ISSN 1110-0419

Annals Of Agric. Sci., Moshtohor,
Vol. 47(2): Ho. 275-283, (2009).

RESPONSE OF AUSTRALIAN UMBRELLA TREES (BRASSAIA) TRANSPLANTS TO SOME FERTILIZATION, SALICYLIC ACID AND DRY YEAST TREATMENTS

BY

Gehan H. Abdel-Fattah*; Azza M. Abd El-Moniem* and El-Shamy, M.A.I.**

* Flori. Res. Dept., Hort. Res. Inst., ARC, Giza, Egypt.
** Bot. Gars. Res. Dept., Hort. Res. Inst., ARC, Giza, Egypt.

ABSTRACT

This investigation was conducted in a glasshouse at the nursery of Hort. Res. Inst., ARC, Giza, Egypt during 2006 and 2007 seasons to examine the individual and the combined effects of aqueous solutions of Fe, Zn and Mn micronutrients mixture at the rates of 0.0+0.0+0.0, 120+60+60 and 240+120+120 ppm for the three elements, respectively, salicylic acid at 0.0 and 300 ppm, active dry yeast at 0.0 and 8 g/l and their interactions when applied as a foliar spray three times with one month interval on the growth and chemical composition of *Brassaia actinophylla* Endl. transplants grown in 20-cm-diameter plastic pots filled with about 2.5 kg of sand and clay (1:1,v/v).

The obtained results revealed that all fertilization treatments significantly improved plant height, stem diameter, No. of leaves/plant, fresh and dry weights of leaves, stem and roots, as well as, leaf content of chlorophylls a, b, carotenoids, N, P, K, Fe, Zn and Mn with the mastery of the combined treatments between the micronutrients mixture at 240+120+120ppm and the active dry yeast at 8g/l, which gave the utmost high means in most cases of both seasons. This was followed by 8g/l active dry yeast treatment that recorded means closely near to those of the combined one.

Therefore, from economical and environmental point of view, it can be recommended to spray the aqueous solution of active dry yeast (8g/l) alone, thrice with one month interval on the leaves to improve the growth and performance of *Brassaia actinophylla*, Endl. plants grown in 20-cm-diameter plastic pots.

INTRODUCTION

Brassaia actinophylla Endl. (*Schefflera actinophylla* (Endl.) Harms.), Australian umbrella tree that belongs to Fam. Araliaceae is an evergreen tree up to 40 ft. height, native to Australia and widely used as one of the most decorative foliage pot plants. It can be also used for gardening and landscape design. May be kept multiple-stemmed and bushy by cutting-back. Propagation by seeds, cuttings and air-layers (Bailey, 1976).

The good nutrition is considered the best and the most direct way to achieve the highest quality plants production. However, the nutritive materials used for plant nutrition are many and among them may be salicylic acid that promotes flowering, retards senescence and serves as a co-factor for many enzymes (Barth *et al.*, 2006). This was true and emphasized by Handro *et al.*, (1997) who found that salicylic acid at 1 or 2mM significantly increased production of flowers in *Streptocarpus nobilis*, while at 0.5mM increased number and length of shoots in *Ullucus tuberosus*. On cut roses, Xueping *et al.* (1999) postulated that salicylic acid at 50 mg/l greatly decreased the respiration rate, alleviated the moisture stress and membrane injury, improved the decorative quality of cut flowers during the vase period and elongated the vase life by 3 days. Moreover, salicylic acid treatments made the cut roses more colourful with higher ornamental value than 8-HQS treatments. Similarly, Kumar *et al.*

(2006) indicated that salicylic acid at 100 ppm recorded less number of days to flowering and highest flowering% in gladiolus. The maximum spike length, No. florets/spike, floret size and No. corms and cormels/plot were also due to such treatment.

Using active dry yeast to improve plant growth was noticed by some workers. In this regard, Abdel-Wahed *et al.* (2006) stated that using yeast twice at 4 g/l plus 6 g 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. Anonymous (1994) claimed that yeast contains proteins, arginine, glucine, histamine, isolysine, leucine, lysine, methionine, cystine, phenylalanine, tyrosine, tryptophan and vitamin B. Ahmed (1998) mentioned that spraying marjoram plants with active dry yeast at 0.2% caused more branching, heavier herb and leaves dry weight. He attributed these beneficial effects to its content of proteins, ash, glycogen fats and cellulose.

Micronutrients play an important role in activating most vital processes in plants, although they are needed in small quantities (Marschner, 1995). Among micronutrients usually used in a wide scale for enhancing plant growth ferrous, zinc and manganese. Ferrous is necessary for oxidation-reduction reactions, respiration, nitrate reduction, RNA and prolin metabolism. A correlation between chlorophyll content and the supplied iron level was also noticed in green plants (Jakon and Dertili, 1965). Zinc is essential for metabolism of carbohydrates, proteins, phosphates, RNA synthesis, tryptophan (the precursor of IAA), chlorophyll synthesis, photosynthesis and its role as a co-factor of several enzymes, which act on phosphorylated substrates (Mohr and Schopter, 1995). The beat defined function of manganese is participating in the photosynthetic reactions in which oxygen is produced from water (Marschner, 1995). It regulates the level of auxin, respiration and nitrogen metabolism. Enzymes of the Kerb's cycle require Mn as an activator (Devlin, 1973). Manganese may be involved in the destruction or oxidation of IAA (Goldacre, 1961). In this regard, Thiffault and Jobidon (2006) found that a slow-release fertilizer with micronutrients was more effective in promoting *Kalmia angustifolia* survival and growth than 26N-12P-6K formulation.

This trial, however was done to investtigate the individual or the combined effects of micronutrients, salicylic acid and yeast on growth and quality of the *Brassaia actinophylla*, Endl. foliage pot-plant.

MATERIALS AND METHODS

A series of pot experiments was consummated under glasshouse at the nursery of Hort. Res. Inst., ARC, Giza, Egypt throughout the two consecutive seasons of 2006 and 2007 to find out the role of Fe, Zn and Mn, as well as salicylic acid and yeast, alone or in combinations on improving growth and performance of Brassaia transplants.

So, six-months-old transplants of *Brassaia acrinophylla* Endl. of about 20-22 cm height and carrying about 7±1 leaves were planted on March, 1st for both seasons in 20-cm-diameter plastic pots (one transplant/pot) filled with 2.5 kg of an equal mixture of sand and clay (1:1, by volume). The physical and chemical properties of the used sand and clay in the two seasons are shown in Table (a).

The layout of the experiments in both seasons was a randomized complete block design in factorial experimente (Snedecor, and Cochran 1982) with three replicates, in each contained six treatments (plot = 6 transplants). After one month from planting, the transplants received the following fertilization treatments:

Table (a): Some physical and chemical properties of the used sand and clay media during 2006 and 2007 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^{-}
Sand	2006	89.03	2.05	0.40	8.52	23.01	3.56	7.90	7.50	1.63	33.60	0.50	3.20	22.00	18.03
	2007	84.76	6.29	1.50	7.45	21.87	3.71	7.80	19.42	8.33	7.20	0.75	1.60	7.80	26.30
Clay	2006	10.18	46.17	19.53	24.12	35.00	3.48	8.27	17.50	9.42	20.00	0.79	3.80	10.00	33.91
	2007	10.30	46.54	18.88	24.28	33.07	3.36	7.96	18.00	8.95	20.50	0.85	3.65	10.20	34.45

1- No treatment, referred to as control.
2- A mixture of ferrous (Fe), zinc (Zn) and manganese (Mn) micronutrients at the levels of 0.0 +0.0+0.0, 120+60+60 and 240+120+120 ppm for the three elements, respectively was prepared from chelated iron (12%) and chelated manganese (12%) manufactured by Biotec Co., Al-Sadat City, Egypt, and chelated zinc (12%) from Al-Nasr Co., Al-Sadat City, Egypt and added in the form of aqueous solution.
3- An aqueous solutions of either salicylic acid (99%) produced by Technogreen Con., Dokki, Egypt at the concentrations of 0.0 and 300 ppm or active dry yeast at the rates of 0.0 and 8g/l combined with 30 g sugar /l. The chemical composition of the active dry yeast used in both seasons are averaged in Table (b). All previous treatments were applied as a foliar spray, thrice with one month interval till solution run-off.
4- Each level of micronutrients mixture was combined with each one of either salicylic acid or active dry yeast to form nine interaction treatments.

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

Proteins	47.0%	Niacin	300-500 µg
Carbohydrates	33.0%	Pyrodoxin	28.0 µg
Minerals	8.0%	Pantathenate	70.0 µg
Nucleic acids	8.0%	Biotin	1.3 µg
Lipids	4.0%	Cholin	4000 µg
Thiamine	60-100µg	Folic acid	5.13 µg
Riboflavin	35-50 µg	Vit. B12	0.001 µg
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

During the course of this work, the transplants were irrigated two times every week with 200ml of fresh water/pot and fertilized three times with 2g/pot of a compound NPK fertilizer (1:1:1) using ammonium sulphate (20.5%N), calcium super-

phosphate (15.5%P_2O_5) and potassium sulphate (48%K_2O). Air temperature and relative humidity inside the glasshouse ranged between 21.5-38°C and 50-80%, respectively. In addition, the usual agricultural practices necessary for such plantation were also done whenever needed.

At the end of each season (on September, 30th), data were recorded as follows: plant height (cm), stem diameter at the base (cm), number of leaves/plant and fresh and dry weights (g) of leaves, stem and roots. In only the second season, fresh leaf samples were taken from the middle parts of the plants to determine the content of photosynthetic pigments (chlorophyll a, b and carotenoids as mg/g f.w.) according to the method of Moran (1982), while in dry samples, the percentages of nitrogen (Pregl, 1945), phosphorus (Luatanab and Olsen, 1965) and potassium (Jackson, 1973) were assessed. Another dry leaf samples were digested in nitric and perchloric acids and analyzed for the determination of Fe, Zn and Mn (ppm) as indicated by Jackson, 1973.

Data were then tabulated and subjected to analysis of variance using SAS program (1994), while Duncan's Multiple Range Test (1955) was employed to verify the significancy level among means of treatments.

RESULTS AND DISCUSSION

Effect of micronutrients, salicylic acid, active dry yeast and their interaction on:

1- Vegetative and root growth characters:

It is obvious from data in Tables (1 and 2) that spraying micronutrients mixture, salicylic acid or active dry yeast, individually or in combination caused a significant increment in plant height (cm), stem diameter (cm), No. of leaves/plant and fresh and dry weights (g) of leaves, stem and roots comparing with control treatment in the two seasons. The means of these parameters were progressively increased with raising micronutrients level, while spraying with active dry yeast at 8g/l gave better results than salicylic acid at 300ppm in most cases of both seasons. The maximum values were, however attained by the combined treatments between the highest rate of micronutrients (240+120+120 ppm) and 8g/l active dry yeast.

This may be attributed to the synergistic effect of both micronutrients as a vital component more effective on promoting survival and growth (Thiffoult and Jobidon, 2006) and yeast as a source of proteins, amino acids, ash, glycogen, fats, cellulose and vitamin B (Ahmed, 1998). Moreover, Devlin (1975) reported that some micro-elements, like manganese regulate the level of auxin, respiration, N metabolism and activate enzymes of Kreb's cycle.

These results are in parallel with those detected by Handroo *et al.* (1997) on *Streptocarpus nobilis* and *Ullucus tuberosus*, Xueping *et al.* (1999) on roses, Abdel-Wahed *et al.* (2006) on *Euonymus japonicus* and Kumar *et al.* (2006) on gladiolus.

2- Chemical composition:

As shown in Table (3), the data pointed out that pigments content (chlorophyll a, b and carotenoids, as mg/g f.w.) in the leaves was cumulatively increased with elevating micronutrients level. Salicylic acid at 300 ppm, on the other hand, scored higher content than either micronutrients or active dry yeast treatments, but the superiority was found due to the highest rate of micronutrients (240+120+120ppm) combined with salicylic acid at 300 ppm as this combination gave, in general the utmost high averages over control and other individual and combined treatments.

Concerning the leaf content of N, P and K(%), as well as Fe, Zn and Mn (ppm), data in Table (3) exhibit that these elements were significantly increased in response to either fertilization treatments used in the current study, with a notice that the high level of micronutrients registered of high content than both control and micronutrients at the low level, and spraying with 8g/l of yeast gave a higher content than spraying with 300 ppm of salicylic acid. The prevalence, however was ascribed to the combination between yeast at 8g/l and the mixture of Fe, Zn and Mn at 240, 120 and 120 ppm, respectively.

Table (1): Effect of salicylic acid, yeast, micronutrients and their interaction on some vegetative growth parameters of *Brassaia actinophylla* (Endl.) Harms. plant during 2006 and 2007 seasons.

A and B treatments / Fe+Zn+Mn treatments (ppm)	Plant height (cm)			
	0.0	A	B	Mean
	First season: 2006			
0.0+0.0+0.0	54.1f	58.5e	60.4e	**57.7c**
120+60+60	59.3e	64.7cd	68.8b	**64.3b**
240+120+120	63.6d	67.3bc	73.4a	**68.1a**
Mean	59.0c	63.5b	63.5b	
	Stem diameter (cm)			
0.0+0.0+0.0	0.94f	0.98e	1.14b	**1.02c**
120+60+60	0.99e	1.03d	1.15b	**1.06b**
240+120+120	0.99e	1.08c	1.23a	**1.10a**
Mean	0.97c	1.03b	1.17	
	No. leaves/plant			
0.0+0.0+0.0	24.5g	26.4f	30.8de	**27.2c**
120+60+60	27.3f	31.3cd	35.2b	**31.3b**
240+120+120	29.6e	32.8c	42.3a	**34.9a**
Mean	27.2c	30.1b	36.1	
	Second season: 2007			
	Plant height (cm)			
0.0+0.0+0.0	48.7i	51.4h	55.7f	**51.9c**
120+60+60	52.6g	58.3d	59.9c	**56.9b**
240+120+120	57.9e	61.1b	66.3a	**61.8a**
Mean	**53.1c**	**56.9b**	**60.7a**	
	Stem diameter (cm)			
0.0+0.0+0.0	0.87d	0.97cd	1.00cd	**0.95b**
120+60+60	0.89d	1.05bc	1.09ab	**1.01ab**
240+120+120	0.93cd	1.11ab	1.16a	**1.07a**
Mean	**0.90b**	**1.05a**	**1.09a**	
0.0+0.0+0.0	22.0g	22.9f	24.5d	**23.2c**
120+60+60	23.9e	25.8c	26.6b	**25.4b**
240+120+120	25.4c	26.7b	29.9a	**27.3a**
Mean	**23.8c**	**25.1b**	**27.0a**	

* **A:** Salicylic acid at 300ppm, and **B:** active dry yeast at 8g/l.
* 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

The increment in the various active constituents of the leaves of fertilized plants might be attributed to the promotive effect of yeast on some metabolic activities in the plant cells, which leads to higher accumulation of nutrients (Fruton and Simmonds, 1959).

Moreover, Zn is essential for metabolism of carbohydrates, protein, phosphates, tryptophan and RNA and chlorophylls synthesis (Mohr and Schopter, 1995). A correlation between chlorophylls content and supplied Fe was also noticed in green plants (Jakson and Dertili, 1956). On the same line, were those results indicated by Abdel-Wahid *et al.* (2006) on *Euonymus japonicus*, Ahmed (1998) on marjoram and Naguib (2002) who observed that active dry yeast treatments led

to the highest N, P and K content in the leaves of lemongrass.

From the previous gains, it could be concluded that spraying active dry yeast (8g/l) three times with one month interval, alone or combined with Fe, Zn and Mn mixture at 240, 120 and 120 ppm, respectively improved the growth and quality of Brassaia plant, but from the economical and environmental point of view, it is preferred to use active dry yeast alone.

Table (2): Effect of salicylic acid, yeast, micronutrients and their interaction on fresh and dry weights of *Brassaia actinophylla* (Endl.) Harms. plant during 2006 and 2007 seasons.

A and B treatments / Fe+Zn+Mn treatments (ppm)	Fresh Weight (g)											
	Leaves				Stem				Roots			
	0.0	A	B	Mean	0.0	A	B	Mean	0.0	A	B	Mean
	First season: 2006											
0.0+0.0+0.0	85.9h	93.7g	109.2d	**69.3c**	23.7f	26.0e	27.0de	**25.6c**	33.7g	41.5e	47.9d	**41.0c**
120+60+60	98.0f	110.8d	123.3b	**110.7b**	25.9e	28.7bc	30.1b	**28.3b**	36.4f	47.1d	61.5b	**48.4b**
240+120+120	106.0e	117.0c	149.5a	**124.2a**	27.8cd	29.2bc	32.6a	**29.9a**	40.1e	56.2c	66.2a	**54.2a**
Mean	**96.6c**	**107.1b**	**127.4a**		**25.8c**	**28.0b**	**29.9a**		**36.7c**	**48.3b**	**58.6a**	
	Second season: 2007											
0.0+0.0+0.0	75.8i	79.9h	86.6e	**80.8c**	21.3i	22.3h	24.3f	**22.6c**	27.1f	29.7e	30.7de	**29.2c**
120+60+60	82.9g	86.2f	93.5b	**87.5b**	22.9g	25.1e	26.2c	**24.7b**	31.8de	34.5c	36.5bc	**34.0b**
240+120+120	87.2d	92.0c	102.9a	**94.1a**	25.2d	28.0b	28.9a	**27.3a**	31.8d	37.3ab	39.3a	**36.1a**
Mean	**82.0c**	**86.0b**	**94.3a**		**23.1c**	**25.1b**	**26.5a**		**30.0c**	**33.8b**	**35.5a**	
	Dry Weight (g)											
	First season: 2006											
0.0+0.0+0.0	17.5e	18.9d	22.1c	**19.5c**	10.1i	11.2g	11.7f	**11.0c**	12.7e	15.9d	17.0c	**15.2c**
120+60+60	20.0d	22.3c	25.0b	**22.5b**	11.1h	12.3d	13.1b	**12.1b**	13.8e	17.5c	19.9b	**17.1b**
240+120+120	21.5c	24.0b	29.7a	**25.1a**	11.9e	12.6c	14.1a	**12.9a**	15.5d	21.6a	22.5a	**19.9a**
Mean	**19.7c**	**21.7b**	**25.6b**		**11.0c**	**12.0b**	**13.0a**		**14.0c**	**18.4b**	**19.8a**	
	Second season: 2007											
0.0+0.0+0.0	15.8i	16.7h	18.0f	**16.8c**	9.6e	10.2de	11.0bc	**10.3c**	9.4d	9.9cd	10.4cd	**9.9b**
120+60+60	17.5g	18.2e	19.8b	**18.5b**	10.1de	11.5b	12.3a	**11.3b**	10.5cd	12.4ab	13.0a	**12.0a**
240+120+120	18.4d	19.7c	21.6b	**19.9a**	10.8cd	12.4a	13.0a	**12.1a**	11.0bc	13.2a	13.9a	**12.7a**
Mean	**17.2c**	**18.2b**	**19.8a**		**10.1c**	**11.4b**	**12.1a**		**10.3b**	**11.8a**	**12.4a**	

* **A:** Salicylic acid at 300ppm, and **B:** active dry yeast at 8g/l.
* 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 salicylic acid, yeast, micronutrients and their interaction on some chemical constituents of *Brassaia actinophylla* (Endl.) Harms. plant during 2006 and 2007 seasons.

A and B treatments / Fe+Zn+Mn treatments (ppm)	Chlorophyll a (mg/g f.w.)				Chlorophyll b (mg/g f.w.)				Carotenoids (mg/g f.w.)			
	0.0	A	B	Mean	0.0	A	B	Mean	0.0	A	B	Mean
0.0+0.0+0.0	0.94d	1.11ab	1.08bc	1.04b	0.55f	0.64c	0.59d	0.59c	0.42f	0.51c	0.47de	0.47c
120+60+60	0.96cd	1.18ab	1.14ab	1.09ab	00.57e	0.67b	0.64c	0.63b	0.45e	0.56b	0.52c	0.51b
240+120+120	0.97cd	1.23a	1.21a	1.14a	0.60d	0.69a	0.66b	0.65a	0.48d	0.63a	0.58b	0.56a
Mean	0.96b	1.17a	1.14a		0.57c	0.67a	0.63b		0.45c	0.57a	0.52b	
	N (%)				P (%)				K (%)			
	0.0	A	B	Mean	0.0	A	B	Mean	0.0	A	B	Mean
0.0+0.0+0.0	1.83g	1.86g	2.01fg	1.90c	0.53h	0.64f	0.69e	0.62c	2.19e	2.33de	2.42cd	2.31b
120+60+60	2.13ef	2.34de	2.57bc	2.35b	0.60g	0.72d	0.78c	0.70b	2.28de	2.41cd	2.57ab	2.42ab
240+120+120	2.44cd	2.69b	2.94a	2.69a	0.64f	0.81b	0.84a	0.76a	2.37cd	2.54ab	2.67a	2.53a
Mean	2.13c	2.30b	2.51a		0.59c	0.72b	0.77a		2.28c	2.43b	2.55a	
	Fe (ppm)				Zn (ppm)				Mn (ppm)			
	0.0	A	B	Mean	0.0	A	B	Mean	0.0	A	B	Mean
0.0+0.0+0.0	47.09i	55.11h	59.82f	54.01c	35.94f	40.33e	45.07d	40.45c	43.09h	63.19f	72.16d	59.48c
120+60+60	58.20g	69.91d	74.55c	67.55b	41.62e	46.00d	51.78b	46.47b	57.67g	69.31e	81.32b	69.43b
240+120+120	63.36e	77.56b	81.30a	74.07a	49.25c	52.89b	62.41a	54.85a	64.38f	75.11c	84.36a	74.62a
Mean	56.22c	67.53b	71.89a		42.47c	46.41b	53.09a		55.05c	69.20b	79.28a	

* A: Salicylic acid at 300ppm, and B: active dry yeast at 8g/l.

* 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

REFERENCES

Abdel-Wahed, Safwat M.K.; Labib, Y.; Naglaa and Rezk-Alla, B.B. (2006) Effect of active dry yeast and chemical fertilization on vegetative growth and the main constituents of *Euonymus japonicus* Thunb. plant. Fayoum J. Agric. Res. & Dev., 20(1):136-147.

Ahmed, E.T. (1998) Influence of concentration and time of praying active dry yeast on growth and volatile oil content of marjoram plant. J. Agric. Sci., Mansoura Univ., 23(11):5067-5081.

Anonymous, A. (1994) Nutrient Requirements of Poultry, P.68, subcommittee on Poultry Nutrition, Committee on Animal Nutrition, Boord on Agriculture, NRC, National Academy Press, Washington D.C.

Bailey, L.H. (1976) Hortus Third. Macmillan Publishing Co., Inc., 866 Third Avenue, New York, N.Y. 10022, 1290pp.

Barth, C.; De Tullio, M. and Conklin, Patricia, L. (2006) The role of ascorbic acid in the control of flowering time and the onset of senescence. J. Experi. Botany, 57(8):1657-1665.

Devlin, R.W. (1975) Plant Physiology, 2nd Ed., pp. 159-205, Affiliated East-West Press, New Delhi.

Duncan, D.B. (1955) Multiple range and multiple F-tests. J. Biometrics, 11:1-42.

Fruton, J.S. and Simmonds, S. (1959) General Biochemistry. JhonWiley & Sons, Inc., New York, p:333-336.

Goldacre, P.L. (1961) The indole-3-acetic acid oxidase peroxidase of peas. In R.M. Klein, ed., Plant Growth Regulation, Amer. Iowa State Univ. Press, p. 143-147.

Handro, W.; Mello, C.M.; Manzana, M.A. and Flah, E.I. (1997) Enhancement of stem elongation and flower bud regeneration by salicylic acid. Revista Brasileira de Fisiologia vegetal, 9(2):139-142.

Jackson, M.L. (1973) Soil Chemical Analysis. Prentic-Hall of India Private Ltd. M-97, New Delhi, India 498pp.

Jakson, A. and Dertili, D. (1956) The relation between iron and chlorophyll content in chlorotic sunflower leaves. Plant Physiology., 31-199-204.

Kumar, P.N.; Reddy, Y.N. and Chandrashekar, R. (2006) Flower induction in gladiolus cormels by application of chemicals. J. Ornam. Hort., 9(3):174-178.

Luatanab, F.S. and Olsen, S.R. (1965) Test of an ascorbic acid method for determining phosphorus in water and $NaHCO_3$ extracts from soil. Soil Sci. Soc. Amer. Proc., 29:677-678.

Marschner, H. (1995) Mineral Nutrition of Higher Plants. 2nd Ed., p. 75. Academic Press, London.

Mohr, M. and Schopter, P. (1995) Plant Physiology, 3rd Ed., p.112-114. Springer-Verlag, New York.

Moran, R. (1982) Formula for determination of chlorophyllous pigment extracted with N-N-dimethyl formamid. Plant Physiol., 69: 1376-1381.

Naguib, Nabila Y. (2002) Yield and quality of lemongrass (*Cymbopogon flexuous* Stapf.) plants as influenced by farmyard manure and foliar application of bread yeast. Ann. Agric. Sci., Cairo Univ., 47(3):859-873.

Pregl, F. (1945) Quantitative Organic Micro-Analysis, 4th Ed.,J. and A. Churchill Ltd., Ltd., London, p. 203-209.

SAS Institute (1994) SAS/STAT User's Guide: Statistics. Vers. 6.04, 4th Ed., SAS Institute Inc., Cary, N.C., USA.

Sndecor, G.W. and Cochran, W.G. (1982) statislical Methods 7 ed.,lowa state univ press, Iowa, USA.

Thiffault, N. and Jobidon, R. (2006) How to shift unproductive *Kalmia angustifolia* to productive conifer plantation. Canadian J. Forest Res., 36(10): 2364-2376.

Xueping, L.; Xuequn, P.; Zhang, Z. and Li, Z. (1999) Preservation effects of salicylic acid on cut roses. J. Fujian Academy Agric. Sci., 14(3):38-42.

إستجابة شتلات نبات شجرة الشمسية الاسترالي (الشفليرا) لبعض معاملات التسميد وحمض الساليسيليك والخميرة الجافة

جيهان حسن عبد الفتاح*، عزة محمد عبد المنعم*، ممدوح أحمد ابراهيم الشامي**

* قسم بحوث الزينة، معهد بحوث البساتين، مركز البحوث الزراعية – الجيزة – مصر.

** قسم بحوث الحدائق النباتية، معهد بحوث البساتين، مركز البحوث الزراعية – الجيزة – مصر.

أجري هذا البحث بإحدى الصوبات الزجاجية بمشتل معهد بحوث البساتين – مركز البحوث الزراعية – الجيزة – مصر خلال موسمي ٢٠٠٦، ٢٠٠٧ و ذلك لدراسة تأثير مخلوط العناصر الصغرى: الحديد، الزنك و المنجنيز بتركيزات: صفر + صفر + صفر، ١٢٠+٦٠+٦٠ و ٢٤٠+١٢٠+١٢٠ جزء في المليون للعناصر الثلاثة، على الترتيب، حمض الساليسيلك بتركيزات: صفر، ٣٠٠ جزء في المليون، الخميرة الجافة النشطة بتركيزات: صفر و ٨جم/لتر و التفاعلات بينهم عند رشها على الأوراق ثلاث مرات بفاصل شهر بين كل رشتين على النمو و التركيب الكيميائي لشتلات نبات الشفليرا (*Brassaia actinophylla* Endl.) المنزرعة في أصص بلاستيك قطرها ٢٠ سم مملوءة بحوالي ٢,٥ كجم مخلوط متساوي (بالحجم) من الرمل و الطمي.

و لقد أوضحت النتائج المتحصل عليها أن جميع معاملات التسميد موضع الدراسة قد أحدثت تحسناً معنوياً في ارتفاع النبات، قطر الساق، عدد الأوراق/نبات، الوزن الطازج و الجاف للأوراق و الساق والجذور، و أيضا في محتوى الأوراق من كلوروفيللي أ، ب و الكاروتينويدات، النيتروجين، الفوسفور، البوتاسيوم، الحديد، الزنك و المنجنيز، مع تفوق المعاملة المشتركة بين المستوى الأعلى من العناصر الصغرى (٢٤٠+١٢٠+١٢٠ جزء في المليون) و الخميرة الجافة النشطة بمعدل (٨جم/لتر) و التي أعطت أعلى المتوسطات في جميع القياسات السابقة في معظم الحالات بكلا الموسمين، تلتها معاملة الخميرة الجافة النشطة بمفردها (٨جم/لتر) و التي أعطت متوسطات قريبة من متوسطات المعاملة المشتركة.

و عليه، فإنه من الناحية الاقتصادية و البيئية، يمكن التوصية برش المحلول المائي للخميرة الجافة النشطة (٨جم/لتر) بمفردها، ثلاث مرات و بفاصل زمني شهر بين كل رشتين، على الأوراق لتحسين نمو و مظهر نباتات الشفليرا المنزرعة في أصص بلاستيك قطرها ٢٠سم و ملئت بحوالي ٢,٥ كجم من مخلوط الرمل و الطين (١:١ حجما).