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EFFET OF GROWING MEDIA AND HUMIC ACID ON SCHEFFLERA QUAILTY (*Brassaia actinophylla*).

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ABSTRACT

A greenhouse trial was conducted at Horticulture Research Institute, Giza Egypt during 2005 and 2006 seasons to study the separate and the combined effects of different growing media [peatmoss, peat+sand (1:1 by volume) and peat+ sand + clay (1:1:1 by volume)] with the commercial liquid organic fertilizer containing humic acid (actosol®) at four levels [0, 5.0 cm^3/L as foliage spray, 10.0 cm^3/L as soil drench and 5.0 cm^3/L spray + 10.0 cm^3/L as drench] on growth and chemical composition of Schefflera (*Brassaia actinophylla*).

The results showed that the peatmoss was superior than the other media in plant height, number of leaves/plant, stem diameter, fresh and, dry weights of foliage and roots as well as leaves content of N, P, K, Zn, Fe and Mn.

Humic acid treatments revealed significant effect on plant parameter, which reached its maximum due to the use of (actosol®) humic acid as foliage spray plus soil drench.

It could be recommended to use the peatmoss medium and fertilize the plants every two weeks with humic acid [actosol®] at the rate of 5.0cm^3/L foliage spray+ 10.0 cm^3/L soil drench, to obtain high quality plants.

Keywords: Humic acid, peatmoss, sand, clay and *Brassaia actinophylla*.

INTRODUCTION

Schefflera [*Brassaia actinophylla*] Fam. Araliaceae is an evergreen shrubs has umbrella foliage, native to Australia. It is widely used for decoration as indoor plant, as well as it can be used in gardening and landscape design (Bailey 1978).

Growing medium is one of the most important factors affecting the growth and production of indoor plants, as it greatly affects providing plants with water, nutrition and aeration. Various kinds of media were studied by several investigators. Media containing peat, were proposed as favorable media for Schefflera, as reported by Gad (2003), and Badawy *et al* (1994)for *Philodendron erubescens*, and for *Chlorophytum comosum* as reported by Ali (1991) and Abou Dahab (1992).

Meanwhile EL-Ashry *et al* (1997) found that the potting mixture of peat + loam + coarse sand (1:1:2 by volume) gave the best growth [expressed in plant height, number of leaves, stolons number and plant length] of *Chlorophytum comosum*.

Stevenson (1994) showed that humic substances isolated from different materials contained 45-65% carbon, 30-48% oxygen, 2-6% nitrogen, and about 5% hydrogen. Humic substances (HS) are an extremely important soil component because they constitute a stable fraction of carbon (C), thus regulating the carbon cycle and release of nutrients, including nitrogen (N), phosphorus (P), and sulphur (S). Additionally, the presence of HS improves water-holding capacity, pH buffering and thermal insulation. Liu *et al.,* (1998)

on creeping bentgrass (*Agrostis stolonifera*), reported that, HA at 400 mg/litre significantly increased net photosynthesis on all four observation dates. Chlorophyll content was unaffected by HA rate at each observation date. HA increased tissue content of Mg, Mn and S and decreased those of Ca, Cu and N. Cooper *et al.,* (1998) also on creeping bentgrass indicated that, humate incorporated to a depth of 10 cm in sand culture gave a 45% increase in root mass at the 0 to 10 cm depth and a 38% increase in root mass at the 10 to 20 cm depth compared with the control.

The present study was carried out to detect the response of Schefflera [*Brassaia actinophylla*] to different media mixtures either used alone or in combination with the liquid organic fertilizer containing humic acid (micronutrients actosol®).

MATERIALS AND METHODS

This work was carried out under the greenhouse condition at Horticulture Research Institute, Giza, Egypt during 2005 and 2006 seasons. It intended to study the independent and the combined effects of different growing media and organic liquid fertilizer levels on growth and chemical constituents of Schefflera [*Brassaia actinophylla*].

Four month old Schefflera [*Brassaia actinophylla*] transplants with average height of 20-22 cm were planted in 20 cm plastic pots (one plant/pot) filled with the tested media, on March 1st for both seasons.

Media treatments were the following: peat, peat/sand (1:1 by volume) and peat/sand/clay (1:1:1 by volume).

Commericial liquid organic fertilizer (micronutrients actosol®) which contains 2.9% humic acid plus 0.5% from each of Fe, Zn, Mn and Cu was applied at four treatments: 0.0, 5.0cm^3/L as foliage spray; 10.0cm^3/L as soil drench (50cm^3/pot) and 5.0cm^3/L as foliage spray + 10.0cm^3/L. The organic fertilizer was applied biweekly from March 15th to October 15th.

Factorial experimental type in complete randomized design was carried out during two successive seasons. 15 plants were planted in every treatment and replicated three times (5 plants in each replicate).

Regular agricultural practices such as weeding, watering…..etc., were carried out whenever necessary.

Physical and chemical analysis of the used soils are presented in Table (a) while chemical analysis of the used peatmoss is shown in Table (b)

At the end of the experiments (November 1st) in both seasons the following data were recorded: Plant height (cm), stem diameter (cm), number of leaves/plant, fresh and dry weight of leaves, stem and roots (gm). Chlorophyll a, b and carotenoids in the fresh matter (mg/g f.w.) were determined according to Saric *et al* (1976). The nitrogen percentage was determined by the usual Kjeldahl method according to A.O.A.C., (1980). Phosphorus percentage was determined according to the method adapted by Hucker and Catroux (1980). However, potassium percentage was determined by using flame photometer according to the method described by Cottenie *et al.,* (1982). The contents of Zn, Fe and Mn were determined by using operation chart of Shimadzu Atomic absorption and recorded readout.

Analysis of variance of the data was carried out according to Snedecor and Cohran (1980) and means between treatments were compared by L.S.D method.

Table (a): Physical and chemical analysis of the used soil in the two seasons.

Soil type	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^{--}
Clay	7.46	16.75	34.53	40.89	41.76	2.18	8.33	16.93	9.33	20.44	0.37	3.82	1.46	41.79
Sandy	18.72	71.28	4.76	5.34	21.83	1.58	8.20	2.65	2.48	21.87	0.78	3.85	13.00	10.93

Table (b): Chemical analysis of the used peatmoss in the two seasons.

Organic matter	90-95%	Water relation capacity	60-75%	K	1.77 %
Ash	5-10%	Salinity	0.3 g/L	Fe	421 ppm
Density (Vol. Dry)	80-90 Mg/L.	N	1.09%	Mn	27 ppm
pH value	3.4	P	0.23 %	Zn	41 ppm

RESULTS AND DISCUSSION

I- Effect of growing media and Humic acid on plant height, stem diameter and number of leaves/plant of *Brassaia actinophylla*:-

Data of growth characters of *Brassaia actinophylla* plants as affected by different growing media and humic acid, are shown in Table(1). It appears from data that plants grown in peatmoss medium produced the highest significant values of plant height, stem diameter and number of leaves per plants for both seasons, comparing to the used other two media. Such results agree with the findings of Gad (2003) on Schefflera and Badawy *et al* (1994) on *Chlorophytum comosum.*

Table(1). Effect of growing media and humic acid on plant height (cm), stem diameter (cm) and number of leaves/plant of *Brassaia actinophylla* during 2005 and 2006 seasons.

First season 2005

Actosol® Ferti-rate	Plant height (cm)				Stem diameter (cm)				Number of leaves/plant			
	P	P+S	P+S+C	Mean	P	P+S	P+S+C	Mean	P	P+S	P+S+C	Mean
Control	55.58	41.86	40.07	45.84	1.05	0.78	0.65	0.83	12.58	11.33	9.25	11.06
5cm³/L spray	61.83	43.50	41.42	48.92	1.11	0.80	0.69	0.87	15.08	11.75	9.92	12.25
10cm³/L drench	58.50	43.04	40.79	47.44	1.08	0.71	0.65	0.81	14.50	11.00	9.58	11.69
Spray+drench	65.25	46.96	42.50	51.57	1.50	0.81	0.79	0.92	18.50	13.75	10.25	14.17
Mean	60.29	43.84	41.20	-------	1.19	0.78	0.70	-------	15.17	11.96	9.75	-------
LSD at 5%	A= 2.045 B=2.361 AB= 4.090				A=0.027 B=0.031 AB= 0.053				A= 1.160 B=1.339 AB= 2.319			

Second season 2006

Actosol® Ferti-rate	Plant height (cm)				Stem diameter (cm)				Number of leaves/plant			
	P	P+S	P+S+C	Mean	P	P+S	P+S+C	Mean	P	P+S	P+S+C	Mean
Control	57.35	43.62	42.34	47.77	1.08	0.81	0.70	0.86	14.63	13.45	10.75	12.75
5cm³/L spray	64.57	46.20	44.68	51.82	1.16	0.85	0.74	0.92	18.12	14.60	11.33	14.68
10cm³/L drench	60.20	44.61	42.39	49.07	1.10	0.79	0.69	0.86	16.33	13.81	10.65	13.60
Spray+drench	68.94	49.10	46.07	54.70	1.60	0.90	0.86	1.12	23.75	16.90	13.80	18.15
Mean	62.77	45.88	43.87	-------	1.24	0.84	0.75	------	18.21	14.69	11.63	-------
LSD at 5%	A= 1.36 B= 1.57 AB= 2.73				A= 0.02 B= 0.03 AB= 0.04				A= 1.02 B= 1.17 AB= 2.03			

P: peat P+S: peat+sand P+S+C: peat+sand+clay

A= growing media B= fertilization AB= interaction

The obtained data also revealed the favorable effect of humic acid treatments for increasing plant height, stem diameter and number of leaves per plant. Such increaments reached maximum due to the use of humic acid as foliar spry + soil drench. In this regard Atef *et al* (2005) concluded that the use of actosol® on leconte pear and camino apricot trees gave the highest vegetative growth parameters. The same trend was recorded on apple trees by Guo *et al* (2000).

Concerning the interaction, the highest significant estimations of plant height, stem diameter and number of leaves/plant were obtained from plants grown in peatmoss medium and treated with humic acid as foliar spray + soil drench, as recorded 65.25cm, 1.50cm, 18.50 leaves/plant and 68.49cm, 1.60cm, 23.75 leaves/plant for the first and second seasons, respectively.

II- Effect of growing media and Humic acid on fresh weight of leaves, stem and roots/plant of *Brassaia actinophylla*:-

The data in Table (2) indicated that, the heaviest fresh weight of leaves (74.05 and 76.23 gm respectively) was recorded for the plants grown in peatmoss and peatmoss + sand compared with peatmoss +sand + clay which gave 37.42 gm. On the other hand, maximum increase of fresh weight of stem and roots was obtained from plants grown in peat, which gave 37.97 and 46.61 gm, respectively. This result was in accordance with the result of Ali (1991) and Abou Dahab (1992) on *Chlorophytum comosum*.

Table (2). Effect of growing media and humic acid on fresh weight of leaves, stem and roots (g) of *Brassaia actinophylla* , during 2005 and 2006 seasons.

First season 2005

Actosol® Ferti-rate	Fresh weight of leaves				Fresh weight of stem				Fresh weight of roots			
	P	P+S	P+S+C	Mean	P	P+S	P+S+C	Mean	P	P+S	P+S+C	Mean
Control	37.38	24.45	15.23	25.69	24.32	13.90	10.24	16.15	31.11	21.63	11.09	21.28
5cm³/L spray	78.93	39.07	21.14	46.38	35.55	21.01	12.62	23.06	44.64	31.04	13.07	29.58
10cm³/L drench	72.09	38.73	16.04	42.29	32.58	17.80	10.62	20.33	44.48	30.17	12.18	28.94
Spray + drench	107.79	47.43	26.00	60.41	59.41	31.54	21.03	37.33	66.22	32.74	13.65	37.54
Mean	74.05	37.43	19.60	-------	37.97	21.06	13.63	------	46.61	28.90	12.50	------
LSD at 5%	A= 5.441 B= 6.283 B=10.883				A=4.364 B= 5.039 AB=8.727				A=2.362 B=2.728 AB= 4.725			

Second season 2006

Actosol® Ferti-rate	Fresh weight of leaves				Fresh weight of stem				Fresh weight of roots			
	P	P+S	P+S+C	Mean	P	P+S	P+S+C	Mean	P	P+S	P+S+C	Mean
Control	38.19	26.91	18.23	27.78	26.14	15.08	12.72	17.98	33.41	24.08	12.82	21.28
5cm³/L spray	80.24	42.13	24.06	48.81	37.26	24.61	15.31	25.72	46.70	34.65	15.43	29.58
10cm³/L drench	75.66	39.21	19.39	44.75	33.19	20.33	13.16	20.33	45.36	32.28	14.00	28.94
Spray+drench	110.82	50.18	29.21	63.40	63.57	34.87	25.82	37.33	70.19	36.58	17.93	37.54
Mean	76.23	39.61	22.72	-------	40.04	23.72	16.75	-------	46.61	28.90	12.50	-------
LSD at 5%	A= 2.11 B= 2.44 AB= 4.22				A= 2.50 B= 2.89 AB= 5.00				A= 2.20 B= 2.54 AB= 4.40			

P: peat **P+S: peat+sand** **P+S+C: peat+sand+clay**
A= growing media **B= fertilization** **AB= interaction**

Concerning the effect of Humic acid, the results showed that the highest significant increases in fresh weight of leaves, stem and roots were obtained when plants were treated by foliar spray + soil drench which reached 60.41, 37.33 and 13.65 gm, respectively. This result was in accordance with that of Eissa (2003) on plum.

Regarding the interaction between the media and humic acid, the results indicated that, the heaviest fresh weight of leaves (107.79 gm), stem(59.41gm) and roots (66.22 gm) was recorded from plants planted in peat and treated with foliar spray + soil drench, compared with the lowest value which was recorded from plants grown in peat+ sand+ clay without humic acid (15.23, 10.24 and 11.09 gm).

In the second season, the effect of media was almost similar to that observed in the first season, except for peat medium which showed to be more favourable effect on fresh weight of leaves. On the other side, the effect of media, humic acid and interaction between them was similar to that observed in the first season.

III- Effect of growing media and Humic acid on dry weight of leaves, stem and roots/plant of *Brassaia actinophylla*:-

The results presented in Table (3) show the effect of media and humic acid on the dry weight in the leaves, stem and roots.

The data indicated that, using peat gave the heaviest values of 17.64, 15.12 and 19.21 gm of dry weight of leaves, stem and roots, respectively. Whereas the least dry weight of leaves (6.84 gm), stem (7.36 gm) and roots (4.49 gm) was recorded from the plants grown in peat + sand + clay. These results agree with those of Gad (2003) on Schefflera and Badawy *et al.,* (1994) on *Philodendron erubescens*

Table (3). Effect of growing media and humic acid on dry weight of leaves, stem and roots (g) of *Brassaia actinophylla* during 2005 and 2006 seasons..

First season 2005

Actosol®Ferti-rate	Dry weight of leaves				Dry weight of stem				Dry weight of roots			
	P	P+S	P+S+C	Mean	P	P+S	P+S+C	Mean	P	P+S	P+S+C	Mean
Control	12.55	7.32	5.15	8.34	10.40	7.35	6.66	8.14	12.41	7.18	3.16	7.58
5cm^3/L spray	16.78	8.07	5.99	10.28	14.08	9.08	7.77	10.31	18.90	11.20	4.44	11.51
10cm^3/L drench	16.47	6.93	4.00	9.13	11.52	7.51	5.90	8.31	18.66	10.60	4.08	11.11
Spray + drench	24.75	10.04	12.23	15.67	24.48	14.53	9.00	16.03	26.85	12.06	6.28	15.06
Mean	17.64	8.09	6.84	-------	15.12	9.62	7.33	------	19.21	10.26	4.49	-----
LSD at 5%	A=2.028 B=2.342 AB= 4.056				A= 3.060 B=3.533 AB= 6.120				A=2.152 B=2.484 AB= 4.303			

Second season 2006

Actosol® Ferti-rate	Dry weight of leaves				Dry weight of stem				Dry weight of roots			
	P	P+S	P+S+C	Mean	P	P+S	P+S+C	Mean	P	P+S	P+S+C	Mean
Control	13.10	7.86	6.40	9.12	12.10	8.62	7.39	9.37	13.83	9.16	5.06	9.35
5cm^3/L spray	17.82	10.13	8.18	12.04	16.36	10.50	9.72	12.19	19.70	13.24	6.73	13.22
10cm^3/L drench	16.93	8.27	6.98	10.73	12.50	9.00	8.89	10.13	19.05	11.52	5.92	12.16
Spray + drench	27.17	13.53	14.28	18.33	27.18	15.32	11.26	17.92	30.64	15.11	8.25	18.03
Mean	18.75	9.95	8.96	—	17.04	10.86	9.32	—	20.81	12.26	6.49	—
LSD at 5%	A=1.85 B=2.13 AB=3.69				A=1.10 B=1.27 AB=2.19				A=1.53 B=1.77 AB=3.07			

P: peat P+S: peat+sand P+S+ C: peat+sand+clay
A= growing media B= fertilization AB= interaction

Concerning the effect of humic acid on dry weight of leaves, stem and roots, the results showed significant increases in leaves, stem and roots were obtained when the plants were treated by foliar spray + soil drench, as recorded 15.67, 16.03 and 15.06 gm, respectively. The results of the interaction between the media and humic acid indicated that, the heaviest dry

weight of leaves (24.75 gm), stem (24.48 gm) and roots (26.85 gm) were recorded from plants grown in peatmoss and treated with humic acid, as foliar spray + soil drench. In the second season, the effect of media and humic acid was similar to that observed in the first season. In this regard however, the previous results are in agreement with these of Padem *et al.* (1997) on eggplant and pepper.

Chemical composition:-

Chlorophyll contents of leaves (%):

The results which are presented in Table (4) show the effect of growing media and humic acid on chlorophyll –a,b and caroteniods contents of leaves of *Brassaia actinophylla*.

The data indicated that the highest percentage of chlorophyll a (0.62 %) was recorded in the leaves of the plants grown in peatmoss, comparing to the lowest value (0.56%), which was obtained from plants grown in medium of peat+sand+clay

Concerning the effect of humic acid on chlorophyll a percentage, data showed that, the best result was recorded from plants treated with foliar spray + soil drench, as it gave 0.74 % of chlorophyll a. The results of the interaction between the media and humic acid on chlorophyll a percentage, indicated that the highest percentage of chlorophyll (0.90) in the leaves was recorded from plants grown in peat +sand +clay (1:1:1 v/v/v) and treated with humic acid, as foliar spray + soil drench. In general, these results are in line with those obtained by Guo *et al* (2000) who reported that spraying apple trees with Komix (an organic humic acid as liquid fertilizer) promoted shoot growth and increased chlorophyll content.

Concerning the interaction between media and humic acid, the best results were recorded with plants grown in peat and treated with foliar spray + soil drench which reached 0.88% of chlorophyll a content.

Chlorophyll b content:

The data indicated that, the highest percentage of chlorophyll b (1.32% and 1.38%) was recorded in the leaves of plants grown in peat +sand (1:1 v/v) in the first and second seasons respectively.

Regarding humic acid the best results of chlorophyll b (0.90 %) was recorded in the leaves of plants treated with foliar spray + soil drench. Concerning the interaction the best results were recorded from plants grown in peat +sand and treated with foliar spray + soil drench.

Carotenoides content:

The data indicated that, the best percentages of carotenoids (1.12, 1.24%) were recorded in the leaves of the plants grown in peat +sand (1:1 v/v) in the first and second seasons respectively.

Concerning humic acid the best results of carotenoids 0.92 % was recorded in the leaves of plants treated with soil drench and foliar spray + soil drench. On the other hand, the interaction between media and humic acid gave 1.22% for plants which were grown in peat +sand and treated with foliar spray + soil drench.

Obtained results in this study cleared that adding actosol® as soil + foliar at the same time makes complete benefit to the plant as improved

vegetative growth, and leaf chlorophyll. Foliar treatments led to quick absorption via leaves and limited loss of the nutrient. This can be explained by the ability of humic acid to adjust pressure potential of guard cell of stoma in leaves thus controlling the opening and closing and so lowering moisture transpiration rates. Thus, the application of such treatment may be useful for decreasing the cost of production and increasing the return income.

Table (4). Effect of media and humic acid on chlorophyll-a, -b and carotenoids contents (mg/g FW) in leaves of *Brassaia actinophylla*, during 2005 and 2006 seasons.

First season 2005

Actosol® Ferti-rate	Chlorophyll -a content				Chlorophyll -b content				Carotenoids content			
	P	P+S	P+S+C	Mean	P	P+S	P+S+C	Mean	P	P+S	P+S+C	Mean
Control	0.57	0.30	0.31	0.39	0.18	1.30	1.00	0.83	0.32	0.90	0.58	0.60
5cm^3/L spray	0.63	0.70	0.63	0.65	0.21	1.34	0.71	0.75	0.35	1.16	1.18	0.90
10cm^3/L drench	0.67	0.71	0.39	0.59	0.22	1.33	0.52	0.69	0.37	1.20	1.20	0.92
Spray+drench	0.61	0.72	0.90	0.74	0.19	1.30	1.20	0.90	0.38	1.22	1.16	0.92
Mean	0.62	0.61	0.56	------	0.20	1.32	0.86	------	0.36	1.12	1.03	------
LSD at 5%	A= 0.017 B=0.020 AB=0.034				A=0.038 B=0.044 AB=0.076				A=0.027 B=0.031 AB=0.054			

Second season 2006

Actosol® Ferti-rate	Chlorophyll -a content				Chlorophyll -b content				Carotenoids content			
	P	P+S	P+S+C	Mean	P	P+S	P+S+C	Mean	P	P+S	P+S+C	Mean
Control	0.62	0.42	0.39	0.48	0.24	1.32	1.15	0.90	0.50	1.03	0.73	0.75
5cm^3/L spray	0.87	0.79	0.74	0.80	0.30	1.46	0.84	0.92	0.56	1.21	1.22	1.00
10cm^3/L drench	0.74	0.80	0.43	0.66	0.36	1.40	0.69	0.82	0.70	1.32	1.36	1.13
Spray+ drench	0.88	0.84	0.96	0.89	0.27	1.35	1.34	0.99	0.59	1.38	1.24	1.07
Mean	0.78	0.71	0.63	-----	0.29	1.38	1.01	-----	0.59	1.24	1.14	------
LSD at 5%	A=0.027 B=0.031 AB=0.054				A=0.038 B=0.044 AB=0.076				A=0.038 B=0.044 AB=0.076			

P: peat P+S: peat+sand P+S+C: peat+sand+clay
A= growing media B= fertilization AB= interaction

Nitrogen content (% DW).

The results presented in Table (5) show the effect of media and humic acid on leaves content of N, P and K of *Brassaia actinophylla.*

Data indicated that, the highest percentage of 2.18 % was recorded in the leaves of plants grown in peatmoss, whereas the growing medium of peat+sand+clay (1:1:1 by volume) gave the lowest value of 1.56%.

Concerning humic acid, the highest value of 2.32% was recorded from plants treated with foliar spray + soil drench compared with control which gave 1.36%.

Results of the interaction between media and humic acid showed that the highest N percentages (2.90%) in the leaves, were recorded from plants grown in peat and treated with humic acid (foliar spray + soil drench).

In the second season, the results were similar to that observed in the first season. Such results are in agreement with those obtained by Badawy *et al* (1994) on Philodendron plant.

Phosphorus content (% DW).

The significant by highest phosphorus percentage, resulted by the peatmoss medium, in both seasons [0.77 and 0.88%, respectively], whereas

the peat+sand+clay medium significantly gave the least values of 0.29 and 0.38%, in the two seasons of the experiment, successively.

In this regard Badawy *et al* (1994) pointed out that sand/clay/peat medium decreased N, and P in the leaves of philodendron plant.

Application of humic acid (foliar spray + soil drench) increased phosphorus content % up to 0.64% in the plants comparing with other treatments which recorded 0.50, 0.43 % for foliar spray, soil drench and 0.35% for control

The results of the interaction between the media and humic acid indicated that, the highest P% was 0.92 and 1.03%, respectively in the two seasons were obtained from plants grown in peat and treated with foliar spray + soil drench. compared with those grown in peat + sand +clay and not treated with humic acid as recorded 0.20 and 0.26 %, in the two seasons respectively.

Table (5). Effect of growing media and humic acid on nitrogen, phosphorus and potassium (% DW) in leaves of *Brassaia actinophylla* during 2005 and 2006 seasons.

First season 2003/2004

Actosol® Ferti-rate	Nitrogen content %				Phosphorus content %				Potassium content %			
	P	P+S	P+S+C	Mean	P	P+S	P+S+C	Mean	P	P+S	P+S+C	Mean
Control	1.50	1.47	1.10	1.36	0.63	0.23	0.20	0.35	1.10	0.50	0.30	0.63
5cm^3/L spray	2.30	1.90	1.70	1.97	0.80	0.40	0.30	0.50	1.23	0.80	0.40	0.81
10cm^3/L drench	2.00	1.80	1.59	1.80	0.74	0.30	0.24	0.43	1.17	0.60	0.32	0.70
Spray+drench	2.90	2.20	1.85	2.32	0.92	0.60	0.40	0.64	1.28	0.90	0.70	0.96
Mean	2.18	1.84	1.56	-----	0.77	0.38	0.29	------	1.20	0.70	0.43	-----
LSD at 5%	A=0.04 B=0.03 AB=0.07				A=0.03 B=0.04 AB=0.05				A=0.04 B=0.05 AB=0.08			

Second season 2004/2005

Actosol® Ferti-rate	Nitrogen content %				Phosphorus content %				Potassium content %			
	P	P+S	P+S+C	Mean	P	P+S	P+S+C	Mean	P	P+S	P+S+C	Mean
Control	1.62	1.54	1.30	1.49	0.72	0.34	0.26	0.44	1.26	0.63	0.41	0.77
5cm^3/L spray	2.43	2.03	1.81	2.09	0.86	0.52	0.41	0.60	1.44	0.91	0.58	0.98
10cm^3/L drench	2.10	1.86	1.64	1.87	0.90	0.39	0.30	0.53	1.29	0.75	0.50	0.85
Spray+drench	2.95	2.28	1.93	2.39	1.03	0.74	0.55	0.77	1.58	1.10	0.94	1.21
Mean	2.28	1.93	1.67	------	0.88	0.50	0.38	-----	1.39	0.85	0.61	------
LSD at 5%	A=0.03 B=0.02 AB=0.05				A=0.02 B=0.04 AB=0.06				A=0.04 B=0.06 AB=0.08			

P: peat P+S: peat+sand P+S+ C: peat+sand+clay
A= growing media B= fertilization AB= interaction

Potassium content (% DW).

Data in Table (5), reveal the superiority of peatmoss medium for increasing potassium content in the leaves (1.20 and 1.39%) in the first and second seasons respectively. Whereas the lowest values 0.43 and 0.61% was recorded from plants grown in (peat + sand + clay) medium in the two seasons, respectively.

Referring the effect of humic acid, the treatment of (spray + drench) showed its superiority in increasing potassium accumulation in leaves (0.96 and 1.21%) in the two seasons respectively.

The interaction, indicated the favourable effect of using peatmoss medium and treated the plants with humic acid (spray + drench), as it gave the highest values 1.28 and 1.58% in the two seasons respectively.

The results was similar with David *et al* (1994), found that, the addition of 1280 mg/L humic acid produced a significant increase in the accumulation of P, K, Ca, Mg, Mn and Zn in shoots.

Zinc, manganese and iron content (ppm).-

Considerable variations were recorded in zinc, manganese and iron accumulation in the leaves due to the effect of different growing media as shown in Table (6).

Table (6). Effect of growing media and humic acid on zinc, manganese and iron content (ppm) of leaves of *Brassaia actinophylla* during 2005 and 2006 seasons.

First season 2003/2004

Actosol® Ferti-rate	Zinc content				Manganese content				Iron content			
	P	P+S	P+S+C	Mean	P	P+S	P+S+C	Mean	P	P+S	P+S+C	Mean
Control	39.94	30.71	25.13	31.93	65.19	59.36	42.18	55.58	51.38	46.32	43.12	46.94
5cm^3/L spray	44.76	32.76	29.63	35.72	83.10	85.29	70.48	79.62	74.59	68.61	75.49	72.90
10cm^3/L drench	52.00	42.35	31.40	41.92	75.08	70.45	63.19	69.57	81.37	77.10	79.88	79.45
Spray+drench	64.24	57.31	50.82	57.46	90.73	84.16	73.98	82.96	89.16	80.76	83.10	84.34
Mean	50.24	40.78	34.25	----	78.53	74.82	62.46	-----	74.13	68.20	70.40	----
LSD at 5%	A=2.46	B=2.84	AB=4.92		A=2.59	B=2.99	AB=5.17		A=2.29	B=2.64	AB=4.58	

Second season 2003/2004

Actosol® Ferti-rate	Zinc content				Manganese content				Iron content			
	P	P+S	P+S+C	Mean	P	P+S	P+S+C	Mean	P	P+S	P+S+C	Mean
Control	43.05	36.82	28.39	36.09	59.31	60.14	51.72	57.06	63.17	50.39	49.66	54.41
5cm^3/L spray	52.62	41.19	33.04	42.28	90.42	80.37	73.66	81.48	80.90	73.00	71.18	75.03
10cm^3/L drench	60.27	50.38	36.56	49.07	81.17	77.56	69.11	75.95	78.11	80.10	82.57	80.26
Spray+drench	71.08	62.13	52.17	61.79	100.20	90.76	83.39	91.45	95.56	86.43	90.32	90.77
Mean	56.76	47.63	37.54	----	82.78	77.21	69.47	-----	79.44	72.48	73.43	-----
LSD at 5%	A=2.14	B=2.47	AB=4.27		A=2.20	B=2.54	AB=4.40		A=2.65	B=3.06	AB=5.29	

P: peat P+S: peat+sand P+S+C: peat+sand+clay

A= growing media B= fertilization AB= interaction

Peatmoss medium showed its superiority in this concern, as recorded 50.24, 78.53, and 74.13 ppm for the three elements respectively in the first season. The use of humic acid as foliage spray plus soil drench was more effective for increasing this elements comparing to all other treatments.

Regarding the interaction, data indicated the favorable effect from using peatmoss medium and treating the plants with humic acid as foliage spary + soil drench.

All the obtained results are in harmony with those of Senn and Kingman (1973) who reported the humic acid increased the permeability of plant membranes, so promoting the uptake of nutrients. Russo and Berlyn (1990) and Eissa (2003) when using various groups of biostimulants and hummates, they found that these substances increased the nutrients uptake.

REFERENCES

A.O.A.C.(1980). Official Methods of Analysis of A.O.A.C. International 16th Edition Vol. 1 A.O.A.C. international press USA chapter 4,p31.

Abou Dahab, T.A.M. (1992). Effect of growing media, and NPK fertilization on growth and chemical composition of *Chlorophytum comosum* and *Asparagus sprengeri.* M.Sc. Thesis, Fac. Agric. Cairo Univ.

Ali, M.S. (1991). Effect of growing media on growth of *Chlorophytum comosum* "Variegatum" and *Ficus benjamina*. Egypt J. Appl. Sci., 6(4):370-379.

Atef, M.H.; El. Maghraby, A.T.; Sherif, H.M. and El-Shal, S.A. (2005). Effect of liquid organic fertilization techniques on yield and chemical composition of pear and apricot trees grown on sandy soils at South Tahrir Province. Fayoum J. Agric. Res. Dev., 19 (2): 224-238.

Badawy, E.M.; Hanafy M.S.; Nabih A. and Badawy O.E.E. (1994). Effect of planting location and growing media on propagation and growth of *Philodendron erubescence* cv. Emerald Queen 1st Proc. Orn. Conf. Fac. Agric., Cairo Univ. P. 149-175.

Bailey, L.H. (1987). "Hortus Third". 1015-1016, McMillan Publishing Co., Inc. New Yourk.

Cooper, R. J.; Liu, C.H. and Fisher, D. S.(1998). Influence of humic substances on rooting and nutrient content of creeping bentgrass. Crop Science, 38(6): 1639-1644.

Cottenie, A.; Velghe, M. and Camerlynck, R. (1982). Chemical Analysis of Plant and Soil Laboratory of Analytical and Agrochemical. State Univ. Ghent, Belgium.

David, P.P.; Nelson, P.V. and Sanders, D.C. (1994). A humic acid improves growth and nutrient absorption by humic substances originating from various organic materials. Bioresource Technology, 57(3):251-257.

Eissa, F.M. (2003). Effect of some biostimulant on vegetative growth, yield and fruit quality of Kelsey plum. Egypt. J. Appl. Sci., 18(5B):716-735.

El-Ashry, A.I.; Auda M.S. and Bakry M.Y. (1997). Effect of different growing media on growth and production of some foliage plants. III. Response of *Chlorophytum comosum* var. Variegatum, to different growing media. Egypt. J. Appl. Sci., 12(3):175-186.

Gad, M. M. (2003). Growth response of *Schefflera actinophylla*, harms plants to different planting media and paclobutrazol application. Assiut Journal of Agricultural Sciences. Faculty of Agriculture, Assiut University, Assiut, Egypt, 34(3): 131-159.

Guo, B.; Yang, J.; Lu, R. and Yu, S. (2000). Effect of Komix on the growth and fruiting of red fuji apple variety. J. Fruit Sci., 17(1): 73-75.

Hucker, T. and Catroux, G.(1980). Phosphorus in sewage ridge and animals wester slurries. Proceeding of the EEC-Seminar, Haren (G.R.) Groningen, Netherlands, 12-13 June.

Liu, C.H.; Cooper, R. J. and Bowman, D. C. (1998). Humic acid application affects photosynthesis, root development, and nutrient content of creeping bentgrass. HortScience. 33(6): 1023-1025.

Padem, H.; Ocal, A. and Alam,A. (1997). Effect of humic acid addition as foliar fertilizer on seedling quality and nutrient content of eggplant and pepper. ISHS Symposium on Greenhouse Management for Better Yield and quality in Winter Climates, 3-5 November 1997. Acta Horticulturae.

Pertit, R.E. (2002). Organic matter, Humus, Humate, Humic acid, fulivic acid and humin: their imortance in soil fertility and plant healthy. www.humate.info/mainpage.htm.

Russo, R.O. and Berlyn (1990). The use of organic biostimulants to help low input sustainable agriculture. J. Sustainablo Agric, 1(2):19-24.

Saric, M.; Kastrori, R., Curie, R.; Cupina, T. and Gerie, I. (1976). Chlorophyll Determination. Univ. Unoven Sadu Parktikum is fiziologize Bibjoke, Beagard, Hauncna, Anjiga, 215 pp.

Senn, T.L. and Kingman, A.R. (1973). A review of humus and humic acids. S.C. Agricultural Experiment Station, Clemsan. S.C. Research Series Report No. 145.

Snedecor, C.W. and Cochran, W.G. (1980). Statistical Methods 8th Ed. Chapter No. 112 and 14. Iowa State Univ. Preses. Iowa, USA p:217-272.

Stevenson, F.J. (1994). Humus Chemistry: Genesis, Composition, Reaction. 2nd ed. John Wiley and sons, Inc., New York.

تأثير بيئات النمو و حمض الهيوميك على جودة نباتات الشفليرا

بشرة عبد الله السيد و سعد عبد الواحد الشال****

*** قسم بحوث الزينة و تنسيق الحدائق-معهد بحوث البساتين-مركز البحوث الزراعية**

**** قسم الفاكهة المتساقطة-معهد بحوث البساتين-مركز البحوث الزراعية**

أجريت تجربة في معهد بحوث البساتين بالجيزة – مصر - خلال عامين متتالين ٢٠٠٥ - ٢٠٠٦. لدراسة الأثر المنفرد و المشترك لبيئات النمو: بيت موس، بيت موس : رمل بنسبة ١:١بالحجم و بيت موس : رمل : طمي بنسبة ١:١:١ بالحجم و التسميد بالسماد العضوي السائل (actosol®) المحتوي على حمض الهيوميك بمعدل صفر و ٥ سم^3 /لتر رشا على المجموع الخضري و ١٠ سم^3 /لتر إضافة للتربة، (٥ سم^3 /لتر رشا + ١٠سم^3 إضافة للتربة) و ذلك على نبات الشفليرا *B. actinophylla* و قد أظهرت النتائج أن بيئة النمو المكونة من البيت موس كانت أفضل من البيئات الأخرى في ارتفاع النبات و عدد الأوراق و سمك الساق و الأوزان الطازجة و الجافة للمجموع الخضري و الجذور و محتوى الأوراق من النيتروجين و الفوسفور و البوتاسيوم و الزنك و الحديد و المنجنيز.

و قد أظهرت معاملات حمض الهيوميك زيادات معنوية في القياسات النباتية و بلغت هذه الزيادات اقصاها عند استعمال حمض الهيوميك عن طريق التسميد بالرش + اضافة للتربة.

و من نتائج التفاعلات يمكن النصح باستخدام بيئة البيت موس مع تسميد النباتات بالسماد المحتوي على حمض الهيوميك (actosol®) بمعدل ٥ سم^3 /لتر رشا + ١٠سم^3 اضافة للتربة مرة كل ١٥ يوم للحصول على نباتات شفليرا ذات جودة عالية.