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# Effect of Planting Media and Fertilization Treatments on Growth and Chemical Composition of *Cupressus Macrocarpa* L.Plant

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**Abstract**

A pot experimental study was conducted at the Floriculture Nursery of the Horticulture Department, Faculty of Agriculture Moshtohor, Benha University, during 2014 and 2015 seasons to study the effect of 20 treatments which were represented by the combinations between five different growing media, i.e. sand + clay, sand + clay + perlite, sand+ clay + compost, sand + clay + peatmoss, and compost+ perlite+ peat moss (1:1:1 by volume) and four chemical fertilization rates of kristalon fertilizer at 0, 2,4 and 6g/L on the growth and chemical composition of *Cupressus macrocarpa* plants. Results showed that growing *Cupressus macrocarpa* plants in a mixture medium contained compost + perlite+ peat moss (1:1:1 by volume) + kristalon fertilizer at 6g/L or 4gL produced the tallest plant, the highest values of fresh and dry weights of shoots and, root length (cm),number of roots/plant and fresh and dry weights of roots/plant in both seasons. Besides, the highest leaf total nitrogen, phosphorus, potassium contents . In addition, the greatest total carbohydrates content of *Cupressus macrocarpa* was recorded by using the mixture media of compost +perlite+ peat moss and sprayed Kristalon fertilizer at 6g/L .In this context, The medium consists of compost+pearlite+peatmoss and sprayed with kristalon fertilizer at 4 g / L came second in relation to the above-mentioned studied parameters in both seasons. Conclusively, growing *Cupressus macrocarpa* plant in a medium contained compost+ perlite+ peat moss and sprayed with kristalon fertilizer at 6g/L produced the best growth and quality of lemon cypress (*Cupressus macrocarpa)* plants.

**Key words:** lemon cypress (*Cupressus macrocarpa),* planting media, chemical fertilization, growth, and chemical composition.

## Introduction

The commercial production of ornamental plants is growing worldwide. Its monetary value has significantly increased over the last two decades and there is a great potential for continued further growth in both domestic and international markets. Major pot plants such as Begonia, Aspidistra, Anthurium, Chrysanthemum, and Spathiphyllum are being produced in the developed countries. *Cupressus macrocarpa*'Goldcrest Wilma' is an evergreen tree belongs to family Cupressaceae. It is commonly known as Monterey cypress or Lemon cypress, while native to California. ( **Graf, 1992** and **Thukral *et al.*, 2014)**. It is able to face many unwanted changes during its growth stages and excellent choice for seaside plantings. It can be pruned to form a hedge whilst smaller cultivars such as'Goldcrest' are grown in containers. 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. Thus,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. 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 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.**, Mohamed (2018)** showed that growing areca palm (*Dypsis cabadae*H. E. Moore) plants in a medium containing composted + peat moss + vermiculite or a medium composed of clay + peat moss 1:1:1(v:v) gave the best growth of this plant. Fertilizers are required to produce the best characteristics of ornamental potted plants. Natural plants need many chemical elements to grow and thrive, but the most important are nitrogen, phosphorus and potassium. Most packaged fertilizers contain these three macronutrients. Nitrogen is particularly important, and each amino acid in plants contains nitrogen as one essential component for plants to manufacture new cells **(Marschner, 1997).**Potassium is important for growth and elongation probably due to its function as an osmoticum and may react synergistically with IAA. Moreover, it promotes CO2 assimilation and translocation of carbohydrates from the leaves to storage tissues (**Mengel and Kirkby, 1987**).The effect of chemical fertilizer on vegetative growth and chemical composition of *Aspidistra elatior* in several studiedwas revealed by **Ghatas,(2016)** on *Gladiolus grandiflorus***. Mohamed,(2018)** on Areca plant.,**Mohamed and Ghatas, (2016)** on *Viola odorata* and **Ghatas and Abdallah (2016)** on *Echinacea purpurea***.**In this concern**,Ghatas (2015)** pointed out that chemical fertilizer (NPK) at 5 g/plant improved the studied vegetative and flowering growth parameters of *Hemerocallis aurantiaca*plants.**, 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 control plants.

Thereupon, this study was conducted to evaluate the effect of different growing media mixture i.e. sand+ clay,sand + clay+perlite , sand + clay+compost , sand + clay + peat moss , compost+ perlite+peatmoss and kristalon fertilizer on growth and chemical composition of *Cupressus macrocarpa* L.plant.

## Materials and Methods

A pot experimental study was conducted at the Floriculture Nursery of the Horticulture Department, Faculty of Agriculture ,Moshtohor, Benha University, during 2014 and 2015 seasons to study the effect of some different mixture growing media and chemical fertilization as well as their interaction on growth and chemical composition of *Cupressus macrocarpa* plant.

**Plant Material**: Uniform *Cupressus macrocarpa* seedlings having 2-4 branches and 17-20 cm height were selected for achieving this study. The plants were obtained from Floriculture Nursery of the Horticulture Department, Faculty of Agriculture at Moshtohor, Benha University. The plants were repotted in plastic pots of 25cm diameter (one plant / pot) packed with the five chosen planting media, mention later, and placed in a partial shade (14000-16000 lux) under lath house condition on 15 February, for the two seasons of this study.

**Procedure and Lay-out of the Experiment:**

Two factors were involved in the present study, the first was the planting medium and the second was chemical fertilization. The different five planting media chosen; sand+clay (M1) ,sand+clay+ perlite (1:1:1 by volume) (M2) sand+clay+ compost (1:1:1 by volume) (M3), sand+clay+peat moss (1:1:1 by volume) (M4), and compost + perlite + peat moss (1:1:1 by volume) (M5). All chosen planting media were analyzed for their chemical parameters (Table, a).

**Fertilization treatments:**

*Cupressus macrocarpa* plants were sprayed at (0,2,4,and 6g/L monthly interval, four eight times, starting after one month from planting time in the two seasons of this study. The kristalon chemical fertilizer as NPK (19:19:19) was used. Kristalon analysis: Nitrogen 19%, P2O5 19%, K2O 19%, 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%.. Common agricultural practices (irrigation, manual weed control, etc.) were conducted when needed.

The layout of the experiment was designed to provide a factorial experiment in randomized complete blocks. The study contained 20 treatments (5 planting media x 4 rates of chemical fertilization) with three replicates. Each replicate contained 5 pots. The study was finished on 30$^{th}$ December during the two seasons.

**Table a.** The chemical characteristics of the five chosen planting media.

| Parameter / Media | pH | EC ($dS.m^{-1}$) | Organic matter (%) | Available nitrogen (mg/Kg) | Available phosphorus (mg/Kg) | Available potassium (mg/Kg) |
|---|---|---|---|---|---|---|
| sand+clay (m1) | 7.70 | 0.81 | 1.85 | 3650 | 530 | 729 |
| sand+clay+ perlite (m2) | 7.31 | 0.78 | 1.33 | 3379 | 522 | 748 |
| sand+clay+ compost (m3) | 7.14 | 1.13 | 2.54 | 4635 | 640 | 878 |
| sand+clay+peat moss (m4) | 6.80 | 0.80 | 2.51 | 4418 | 569 | 849 |
| compost + perlite + peat moss (m5) | 679 | 0.74 | 2.61 | 5033 | 765 | 960 |

**Recorded data:**

**I-Vegetative growth parameters:**

1-Plant height (cm)
2- Number of branches/plant
3- Fresh weight of shoots/plant (g)
4-Dry weight of shoots/plant (g)

**II-Root growth parameters:**

1- Number of roots / plant
2- Length of roots / plant (cm)
3- Fresh weight of roots / plant (g)
4- Dry weight of roots / plant (g)

**III- Chemical composition determination:**

A sample weight of 0.2 g fine powder of the dry leaves of lemon cypress was digested using a mixture of hydrogen peroxide ($H_2O_2$) and concentrated sulphuric acid ($H_2SO_4$) (4:10). The clear digestion was quantitively 100 ml volumetric flask. In this solution, the following elements were determined:

* Nitrogen (%) was determined according to the modified Microkjeldahle method as described by **Pregl (1945).**

*Phosphorus (%) was determined colorimetrically by the spectrophotometer at wavelength of 650 µm according to the method of **Trouge and Meyer (1939).**

* Potassium (%) was determined using flame-photometry method according to **Brown and Lilleland (1946).**

*Total carbohydrates (%) were determined colorimetrically by the spectrophotometer according to the method of **Herbert (1971)**.

**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).**

**Results and Discussion**

## I- Vegetative growth parameters

**1-Plant height (cm)**

Data in Table, 1 revealed that the different growing media have significantly affected plant height, especially using a medium containing 1 part compost: 1 part perlite: 1 part peatmoss (M5) compared with the other media, as it scored 96.29 and 108.95 cm, followed in descending order by using a medium containing 1 part sand: 1 part clay: 1 part peat moss (M4) which recorded 82.63 and 92.41 cm in the first and second seasons, respectively. On contrary the lowest values of plant height were gained by using a medium containing sand +clay only (M1) as it registered 52.33 and 57.78 cm, followed in ascending order by using a medium containing 1 part clay: 1 part perlite (M2) as it registered 61.32 and 71.68cm in the first and second seasons, respectively. The medium (1 part sand: 1 part clay: 1 part compost, {M3}) gave 64.33 and 80.60 cm in the first and second seasons, respectively. Data regarding the effect of chemical fertilization on plant height obviously showed that increasing chemical fertilization levels from 0.0 to 6g/L caused a gradual increase in this parameter in the two seasons. In this concern, the tallest lemon cypress plant was scored by 6 g/L kristalon-sprayed as it recorded 78.16 and 89.02 cm, followed by 4 g / L kristalon- fertilized plants which recorded 73.44 and 85.60 cm in the first and second seasons, respectively. Irrespective un-fertilized plants gave the lowest value of this parameters .Also, by using the low level of the tested chemical fertilization (2 g /L) in the two seasons. The interaction effect between the tested growing media and NPK fertilization (kristalon fertilizer) had a positive effect on plant height as the tallest plants (105.11 and 118.55cm) were obtained on plants grown in a mixture medium containing compost + perlite + peat mossat a ratio of 1:1:1 by volume and received NPK fertilization at 6g /L, in the first and second seasons, respectively. On contrary, the lowest values of plant height (45.0 and 52.20 cm) were scored by using a medium containing sand+clay and no receiving chemical fertilization in the two seasons, respectively. The remained treatments occupied an intermediate position between the abovementioned treatments in the two seasons of this study.

**Table 1.** Effect of planting media and chemical fertilization on Plant height of *Cupressus macrocarpa* plant during 2014 and 2015seasons

| Parameters / Treatments | Plant height (cm) | | | | |
|---|---|---|---|---|---|
| | Chemical fertilizer | | | | |
| | 0g/L | 2g/L | 4g/L | 6g/L | Mean |
| | **1st season (2014)** | | | | |
| M1 (control) | 45.00 | 53.11 | 55.40 | 55.80 | **52.33** |
| M2 | 53.80 | 62.37 | 64.12 | 65.00 | **61.32** |
| M3 | 51.00 | 64.11 | 66.33 | 75.88 | **64.33** |
| M4 | 77.15 | 80.22 | 84.18 | 88.99 | **82.63** |
| M5 | 91.88 | 91.00 | 97.16 | 105.11 | **96.29** |
| **Mean** | **63.77** | **70.167** | **73.44** | **78.16** | |
| **L.S.D at 0.05 for** | **Fertilization=1.90** | | **Media=2.11** | **Interaction=4.23** | |
| | **2nd season (2015)** | | | | |
| M1 (control) | 52.20 | 56.37 | 59.80 | 62.77 | **57.78** |
| M2 | 65.28 | 71.99 | 73.87 | 75.59 | **71.68** |
| M3 | 73.11 | 76.12 | 85.13 | 88.05 | **80.60** |
| M4 | 84.13 | 89.15 | 96.22 | 100.15 | **92.41** |
| M5 | 98.13 | 106.12 | 112.99 | 118.55 | **108.95** |
| **Mean** | **74.57** | **79.95** | **85.60** | **89.02** | |
| **L.S.D at 0.05 for** | **Fertilization= 2.61** | | **Media = 4.02** | **Interaction=6.60** | |

(M1)= sand+clay,(M2)= sand+clay+ perlite ,(M3)= sand+clay+ compost,(M4)= sand+clay+peat moss (,(M5)= compost + perlite + peat moss

## 2- Number of branches /plant

Data in Table, 2 indicated that using M5 showed to be the most effective one for inducing the highest branches number /plant as it gave 36.19 and 38.26, followed by using the growing medium M4 which scored 33.75 and 36.25 in the first and second seasons, respectively. On the reverse, the lowest values of this parameter was gained by M1 which recorded 20.24 and23.36 leaves / plant, followed in descending order by M3 as it registered 29.79 and 32.09 branches number / plant in the first and second seasons, respectively. Also, all tested applications of chemical fertilization increased the values of this parameter, especially using the highest level (6g/L) as it recorded 33.22 and 35.74 branches number / plant, when compared with un-fertilized plants in the first and second seasons, respectively. As for the interaction effect between growing media and chemical fertilization , data in Table, 2 showed that all resulted combinations between growing media and chemical fertilization at 2, 4 and 6 g/L succeeded in increasing the values of this parameter, with superiority for the combination of chemical fertilization at 6g/L in both seasons. However, the highest number of branches /plant (40.22 and 42.13) was recorded by the plants grown in a medium containing compost + perlite+ peat moss and sprayed with chemical fertilization at 6g /L, in the first and second seasons, respectively. On the opposite, the lowest values of branches number (15.51 and 18.52 ) was scored by using a medium containing sand+clay and receiving no chemical fertilization in the first and second seasons, respectively. The rest treatments occupied an intermediate position between the aforementioned treatments in the two seasons of this study.

## 3- Fresh weight of shoots /plant (g)

Data presented in Table, 3 indicated that the heaviest Fresh weight of shoots/plant was recorded by using M5 medium as it gave 1034.22 and 1057.62g, followed in descending order by M4 which scored 895.32 and 912.37g ,in the first and second seasons, respectively. Whereas, the lowest fresh weight of shoots was obtained by M1 (689.27 and 771.62 g), followed in ascending order by using M2 (833.82 and 876.45 g) in the first and second seasons, respectively. Furthermore, all studied levels of chemical fertilization increased this parameter, especially the high level (952.96 and **973.7**g) in comparison with un-fertilized plants in the two seasons. Regarding the interaction effect between growing media and chemical fertilization, data in Table,3 reveales that all obtained interactions increased the fresh weight of shoots in both seasons. In this concern, the heaviest Fresh weight of shoots/plant ( 1107.4 and 1170.9 g) was detected by using the mixture media of compost + perlite + peat moss and received chemical fertilization at 6g/L, in both seasons, respectively.

## 4- Dry weight of shoots /plant (g)

Data presented in Table, 4 indicated that the heaviest dry weight of shoots/plant was recorded by using M5 medium as it gave 345.0 and 362.05 g, followed in descending order by M4 which scored 325.30 and 330.52g ,in the first and second seasons, respectively. Whereas, the lowest dry weight of shoots was obtained by M1 (234.45 and 238.99 g), followed in ascending order by using M2 (275.57 and 277.25 g) in the two seasons, respectively. Furthermore, all studied levels of chemical fertilization increased this parameter, especially the high level at 6g/L (319.09 and 326.72g) in comparison with un-fertilized plants in the two seasons. Regarding the interaction effect

between growing media and chemical fertilization, data in Table,4 showes that all obtained interactions increased the dry weight of shoots in both seasons. In this concern, the heaviest dry weight of shoots/plant ( 359.3 and 380.2 g) was detected by using the mixture media of compost + perlite + peat moss and received chemical fertilization at 6g/L, in both seasons, respectively.

**Table 2.** Effect of planting media and chemical fertilization on number of branches /plant of *Cupressus macrocarpa* plant during 2014and 2015 seasons

| Parameters / Treatments | Number of branches /plant | | | | |
|---|---|---|---|---|---|
| | Chemical fertilizer | | | | |
| | 0g/L | 2g/L | 4g/L | 6g/L | Mean |
| | **1st season (2014)** | | | | |
| M1 (control) | 15.51 | 18.50 | 23.19 | 23.78 | **20.24** |
| M2 | 22.16 | 30.80 | 31.73 | 32.85 | **29.38** |
| M3 | 27.33 | 27.92 | 31.60 | 32.31 | **29.79** |
| M4 | 30.00 | 33.10 | 34.94 | 36.96 | **33.75** |
| M5 | 31.52 | 35.03 | 38.01 | 40.22 | **36.19** |
| **Mean** | **25.30** | **29.07** | **31.89** | **33.22** | |
| **L..D at 0.05 for** | **Fertilization=1.05** | | **Media =1.00** | **Interaction=2.12** | |
| | **2nd season (2015)** | | | | |
| M1 (control) | 18.52 | 21.94 | 26.17 | 26.81 | **23.36** |
| M2 | 25.00 | 32.70 | 33.66 | 34.58 | **31.48** |
| M3 | 30.18 | 30.22 | 31.77 | 36.18 | **32.09** |
| M4 | 33.18 | 36.15 | 36.66 | 39.01 | **36.25** |
| M5 | 34.15 | 36.90 | 39.88 | 42.13 | **38.26** |
| **Mean** | **28.21** | **31.58** | **33.63** | **35.74** | |
| **L.S.D at 0.05 for** | **Fertilization=0.99** | | **Media =1.11** | **Interaction=2.44** | |

(M1)= sand+clay,(M2)= sand+clay+ perlite,(M3)= sand+clay+ compost,(M4)= sand+clay+peat moss (,(M5)= compost + perlite + peat moss

**Table 3.** Effect of planting media and chemical fertilization on fresh weight of shoots/plant (g) of *Cupressus macrocarpa* during 2014 and 2015 seasons

| Parameters / Treatments | Fresh weight of shoots/plant (g) | | | | |
|---|---|---|---|---|---|
| | Chemical fertilizer | | | | |
| | 0g/L | 2g/L | 4g/L | 6g/L | Mean |
| | **1st season(2014)** | | | | |
| M1 (control) | 613.2 | 676.4 | 732.0 | 735.5 | **689.27** |
| M2 | 665.3 | 847.0 | 891.8 | 931.2 | **833.82** |
| M3 | 676.2 | 847.0 | 849.7 | 976.4 | **837.32** |
| M4 | 781.0 | 890.5 | 895.5 | 1014.3 | **895.32** |
| M5 | 853.7 | 1078.2 | 1097.6 | 1107.4 | **1034.22** |
| **Mean** | **717.88** | **867.82** | **893.32** | **952.96** | |
| **L.S.D at 0.05 for** | **Fertilization= 21.4 Media =25.4 Interaction= 48.7** | | | | |
| | **2nd season(2015)** | | | | |
| M1 (control) | 661.9 | 767.0 | 816.3 | 841.3 | **771.62** |
| M2 | 787.5 | 865.2 | 893.9 | 959.2 | **876.45** |
| M3 | 814.2 | 843.5 | 924.5 | 928.3 | **877.62** |
| M4 | 830.2 | 925.1 | 925.4 | 968.8 | **912.37** |
| M5 | 884.8 | 1074.6 | 1100.2 | 1170.9 | **1057.62** |
| **Mean** | **795.72** | **895.08** | **932.06** | **973.7** | |
| **L.S.D at 0.05 for** | **Fertilization=25.3 Media =28.2 Interaction= 50.03** | | | | |

(M1)= sand+clay,(M2)= sand+clay+ perlite ,(M3)= sand+clay+ compost,(M4)= sand+clay+peat moss (,(M5)= compost + perlite + peat moss

**Table 4.** Effect of planting media and chemical fertilization on dry weight of shoots (g) of *Cupressus macrocarpa* during 2014 and 2015 seasons

| Parameters / Treatments | | Dry weight of shoots /plant (g) | | | | |
|---|---|---|---|---|---|---|
| | | Chemical fertilizer | | | | |
| | | 0g/L | 2g/L | 4g/L | 6g/L | Mean |
| | | **1st season(2014)** | | | | |
| M1 | (control) | 210.3 | 222.5 | 244.4 | 260.6 | **234.45** |
| M2 | | 260.2 | 275.2 | 278.6 | 288.3 | **275.57** |
| M3 | | 277.1 | 299.2 | 311.1 | 344.6 | **308.00** |
| M4 | | 300.1 | 322.6 | 335.8 | 342.7 | **325.30** |
| M5 | | 335.1 | 338.4 | 347.2 | 359.3 | **345.00** |
| **Mean** | | **276.56** | **291.58** | **303.43** | **319.09** | |
| **L.S.D at 0.05 for** | | **Fertilization=9.2** | | **Media =10.3** | **Interaction=22.2** | |
| | | **2nd season(2015)** | | | | |
| M1 | (control) | 220.6 | 226.4 | 246.37 | 262.6 | **238.99** |
| M2 | | 261.2 | 277.3 | 280.4 | 290.1 | **277.25** |
| M3 | | 279.3 | 300.1 | 313.5 | 345.6 | **309.62** |
| M4 | | 301.0 | 325.6 | 340.4 | 355.1 | **330.52** |
| M5 | | 341.5 | 358.3 | 368.2 | 380.2 | **362.05** |
| **Mean** | | **280.72** | **297.54** | **309.77** | **326.72** | |
| **L.S.D at 0.05 for** | | **Fertilization=10.4** | | **Media =12.2** | **Interaction=19.03** | |

(M1)= sand+clay,(M2)= sand+clay+ perlite ,(M3)= sand+clay+ compost,(M4)= sand+clay+peat moss (,(M5)= compost + perlite + peat moss

The aforementioned results of growing media are in conformity with those reported by **Shah *et al* ., (2006)** on *Ficus binjamina*, **Khayyat *et al.* (2007)** on *Epipremnum aureum*, **Kiran *et al.* (2007)** on *Dahlia pinnata*, **Chavez *et al.* (2008)** on *Petunia 604arieg*, **Riaz *et al.* (2008)** on *Zinnia elegans*, **Younis *et al.* (2010)** on *Codiaeum variegatum*, **Ikram *et al.* (2012)** on tuberose plant, **Aklibasinda *et al.*, (2011)** on *Pinus sylvestris*, **Khalaj *et al.* (2011)** on *Gerbera jamesonii* L., **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*. And **Tahir *et al.* (2013)** on *Antirrhinum majus* L., **Youssef (2014)** on *Beaucarnea recurvata*, **Mohamed (2018)** growing *Dypsis cabadae* palm plants in a medium contained compost + peat moss + perlite or a medium composed of clay + sand + compost+ peat moss +perlite induced the best vegetative growth of this plant.The abovementioned results of chemical fertilization are in harmony with those attained by **Singh *et al.* (2002)** on *Gladiolus grandiflorum*, **Pal and Biswas (2005)** on *Polianthes 604ariegat* L., **El- Malt *et al.* (2006)** on *Hippeastrum vittatum*, **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*) and **Youssef and Abd El- Aal (2014)** on *Hippeastrum vittatum*, **Habib (2012)** on *Caryota mitis* Lour, **Ghatas (2016)** on gladiolus plant, **Ghatas (2020)** on coriander plant **, Hamad (2020)** on *Aspidistra elatior***,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/ m2gave 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 growth as compared to the control (NPK treatment) in most cases of *Calendula officinalis* plant and **Ghatas (2015)** statd that using NPK at 6g/plant gave the best results of vegetative growth,i.e. number of leaves/plant, fresh and dry weights of leaves/plant and number of offshoots/clumb for *Hemerocallis aurantiaca* plant.Also, **Mohamed (2018)** indicated that 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 qualy of this plant.Besides,**Ghatas (2020)** declared that using kristalon as chemical fertilizer at 7g/pot gave the best vegetative growth parameters of *Cupressus macrocarpa* L plant.On the other side ,**Mohamed *et al.*, (2020)** stated that adding kristalon fertilizer at 6g/pot to *Aspidistra elatior* plant produced high significant effect for plant height,number of leaves/plant,fresh weight of leaves /plant and dry weight of leaves /plant.

## II-Root growth parameters :

### 1- Number of roots / plant:

Data presented in Table , 5 cleared that using a mixture medium containing compost + perlite + peat moss was more promising in increasing the roots number of *Cupressus macrocarpa* plant as it scored 14.47 and 15.25 roots / plant, followed by using M4 which scored 13.34 and 13.48 roots/ plant, in the first and second seasons, respectively. On contrary M1 scored the lowest values in this sphere, followed in ascending order by M2 in the two seasons of this study. Additionally, there were a positive correlation between the levels of chemical fertilization and the values of roots number of *Cupressus macrocarpa* plants, whereas the levels of chemical fertilization increased the values of roots number increased at the highest levels in the two seasons. Therefore, chemical fertilization at 6 g / L showed to be the most effective one for producing the greatest number of roots / plant (14.02 and 14.45), followed by 4 g / L (12.87 and 13.28) and finally 2 g / L (12.15 and 12.57) in the first and second seasons, respectively. The differences between the three above mentioned treatments were not significant in the two seasons. With respect to the interaction between chemical fertilization and planting media data in the same Table,6 referred that all combination of chemical fertilization increased the number of roots / plant when compared with the combination of control plants in the two seasons. However, the combination of chemical fertilization at 6 g / L exhibited to be the most pronounced one for inducing the highest values, particularly those grown in medium involving compost + perlite + peat moss as it registered 16.91 and 18.11 roots / plant, followed descendingly, by those grown in M5 and sprayed with chemical fertilization at 4 g / L as it scored 14.66 and 15.66 roots / plant in the first and second seasons, respectively. On the reverse, the lowest values of roots number/plant were scored by control combination, especially those planted at M1 in the two seasons.

**Table 5.** Effect of planting media and chemical fertilization on number of roots /plant of *Cupressus macrocarpa* during 2014 and 2015 seasons

| Parameters / Treatments | | Number of roots /plant | | | | |
|---|---|---|---|---|---|---|
| | | Chemical fertilizer | | | | |
| | | 0g/L | 2g/L | 4g/L | 6g/L | Mean |
| | | **1st season (2014)** | | | | |
| M1 | (control) | 8.99 | 9.88 | 10.92 | 10.97 | **10.19** |
| M2 | | 11.34 | 12.00 | 12.33 | 13.01 | **12.17** |
| M3 | | 12.44 | 12.64 | 13.33 | 14.55 | **13.24** |
| M4 | | 12.66 | 12.94 | 13.11 | 14.64 | **13.34** |
| M5 | | 12.88 | 13.45 | 14.66 | 16.91 | **14.47** |
| **Mean** | | **11.66** | **12.18** | **12.87** | **14.02** | |
| **L.S.D at 0.05 for** | | **Fertilization=0.68** | | **Media = 0.70** | **Interaction=1.40** | |
| | | **2nd season(2015)** | | | | |
| M1 | (control) | 9.23 | 10.49 | 10.94 | 11.18 | **10.46** |
| M2 | | 11.66 | 12.44 | 12.63 | 13.33 | **12.51** |
| M3 | | 12.55 | 12.91 | 13.30 | 14.88 | **13.41** |
| M4 | | 12.60 | 12.68 | 13.88 | 14.77 | **13.48** |
| M5 | | 12.90 | 14.33 | 15.66 | 18.11 | **15.25** |
| **Mean** | | **11.79** | **12.57** | **13.28** | **14.45** | |
| **L.S.D at 0.05 for** | | **Fertilization=1..09** | | **Media = 1.36** | **Interaction=1.91** | |

(M1)= sand+clay,(M2)= sand+clay+ perlite ,(M3)= sand+clay+ compost,(M4)= sand+clay+peat moss (,(M5)= compost + perlite + peat moss

### 2- Length of roots /plant (cm):

It is obvious from Table , 6 that using a mixture medium containing compost +perlite + peat moss was more effective in increasing the length of roots per areca plant (31.37 and 34.6) as compared with the other growing media in the first and second seasons, respectively.

Referring to the effect of chemical fertilization data in Table ,7 indicated the all tested levels of chemical fertilization statistically increased the root length / plant with superior for the highest level (6 g / L) as it scored 29.94 and 31.09 cm, followed in descending order by medium level (4 g / L) as it gave 28.57 and 29.78 cm in the first and second seasons, respectively. As for the interaction affect between growing media and chemical fertilization data in Table ,7 pointed out that the combination of M5 showed to be the most affective one for producing the highest values in this concern, especially those sprayed with NPK at the high level as it recorded 34.15 and 37.88 cm in the first and second seasons respectively.

**Table 6.** Effect of planting media and chemical fertilization on length of roots (cm) of *Cupressus macrocarpa* during 2014 and 2015 seasons

| Parameters / Treatments | | Length of roots (cm) | | | | |
|---|---|---|---|---|---|---|
| | | Chemical fertilizer | | | | |
| | | 0g/L | 2g/L | 4g/L | 6g/L | Mean |
| | | 1st season(2014) | | | | |
| M1 | (control) | 24.39 | 24.43 | 24.86 | 25.11 | **24.70** |
| M2 | | 24.88 | 25.22 | 26.33 | 27.15 | **25.89** |
| M3 | | 26.12 | 27.44 | 28.90 | 31.15 | **28.40** |
| M4 | | 26.62 | 28.55 | 30.11 | 32.15 | **29.36** |
| M5 | | 28.11 | 30.55 | 32.66 | 34.15 | **31.37** |
| **Mean** | | **26.02** | **27.24** | **28.57** | **29.94** | |
| **L.S.D at 0.05 for** | | **Fertilization= 0.90** | | **Media =1.06** | **Interaction=1.39** | |
| | | 2nd season(2015) | | | | |
| M1 | (control) | 25.15 | 25.33 | 26.12 | 26.33 | **25.73** |
| M2 | | 25.55 | 26.15 | 26.27 | 27.88 | **26.46** |
| M3 | | 26.33 | 28.11 | 29.33 | 30.22 | **28.50** |
| M4 | | 29.11 | 31.00 | 31.99 | 33.15 | **31.31** |
| M5 | | 32.18 | 33.16 | 35.18 | 37.88 | **34.6** |
| **Mean** | | **27.66** | **28.75** | **29.78** | **31.09** | |
| **L.S.D at 0.05 for** | | **Fertilization=1.27** | | **Media =1.42** | **Interaction=2.60** | |

(M1)= sand+clay,(M2)= sand+clay+ perlite ,(M3)= sand+clay+ compost,(M4)= sand+clay+peat moss (,(M5)= compost + perlite + peat moss.

### 3- Fresh weight of roots / plant (g):

Data outlined in Table,7 reveales that the heaviest roots fresh weight was recorded by using M5 as it gave 30.87 and 52.59g, followed in descending order by M4 which scored 27.90 and 50.32 g in the first and second seasons, respectively. Whereas, the lowest fresh weight of roots was gained by M1 (23.58 and 39.07g), followed in ascending order by using M2 (26.05 and 45.19 g) in the first and second seasons, respectively. In addition, roots fresh weigth of *Cupressus macrocarpa* plants were increased by increasing chemical fertilization levels in the two seasons. However, 6 g / L-sprayed plants significantly detected the heaviest roots fresh weight / plant (27.97 and 50.01g), followed descendingly by 4 g / L-sprayed plants (27.43 and 48.86 g) in the first and second seasons, respectively. While, 2 g / L-sprayed plants recorded the lowest values in this regard (26.58 and 46.88 g) in the first and second seasons, respectively. The differences between the tested three levels of chemical fertilization and control were significant in the two seasons. Generally, all resulted combination between growing media and chemical fertilization increased the fresh weight of roots / plant with significant differences in most cases when compared with un-fertilized plants in the two seasons of this study. However, the heaviest fresh weight of roots / plant was obtained by those planted on M5 and sprayed with kristalon at 6 g / L as it recorded 33.11 and 55.77 g, in the first and second seasons respectively. The lowest values of this parameter were registered by those planted on M1 and sprayed with tap water as it scored 20.61 and 29.20 g in the first and second seasons, respectively.

### 4- Dry weight of roots / plant (g):

Data presented in Table ,8 reported that the heaviest dry roots / plant was obtained by using M5 as it scored 2.89 and 4.67 g, followed in descending order by M4 which gave 2.56 and 3.97 g in the first and second seasons, respectively. Whereas, the lowest dry weight of roots was gained by M1 (2.24 and 2.70 g), followed in ascending order by using M2 (2.35 and 3.18g) in the first and second seasons, respectively. Also, roots dry weigh of areca plants were increased by increasing chemical fertilization levels in the two seasons. However, 6 g / L-sprayed plants significantly scored the heaviest dry roots / plant (3.18 and 4.20 g), followed descendingly by 4 g / L-sprayed plants (2.99 and 3.89 g) in the first and second seasons, respectively. While, 2 g / L-sprayed plants recorded the lowest values in this respect (2.00 and 3.65 g) in the first and second seasons, respectively. The differences between the tested three levels of chemical fertilization and control were significant in the two seasons.

**Table 7.** Effect of planting media and chemical fertilization on fresh weight of roots /plant of *Cupressus macrocarpa* during 2014and 2015 seasons

| Parameters / Treatments | | Fresh weight of roots /plant(g) | | | | |
|---|---|---|---|---|---|---|
| | | Chemical fertilizer | | | | |
| | | 0g/L | 2g/L | 4g/L | 6g/L | Mean |
| | | **1st season(2014)** | | | | |
| M1 | (control) | 20.61 | 23.71 | 24.89 | 25.11 | **23.58** |
| M2 | | 25.06 | 25.72 | 26.38 | 27.04 | **26.05** |
| M3 | | 24.84 | 25.50 | 26.16 | 26.22 | **25.68** |
| M4 | | 27.21 | 27.67 | 28.36 | 28.38 | **27.90** |
| M5 | | 28.72 | 30.31 | 31.36 | 33.11 | **30.87** |
| **Mean** | | **25.29** | **26.58** | **27.43** | **27.97** | |
| **L.S.D at 0.05 for** | | **Fertilization=0.53** | | **Media =1.01** | | **Interaction=1.62** |
| | | **2nd season(2015)** | | | | |
| M1 | (control) | 29.20 | 39.21 | 43.18 | 44.70 | **39.07** |
| M2 | | 41.16 | 45.44 | 46.76 | 47.42 | **45.19** |
| M3 | | 41.80 | 47.12 | 48.13 | 48.80 | **46.46** |
| M4 | | 45.46 | 50.20 | 52.30 | 53.34 | **50.32** |
| M5 | | 48.21 | 52.44 | 53.95 | 55.77 | **52.59** |
| **Mean** | | **41.17** | **46.88** | **48.86** | **50.01** | |
| **L.S.D at 0.05 for** | | **Fertilization=0.77** | | **Media =1.22** | | **Interaction=1.77** |

(M1)= sand+clay,(M2)= sand+clay+ perlite ,(M3)= sand+clay+ compost,(M4)= sand+clay+peat moss (,(M5)= compost + perlite + peat moss

Briefly, all obtained combination between growing media and chemical fertilization increased the dry weight of roots / plant with significant differences in most cases in comparison with un-fertilized plants in the two seasons of this study. However, the heaviest roots dry weight / plant was obtained by those planted on M5 and sprayed with NPK as chemical fertilization at 6 g / L as it gave 3.73 and 5.82 g, in the first and second seasons respectively. The lowest values of this parameter were gained by those planted on M1 and sprayed with tap water as it recorded 1.81 and 1.80 g in the first and second seasons, respectively**.** The aforementioned results of growing media are in conformity with those reported by **Younis *et al.* (2010)** on *Codiaeum variegatum*, **Aklibasinda *et al*., (2011)** on *Pinus sylvestris*, **Khalaj *et al.* (2011)** on *Gerbera jamesonii* L., **Abouzar (2012)** on *Ficus benjamina*, , **Kakoei and Salehi (2013)** on *Spathiphyllum wallisii* Regel, **Mohamed *et al.*, (2020)** stated that growing *Aspidistra elatior* plants in a medium contained compost + peat moss + perlite or a medium composed of sand + peatmoss+ compost induced the best root growth of this plant. The abovementioned results of chemical fertilization are in harmony with those attained by, on **Habib (2012)** on *Caryota mitis* Lour**, Wanderley *et al.* (2012)** on areca bamboo palm (*Dypsis lutescens*) and **Youssef and Abd El- Aal (2014)** on *Hippeastrum vittatum*, **Youssef (2014)** found that fertilizing *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/ m2gave the maximum values of all growth parameters of *Gladiolus grandiflorus* in both seasons compared with untreated plants. Also. **Mohamed *et al*., (2020)** stated that adding kristalon fertilizer at 6g/pot to *Aspidistra elatior* plant produced high significant effect for number of roots,length of roots ,and fresh , dry weights of roots of this plant. **Mohamed (2018)** 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 root parmeters of this plant.However, **Ghatas (2020)** demonstrated that using kristalon fertilizer at 7g/pot gave high significantly increase for fresh ,dry weigths of roots of *Cupressus macrocarpa* L plant .

**Table 8.** Effect of planting media and chemical fertilization on dry weight of roots /plant of *Cupressus macrocarpa* during 2014 and 2015 seasons

| Parameters | | Dry weight of roots /plant(g) | | | | |
|---|---|---|---|---|---|---|
| | | Chemical fertilizer | | | | |
| Treatments | | 0g/L | 2g/L | 4g/L | 6g/L | Mean |
| | | 1st season(2014) | | | | |
| M1 | (control) | 1.81 | 1.60 | 2.75 | 2.79 | **2.24** |
| M2 | | 1.51 | 1.88 | 2.96 | 3.06 | **2.35** |
| M3 | | 1.70 | 1.85 | 2.94 | 2.96 | **2.36** |
| M4 | | 1.79 | 2.14 | 3.01 | 3.30 | **2.56** |
| M5 | | 2.00 | 2.52 | 3.31 | 3.73 | **2.89** |
| **Mean** | | **1.76** | **2.00** | **2.99** | **3.18** | |
| **L.S.D at 0.05 for** | | **Fertilization=0.18 Media =0.26 Interaction=0.41** | | | | |
| | | 2nd season(2015) | | | | |
| M1 | (control) | 1.80 | 2.68 | 3.11 | 3.21 | **2.7** |
| M2 | | 2.29 | 3.31 | 3.51 | 3.61 | **3.18** |
| M3 | | 2.57 | 3.56 | 3.71 | 3.87 | **3.43** |
| M4 | | 3.03 | 4.03 | 4.34 | 4.49 | **3.97** |
| M5 | | 3.42 | 4.66 | 4.77 | 5.82 | **4.67** |
| **Mean** | | **2.62** | **3.65** | **3.89** | **4.20** | |
| **L.S.D at 0.05 for** | | **Fertilization=0.29** | | **Media =0.51** | **Interaction=0.99** | |

(M1)= sand+clay,(M2)= sand+clay+ perlite ,(M3)= sand+clay+ compost,(M4)= sand+clay+peat moss (,(M5)= compost + perlite + peat moss

## III- Chemical composition determination:

### 1- Leaf nitrogen percentage

Data presented in Table, 9 indicated that using M5 medium exhibited to be the most promising one for detecting the highest leaves nitrogen percentage as it gave 2.54 and 2.63 %, followed by using the growing medium M4 which scored 2.46 and 2.53 in the first and second seasons, respectively. On the other hand, the lowest values of this parameter was gained by M1 which recorded 2.27 and 2.35 % in the first and second seasons, respectively. Also, all tested applications of chemical fertilization increased the values of this parameter, especially using the highest level (6g/L) as it recorded 2.47 and 2.57 %, when compared with un-fertilized plants in the first and second seasons, respectively. As for the interaction effect between growing media and chemical fertilization , data in Table, 10 showed that all resulted combination between growing media and chemical fertilization at 2, 4 and 6 g/L succeeded in increasing the values of this parameter, with superiority for the combination of chemical fertilization at 6g/L in both seasons. However, the greatest leaf nitrogen percentage (2.73 and 2.80) was recorded by the plants grown in a medium containing compost + perlite +peatmoss and sprayed with chemical fertilization at 6g /L, followed by those grown in M5 and sprayed with chemical fertilization at 4 g / L (2.61 and 2.70 %) in the first and second seasons, respectively. On the opposite, the lowest values of leaves nitrogen percentage (2.21 and 2.28) was scored by using a medium containing sand+clay and receiving no chemical fertilization in the first and second seasons, respectively. The rest treatments occupied an intermediate position between the aforementioned treatments in the two seasons of this study.

### 2- Leaf phosphorus percentage

Data outlined in Table , 10 illustrated that the richest leaf phosphorus percentage was scored by using a mixture medium of compost+ perlite + peatmoss as it scored 0.154 and 0.171 %, followed in descending order by M4 which detected 0.147 and 0.165 % in the first and second seasons, respectively. Whereas, the lowest values of this parameter was gained by M1 (0.139 and 0.151 %), followed in ascending order by using M2 (0.144 and 0.159 %) in the first and second seasons, respectively. Additionally, all sprayed levels of chemical fertilization increased this parameter, especially the high level (0.152 and 0.170 %) when compared with un-fertilized plants in the two seasons. Referring to the interaction effect between growing media and chemical fertilization, data in the same Table, 11 declared that all resulted interactions increased leaf phosphorus percentage in both seasons. However, the highest leaf phosphorus percentage (0.166 and 0.183 %) was registered by using the mixture media of compost + perlite + peat moss and sprayed with chemical fertilization at 6g/L, followed by those grown in M5 and sprayed with chemical fertilization at 4g / L (0.155 and 0.174%) in the first and second seasons, respectively. On the reverse, the lowest values of leaves phosphorus percentage (0.132 and 0.140 %) was scored by using a medium containing sand+ clay and sprayed with tap water in the first and second seasons, respectively. The remained treatments occupied an intermediate position between the aforementioned treatments in the two seasons of this study.

### 3- Leaf potassium percentage

It is clear from data in Table, 11 that using a mixture medium containing clay + compost (M5) was more effective in increasing leaf potassium percentage of areca stem as it scored 1.73 and 1.77 %, followed by using M4 medium which scored 1.60 and 1.67 %, in the first and second seasons, respectively. On the reverse M1 medium scored the lowest values in this concern, followed in ascending order by M2 in the two seasons of this study. Besides, data in the same Table showed that there were a positive relationship between the values of leaf potassium percentage and the used levels of chemical fertilization, hence as the chemical fertilization levels increased the values of leaf potassium percentage increased till reach to the highest increase at 6 g / L-sprayed plants which gave 1.69 and 1.73 % in the first and second seasons, respectively. This trend was true in the two seasons of this study. As for the interaction effect between growing media and chemical fertilization, data in Table, 12 cleared that grown lemon cypress plants in medium containing compost+perlite+peatmoss and enriched with NPK fertilizer at 6 g / L is being the most effective one for producing the greatest values as it scored 1.88 and 1.96 % in the first and second seasons, respectively.

On the reverse, the lowest values of this parameter (1.39 and 1.42 %) was gained by using a medium containing sand+clay and receiving no chemical fertilization in the first and second seasons, respectively. The other treatments came in between the abovementioned treatments in the two seasons of this study.

### 4- Leaf total carbohydrates percentage:

Data outlined in Table, 12 revealed that the greatest leaf total carbohydrates percentage was scored by using M5 as it gave 16.55 and17.59 %, followed in descending order by M4 which scored 15.35 and16.55 % in the first and second seasons, respectively. Whereas, the lowest values of this parameter was gained by M1 (13.61 and 14.63 %), followed in ascending order by using M2(14.23 and 15.08 %) in the first and second seasons, respectively. Moreover, leaf total carbohydrates percentage of lemon cypress plant were increased by increasing chemical fertilization levels in the two seasons. However, 6 g / L-sprayed plants significantly detected the highest values (15.98 and 17.14%), followed descendingly by 4 g / L-sprayed plants (15.01 and 15.98) in the first and second seasons, respectively. While, 2 g / L-sprayed plants recorded the lowest values in this regard (14.62 and15.61%) in the first and second seasons, respectively.

**Table 9.** Effect of planting media and chemical fertilization on leaf N % of *Cupressus macrocarpa* plant during 2014and 2015 seasons.

| Parameters / Treatments | | N% | | | | |
|---|---|---|---|---|---|---|
| | | Chemical fertilizer | | | | |
| | | 0g/L | 2g/L | 4g/L | 6g/L | Mean |
| | | 1st season(2014) | | | | |
| M1 | (control) | 2.21 | 2.28 | 2.27 | 2.31 | **2.27** |
| M2 | | 2.23 | 2.32 | 2.36 | 2.35 | **2.31** |
| M3 | | 2.25 | 2.36 | 2.33 | 2.41 | **2.34** |
| M4 | | 2.36 | 2.41 | 2.53 | 2.56 | **2.46** |
| M5 | | 2.38 | 2.43 | 2.61 | 2.73 | **2.54** |
| **Mean** | | **2.27** | **2.36** | **2.42** | **2.47** | |
| **L.S.D at 0.05 for** | | **Fertilization=0.04** | | **Media =0.05** | **Interaction=0.11** | |
| | | 2nd season(2015) | | | | |
| M1 | (control) | 2.28 | 2.31 | 2.40 | 2.43 | **2.35** |
| M2 | | 2.29 | 2.40 | 2.39 | 2.43 | **2.38** |
| M3 | | 2.31 | 2.39 | 2.48 | 2.53 | **2.43** |
| M4 | | 2.42 | 2.48 | 2.56 | 2.65 | **2.53** |
| M5 | | 2.42 | 2.59 | 2.70 | 2.80 | **2.63** |
| **Mean** | | **2.34** | **2.43** | **2.51** | **2.57** | |
| **L.S.D at 0.05 for** | | **Fertilization=0.05** | | **Media =0.09** | **Interaction=0.10** | |

(M1)= sand+clay,(M2)= sand+clay+ perlite ,(M3)= sand+clay+ compost,(M4)= sand+clay+peat moss (,(M5)= compost + perlite + peat moss

**Table 10.** Effect of planting media and chemical fertilization on leaf P % of *Cupressus macrocarpa* plant during 2014 and 2015 seasons

| Parameters / Treatments | | P% | | | | |
|---|---|---|---|---|---|---|
| | | Chemical fertilizer | | | | |
| | | 0g/L | 2g/L | 4g/L | 6g/L | Mean |
| | | **1st season (2014)** | | | | |
| M1 | (control) | 0.132 | 0.140 | 0.142 | 0.144 | **0.139** |
| M2 | | 0.137 | 0.145 | 0.147 | 0.149 | **0.144** |
| M3 | | 0.139 | 0.146 | 0.148 | 0.150 | **0.146** |
| M4 | | 0.140 | 0.148 | 0.149 | 0.151 | **0.147** |
| M5 | | 0.143 | 0.153 | 0.155 | 0.166 | **0.154** |
| **Mean** | | **0.138** | **0.146** | **0.148** | **0.152** | |
| **L.S.D at 0.05 for** | | **Fertilization=0.002** | | **Media =0.006** | | **Interaction=0.09** |
| | | **2nd season (2015)** | | | | |
| M1 | (control) | 0.140 | 0.153 | 0.154 | 0.159 | **0.151** |
| M2 | | 0.151 | 0.158 | 0.162 | 0.167 | **0.159** |
| M3 | | 0.155 | 0.163 | 0.169 | 0.171 | **0.164** |
| M4 | | 0.156 | 0.164 | 0.170 | 0.172 | **0.165** |
| M5 | | 0.158 | 0.171 | 0.174 | 0.183 | **0.171** |
| **Mean** | | **0.152** | **0.162** | **0.166** | **0.170** | |
| **L.S.D at 0.05 for** | | **Fertilization=0.003** | | **Media =0.006** | | **Interaction=0.012** |

(M1)= sand+clay,(M2)= sand+clay+ perlite ,(M3)= sand+clay+ compost,(M4)= sand+clay+peat moss (,(M5)= compost + perlite + peat moss

**Table 11 .**Effect of planting media and chemical fertilization on leaf K % of *Cupressus macrocarpa* plant during 2014 and 2015 seasons

| Parameters / Treatments | | K % | | | | |
|---|---|---|---|---|---|---|
| | | Chemical fertilizer | | | | |
| | | 0g/L | 2g/L | 4g/L | 6g/L | Mean |
| | | **1st season (2014)** | | | | |
| M1 | (control) | 1.39 | 1.43 | 1.51 | 1.55 | **1.47** |
| M2 | | 1.44 | 1.50 | 1.60 | 1.62 | **1.54** |
| M3 | | 1.45 | 1.53 | 1.63 | 1.67 | **1.57** |
| M4 | | 1.47 | 1.54 | 1.69 | 1.72 | **1.60** |
| M5 | | 1.55 | 1.70 | 1.79 | 1.88 | **1.73** |
| **Mean** | | **1.46** | **1.54** | **1.64** | **1.69** | |
| **L.S.D at 0.05 for** | | **Fertilization= 0.04** | | **Media =0.06** | | **Interaction=0.08** |
| | | **2nd season (2015)** | | | | |
| M1 | (control) | 1.42 | 1.45 | 1.51 | 1.55 | **1.48** |
| M2 | | 1.47 | 1.52 | 1.65 | 1.67 | **1.58** |
| M3 | | 1.47 | 1.56 | 1.67 | 1.70 | **1.60** |
| M4 | | 1.49 | 1.66 | 1.74 | 1.79 | **1.67** |
| M5 | | 1.55 | 1.76 | 1.80 | 1.96 | **1.77** |
| **Mean** | | **1.48** | **1.59** | **1.67** | **1.73** | |
| **L.S.D at 0.05 for** | | **Fertilization=0.05** | | **Media =0.07** | | **Interaction=0.14** |

(M1)= sand+clay,(M2)= sand+clay+ perlite ,(M3)= sand+clay+ compost,(M4)= sand+clay+peat moss (,(M5)= compost + perlite + peat moss

The differences between the tested three levels of chemical fertilization were significant when compared with un-treated control plants in the two seasons. Generally, all resulted combination between growing media and chemical fertilization increased leaf total carbohydrates percentage with significant differences in most cases when compared with un-fertilized plants in the two seasons of this study. However, the greatest values of leaf total carbohydrates percentage were obtained by those planted on M5 and sprayed with NPK chemical fertilization at 6 g / L as it recorded 18.33 and19.89 %, in the first and second seasons respectively. The lowest values of this parameter were registered by

those planted on M1 and sprayed with tap water as it scored 11.01 and 12.02 % in the first and second seasons, respectively**.** The aforementioned results of growing media concerning chemical constituents are in conformity with those reported by **Bashir *et al.* (2007)** on jojoba (*Simmondsia chinensis*), **Khelikuzzaman (2007)** on *Tradescantia sp.*, **Turhan *et al.* (2007)** on *Crocus sativus* L., **Ostos *et al.* (2008)** on *Pistacia lentiscus*, **Khalaj *et al.* (2011)** on *Gerbera jamesonii* L., **Khattak *et al.* (2011)** on *Vinca rosea*, , **Alidoust *et al*. (2012)** on *Dracaena fragrans*, **Youssef (2014)** on *Beaucarnea recurvata*, , **Mohamed *et al.*, (2020)** stated that growing *Aspidistra elatior* plants in a medium composed of sand+ peatmoss + compost induced the highest leaf nitrogen phosphorus, potassium ant total carbohydrates contents of this plant.

**Table 12.** Effect of planting media and chemical fertilization on leaf total carbohydrates % of *Cupressus macrocarpa* plant during 2014and 2015 seasons

| Parameters / Treatments | | Total carbohydrates % | | | | |
|---|---|---|---|---|---|---|
| | | Chemical fertilizer | | | | |
| | | 0g/L | 2g/L | 4g/L | 6g/L | Mean |
| | | 1st season(2014) | | | | |
| M1 | (control) | 11. 01 | 13.16 | 13.76 | 13.92 | **12.96** |
| M2 | | 13.84 | 13.89 | 13.97 | 15.21 | **14.23** |
| M3 | | 13.79 | 14.85 | 14.87 | 16.10 | **14.90** |
| M4 | | 14.22 | 15.31 | 15.55 | 16.33 | **15.35** |
| M5 | | 15.11 | 15.88 | 16.90 | 18.33 | **16.55** |
| **Mean** | | **13.59** | **14.62** | **15.01** | **15.98** | |
| **L.S.D at 0.05 for** | | **Fertilization= 0.79** | | **Media = 0.83** | **Interaction=1.41** | |
| | | 2nd season(2015) | | | | |
| M1 | (control) | 12. 02 | 14.15 | 14.78 | 14.96 | **13.98** |
| M2 | | 14.22 | 14.90 | 14.97 | 16.25 | **15.08** |
| M3 | | 14.68 | 15.78 | 15.87 | 16.92 | **15.81** |
| M4 | | 15.72 | 16.31 | 16.53 | 17.66 | **16.55** |
| M5 | | 15.81 | 16.92 | 17.73 | 19.89 | **17.59** |
| **Mean** | | **14.5** | **15.61** | **15.98** | **17.14** | |
| **L.S.D at 0.05 for** | | **Fertilization=0.81** | | **Media = 0.87** | **Interaction=1.75** | |

(M1)= sand+clay,(M2)= sand+clay+ perlite ,(M3)= sand+clay+ compost,(M4)= sand+clay+peat moss (,(M5)= compost + perlite + peat moss

The stimulated effect of NPK fertilizer may be due to the role of NPK 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 jasmine plants (**Marschner, 1997**). The abovementioned results of fertilization are in harmony with those attained by, **Hamad (2020)** on *Aspidistra elatior*, , **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*) and **Youssef and Abd El-Aal (2014)** again on *Hippeastrum vittatum.* **Youssef (2014)** on *Beaucarnea recurvata*, **Mohamed (2018)** 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 chemical fertilizer at 8g/pot produced the highest leaf nitrogen phosphorus, potassium ant total carbohydrates contents of this plant.Also, **Mohamed *et al.*, (2020)** stated that growing *Aspidistra elatior* plants in a medium composed of sand+ peatmoss + compost and supplemented with kristalon fertilizer at 6g/pot induced the highest leaf nitrogen phosphorus, potassium and chlorophyll a,b content of this plant. In this concern,Ghatas(2020)demonstrated that using kristalon fertilizer at 7g/pot gave the the highest leaf nitrogen phosphorus, potassium ,total carbohydrates,total chlorophyll and carotenoids content of *Cupressus macrocarpa* L.plant .

Conclusively, growing lemon cypress (*Cupressus macrocarpa*) plants in a medium composed of compost + perlite + peat moss (1:1:1 by volume) and sprayed with chemical fertilizer with kristalon at 6g/L produced the best growth and quality of this plant.

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## تاثير معاملات بيئات الزراعه والتسميد علي النمو والمحتوي الكيماوي لنبات السرو الليموني

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اجريت تجربه اصص بمزرعه الزينه بقسم البساتين بكليه الزراعه بمشتهر , جامعه بنها وذلك خلال موسمى 2014و 2015وذلك لدراسة تاثير خمس مستويات من بيئات الزراعه وهي( الرمل +الطمى ، الرمل+الطمى + البيرليت ، الرمل+الطمى + الكمبوست، الرمل+ الطمى + البيتموس، الكمبوست + البيرليت+ البيتموس . بمعدل 1 :1 :1 بالحجم ) مع اربعه مستويات من التسميد الكيماوي بسماد الكريستالون وهي (الماء المقطر ككنترول 0،2،4،6 جرام /لتر) علي النمو والمحتوي الكيماوي لنباتات السرو الليموني . واظهرت النتائج ان زراعه نبات السرو الليموني في بيئه مكونه من الكمبوست والبيرليت والبيتموس + رش سماد الكريستالون بتركيز 6جرام/اللتر ادي الي الحصول علي افضل النتائج بالنسبه لطول النبات ،وعدد الافرع /نبات ،والوزن الطازج والجاف للنموات لكل نبات ،وطول الجذور(سم)، والاوزان الطازجه والجافه للجذور لكل نبات في كلا الموسمين .الي جانب ذلك ،زياده محتوي الاوراق من النتروجين والفوسفور والبوتاسيوم .بالاضافه الي تسجيل اعلي القيم بالنسبه لمحتوي الكربوهيدرات الكليه في نبات السرو الليموني في كلا الموسمين .وفي هذا السياق فان المعامله المكونه من استخدام البيئه المكونه من الكمبوست والبيرليت والبيتموس مع الرش بسماد الكريستالون بتركيز 4جرام/لتر قد اتت في المرتبه الثانيه في الحصول علي افضل النتائج لكل الصفات تحت الدراسه والمذكوره اعلاه في كلا الموسمين.من النتائج السابقه المتحصل عليها نجد ان زراعه نباتات السرو الليموني في بيئه مكونه من الكمبوست+ البيرليت+ البيتموس مع الرش بسماد الكريستالون بتركيز 6جرام/لتر قد ادي للحصول علي افضل نمو وجوده لنباتات السرو الليموني.