

EFFECT OF USING DIFFERENT MEDIA ON RAISING THE NURSRLINGS OF ACALYPHA, BOUGAINVILLEA AND NERIUM SHRUBS

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ABSTRACT

This work was conducted to study the effect of seven different media treatments, i.e., peatmoss, sand, composted olive cake, mixture of (peatmoss+ sand, peatmoss + composted olive cake, sand + composted olive cake and peatmoss + sand + composted olive cake) on the vegetative and root growth and some chemical constituents of nursrlings for *Acalypha wilkesiana*, *Bougainvillea glabra* and *Nerium oleander* ornamental shrubs under North Sinai conditions at the Experimental Farm , Fac. of Environmental Agric. Sci. El-Arish Suez Canal Univ. during 2000 –2001 and 2001 – 2002 seasons.

The obtained results indicated that using composted olive cake alone or combined with peatmoss (1:1-v. v.) as a raising media for the production of *Acalypha wilkesiana*, *Bougainvillea glabra* and *Nerium oleander* nursrlings proved a good efficiency concerning the vegetative growth (shoots, root and nursrlings fresh and dry weights) and height than using mixtures peatmoss + sand, composted olive cake + sand (1:1 - v.v) and peatmoss or sand (each alone). Also, using composted olive cake alone resulted in high percentages of NPK and total carbohydrates in the leaves of these nursrlings.

Keywords: Media – Nursrlings – *Acalypha* – *Bougainvillea* – *Nerium* – Ornamental shrubs – Peatmoss – Composted olive cake.

INTRODUCTION

According to Hartmann and Kester (1975) sand contains virtually no mineral nutrients and has no buffering capacity. It is used mostly in combination with organic materials. Peatmoss has high moisture holding capacity and contains a small amount of nitrogen (about 1.0 percent) but little or no phosphorus or potassium. To provide potting mixtures of better texture sand and some organic matter, such as peatmoss or sawdust or shredded barks are usually added. Commercial producers of nursery stock grow many of those plants on to a saleable size in containers, using modified sand soil mix. These mixes vary widely throughout the industry, but generally include fine sand and a mix of varying proportions with such materials as peatmoss, redwood sawdust or shredded fir bark. Such mixes require added fertilizer supplements and continued feeding of plants until the plants become established in their permanent locations. Under North Sinai conditions where sand is a dominant media and there is a lack in organic matter, olive cake represent the majority of agroindustrial by-products. There are about 35000 ton olive product and about 3000 ton olive cake (Information Center of North Sinai Governorate, Agricultural Department, March 2000).

The cultivation and processing of olives for olive oil production are the most important industries in Mediterranean countries, where approximately 98% of the world's commercial olive trees are located. These industries generate large amounts of organic wastes leaves, olive oil mill waste water, wet semi dry and dry olive cakes.

In North Sinai the availability of silt, clay or organic manure is expensive, likewise peatmoss as imported material. Olive cake is a side product of olive oil processing, which is available in large quantities, low price, free from diseases caused agents and weed seeds.

Hence using composted olive cakes alone or combined with sand or peatmoss will be of great benefit in growing the nurslings of ornamental plants. This work was conducting aim to investigate the effect of composted olive cake on raising *Acalypha wilkesiana*, *Bougainvillea glabra* var. *Sanderiana* and *Nerium oleander* nurslings.

MATERIALS AND METHODS

This work has been conducted at the Experimental Farm of the Faculty of Environmental Agricultural Sciences at El-Arish, North Sinai Governorate, Suez Canal Univ. during the two successive seasons of (2000-2001) and (2001-2002) to study the efficiency of using peatmoss, sand and composted olive cake or their combinations on raising the nurslings of some ornamental shrubs, i.e., *Acalypha wilkesiana*, *Bougainvillea glabra* var. *Sanderiana* and *Nerium oleander*.

The initial plant materials from the species under investigation were collected from 12 years old shrubs grown in the Experimental Farm of the Fac. of Env. Agric. Scie. El-Arish

The tested seven media used in this investigation were as follows: peatmoss (Floratorf Germany product), sand, composted olive cake (dried and composted for 12 months without any nutrient addition). The chemical analysis of composted olive cake shows that it contains: N 4.38%, P 0.22%, K 7.30%, Cu 11.60 ppm, Zn 31.30 ppm, Mn 21.70 ppm, Fe 559 ppm, organic matter 49.67, organic carbon 28.81 and C/N 6.58, mixture of peatmoss + sand (1:1-v.v.), peatmoss + composted olive cake (1:1-v.v.), mixture of sand + composted olive cake (1:1-v.v.) and peatmoss + composted olive cake + sand in rate of (1:1:1-v.v.).

The stem cuttings of these shrubs were 10-12 mm thickness and 15cm length were prepared on March 15th for the two seasons. The basal ends of cuttings were quickly dipped (about 30 second) in 3000 ppm indole butyric acid (IBA) and immediately planted in the wet media. Every plant was represented by 420 cuttings in three replicates (each one contained 20 cuttings). The stem cuttings were planted in 20cm diameter plastic pots filled with wet different media (one stem cutting/pot). The plastic pots were placed under seran-house (65% shading) conditions.

The following data were recorded after 12 months from planting, i.e., seedling height (cm), fresh and dry weights of the shoot and root (gm).

Samples of leaves were dried at 70°C for 72 hours wet digested with sulphuric acid and perchloric acid (3:1) to determine total nitrogen percentage according to the method described A. O. A. C. (1980), phosphorus percentage according to the method described in Hucker and Catroux (1980), potassium percentage according to the method described in Brown and Lilleland (1946) and total carbohydrates percentage according to Dubois *et al.*, (1956).

The complete randomized block design in simple experiment was followed. The data were subjected to statistical analysis of variance and the means were compared using Duncan multiple range tests at the 5% levels according to Steel and Torrie (1980).

RESULTS AND DISCUSSION

1. Effect of different media on vegetative growth of *Acalypha wilkesiana*, *Bougainvillea glabra* and *Nerium oleander* raised nurslings:

Data in Table (1) showed that the highest fresh and dry weights of *Acalypha* shoot were resulted from either composted olive cake media or peatmoss + composted olive cake media (1:1). The other used media came in descending order as peatmoss + sand (1:1), peatmoss + sand + composted olive cake (1:1:1), peatmoss, sand and composted olive cake + Sand. Although fresh and dry weights of root followed nearly the same trend, composted olive cake media proved to be the superior one concerning root weight. However, the nurslings fresh weight did not show significant differences between using composted olive cake or composted olive cake + peatmoss (1:1) since they resulted in the highest fresh weight of nursling (94.92, 93.62 and 105.72, 107.88 gm) during the two seasons respectively, where the other media came in descending order as peatmoss + sand (1:1), peatmoss + sand + composted olive cake (1:1:1), peatmoss alone, sand + olive cake (1:1) and sand alone. The nursling height followed the same trend of nursling fresh weight.

As for the effect of the different media on *Bougainvillea glabra*, data in Table (2) showed that each of peatmoss or composted olive cake media resulted in the highest fresh and dry weights of shoot without significant different between them, where peatmoss + composted olive cake media came descendingly in the second order, and the least shoot height was recorded with peatmoss + sand (1:1). The same trend took place for fresh and dry weights of root, nursling fresh weight and height.

With *Nerium oleander* (Table 3) showed that composted olive cake medium proved to be the more effective one in increasing the studied characters followed descendingly by peatmoss + composted olive cake, where using peatmoss or sand each alone or sand + composted olive cake resulted in the least values. The general comparison between the three plants lead to the conclusion that it's best to use composted olive cake or composted olive cake + peatmoss for raising *Acalypha wilkesiana* nurslings using composted olive cake or peatmoss as a raising medium each alone for *Bougainvillea glabra* and using composted olive cake for raising nurslings of

Table (1): Effect of different media components on the vegetative growth and rooting of *Acalypha wilkesiana* nurslings during of 2000- 2001 and 2001-2002 seasons.

Media type	Characters	First season						Nurslings fresh weight (gm)	Nurslings height (cm)
		Shoot fresh weight (gm)	Shoot dry weight (gm)	Root fresh weight (gm)	Root dry weight (gm)	Root fresh weight (gm)	Root dry weight (gm)		
Peat moss	(P)	41.12 b	14.10 b	6.48 bc	3.28 c	47.60 b	84.00 d		
Sand	(S)	34.84 a	11.02 a	2.98 a	1.52 a	37.82 a	58.60 b		
Composted olive cake	(O)	87.16 e	27.22 e	7.76 c	3.90 d	94.92 e	80.00 d		
Mixture of P + S		75.40 d	24.82 d	6.02 b	3.20 c	81.42 d	89.40 e		
Mixture of P + O		88.38 e	28.48 e	5.24 b	2.64 bc	93.62 e	69.40 c		
Mixture of S + O		40.42 b	13.58 ab	4.18 ab	2.10 ab	44.60 b	48.60 a		
Mixture of P + S + O		61.80 c	20.98 c	4.32 ab	2.28 b	66.12 c	46.60 a		
Second season									
Peat moss	(P)	40.62 b	13.44 b	8.84 c	4.32 c	49.46 b	90.60 d		
Sand	(S)	32.30 a	10.90 a	4.64 a	2.34 a	36.94 a	70.00 b		
Composted olive cake	(O)	96.42 e	31.26 e	9.30 c	4.72 c	105.72 e	76.60 c		
Mixture of P + S		87.00 d	28.50 d	7.30 ab	3.68 b	94.30 d	103.20 e		
Mixture of P + O		101.70 f	33.20 f	6.18 ab	3.36 b	107.88 e	74.60 bc		
Mixture of S + O		43.74 b	14.66 b	5.28 a	2.66 ab	49.02 b	46.00 a		
Mixture of P + S + O		65.80 c	20.90 c	5.90 ab	3.12 b	71.70 c	42.60 a		

Table (2): Effect of different media components on the vegetative growth and rooting of *Bougainvillea glabra* nurslings during of 2000- 2001 and 2001-2002 seasons.

Media type	Characters	First season						Second season					
		Shoot fresh weight (gm)	Shoot dry weight (gm)	Root fresh weight (gm)	Root dry weight (gm)	Nurslings fresh weight (gm)	Nurslings height (cm)	Shoot fresh weight (gm)	Shoot dry weight (gm)	Root fresh weight (gm)	Root dry weight (gm)	Nurslings fresh weight (gm)	Nurslings height (cm)
Peat moss	(P)	42.52 e	8.78 b	8.34 c	1.66 b	51.30 d	84.60 de						
Sand	(S)	31.70 c	6.40 ab	3.18 ab	0.96 ab	38.10 c	81.20 d						
Composted olive cake	(O)	45.30 e	10.28 b	4.40 b	1.30 ab	56.18 d	89.00 e						
Mixture of P + S		21.24 a	4.88 a	3.46 ab	1.00 ab	26.12 a	46.60 a						
Mixture of P + O		37.10 d	8.64 b	4.50 b	1.50 ab	45.74 d	88.00 e						
Mixture of S + O		28.98 bc	6.48 ab	2.28 a	0.80 a	35.50 b	65.40 c						
Mixture of P + S + O		27.88 b	6.46 ab	4.12 b	1.14 ab	34.34 b	58.60 b						
Peat moss	(P)	44.78 d	9.00 bc	6.80 c	1.62 b	53.78 d	79.20 c						
Sand	(S)	36.10 c	7.30 b	3.04 ab	0.94 ab	43.40 c	77.20 bc						
Composted olive cake	(O)	46.40 d	10.30 c	4.76 b	1.34 b	56.70 d	112.60 d						
Mixture of P + S		18.16 a	4.18 a	3.68 b	1.08 ab	22.34 a	55.40 a						
Mixture of P + O		37.94 c	8.42 bc	6.66 c	1.58 b	46.36 c	82.00 c						
Mixture of S + O		28.38 b	6.24 ab	1.86 a	0.76 a	34.62 b	72.60 b						
Mixture of P + S + O		25.92 b	6.08 ab	4.48 b	1.24 b	32.00 b	61.40 b						

Table (3): Effect of different media components on the vegetative growth and rooting of *Nerium oleander* nurslings during of 2000- 2001 and 2001-2002 seasons.

Media type	Characters	First season						Nurslings height (cm)
		Shoot fresh weight (gm)	Shoot dry weight (gm)	Root fresh weight (gm)	Root dry weight (gm)	Nurslings fresh weight (gm)	Nurslings height (cm)	
Peat	(P)	33.74 a	9.44 a	6.92 bc	2.76 bc	43.18 a	68.60 b	
Sand	(S)	35.12 a	9.38 a	5.22 ab	2.08 ab	44.50 a	53.20 ab	
Composted olive cake	(O)	44.44 c	12.36 b	8.56 c	3.40 c	56.80 c	56.60 ab	
Mixture of P + S		36.00 a	10.20 ab	6.22 b	2.48 b	46.20 a	55.20 ab	
Mixture of P + O		40.60 b	11.30 ab	8.02 c	3.20 c	51.90 b	52.60 a	
Mixture of S + O		34.48 a	9.76 ab	4.12 a	1.64 a	44.24 a	58.60 b	
Mixture of P + S + O		39.72 b	10.98 ab	3.94 a	1.56 a	50.70 b	67.20 b	
		Second season						
Peat moss	(P)	35.54 ab	9.92 ab	7.72 c	3.08 c	45.46 a	73.20 d	
Sand	(S)	34.66 a	9.58 a	5.94 b	2.36 b	44.24 a	37.20 a	
Composted olive cake	(O)	46.16 d	12.82 b	10.72 d	4.28 d	58.98 d	61.20 c	
Mixture of P + S		38.70 b	10.78 ab	6.48 bc	2.58 bc	49.48 b	38.60 a	
Mixture of P + O		42.94 cd	12.00 b	8.28 c	3.30 c	54.94 cd	54.60 a	
Mixture of S + O		36.60 ab	10.12 ab	4.78 ab	1.90 ab	46.72 ab	62.60 c	
Mixture of P + S + O		42.54 c	11.80 b	4.16 a	1.66 a	54.32 c	69.20 d	

Nerium oleander. The results also declared that *Acalypha wilkesiana* plant attained more growth of nurslings nearly 1.5 fold of that obtained with *Bougainvillea glabra* or *Nerium oleander* concerning the best raising media for each, nevertheless the economic view concerning Sinai area and the availability of composted olive cake can assure the using of it alone as a raising medium for the nursling of these plants.

2.Effect of different media on NPK and total carbohydrates percentages in the leaves of *Acalypha wilkesiana*, *Bougainvillea glabra* and *Nerium oleander*.

Data in Table (4) showed that the least values of N and K percentages were recorded in *Acalypha wilkesiana* leaves grown in sand medium followed by peatmoss medium which recorded high significant values than sand medium. Also, phosphorus percentage recorded similar low values in either sand or peatmoss medium. Mixing peatmoss with sand enhanced NPK percentages than using sand alone. This may be attributed to that sand was poor in the contents of these elements. On the other side, adding composted olive cake to sand and peatmoss enhanced significantly the percentages of these elements and the upper most values of N and K were recorded with using composted olive cake media alone with the exception of phosphorus percentage which showed the highest value in the mixture of sand + composted olive cake or peatmoss + sand + composted olive cake (1:1:1). On the other hand, using composted olive cake media alone showed the highest percentages of NPK with *Bougainvillea glabra* and *Nerium oleander* leaves and using sand or peatmoss alone showed the least values (Tables 5 and 6).

Table (4): Effect of different media components on N, P, K and total carbohydrates percentages in the leaves of *Acalypha wilkesiana* during of 2000-2001 and 2001 – 2002 seasons.

Chemical constituents	N%	P%	K%	Total carbohydrates %
Media type				
First season				
Peat moss (P)	2.98 b	0.54 a	2.94 c	15.49 b
Sand (S)	2.14 a	0.59 ab	2.28 a	14.88 a
Composted olive cake (O)	3.15 c	0.60 b	3.55 d	16.80 d
Mixture of P + S	3.09 bc	0.68 c	2.63 b	16.20 c
Mixture of P + O	3.17 c	0.71 cd	3.32 d	16.61 d
Mixture of S + O	3.11 bc	0.74 d	2.82 bc	16.24 c
Mixture of P + S + O	3.12 c	0.80 e	3.11 cd	16.75 d
Second season				
Peat moss (P)	2.70	0.72 a	3.09 c	15.67 b
Sand (S)	2.67	0.73 a	2.51 a	15.36 a
Composted olive cake (O)	3.25	0.74 ab	3.52 d	16.53 e
Mixture of P + S	3.01	0.75 b	2.73 b	16.03 c
Mixture of P + O	3.29	0.75 b	3.43 e	16.32 d
Mixture of S + O	3.12	0.81 c	2.97 c	16.14 c
Mixture of P + S + O	3.17	0.85 d	3.25 d	16.41 de

Table (5): Effect of different media components on N, P, K and total carbohydrates percentages in the leaves of *Bougainvillea glabra* during of 2000-2001 and 2001 – 2002 seasons.

Chemical constituents	N%	P%	K%	Total carbohydrates %
Media type	First season			
Peat moss (P)	4.16 ab	0.53 c	3.43 c	10.86 b
Sand (S)	4.07 a	0.40 a	2.82 a	10.28 a
Composted olive cake (O)	4.33 c	0.63 d	3.92 d	11.64 d
Mixture of P + S	4.10 ab	0.45 ab	3.06 ab	11.20 c
Mixture of P + O	4.27 bc	0.61 d	3.86 d	11.42 cd
Mixture of S + O	4.12 ab	0.48 b	3.15 b	11.34 cd
Mixture of P + S + O	4.20 b	0.54 c	3.62 c	11.58 d
Second season				
Peat moss (P)	4.18	0.68b	3.29 c	10.31 b
Sand (S)	4.00	0.62a	2.74 a	10.04 a
Composted olive cake (O)	4.33	0.76c	3.68 e	10.96 e
Mixture of P + S	4.11	0.64a	2.86 a	10.44 bc
Mixture of P + O	4.27	0.74c	3.62 e	10.63 c
Mixture of S + O	4.14	0.67b	3.13 b	10.51 c
Mixture of P + S + O	4.20	0.69b	3.48 d	10.78 d

Table (6): Effect of different media components on N, P, K and total carbohydrates percentages in the leaves of *Nerium oleander* during of 2000-2001 and 2001 – 2002 seasons.

Chemical constituents	N%	P%	K%	Total carbohydrates %
Media type	First season			
Peat moss (P)	1.09 bc	0.058 b	0.68 ab	4.10 b
Sand (S)	0.67 a	0.052 a	0.53 a	3.07 a
Composted olive cake (O)	1.17 d	0.068 d	0.76 b	5.51 f
Mixture of P + S	0.94 b	0.053 a	0.64 ab	4.55 c
Mixture of P + O	1.16 cd	0.066 c	0.74 b	5.06 d
Mixture of S + O	1.14 cd	0.054 a	0.67 ab	4.73 c
Mixture of P + S + O	1.13 c	0.061 b	0.71 b	5.35 e
Second season				
Peat moss (P)	1.48 b	0.069 b	0.72 ab	4.52 b
Sand (S)	1.36 a	0.064 a	0.65 a	4.14 a
Composted olive cake (O)	1.74 d	0.083 e	0.79 b	5.28 f
Mixture of P + S	1.41 a	0.066 ab	0.67 ab	4.76 c
Mixture of P + O	1.65 c	0.076 d	0.74 ab	5.11 e
Mixture of S + O	1.63 c	0.067 b	0.69 ab	5.08 d
Mixture of P + S + O	1.56 cd	0.071 c	0.73 ab	5.19 ef

Total carbohydrates percentages in the leaves of the three plants (Tables 4,5 and 6) was in the highest values when composted olive cake used alone followed descendingly by mixing it with peatmoss or sand, then the least values were belong to either sand or peatmoss alone. This may be attributed to the enhanced mineral absorption from composted olive cake, which reflected positively on carbohydrate synthesis.

The effect of olive pomace in addition to sewage sludge and tomato residues were found to enhance the availability of nitrogen and phosphorus in

sandy and calcareous soils and reflected in an increase in shoot dry weight of barley plant (Marzouk, 2002), also, when pressed olive cake was used in combination with chicken manure in sand soil the best vegetative growth and fruit yield of tomato was obtained (El-Kassas and Abd El-Mowly, 1999) and (El-Kassas and El-Sebsy (2002) on sweet pepper .

In the herein work the raised nurslings of *Acalypha wilkesiana*, *Bougainvillea glabra* and *Nerium oleander* showed that the highest vegetative characters were obtained as composted olive cake alone or in combination with peatmass (1:1) were used. This was concomitant with enhancing NPK and total carbohydrates percentages in the leaves. This can be attributed to that pressed olive cake have appreciable amounts of NPK in addition to the other needed minerals.

On the other hand, sand contains virtually no mineral nutrients and has no buffering capacity. It is used mostly in combination with organic materials, where peatmoss has high moisture-holding capacity and contains a small amount of nitrogen (about 1.0 percent) but little or no phosphorus or potassium (Hartmann and Kester, 1975). So many investigators used silt, clay or peatmoss in addition to sand in raising seedlings of some ornamental plants (Treder *et al.*, 1996; Fazli *et al.*, 1996; Mukhtar *et al.*, 1996; Sher and Muhammad, 1996). This was due to that sand is a poor medium and had no capacity of holding water. The results of this work proved the efficiency of pressed olive cake alone or combined with peatmoss (1:1) as raising media for *Acalypha*, *Bougainvillea* and *Nerium* nurslings under Sinai conditions comparing to using peatmoss + sand (1:1) or peatmoss alone.

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تأثير استعمال بينات مختلفة على انتاج شتلات الاكاليفا والجهنمية والدفلة

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كلية العلوم الزراعية البيئية بالعريش - جامعة قناة السويس

لجرى هذا البحث لدراسة تأثير سبع بينات مختلفة هي بيتموس ، رمل ، تفل زيتون مكمور ، مخلوط البيتوموس + الرمل ، مخلوط البيتوموس + تفل زيتون مكمور ، مخلوط البيتوموس + رمل + تفل زيتون مكمور على انتاج الشتلات والنمو الخضري والجذرى وبعض المكونات الكيميائية لبعض شجيرات الزينة مثل الاكاليفا ويليكسيانا ، جهنمية جلابيرا والدفلة تحت ظسروف شمال سيناء فى مزرعة التجارب ، بكلية العلوم الزراعية البيئية بالعريش ، جامعة قناة السويس خلال موسمى ٢٠٠٠-٢٠٠١ و ٢٠٠١-٢٠٠٢ .

وتشير النتائج التى تم الحصول عليها ان استعمال تفل الزيتون المكمور بمفرده او بخلطة مع البيتوموس (بنسبة ١:١) كبنية لانتاج شتلات الاكاليفا ، الجهنمية والدفلة حيث اثبتت مقدرة جيدة على النمو الخضري والجذرى وزيادة فى الوزن الطازج والجاف والارتفاع للشتلات حيث كانت افضل من استعمال مخاليط البيتوموس + الرمل أو تفل الزيتون المكمور + الرمل (بنسبة ١:١) أو البيتوموس أو الرمل كلا على حدة . أيضا زادت النسب المنوية للنيتروجين والفوسفور والبوتاسيوم والكربوهيدرات الكلية فى اوراق هذه الشتلات باستخدام تفل الزيتون المكمور كبنية لانتاج تلك الشتلات.