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EFFECT OF SOME MEDIA AND FERTILIZATION TREATMENTS ON GROWTH AND QUALITY OF SOME FOLIAGE POT-PLANTS

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ABSTRACT

Two independent pot experiments were conducted under glasshouse conditions at the nursery of Antoniades Research Branch, Hort. Res. Inst., Alexandria, Egypt during 2010 and 2011 seasons to study the effect of NPK mixture (2:1:1) and kristalon (19:19:19 + micronutrients), both at 2 g/pot as soil drench, foliar spray with active dry yeast at 5 g/L and the combined treatments of 2g/pot NPK mixture + 5g/L yeast and 2g/pot kristalon + 5g/L yeast, when applied six times with one month interval during the growing season, on growth and chemical composition of *Brassaia actinophylla*, Endl. and *Euonymus japonicus* Thunb cv. Aureus 6-months-old transplants cultivated in 20-cm-diameter plastic pot filled with about 2.5 kg of pure sand or sand amended with 25% of either loam or farmyard manure (FYM). Both fertilization and medium treatments were interacted factorially.

The obtained results indicated that all fertilization treatments significantly improved all vegetative and root growth traits of both plants used in this study compared to control, especially the combined treatment between 2g/pot kristalon and 5g/L active dry yeast. Addition of either loam or FYM induced also, a marked improve in the various vegetative and root growth parameters, especially FYM compost, which gave better results than loam. The least improvement, on the other hand, was found due to spraying yeast alone at 5g/L. A similar trend was also obtained concerning the contents of chlorophyll a, b, carotenoids, N, P and K in the leaves of both plants. However, the superiority in all vegetative and root growth characters, as well as chemical composition in the two plants was for the interaction

treatment between fertilization with kristalon at 2g/pot + active dry yeast at 5g/L and planting in the sand amended with 25% FYM, as this interaction, in general gave the utmost high means compared to control and all other treatments.

So, it could be recommended to cultivate the 6-months-old transplants of both *Brassaia actinophylla*, Endl. and *Euonymus japonicus* Thunb cv. Aureus in sand + 25%FYM mixture and fertilize them with 2g/pot kristalon (as a soil drench) + 5g/L active dry yeast (as a foliar spray), six times with one month interval during the active growing season, to obtain good and healthy growth.

INTRODUCTION

The importance of some ornamental indoor plants is mainly referred to beauty of their leaves; among of them may be *Brassaia actinophylla*, Endl. (*Schefflera actinophylla* (Endl.) Harms), Australian umbrella tree that belongs to Fam. Araliaceae. It is an evergreen tree up to 40 ft. height, native to Australia and widely used as one of the most decorative foliage pot plants, and also for gardening and landscape. May be kept multiple-stemmed and bushy by cutting-back. Propagates by seeds, cuttings and air-layers (**Bailey, 1976**). Another one is Spindle tree, *Euonymus japonicus* Thunb cv. Aureus plant that belongs to Fam. Celastraceae. It is an evergreen shrub or tree, native to South Japane; leaves with large golden yellow blotch in center make it an amenity foliage pot plant; due to its compact growth and dense leaves, it may be used for limitation (**Bailey, 1976**).

Many workers affirmed that growing medium is considered one of the main factors affecting the growth and production of indoor pot plants, as it greatly affects providing plants with water, nutrition and aeration. However, many kinds of media were studied by several investigators. In this concern, **Wazir *et al.* (2004)** on *Schefflera actinophylla*, found that amending the garden soil+silt with leaf mould, farmyard manure or greenfert compost recorded the maximum survival%, plant height, stem thickness, stem weight, No. branches and leaves/plant, leaf area, No. roots, root length and thickness, root weight and crown thickness. Likewise, **Cardoso and Ramirez (2006)** postulated that organic matter compost derived from tannery waste and sewage sludge after removing all contaminants markedly

improved growth and quality of *Schefflera actinophylla* and *Dracaena sanderiana* plants with raising tissue content of N, P, Mn and Zn. **El-Sayed and El-Shal (2008)** stated that peatmoss alone as a medium of Brassaia plants significantly increased plant height, stem diameter, No. leaves and aerial parts and roots fresh and dry weights comparing with the sand. The leaf content of N, P, K, Fe, Mn and Zn was also increased. In addition, **Abdel-Fattah *et al.* (2008)** reported that farmyard and chicken manures was the best organic additives to sand for increasing vegetative and root growth, as well as the content of chlorophylls a, b, carotenoids, N, P, K, Fe, Mn and Zn in the leaves of Schefflera plant. Similar observations were also obtained by **Marfa *et al.* (2002)** on *Euonymus japonicus* and *Nerium oleander*, **Gad (2003)** on *Ficus benjamina*, **Verhagen (2004)** on *Tagetes erecta, Salvia splendens* and *Scaevola aemula,* **Chen and Li (2006)** on Spathiphyllum, **Shahin *et al.* (2007)** on *Agave americana* cv. Marginata and **El-Sayed *et al.* (2009)** on *Nephrolepis exaltata.*

Many workers proved that the good nutrition with any type of fertilizers usually improves growth and quality of various plants. This truth was emphasized by **Abdel-Fattah *et al.* (2009)** who revealed that the combination of Fe+Zn+Mn at 240+120+120 ppm and active dry yeast at 8g/L significantly enhanced vegetative and root growth of Schefflera transplants, as well as leaf content of chlorophylls a and b, carotenoids, N, P, K, Fe, Zn and Mn. **Abdel-Wahid *et al.* (2006)** observed that using yeast twice at 4 g/L+ 6g NPK/plant significantly increased height, fresh and dry weights of shoots and N% in roots of *Euonymus japonicus* plant, while yeast alone led to an increment in No. branches, stem diameter, root length, fresh and dry weights of roots, carotenoids content in leaves and K% in roots. On the same line, were those results of **Desouky (2004)** on *Strelitzia reginae,* **Broschat (2006)** and **El-Sayed *et al.* (2010)** on Spathiphyllum and **El-Sayed *et al.* (2010)** on *Vinca rosea* cv. major.

This study, however aims to elicite the effect of both media and fertilization, as the main important factors on growth and performance of Schefflera and Euonymus foliage pot plants.

MATERIALS AND METHODS

Two independent pot experiments were carried out under glasshouse conditions at the nursery of Antoniades Research Branch, Hort. Res. Inst., Alexandria, Egypt during the two successive seasons

of 2010 and 2011 to explore the response of Schefflera and Euonymus transplants to some prepared media, some fertilization treatments and their interactions.

So, six-months-old transplants of both *Brassaia actinophylla*, Endl. of about 22-25 cm height with 8-10 leaves and *Euonymus japonicus* Thunb. cv. Aureus of about 12-14 cm height and one branch carries about 28-30 leaves were planted on March, 21st. for the two seasons in 20-cm-diameter plastic pots (one transplant/pot) filled with about 2.5 kg of one of the following media: pure sand, sand + 25% loam and sand + 25% farmyard manure (FYM). The physical and chemical properties of the used sand and loam are shown in Table (a), while those of FYM are averaged in Table (b).

Table (a): Some physical and chemical properties of sand and loam during 2010 and 2011 seasons.

Soil type	Seasons	Particle size distribution (%)				S.P	E.C. (ds/m)	pH	Cations (meq/l)				Anions (meq/l)		
		Coarse sand	Fine sand	Silt	Clay				Ca^{++}	Mg^{++}	Na^{+}	K^{+}	HCO_3^-	Cl^-	SO_4^{--}
Sandy	2010	89.03	2.05	0.40	8.52	23.00	3.31	7.50	7.50	1.63	33.60	0.50	3.20	22.00	18.03
	2011	90.10	1.95	0.50	7.45	22.63	3.58	7.82	19.42	8.33	7.20	0.75	1.60	7.00	27.10
Loamy	2010	10.18	46.17	19.53	24.12	35.00	3.46	8.27	17.50	9.42	20.00	0.79	3.80	10.00	33.91
	2011	10.30	46.54	18.88	24.28	33.68	3.51	8.18	18.00	8.95	20.50	0.85	3.65	10.20	34.45

Table (b) Some physical and chemical properties of farmyard manure (FYM) used in both seasons.

Macro elements (%)					Microelements (ppm)				O.C. (%)	O.M. (%)	C/N Ratio	pH	E.C. (ds/m)
N	P	K	Ca	Mg	Zn	Fe	Mn	Cu					
1.85	0.71	2.29	0.21	0.79	20.10	1620	330	54	23.28	25.80	12.58	7.88	4.50

After three weeks from planting (on April, 11th), the following fertilization treatments were applied as follows:

1. No fertilization, referred to as control.
2. Chemical fertilization with either a mixture of NPK (2:1:1) or kristalon fertilizer (19:19:19 + micronutrients, manufactured by DSM Agrospecialists, Holland) at the rate of 2g/pot for each, added as a soil drench, six times with one month interval. Ammonium

sulphate (20.5% N), calcium superphosphate (15.5% P_2O_5) and potassium sulphate (48.5% K_2O) fertilizers were used to obtain the required ratio for the mixture of NPK.

3. Biofertilization with an aqueous solution of active dry yeast at the rate of 5 g/L combined with 30 g sucrose/L was applied as a foliar spray, six times with one month interval till the solution was run-off. The chemical composition of the active dry yeast used in the two seasons are indicated in Table (c).

4. Drenching with either NPK mixture (2:1:1) or kristalon (at 2g/pot) was combined with spraying of yeast (at 5g/L) to form the following two combined treatments:

a. 2g/pot NPK mixture + active dry yeast at 5 g/L.

b. 2g/pot Kristalon + active dry yeast at 5 g/L.

Table (c): Chemical composition of the active dry yeast used in the two seasons.

Proteins	47.0%	**Niacin**	300-500 µ/g
Carbohydrates	33.0%	**Pyrodoxin**	28.0 µ/g
Minerals	8.0%	**Pantathenate**	70.0 µ/g
Nucleic acids	8.0%	**Biotin**	1.3 µ/g
Lipids	4.0%	**Cholin**	4000 µ/g
Thiamine	60-100µ/g	**Folic acid**	5.13 µ/g
Riboflavin	35-50 µ/g	**Vit. B12**	0.001 µ/g
Approximate composition of minerals (mg/g):			
Na	0.12	**Cu**	8.0
Ca	0.75	**Se**	0.1
Fe	0.02	**Mn**	0.02
Mg	1.65	**Cr**	2.2
K	21.0	**Ni**	3.0
P	13.5	**Va**	0.04
S	3.9	**Mo**	0.4
Zn	0.17	**Sn**	3.0
Si	0.03	**Li**	0.17

5. Each fertilization treatment mentioned above was interacted with each type of the used media to form eighteen interaction treatments.

The layout of the experiments in the two seasons was a complete randomized design in factorial experimental type (**Mead *et al.*, 1993**) with three replicates, as each replicate contained five plants. All plants under various treatments received the usual agricultural practices recommended for such plantation whenever needed.

At the end of each season (October, 1st.), the following data were recorded for both plants: plant height (cm), stem diameter (cm), number of leaves/plant and aerial parts and roots fresh and dry weights (g). In case of Schefflera, fresh and dry weights of aerial parts individually expressed for leaves and stem (each alone). Moreover, number of branches/plant and leaf area (cm^2) were recorded for Euonymus plants only. In fresh leaf samples taken from the middle parts of both plants in the only second season, photosynthetic pigments (chlorophyll a, b and carotenoids, mg/g F.W.) were determined according to **Moran (1982)**, while in dry samples, the percentages of nitrogen using micro-kjeldahle method (**Jackson, 1973**), phosphorus colorimetrically as described by **Cottenie *et al.* (1982)** and potassium using flamephotometer set (**Jackson, 1973**) were measured.

Data were then tabulated and statistically analyzed according to **SAS Program (1994)** using Duncan's Multiple Range Test (**Duncan, 1955**) to compare among means of the different treatments.

RESULTS AND DISCUSSION

I. Effect of fertilization treatments, media and their interactions on growth and chemical composition of *Brassaia actinophylla*:

a. On vegetative and root growth:

It is obvious from data in Tables (1, 2 and 3) that all fertilization treatments employed in this work caused a marked increment in plant height (cm), stem diameter (cm), No. leaves/plant and fresh and dry weights of leaves, stem and roots (g) with various significant differences in comparison to control treatment in the two seasons, especially the combined treatment between 2g/pot kristalon and yeast

at 5g/L which recorded the utmost high means at all. Also, addition of either loam or FYM to sand at 25% significantly improved all previous parameters, especially the FYM compost that gave the highest averages in both seasons. However, the superiority in the two seasons was due to the interaction treatment between fertilization with 2g/pot kristalon + 5 g/L active dry yeast and planting in the sand amended with 25% FYM, while the inferiority was for the interaction between spraying yeast alone and planting in the pure sand. So, yeast alone slightly improved vegetative and root growth, but collecting between it and either NPK mixture or kristalon clearly improved growth. In addition, using FYM in preparing the growing medium gave better results than using loam.

Stimulation of plant growth due to kristalon and yeast application would be reasonable since different nutrients from kristalon usually activate vital processes, produce essential compounds as carbohydrates, proteins, hormones, enzymes and energy-reserve material (**Broschat, 2006**), while yeast contains proteins, amino acids, ash, glycogen, fats, cellulose and vitamin B, which necessary for healthy growth (**Anonymous, 1994**). Furthermore, farmyard manure has a high manurial value for crop yields (**Drechsel and Reck, 1998**), it may improve soil structure and texture, increase cation exchange capacity and fertility (**Singh, 1999**). Besides, it raises the water holding capacity of the growing mixture and consequently, water uptake by plants which leads finally to activate vital processes to produce more constituents necessary for more growth and high quality (**Gonzalez and Cooperband, 2003**).

These results are in harmony with those detected by **Wazir *et al.* (2004)**, **Cardoso and Romeriz (2006)**, **El-Sayed and El-Shal (2008)** and **Abdel-Fattah *et al.* (2008)** on Schefflera, **Abdel-Wahed *et al.* (2006)** on *Euonymus japonicus* and **El-Sayed *et al.* (2010)** on Spathiphyllum.

Table (1) Effect of media, fertilization treatments and their interactions on some vegetative growth traits of *Brassaia actinophylla* Endl. plants during 2010 and 2011 seasons.

Media / Fertilization treatments	Plant height (cm)				Stem diameter (cm)				No. leaves/plant			
	Sand(S)	S+25%L.	S+25% FYM	Mean	Sand(S)	S+25%L.	S+25% FYM	Mean	Sand(S)	S+25%L.	S+25% FYM	Mean
	First season: 2010											
Control	51.50h	56.03g	60.33f	55.95e	0.96d	1.03d	1.12cd	1.04c	15.00j	19.56i	26.47g	20.34d
NPK at 2g/pot (A)	62.38fe	67.31ed	71.40d	67.03cd	1.09dc	1.18c	1.30bc	1.19b	27.63g	35.83e	42.61dc	35.36b
Krist. at 2g/pot (B)	65.43e	70.00d	75.38c	70.27c	1.23c	1.33b	1.39b	1.32ab	30.00f	39.00d	46.50c	38.50b
Yeast at 5g/L. (C)	58.37g	61.33f	66.00e	61.90d	1.03d	1.12cd	1.30bc	1.15b	23.76h	28.79fg	37.50de	30.02c
A+C	71.29d	75.60c	78.29cb	75.06b	1.31bc	1.42ab	1.46a	1.40a	33.21ef	42.90dc	51.10b	42.40ab
B+C	76.50c	81.65b	87.50a	81.88a	1.42ab	1.47a	1.51a	1.47a	35.10e	46.67c	55.63a	45.80a
Mean	64.25c	68.65b	73.15a		1.17b	1.26ab	1.35a		27.45c	35.46b	43.30a	
	Second season: 2011											
Control	53.68h	55.69g	59.47f	56.28f	0.98d	1.06d	1.10dc	1.05c	17.28i	22.56h	30.00ef	23.28d
NPK at 2g/pot (A)	60.81f	64.81e	69.10d	64.91d	1.10dc	1.20c	1.33b	1.21b	26.96fg	33.80ed	40.22c	33.66bc
Krist. at 2g/pot (B)	64.33e	69.98d	73.65cd	69.32c	1.19c	1.28bc	1.38b	1.28ab	28.41f	36.17d	43.18cb	35.92b
Yeast at 5g/L. (C)	56.97g	61.56f	64.52e	61.02e	1.05d	1.14cd	1.26bc	1.15bc	24.16g	32.50e	41.87c	32.84c
A+C	70.86d	73.87cd	78.00cb	74.24b	1.35b	1.39b	1.39b	1.38a	31.56e	39.46c	46.43b	39.15ab
B+C	75.30c	80.33b	86.37a	80.67a	1.40b	1.43ba	1.55a	1.46a	34.90de	43.50cb	51.60a	43.33a
Mean	63.66c	67.71b	71.85a		1.18b	1.25ab	1.34a		27.21c	34.67b	42.22a	

* L: Loam, FYM: Farmyard manure and Krist: Kristalon (19:19:19+micronutrients).

* Means within a column or row having the same letters are not significantly different according to Duncan's Multiple Range Test (DMRT) at 5% level.

Table (2) Effect of media, fertilization treatments and their interactions on fresh weight of *Brassaia actinophylla* Endl. leaves, stem and roots during 2010 and 2011 seasons.

Media / Fertilization Treatments	Leaves F.W. (g)				Stem F.W. (g)				Roots F.W. (g)			
	Sand(S)	S+25%L.	S+25% FYM	Mean	Sand(S)	S+25%L.	S+25% FYM	Mean	Sand(S)	S+25%L.	S+25% FYM	Mean
	First season: 2010											
Control	35.80k	41.33j	45.46i	40.86f	21.63e	23.76e	25.10d	23.50d	23.50e	26.00d	28.60cd	26.03d
NPK at 2g/pot (A)	64.41f	70.48e	77.56d	70.82d	26.00d	29.00c	32.00b	29.00b	28.27cd	31.16bc	34.33ba	31.25cb
Krist. at 2g/pot (B)	70.00e	78.50d	81.39c	76.63c	27.31dc	30.10bc	34.11ab	30.51b	29.71c	33.67b	38.10a	33.83b
Yeast at 5g/L. (C)	53.31h	59.31g	67.00fe	59.87e	24.50ed	27.83cd	29.70c	27.34c	25.73d	28.30cd	31.00bc	28.34c
A+C	79.47dc	87.56b	89.71b	85.58b	29.90c	31.26b	35.10a	32.09ab	31.50bc	35.00ab	35.00ab	33.83b
B+C	82.90c	91.30ab	96.00a	90.07a	32.08b	35.20a	36.76a	34.68a	34.81ba	38.27a	37.50a	36.86a
Mean	64.32c	71.41b	76.19a		26.90c	29.53b	32.13a		28.92b	32.07ab	34.09a	
	Second season: 2011											
Control	38.59i	42.50h	47.75g	42.95e	22.10e	25.00d	26.38dc	24.49d	25.33e	27.86d	27.36d	26.85e
NPK at 2g/pot (A)	59.31e	65.00d	71.00c	65.10dc	24.96d	26.81dc	29.50c	27.09cb	27.41d	30.00c	33.50b	30.30cd
Krist. at 2g/pot (B)	62.39ed	68.65cd	75.80cb	68.95c	26.43dc	29.45c	33.00ab	29.63b	30.00c	31.68bc	34.81b	32.16c
Yeast at 5g/L. (C)	53.16f	58.50e	63.43ed	58.36d	23.40de	25.33d	27.63cd	25.45c	26.58de	30.00c	31.79bc	29.46d
A+C	69.20c	75.91cb	77.68b	74.26b	29.06c	31.90b	35.10a	32.02ab	32.95b	37.03ab	39.60a	36.53b
B+C	78.85b	84.80ab	87.00a	83.55a	31.78b	34.78a	36.50a	34.35a	36.14ba	39.60a	41.58a	39.11a
Mean	60.25c	65.89b	70.44a		26.29c	28.88b	31.35a		29.74b	32.70ab	34.77a	

* L: Loam, FYM: Farmyard manure and Krist: Kristalon (19:19:19+micronutrients).

* Means within a column or row having the same letters are not significantly different according to Duncan's Multiple Range Test (DMRT) at 5% level.

Table (3) Effect of media, fertilization treatments and their interactions on dry weight of *Brassaia actinophylla* Endl. leaves, stem and roots during 2010 and 2011 seasons.

Media / Fertilization treatments	Leaves D.W. (g)				Stem D.W. (g)				Roots D.W. (g)			
	Sand(S)	S+25%L.	S+25% FYM	Mean	Sand(S)	S+25%L.	S+25% FYM	Mean	Sand(S)	S+25%L.	S+25% FYM	Mean
	First season: 2010											
Control	8.91e	10.28e	11.45de	10.21e	6.87c	7.46c	8.03bc	7.45c	10.58c	11.70c	12.90bc	11.73c
NPK at 2g/pot (A)	13.10cd	14.13c	15.98b	14.40c	7.93cb	8.85b	9.76ab	8.85b	12.73bc	14.03b	15.46ab	14.07b
Krist. at 2g/pot (B)	15.33bc	17.05b	17.90ba	16.76b	8.25bc	9.10ba	10.33a	9.23ab	13.40b	15.20ab	17.21a	15.27a
Yeast at 5g/L. (C)	11.21de	12.47d	14.10c	12.59d	7.35c	8.35b	8.98b	8.23b	11.38c	12.57cb	13.73b	12.56c
A+C	16.38b	17.53ba	18.25ab	17.39b	9.00b	9.41ab	10.61a	9.67a	13.67b	15.19ab	15.23ab	14.70b
B+C	18.10ab	19.76a	20.84a	19.57a	9.71ab	10.67a	11.12a	10.50a	15.61ab	17.21a	16.84a	16.55a
Mean	13.84b	15.20ab	16.42a		8.19b	8.97ab	9.81a		12.80b	14.32ab	15.23a	
	Second season: 2011											
Control	9.50d	10.46d	11.83cd	10.60d	6.79c	7.72bc	8.15b	7.55c	11.26d	12.39cd	12.31cd	11.99c
NPK at 2g/pot (A)	12.78c	14.00bc	15.30b	14.03cb	7.50cb	8.03bc	8.90ab	8.14b	12.15dc	13.30c	14.86ba	13.44bc
Krist. at 2g/pot (B)	13.64bc	15.10b	16.53ab	15.09b	7.98bc	8.91ab	10.00a	8.96ab	13.00c	14.00b	15.10ba	14.03b
Yeast at 5g/L. (C)	11.00dc	12.16c	13.15cb	12.10c	7.10c	7.69bc	8.40b	7.70bc	11.96dc	14.67b	14.36b	13.66b
A+C	15.21b	16.33ba	17.06a	16.20ab	8.76b	9.58ab	10.60a	9.65a	14.50b	16.30ab	17.40a	16.07a
B+C	17.16a	18.13a	18.79a	18.03a	9.48ab	10.40a	10.97a	10.28a	15.82ba	17.35a	18.21a	17.13a
Mean	13.22c	14.36ab	15.44a		7.94b	8.72ab	9.50a		13.12b	14.67ab	15.37a	

* L: Loam, FYM: Farmyard manure and Krist: Kristalon (19:19:19+micronutrients).

* Means within a column or row having the same letters are not significantly different according to Duncan's Multiple Range Test (DMRT) at 5% level.

b. On chemical composition:

As shown in Table (4), it is clear that the content of chlorophyll a, b and carotenoids (mg/g F.W.), as well as the percentages of N, P and K in the leaves were markedly increased as a result of dressing with either fertilization treatments used in such trial. Combining between yeast (at 5g/L) and either NPK mixture or kristalon (at 2g/pot) induced an additional increment in the above mentioned constituents, but the mastery was for the combination of 2 g kristalon/pot + 5 g yeast/L which registered the highest values at all. This may indicate the synergistic effect of both kristalon and yeast to lump their benefits for supplying the plants luxuriously with some nutrients and vital components that accelerate biosynthesis rate and lead finally to accumulation of more constituents in plant organs.

Applying either loam or FYM at 25% to the sand pronouncedly increased the content of various active constituents in the leaves of treated plants, especially FYM which scored better means than loam. This may explain the role of FYM in improving soil fertility and cation exchange capacity which lead to supplying the plants with more nutrients (**Singh, 1990**).

As for interaction treatments, data revealed that fertilizing with kristalon (2g/pot) + yeast (5g/L) and planting in sand strengthened with 25% FYM was the best interaction treatment compared to all other ones, as it gave the highest content of the different constituents. On the same line, were those results of **Abdel-Fattah *et al.* (2008)** on *Brassaia actinophylla*, **Al-Sayed *et al.* (2009)** on *Nephrolepis exaltata* and **El-Sayed *et al.* (2010)** on *Vinca rosea* cv. Major.

II. Effect of fertilization treatments, media and their interactions on growth and chemical composition of *Euonymus japonicus*:

a. On vegetative and root growth:

Similar observations to those of Schefflera plant were also noticed in case of Euonymus one, as all vegetative and root growth traits (expressed as: plant height (cm), stem diameter (cm), No. branches and leaves/plant, leaf area (cm^2) and fresh and dry weights (g) of aerial parts and roots) were also increased in response to the different fertilization and medium treatments applied in this investigation (Tables, 5 and 6). The best fertilization treatment was a combination of 2g/pot kristalon + 5g/L active dry yeast, while the best medium was a mixture of sand +

25%FYM, as these two treatments recorded the utmost high means in both seasons comparing with control and other individual treatments. However, the prevalence in the two seasons was found due to dressing with kristalon (2g/pot) + yeast (5g/L) and planting in sand fortified with 25% FYM, as this interaction treatment scored the highest values in most cases of both seasons. The rank of improvement due to active dry yeast alone was less than using it with either NPK mixture or kristalon, but the latter (kristalon) gave when used individually or in combination with yeast better results than using NPK mixture alone or in combination. Also, addition of FYM compost gave better records than loam.

These findings could be interpreted and discussed as done before in case of vegetative and root growth of Schefflera plant. Moreover, they are in accordance with those findings attained by **Marfa *et al.* (2002)** and **Abdel-Wahed *et al.* (2006)** on *Euonymus japonicus*.

b. On chemical composition:

According to data presented in Table (7), it could be concluded that application of either NPK mixture or kristalon, individually or in compination with yeast induced a marked augmentation in the leaf content of chlorophyll a, b and carotenoids (mg/g F.W.), as well as the percentages of N, P and K, while yeast alone caused a slight increment. Similarly, addition of either loam or FYM to sand helped in rising content of the different aforestated constituents, especially FYM that recorded higher contents than loam. In general, the dominance was ascribed to the interaction between 2g/pot kristalon + 5 g/L active dry yeast fertilization treatment and cultivating in the mixture of sand+25% FYM compost, which gave the highest contents compared to control and all other treatments.

These results may be discussed and interpreted as those attained in case of chemical composition of Schefflera plant as previously mentioned. Furthermore, they are coincidence with the results postulated by **Gad (2003)** on *Ficus benjamina,* **Desouky (2004)** on *Strelitzia reginae*, **Shahin *et al.* (2007)** on *Agave Americana* cv. Marginata and **El-Sayed *et al.* (2010)** on *Vinca rosea* cv. Major.

Briefly, to obtain the best growth and highest quality from commercial point of view, it is recommended to fertilize both Schefflera and Euonymus plants with kristalon (2g/pot as a soil drench) + active dry yeast (5g/L as foliar spray), six times with one month interval during growing season proved planting them in a mixture of sand + 25% farmyard manure compost.

Table (4) Effect of media, fertilization treatments and their interactions on some chemical composition of *Brassaia actinophylla* Endl. leaves during 2011 season.

Media / Fertilization treatments	Chlorophyll a (mg/g F.W.)				Chlorophyll b (mg/g F.W.)				Carotenoids (mg/g F.W.)			
	Sand(S)	S+25%L.	S+25% FYM	Mean	Sand(S)	S+25%L.	S+25% FYM	Mean	Sand(S)	S+25%L.	S+25% FYM	Mean
Control	0.931	1.013	1.095	1.013	0.413	0.446	0.478	0.446	0.518	0.573	0.593	0.561
NPK at 2g/pot (A)	1.063	1.141	1.170	1.125	0.486	0.521	0.539	0.515	0.469	0.539	0.630	0.546
Krist. at 2g/pot (B)	1.120	1.165	1.213	1.166	0.511	0.558	0.607	0.559	0.587	0.646	0.658	0.630
Yeast at 5g/L. (C)	0.979	1.067	1.101	1.049	0.495	0.509	0.531	0.512	0.541	0.595	0.648	0.595
A+C	1.133	1.221	1.185	1.180	0.563	0.591	0.634	0.596	0.601	0.661	0.689	0.650
B+C	1.172	1.239	1.250	1.220	0.576	0.610	0.631	0.606	0.716	0.736	0.733	0.728
Mean	1.066	1.141	1.169		0.507	0.539	0.570		0.572	0.625	0.659	
Media / Fertilization treatments	N (%)				P (%)				K (%)			
	Sand(S)	S+25%L.	S+25% FYM	Mean	Sand(S)	S+25%L.	S+25% FYM	Mean	Sand(S)	S+25%L.	S+25% FYM	Mean
Control	1.36	1.53	1.73	1.54	0.503	0.541	0.584	0.543	0.918	0.992	1.071	0.994
NPK at 2g/pot (A)	1.48	1.71	1.92	1.70	0.517	0.552	0.599	0.556	1.290	1.301	1.407	1.333
Krist. at 2g/pot (B)	2.13	2.26	2.48	2.29	0.721	0.756	0.786	0.754	1.341	1.409	1.483	1.411
Yeast at 5g/L. (C)	1.43	1.78	1.92	1.71	0.511	0.558	0.603	0.557	1.170	1.270	1.401	1.280
A+C	2.39	2.51	2.60	2.50	0.769	0.756	0.810	0.778	1.519	1.536	1.547	1.534
B+C	2.51	2.65	2.74	2.63	0.818	0.809	0.876	0.834	1.613	1.631	1.642	1.629
Mean	1.88	2.07	2.23		0.640	0.662	0.710		1.309	1.357	1.425	

* L: Loam, FYM: Farmyard manure and Krist: Kristalon (19:19:19+micronutrients).

Table (5): Effect of media, fertilization treatments and their interactions on some vegetative growth traits of *Euonymus japonicus* Thunb. cv. Aureus plants during 2010 and 2011 seasons.

Media / Fertilization treatments	Plant height (cm)				Stem diameter (cm)				No. branches/plant				No. leaves/plant				Leaf area (cm^2)			
	Sand (S)	S+ 25%L.	S+ 25% FYM	Mean	Sand (S)	S+ 25%L.	S+ 25% FYM	Mean	Sand (S)	S+ 25%L.	S+ 25% FYM	Mean	Sand (S)	S+ 25%L.	S+ 25% FYM	Mean	Sand (S)	S+ 25%L.	S+ 25% FYM	Mean
	First season: 2010																			
Control	21.33d	22.67d	24.52dc	22.84c	0.51c	0.56c	0.61cb	0.56c	3.00e	3.33ed	4.17dc	3.50c	41.00e	43.36ed	45.46d	43.27d	5.83c	5.98c	6.50bc	6.10d
NPK at 2g/pot (A)	25.80cd	26.18c	27.00bc	26.33b	0.60cb	0.67bc	0.71b	0.66b	3.00e	4.00d	4.00d	3.67c	48.67cd	51.10c	53.70cb	51.16b	6.25cb	6.79bc	7.10b	6.71c
Krist. at 2g/pot (B)	26.35c	28.47b	29.31ab	28.04ab	0.73b	0.73b	0.82ab	0.76ab	4.00d	4.78c	5.00c	4.59b	52.31c	55.78b	58.81ab	55.63a	6.97bc	7.33b	8.16a	7.49b
Yeast at 5g/L. (C)	23.65d	25.60cd	27.23bc	25.49b	0.59c	0.65bc	0.70b	0.65b	3.00e	3.87de	4.28cd	3.72c	43.50ed	47.15dc	49.50c	46.72c	6.00c	6.31cb	6.80bc	6.37c
A+C	27.46bc	29.33ab	30.51a	29.10a	0.81ab	0.83ab	0.91a	0.85a	4.67c	5.00c	6.00b	5.22a	55.00b	57.24ab	60.13a	57.46a	7.28b	8.00a	7.93ab	7.74b
B+C	28.33b	30.25a	31.37a	29.28a	0.87ab	0.86b	0.96a	0.90a	4.98c	5.33cb	7.29a	5.87a	56.33b	59.37a	61.33a	59.01a	7.90ab	8.41a	8.57a	8.29a
Mean	25.49b	27.08ab	28.32a		0.69b	0.72b	0.79a		3.78b	4.39ab	5.12a		49.47b	52.33ab	54.82a		6.71b	7.14ab	7.51a	
	Second season: 2011																			
Control	20.56e	22.41de	25.16c	22.71c	0.57c	0.58c	0.63c	0.59c	3.00d	3.00d	3.76c	3.25c	38.27e	41.60ed	42.78de	40.88d	5.21d	5.67cd	6.23c	5.70d
NPK at 2g/pot (A)	23.35d	25.61c	26.73bc	25.23b	0.63c	0.69bc	0.72b	0.68bc	3.00d	3.58cd	3.93c	3.50bc	50.83c	54.00b	56.23ab	53.69b	6.18c	6.70cb	7.24b	6.71c
Krist. at 2g/pot (B)	25.40c	27.83b	29.48ab	27.57ab	0.76b	0.74b	0.80b	0.77b	3.25dc	3.54cd	4.38cb	3.72b	50.69c	55.73ba	57.50ab	54.64ab	7.03bc	7.46b	7.83ab	7.44b
Yeast at 5g/L. (C)	22.73d	24.86cd	27.03b	24.87cb	0.63c	0.67cb	0.72b	0.67cb	3.10dc	3.79c	4.16cb	3.68b	43.18de	45.29d	46.00d	44.82c	6.12c	6.68cb	6.91bc	6.57c
A+C	26.30cb	28.67ab	29.50a	28.16ab	0.84ab	0.88a	0.93a	0.88a	4.27cb	5.00b	5.63ab	4.97a	55.43ba	58.32a	59.17a	57.64a	6.87cb	7.38b	8.00a	7.42b
B+C	28.00b	31.10a	31.00a	30.03a	0.86ab	0.91a	0.95a	0.91a	4.51bc	4.92b	6.41a	5.28a	58.36a	60.48a	61.00a	59.95a	8.03a	7.79ab	8.43a	8.08a
Mean	24.39b	26.75ab	28.15a		0.72b	0.75ab	0.79a		3.52b	3.97ab	4.71a		49.46b	52.57ab	53.78a		6.57b	6.95ab	7.44a	

* L: Loam, FYM: Farmyard manure and Krist: Kristalon (19:19:19+micronutrients).

* Means within a column or row having the same letters are not significantly different according to Duncan's Multiple Range Test (DMRT) at 5% level.

Table (6): Effect of media, fertilization treatments and their interactions on some chemical composition of *Euonymus japonicus* Thunb. cv. Aureus plants during 2010 and 2011 seasons.

Media / Fertilization treatments	Aerial parts F.W. (g)				Aerial parts D.W. (g)				Roots F.W. (g)				Roots D.W. (g)			
	Sand (S)	S+ 25%L.	S+ 25% FYM	Mean	Sand (S)	S+ 25%L.	S+ 25% FYM	Mean	Sand (S)	S+ 25%L.	S+ 25% FYM	Mean	Sand (S)	S+ 25%L.	S+ 25% FYM	Mean
	First season: 2010															
Control	9.91e	10.70de	12.33dc	10.98d	4.48c	4.86c	5.58bc	4.97c	2.96c	3.20cb	3.50bc	3.22d	1.42c	1.53cb	1.70bc	1.55c
NPK at 2g/pot (A)	11.08de	12.00d	13.47c	12.18b	4.96c	5.42cb	6.12b	5.50b	3.78bc	4.09b	4.18ba	4.02b	1.67bc	1.81b	1.85b	1.78cb
Krist. at 2g/pot (B)	12.64cd	13.72c	15.00b	13.79b	5.10cb	5.56bc	5.96b	5.54b	3.90b	4.21ba	4.50ab	4.20b	2.10b	2.25ba	2.42ab	2.26b
Yeast at 5g/L. (C)	10.50ed	11.34d	12.46cd	11.43c	4.50c	4.93c	5.67b	5.03bc	3.47cb	3.76bc	3.93b	3.72c	1.56cb	1.70bc	1.78b	1.68c
A+C	15.26b	16.50ab	17.30a	16.35ab	6.39ba	6.91a	7.28a	6.86a	4.33ba	4.80ab	5.00a	4.71ab	2.21ba	2.47ab	2.57a	2.42ab
B+C	16.34ab	17.81a	18.67a	17.61a	6.47ab	7.09a	7.41a	6.99a	5.12a	5.33a	5.38a	5.28a	2.63a	2.74a	2.80a	2.72a
Mean	12.62c	13.68b	14.87a		5.32b	5.80b	6.34a		3.93b	4.23ab	4.42a		1.93b	2.08ab	2.19a	
	Second season: 2011															
Control	11.00d	11.93cd	13.00c	11.98d	4.63c	5.03b	5.50ba	5.05c	3.20c	3.46cb	3.70bc	3.45d	1.58c	1.71bc	1.83b	1.71c
NPK at 2g/pot (A)	11.58cd	12.85c	14.00b	12.81c	4.99b	5.55ba	6.05ba	5.53b	3.89bc	4.18b	4.36ba	4.14cd	1.73bc	1.86b	1.95b	1.85b
Krist. at 2g/pot (B)	13.50bc	14.61b	15.78ab	14.63bc	5.34b	5.79ba	6.25ab	5.79b	4.17b	4.50ba	4.78ba	4.48c	2.25ba	2.46ab	2.62ab	2.44ab
Yeast at 5g/L. (C)	11.36dc	12.28cd	13.30cb	12.31c	4.68c	5.10b	5.58ba	5.12bc	3.56cb	3.80bc	4.00b	3.79d	1.62cb	1.75b	1.86b	1.74bc
A+C	14.33b	15.42ab	16.63a	15.46b	5.91ba	6.37a	6.90a	6.39a	4.81ba	5.10ba	5.43ab	5.11b	2.30ba	2.48ab	2.70a	2.49ab
B+C	17.07a	16.70a	18.10a	17.29a	6.50a	6.39a	6.92a	6.60a	5.76a	5.97a	5.88a	5.87a	2.71a	2.80a	2.89a	2.80a
Mean	13.14b	13.97b	15.14a		5.34b	5.71b	6.20a		4.23b	4.50ab	4.69a		2.03b	2.18ab	2.31a	

* L: Loam, FYM: Farmyard manure and Krist: Kristalon (19:19:19+micronutrients).

* Means within a column or row having the same letters are not significantly different according to Duncan's Multiple Range Test (DMRT) at 5% level.

Table (7) Effect of media, fertilization treatments and their interactions on some chemical constituents in the aerial parts of *Euonymus japonicus* Thunb. cv. Aureus plants during 2011 season.

Media / Fertilization treatments	Chlorophyll a (mg/g F.W.)				Chlorophyll b (mg/g F.W.)				Carotenoids (mg/g F.W.)			
	Sand(S)	S+25%L.	S+25% FYM	Mean	Sand(S)	S+25%L.	S+25% FYM	Mean	Sand(S)	S+25%L.	S+25% FYM	Mean
Control	0.432	0.467	0.514	0.471	0.317	0.343	0.371	0.344	0.245	0.270	0.292	0.269
NPK at 2g/pot (A)	0.461	0.506	0.539	0.502	0.338	0.365	0.396	0.366	0.274	0.296	0.315	0.295
Krist. at 2g/pot (B)	0.503	0.551	0.612	0.555	0.350	0.379	0.417	0.382	0.281	0.310	0.341	0.311
Yeast at 5g/L. (C)	0.450	0.493	0.540	0.494	0.326	0.352	0.387	0.355	0.263	0.284	0.310	0.286
A+C	0.558	0.603	0.629	0.597	0.351	0.381	0.430	0.387	0.300	0.326	0.350	0.325
B+C	0.601	0.648	0.671	0.640	0.378	0.411	0.453	0.414	0.335	0.361	0.378	0.358
Mean	0.501	0.545	0.584		0.343	0.372	0.409		0.283	0.308	0.331	
Media / Fertilization treatments	N (%)				P (%)				K (%)			
	Sand(S)	S+25%L.	S+25% FYM	Mean	Sand(S)	S+25%L.	S+25% FYM	Mean	Sand(S)	S+25%L.	S+25% FYM	Mean
Control	1.03	1.18	1.33	1.21	0.37	0.43	0.48	0.43	1.18	1.33	1.60	1.37
NPK at 2g/pot (A)	1.32	1.50	1.56	1.46	0.43	0.52	0.56	0.50	1.30	1.42	1.68	1.47
Krist. at 2g/pot (B)	1.46	1.63	1.69	1.59	0.56	0.67	0.79	0.67	1.61	1.66	2.01	1.76
Yeast at 5g/L. (C)	1.15	1.30	1.38	1.28	0.39	0.43	0.53	0.45	1.50	1.50	1.80	1.60
A+C	1.68	1.78	1.91	1.79	0.59	0.51	0.81	0.64	1.67	1.89	2.10	1.89
B+C	1.90	2.03	2.13	2.02	0.61	0.56	0.86	0.68	1.79	1.90	2.17	1.95
Mean	1.42	1.57	1.67		0.49	0.52	0.67		1.51	1.62	1.89	

* L: Loam, FYM: Farmyard manure and Krist: Kristalon (19:19:19+micronutrients).

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تأثير بعض البيئات و معاملات التسميد على نمو و جودة بعض نباتات الأصص الورقية

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أجريت تجربتا أصص منفصلتين داخل احدى الصوبات الزجاجية بمشتل فرع بحوث حدائق أنطونيادس، معهد بحوث البساتين، الأسكندرية، مصر خلال موسمي ٢٠١٠ و ٢٠١١ و ذلك لدراسة تأثير التسميد بمخلوط الـ NPK (١:١:٢) و الكريستالون (١٩:١٩:١٩ + عناصر صغرى)، كلٍ منهما بمعدل ٢ جم/إصيص كإضافة أرضية، الرش الورقي بالخميرة الجافة النشطة بمعدل ٥ جم/لتر، و التوليفتين المكونتين من مخلوط الـ NPK (٢ جم/إصيص) + الخميرة (٥ جم/لتر) و الكريستالون (٢ جم/إصيص) + الخميرة (٥ جم/لتر)، عند اضافتها (٦) مرات بفاصل زمني شهر بين كل مرتين متتاليتين خلال موسم النشاط على النمو و التركيب الكيماوي لشتلات الشفليرا (*Brassaia actinophylla*, Endl.) و الأيونيموس (*Euonymus japonicus* Thunb cv. Aureus) عمر ستة أشهر و المنزرعة في أصص بلاستيك قطرها ٢٠ سم مملوءة بحوالي ٢,٥ كجم من أحد البيئات التالية: الرمل فقط أو الرمل المدعم بـ ٢٥% من الطمي او كومبوست مخلفات المزرعة. كما تم دراسة تأثير التفاعلات المشتركة بين معاملات التسميد و البيئات المستخدمة.

و لقد أوضحت النتائج المتحصل عليها أن جميع معاملات التسميد أحدثت تحسناً معنوياً في النمو الخضري و الجذري للنباتين موضع الدراسة مقارنة بالكنترول، خاصة التوليفة المكونة من الكريستالون (بمعدل ٢ جم/إصيص) و الخميرة (بمعدل ٥ جم/لتر). كما أحدثت إضافة الطمي أو كومبوست مخلفات المزرعة لبيئة الزراعة تحسناً ملحوظاً في جميع قياسات النمو الخضري و الجذري، خاصة كومبوست مخلفات المزرعة، الذي أعطى نتائج أفضل من الطمي. على الجانب الآخر، فإن أقل مستوى للتحسن في النمو الخضري و الجذري نتج عن الرش بالخميرة فقط (بمعدل ٥ جم/لتر). و لقد تم الحصول على نتائج مشابهة فيما يتعلق بمحتوى الأوراق من كلوروفيللي أ، ب، الكاروتينويدات، النيتروجين، الفوسفور و البوتاسيوم. إلا أن السيادة في جميع قياسات النمو الخضري و الجذري، و كذلك محتوى الأوراق من المكونات سالفة الذكر في كلا النباتين كانت للمعاملة المشتركة بين التسميد بالكريستالون (٢ جم/إصيص) + الرش بالخميرة (٥ جم/لتر) و الزراعة في مخلوط الرمل + كمبوست مخلفات المزرعة (٢٥%)، و التي أعطت بصفة عامة أعلى المتوسطات مقارنة بالكنترول و جميع المعاملات الأخرى.

و عليه، يمكن التوصية بزراعة الشتلات عمر ستة أشهر لنباتي الشفليرا (*Brassaia actinophylla*, Endl.) و الأيونيموس (*Euonymus japonicus* Thunb cv. Aureus) في مخلوط الرمل + كومبوست مخلفات المزرعة (بنسبة ٢٥%) مع التسميد بتوليفة من الكريستالون (بمعدل ٢ جم/إصيص) و الرش بمحلول الخميرة (بمعدل ٥ جم/لتر)، ست مرات و بفاصل شهر بين كل مرتين متتاليتين خلال موسم النشاط للحصول على أفضل نمو و أعلى جودة.