

Influence of different growing media on growth and chemical compositions of *Schefflera* (*Schefflera arboricola* L.) plant

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Abstract

Schefflera arboricola plant is an important ornamental plant used extensively in interior decoration and is native to Australia and belongs to the Araliaceae family. Due to its distinctive umbrella-like leaves and its great ability to adapt to indoor conditions, it has become popular in interior decoration of house plant. A pot experimental trial was carried out during the two consecutive seasons of 2022/2023 and 2023/2024 and at the Horticultural Research Station in Al-Qanater Al-Khairia. Horticultural Research Institute, Agriculture Research Center Qalyubia Governorate with the cooperation of the faculty of Agriculture Benha University to study the effect of four treatments from different growing media, i.e. (sand+ clay , sand + clay + peat moss, sand + clay + compost, and sand + clay + vermiculite) (1:1:1 by volume. of *Schefflera arboricola* L. plant. The results showed the tallest, heaviest fresh and dry weights of shoots as well as root parameters of *Schefflera arboricola* L. plant were scored by (sand+ clay + compost) in both seasons. The mixture media (sand+ clay + compost) gave the richest percentage of N,P, K and total carbohydrates of this plant. Conclusively, growing media mixture (sand+ clay + compost) or (sand+ clay + peat moss) for enhancing the growth and the chemical constituents of *Schefflera arboricola* L. plant.

Keywords: *Schefflera arboricola*., growing media, vegetative growth and chemical compositions.

2-INTRODUCTION

Ornamental plants are among the most popular and widely used plants in the world, as they are used to beautify gardens, homes and landscapes [17]. These plants are characterized by giving an aesthetic and comfortable appearance to the soul, and they also contribute to improving air quality and reducing the temperature of the environment and these plants are available in different shapes and sizes .However, Indoor plants are known to be plants grown in pots and can be used to decorate indoor places such as hotels, homes and other places that need these plants inside to beautify them [11].

Schefflera arboricola plant is an important ornamental plant used extensively in interior decoration and is native to Australia and belongs to the Araliaceae family. Due to its distinctive umbrella-like leaves and its great ability to adapt to indoor conditions, it has become popular in interior decoration of houseplant [1]. This plant with its glossy green leaves and strong, healthy growth has made it a popular choice among plant lovers, which has led to its great popularity. In addition, its attractiveness and beauty, it has become popular for interior decoration and beautification of houseplant and [2]. The growing media used in agriculture include organic and inorganic media, and may be used individually as an medium for plant growth, or mixtures may be made between more than one medium or mixtures may be made between different sizes of the same it, giving new specifications to the growing medium. However, all of this provides a wide range of planting media that are suitable for the growth of a large number of ornamental plants.

Furthermore, many ornamental plants spend their lives inside pots, so these plants need a growth medium to meet their various needs, the types used for this are sand, clay, perlite, and peatmoss. Clay is the basic medium for plants because it is easy to handle and cheap. Many environments consist largely of 50% water, air, and many diverse mineral particles at a rate of 46-49%. Moreover, the organic matter also ranges its percentage is from 1-6%, while the diameters of the mineral particles in the soil or sand are 0.05-2 mm, the diameter of the silt grains particles is 0.002-0.05 mm, and the diameter of the clay particles is less than 0.002 mm [5]. Soil is the primary habitat for the production of green plants. While water and air are considered tools and self-purifying systems for inorganic pollutants. Also, soil is a sink that is absorbed or filtered by the environment and retains the natural water that enters it. Therefore, we call soil a recycling device in nature, as it is a home for many living organisms and families in addition to being an engineering medium [10]. The sand used in the potting mix is very important and has a significant effect on plant growth, the granular material is made up of small particles of minerals and rocks. Silica (silicon dioxide, SiO₂), which is often in the form of quartz, is one of the most common sand compounds and plays a role in increasing the chances of water retention and retention and aeration as well.

Sand is usually used to increase the weight of the mixture. In addition, perlite is known as a gray volcanic rock original extracted from lava flows, it does not contain any herbs, is free of pathogenic contaminants, and works to drain water and aerate the planting mixture. It is mostly neutral in terms of

pH, but one of its biggest drawbacks is that it does not contain many nutrients, meaning that the presence of nutrients in it is very low, and its ability to exchange cations is low [5]. However, peatmoss is considered one of the most common environments and is widely used worldwide. It is a decomposed organic material found in humid areas of the world in large areas known as peat mines. It may be used individually as is or mixed with some other growing media such as vermiculite, perlite or sand. In this context, peatmoss is a modified soil and is a dark brown fibrous material and is used as a growing medium for plants and is added to soil in large and common forms with planting mixes as an important medium for plant growth in it and helps in improving, aerating and retaining moisture and contains a good amount of nutrients important for plant growth as it is a medium of plant origin and over the past thirty years peat moss has been a main component of growing media mixes [24]. Also, [25] they stated that using a medium contained compost+ perlite+ peat moss, gave the best growth and quality of lemon cypress.

Therefore, this study was conducted to find out the effect of different growing media on the growth and chemical constituents of *Schefflera* plant.

3-MATERIALS AND METHODS

This investigation was carried out during two consecutive seasons of 2022/2023 and 2023/2024 and at the Horticultural Rresearch Station in Al-

Qanater Al-Khairia, Horticultural Research Institute, Agriculture Research Center Qalyubia Governorate, to study the effect of different growing media on the growth and chemical compositions of *Schefflera arboricola* L.plant.

A. Plant materials:

Schefflera arboricola plants at one-year-old were taken from the Qanater Khayriyah Horticultural Research Station, affiliated with the Horticultural Research Institute in Qalyubia Governorate. The plants were taken at a length of 41 cm and the average number of leaves per plant was 12 leaves and were repotted in plastic pots of 20 cm diameter (one plant / pot), filled with a mixture of 1 clay: 1 sand (V:V) on 1st March, for the two seasons of this study.. The physical and chemical properties of the soil under study were determined as described by [18] and [12] and presented in Table,1

Experimental layout and procedures

The layout of the experiment was a simple randomized block design included four treatments with three replicates, each replicate contained 5 pots.

Four growing media mixtures were chosen i.e. sand+ clay (1:1 by volume), sand +clay + peat moss, sand + clay + compost, and sand +clay + vermiculite (1:1:1 by volume. All media were analyzed for their chemical characteristics (Table,2).

Table (1) The main properties of the soil under study.

Soil property	Value
Clay	20.12
Silt	11.11
Fine sand	43.16
Coarse sand	25.61
Textural class	Sandy Clay loam
CaCO ₃ (gkg ⁻¹)	2.65
Organic matter (g kg ⁻¹)	0.59
Available N (mg kg ⁻¹) (KCl extract)	200
Available K (mg kg ⁻¹) (AB-DTPA extract)	306
Available P (mg kg ⁻¹) (AB-DTPA extract)	6.04
pH (paste extract)	7.90
EC dSm ⁻¹ (paste extract)	5.20
Saturation (SP) %	50.92
Field capacity (FC) %	25.46
Cations and anions in soil paste extract (mmol _c L ⁻¹)	
Na ⁺	12.80
K ⁺	1.55
Ca ²⁺	21.70
Mg ²⁺	15.90
CO ₃ ²⁻	0.00
HCO ₃ ⁻	8.31
Cl ⁻	25.23
SO ₄ ²⁻	18.41
SAR	2.95

Table (2) Chemical characteristics of the four 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)
Sand + clay	7.3	1.14	1.40	3660	526	750
Sand+clay +peatmoss	6.2	1.12	3.39	5499	690	870
Sand+clay +compost	6.6	0.96	3.30	5088	644	855
Sand+clay + Vermiculite	5.9	0.88	2.90	4878	520	790

Common agricultural practices (irrigation, manual weed control, etc.) were applied whenever they were needed.

Data recorded

At the end of the experiment, and after a year of planting the plants, different growth readings are taken for the *Schefflera* plant in both seasons

1) Vegetative growth

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

2) Root growth

1. Root volume (cm³)
2. Fresh weight of roots (g)/ plant.
3. 3-Dry weight of roots (g)/ plant.

3) Chemical composition determination: -

Total nitrogen, phosphorus, potassium % and total carbohydrates % were determined in dried leaves according the methods described by [8], [9], [7] and [6], respectively .

Statistical analysis of data:

All obtained data in both seasons of study were subjected to analysis of variance as simple experiments in a complete randomized block design .L.S.D. Method was used to differentiate between means according to [22]. The differences between the mean values of various treatments were compared by Duncan's multiple range test [3].

Table (3) Effect of growing media mixture treatments on plant height, leaves fresh and dry weights of *Schefflera arboricola* L. during 2022 /2023 and 2023 /2024 seasons.

Parameters	Plant height/cm	shoots fresh weight/g	shoots dry weight/g
Growing media			
	1 st season		
Sand + clay	82.40d	310.5d	75.50c
Sand+ clay +peat moss	85.70c	342.2b	77.45b
Sand+ clay +compost	95.10a	413.5a	95.22a
Sand+ clay + vermiculite	88.90b	335.5c	76.34c
	2 nd season		
Sand + clay	82.70d	311.2d	76.22c
Sand+ clay +peat moss	85.90c	344.0b	77.33b
Sand+ clay +compost	95.90a	415.2a	96.44a
Sand+ clay + vermiculite	89.20b	337.5c	77.10b

Table (4) Effect of growing media mixture treatments on root volume, root fresh and dry weights of *Schefflera arboricola* L. during 2022 /2023 and 2023 /2024 seasons.

4-RESULTS AND DISCUSSION

Effect of growing media mixture treatments on Vegetative growth characteristics:

Tables (3) declares that, the tallest and heaviest fresh and dry weights of shoots *Schefflera arboricola* L. plant were scored by (sand+ clay +compost) in both seasons. The mixture of (sand+ clay +peat moss) gave the second values of parameters mention afore in this concern in most cases. On the reverse, (sand + clay) gave the lowest values of these parameters regarding in the two seasons. Furthermore, the rest treatments came in-between the mentioned above treatments in the two seasons. The abovementioned results of mineral and micro- nutrients are nearly similar to those obtained by [13].

Root volume, root fresh and dry weights:

Table (4) declares that, all growing media mixture treatments statistically increased root volume, root fresh and dry weights of *Schefflera arboricola* L. plant in the two seasons. Hence, the mixture (sand+ clay + compost) gave the highest values in this concern, followed in discerningly by (Sand+ clay + Vermiculite) in both seasons. On the contrary, the lowest values of these parameters were recorded by (sand + clay) in both seasons.

Parameters	Root volume/cm ³	Root fresh weight/g	Root dry weight/g
Growing media			
	1 st season		
Sand + clay	100.1d	93.07c	24.50c
Sand+ clay +peat moss	105.0c	103.4b	24.05c
Sand+ clay +compost	140.2a	133.5a	34.44a
Sand+ clay + vermiculite	115.2b	101.0b	28.11b
	2 nd season		
Sand + clay	102.2d	92.00d	24.71c
Sand+ clay +peat moss	108.4c	103.1c	25.22c
Sand+ clay +compost	142.5a	135.2a	34.52a
Sand+ clay + vermiculite	117.1b	110.4b	28.41b

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 [15] on *Chrysanthemum morifolium* plants, [16] in *Dieffenbachia amoena* plants, [14] on *D Sabagh et al., ypsis lutescens* palm plants, [25] on (*Cupressus macrocarpa*) plants, [13] indicated that the media consisted of (sand + peat moss +compost) gave high significant effect for growth of [4] stated that growing of *Euphorbia milii* cuttings in a potting medium containing clay +perlite +peat moss in (autumn) produced the best rooting quality of cutting.

Chemical composition:

N and P %:

Table (5) reveal that, N and P % were increased by using all growing media especially, the mixture (sand+ clay +compost) of *Schefflera arboricola* L. plant in the two seasons., followed in discerningly by (sand +clay +peat moss) in both seasons.

(Sand+clay + vermiculite) ranked the third values in this respect in 1st and 2nd seasons

K and total carbohydrates % %:

Table (6) reveal that, the mixture media (sand+ clay +compost) gave the richest % K and total carbohydrates of *Schefflera arboricola* L. plant in the 1st and 2nd seasons, followed in descendingly by (sand+clay +peat moss) in both seasons. The growing media (Sand+ clay + vermiculite) ranked the third values in this respect in most cases.

The aforementioned results of growing media concerning chemical constituents are in conformity with those reported by [23] on *aglaonema* plants, [20] on *zinnia* plants, [19] on *Anthurium* and *zinnia* plants, [14] on *Dypsis lutescens* palm plants, [25] on *Cupressus macrocarpa* , [13] indicated that the media consisted of (sand + peat moss +compost) gave the highest leaf total nitrogen, phosphorus and potassium contents of [21] reported that the highest leaf chlorophyll content of 43.28 SPAD value when plant grown in cocopeat, perlite and vermicompost.

Table (5) Effect of growing media mixture treatments on N and P % of *Schefflera arboricola* L. during 2022 /2023 and 2023 /2024 seasons.

Parameters	N%	P%
Growing media		
1 st season		
Sand + clay	1.60b	0.32b
Sand+ clay +peat moss	2.40a	0.33a
Sand+ clay +compost	2.33a	0.34a
Sand+ clay + vermiculite	1.41b	0.26c
2 nd season		
Sand + clay	2.07b	0.30d
Sand+ clay +peat moss	2.37a	0.33b
Sand+ clay +compost	2.50a	0.36a
Sand+ clay + vermiculite	2.01b	0.32c

Table (6) Effect of growing media mixture treatments on K and total carbohydrates % of *Schefflera arboricola* L. during 2022 /2023 and 2023 /2024 seasons.

Parameters	K%	Total
Growing media		carbohydrates %

1 st season		
Sand + clay	1.90b	17.48c
Sand+ clay +peat moss	1.92b	23.45a
Sand+ clay +compost	2.30a	27.74a
Sand+ clay + vermiculite	1.71c	21.14b
2 nd season		
Sand + clay	1.86b	18.81c
Sand+ clay +peat moss	1.91b	24.84a
Sand+ clay +compost	2.19a	25.19a
Sand+ clay + vermiculite	1.66c	22.14b

Conclusively, it is preferable to the growing media mixture (sand+ clay + compost) or (sand+ clay + peat moss) for enhancing the growth and the chemical constituents of *Schefflera arboricola* L. plant

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