Univ., Vol (3):357-681