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EFFECT OF POTTING MEDIA AND FOLIAR ERTILIZATION ON *Epipremnum eureum* PLANT

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ABSTRACT

In a factorial experiment, the influence of five potting media [sand, peat moss, vermiculite, peat moss + sand (1:1, v/v) and vermiculite + sand (1:1, v/v)] and three foliar fertilizer levels [1- spraying with tap water as control, 2- weekly spraying with solution contain 1gm/ liter of Solofert fertilizer (contain 20% N, 20% P_2O_5, 20% K_2O and 600 ppm Fe, 400 ppm Zn, 400 ppm Mn, 50 ppm Mg, 50 ppm Cu and 50 ppm B), and 3- weekly spraying with solution contain 2gm/liter of the same fertilizer] on *Epipremnum aureum* growth and pot grade was evaluated. Foliar fertilization significantly enhanced pothos growth as: vine length, leaves No. /pot, area/leaf and leaves area/pot, shoot and root fresh and dry weight as well as plant quality (pot grade). This was associated with increasing N, P, K, and total carbohydrate percentages in leaves of fertilized plants. Generally, there were no significant differences between low and high fertilizer levels. Growing plants in peat moss + sand (1: 1, v/v) medium resulted in the highest values represented growth, pot grade as well as leaf chemical composition comparing to all the other tested potting media. Interaction treatments between peat moss + sand (1: 1, v/v) medium and 1 or 2 gm fertilizer/ liter levels showed the superior effect in enhancing pothos growth and quality. Correlation coefficients study under the effect of interaction treatments between the used foliar fertilizer levels and potting media recorded high positive significant correlations between percentages of N, P, K, and total carbohydrate in plant leaves and the studied vegetative characters. This was reflected positively on pot grade.

Keywords: *Epipremnum aureum*, pothos, foliar fertilization, potting media, vine length, pot grade, correlation coefficients and leaf chemical composition.

INTRODUCTION

Pothos plant, devil's ivy or hunter's robe (*Epipremnum aureum, Epipremnum aureus* or *Pothos aureus*) is one of the most popular foliage plants belongs to Family *Araceae*. It is a vigorous, evergreen herbaceous vine with simple, alternate leaves which are ovate or chordate. Juvenile leaves are entire and can grow to 30 cm long, but mature leaves are perforated and can reach length of 75 cm. The juvenile form is the most commonly seen (Black, 1992). It normally remains in juvenile form when used indoors and thus never flowers (Conover, 1980). Because pothos plant tolerate indoor growing conditions and a wide range of soil moisture levels as well as they may utilized in many different ways (totems, hanging baskets, dish gardens and various pot sizes), it will probably continue to be one of the major foliage ornamental crops (Steinkamp *et al.*, 1992).

Potting medium which used to grow indoor plants can range from 100% organic matter to approximately 50% organic and 50% inorganic matter (Bunt, 1988). The key factors of potting media should include aeration (Bugbee and Frink, 1986), as well as nutrient (Nelson, 1991) and moisture retention (Heiskanen, 1993).

Chase and Poole (1991a) when grew golden pothos plants in 6-inch plastic pots containing two growing media; *i.e.* Vergro or mixture of Canadian peat and pine bark (1:1, v/v), found that potting media significantly affected vine weight, cutting grade, vine length and top grade. Poole *et al.* (1991) stated that pothos cuttings will root equally well in an organic medium such as peat or an inorganic medium such as calcined clay.

Peat and vermiculite are the most extensively used as a potting media. But these components have poor P-retaining ability (Fox and Kamprath, 1971). According to Ingram *et al.* (1993), peat moss is the most common growth medium component for container production. There can be tremendous, diversity among the characteristics of peat from different sources and locations. In addition, vermiculite (an aluminum-iron magnesium-salicate, a mica like mineral) has been used increasingly as a potting mix amendment. Due to the range of pore spaces of processed vermiculite, it retains considerable moisture upon wetting. Various characteristics of the potting medium also affect the rate at which nutrients are made available to foliage plants. Potting media composed of large amounts of sand may require slightly higher fertilizer levels because of decreased nutrient retention ability, especially where frequent or heavy leaching occurs (Conover *et al.*, 1991).

Pothos growth was frequently enhanced by fertilizer applications; this enhancing effect was depended upon many factors. Conover and Poole (1972) recommended 0.8 to 1.0 lbs P_2O_5 and 1.7 to 2.0 lbs K_2O/1000 Ft^2/month for production pothos stock plants. Also, they advised reduction of fertilizer rates by 30% in winter in unheated propagation areas, since plants utilized less fertilizer under winter conditions. Additionally, the same researchers Conover and Poole (1978) found that fertilizer rate was lower for production of acclimatized golden pothos compared to those made for stock plants which never leave the production area; they recommended 34-11-23 N-P_2O_5-K_2O lbs/1000 Ft^2/yr. In other experiment, Conover and Poole (1990) published that pothos in 6-inch pots getting a 3:1:2 fertilizer such as 19-6-12 Osmocote should receive 4.0 gm/pot /3 months, while plants in 6-inch pots receiving a 20-20-20 soluble liquid fertilizer such as Peters would get 1.3 gm/pot/month. As for fertilizer source effect, Poole and Chase (1991a and b) when tested the effect of N fertilization from 3 sources at 3 application rates, found that N rate was more important than N source in golden pothos stock plant and cutting production. The highest tested N rate (112.5 mg N/6-inch pot/week in the first research under summer season conditions and 56 mg N/6-inch pot/week in the second one) hade more vines, leaves and number of nodes / vine. While, the lowest application rate (12.5 mg N/6-inch pot/week or 14 mg N/6-inch pot/week in the first and second experiments, respectively) produced poor quality of stock plants. Also, potassium fertilization enhanced number of new breaks/vine and number of vines as well as top fresh weight/pothos plant (Chase and Poole, 1991a and b).

Recently, in a comparison between N and K effects, Chase and Poole (1992) found that N rate was more important for pothos stock plants and cutting production than K rate when plants grown with a urea formaldehyde N source. The combined amounts of N and K that plants received also influenced

growth and quality, best quality were produced when plants received 2.0 or 4.0 gm urea + 1.3 gm K_2O/6-inch pot.

Foliar feeding has many advantages than soil fertilization. Lovatt (1999) stated that foliar feeding can be from five to thirty times as efficient as ground application of nutrients. Also, foliar fertilization can make some minerals available to plants immediately when they are not available or in low amounts in the soil, water or hydroponics nutrient solutions (Gettier *et al.*, 1985). So, the present research was conducted aiming to evaluate influence of potting media on *Epipremnum aureum* growth and to what extent foliar fertilization (N,P,K and some microelements) can be enhance and improve plant growth and quality in different used media combinations.

MATERIALS AND METHODS

This work was conducted during the two successive seasons of 2001-2002 and 2002-2003 at the Glasshouse conditions of Efficient Productivity Institute, Zagazig University, Egypt, to study the influence of five potting media on *Epipremnum aureum* growth, beside to what extent foliar fertilization of N, P, K and some micronutrients can enhance and improve plant growth and quality in different potting media combinations.

On November 1st during the two tested seasons, uniform well rooted leaf bud cuttings of *Epipremnum aureum* (8 cm length and 0.6 to 0.8 mm thickness) were planted into 8 cm plastic pots filled with the designated prepared media; three cuttings were planted per pot. All cuttings were prepared from juvenile stems of the same plant. Pots were left in the glasshouse with a temperature ranged from 22 to 28°C, relative humidity between 80 to 85% and maximum light intensity from 1300 to 1700 foot candles (measured at 2 pm o'clock). Plants were overhead irrigated two times / week during the experimental period (from November 1st to February 15th of the two seasons).

The used potting media were sand, peat moss, vermiculite, peat moss + sand (1:1 v/v) and vermiculite + sand (1:1 v/v). German peat moss (pH 4.5) was used in this research. The pH of peat moss was adjusted to 7.0 using 2 kg calcium carbonate / 400 liter peat. Also, the used sand was well washed using tap water for 24 hours to eliminate any harmful salts. The chemical and physical properties of the used potting media are shown in Table A.

Three foliar fertilization levels of soluble fertilizer commercially named Solofert (contain 20% N, 20% P_2O_5, 20% K_2O and 600 ppm Fe, 400 ppm Zn, 400 ppm Mn, 50 ppm Mg, 50 ppm Cu and 50 ppm B) were tested as follows: 1- control plants were sprayed with tap water, 2- plants were subjected to spraying with solution containing 1 gm fertilizer / liter, and 3- plants were sprayed with solution containing 2 gm /liter of the same fertilizer. The foliar feeding was applied once/week using hand-held sprayer to achieve thorough coverage of the leaves and stems in various rates according to the treatment, beginning of planting on November 1st till the end of experiment on February 15th for the two seasons.

Table A: Chemical and physical analysis of the used potting media.

Analysis / Media	Coarse sand %	Fine sand %	Silt %	Clay %	Organic matter %	E.C. m mhose /cm	pH	Total		
								N%	P%	K%
Sand	71.5	11.7	12.1	2.7	1.8	0.6	7.6	0.06	0.01	0.64
Peat moss	-	-	-	-	98.0	1.4	7.0	0.36	0.29	2.45
Vermiculite	-	-	-	100.0	-	0.1	6.4	0.19	0.14	2.30
Peat moss + Sand (1:1, v/v)	36.2	6.1	7.0	1.6	49.1	1.1	7.4	0.29	0.17	1.56
Vermiculite + Sand (1:1,v/v)	34.9	5.8	6.9	52.0	-	0.7	7.1	0.08	0.09	1.81

Treatments were set up in a factorial experiment between the five potting media and the three foliar fertilization levels in a randomized complete block design. Three replicates were used for each of the 15 treatments, and each replicate contain 5 pots.

Recorded data:

Vine length (cm), leaves number/pot, area/leaf and leaves area (cm^2)/pot (calculated by determining the relationship between fresh weight of known leaf area,10 leaf disks, and leaf fresh weight/ leaf or /pot), shoot and root fresh and dry weight/pot (gm).

Also, plants were assigned a plant grade (pot grade) based on the following scale: 1= dead; 2= poor, unsalable; 3= moderate, salable= 4: good, salable; and 5= excellent, salable.

Leaves samples for chemical analysis were also taken and were dried at 70 ^{o}C for 72 hours, finally ground and chemically analyzed to determine total N% according to A.O.A.C. (1980), total P% according to Hucker and Catroux (1980), K% according to Brown and Lilleland (1946), total carbohydrate % according to Dubois *et al.* (1956).

All vegetative growth data and plant quality (pot grade) as well as chemical analysis were recorded and determined at the end of experiment on February 15th for the two tested seasons.

The obtained data were statistically analyzed according to Steel and Torrie (1980). Mean separation was done using Duncan's multiple range test at 5% level (Duncan,1955). Moreover, correlation coefficients between pothos growth characters, and chemical constituents under interaction treatment effect between fertilization levels and potting media were calculated according to Svab (1973).

RESULTS AND DISCUSSION

1- Effect of potting media:

Data represented vegetative growth as affected by growing media in Tables 1 and 2 show that growing pothos plants in peat moss + sand (1:1, v/v) medium resulted in the highest values of vine length (cm), leaves No/pot, area/leaf and leaves area/pot (cm^2) as well as fresh and dry weight of

shoot/pot (gm), comparing to all the other used media. Generally, this enhancing effect was significant comparing to the other media treatments during the two tested seasons. Vermiculite alone as potting medium had a suppressing effect in this regard. Visually growing plants in vermiculite caused leaf edge burning .Chase and Poole (1991a) stated that potting media (Vergro or a mixture of Canadian peat and pine bark 1:1, v/v) significantly affected vine weight and vine length of golden pothos.

As for root growth expressed as fresh and dry weight/pot (gm), data in Table 2 show that plants grown in peat moss medium had heaviest fresh weight during the two seasons comparing to the other tested media. This may be due to the high water retention of peat moss as an organic medium. While, root dry weight/pot (gm) was significantly enhanced in plants grown in peat moss + sand (1:1 v/v) medium.

The same Table 2 shows that the highest pot grades were recorded for plants grown in peat moss + sand (1:1, v/v) medium during the two seasons (4.88 and 4.78 grades for first and second seasons, respectively). This effect was significant comparing to all other used media. Simultaneously, vermiculite produced plants with poor quality during the two tested seasons (1.5 and 2.0 pot grades for first and second season, respectively). Also, peat moss, alone produced good pots, while sand medium resulted in moderate quality pots. Chase and Poole (1991a) recorded that potting media (Vergro or mixture of Canadian peat and pine bark 1:1, v/v) significantly affected top and cutting grades of golden pothos.

Also, potting media had significant effect on pothos leaf chemical composition (Table 3). As clear peat moss + sand (1:1, v/v) medium significantly increased N,P,K and total carbohydrate percentages in leaves comparing to the most other used media during the two growing seasons. While, vermiculite alone or sometimes when mixed with equal volume of sand, generally, had the least values in this respect. Poole and Conover (1976) stated that good quality of golden pothos plants were found to have tissue levels of 2.5-3.5% N, 0.20-0.35% P and 3.0-4.5% K. Results of this research are in line with these values

2- Effect of foliar fertilization:

The main effect of foliar fertilization levels is represented in Tables 1 and 2. The results clear that as fertilization level increased pothos growth (vine length, leaves No/pot, area/leaf, leaves area/pot, shoot fresh and dry weight/ pot as well as root fresh and dry weights/ pot) was increased. Generally, the highest fertilizer level (weekly spraying with solution contains 2 gm fertilizer/liter) resulted in the highest values in this concern. These results are in harmony with those obtained by Conover and Poole (1972) using P and K fertilization; Conover and Poole (1978 and1990) using N, P and K fertilization; Poole and Chase (1991a and b) testing N fertilization and Chase and Poole (1992) using N and K fertilizers. However, the favorable effects of applied levels of used foliar fertilizer on growth might be due to the availability of N, P, K and the other used elements at suitable rates needed for different metabolic processes enhanced growth of treated plants (Epstein, 1972).

Table 1: Effect of potting media, fertilization, and their interaction treatments on some vegetative growth characters of *Epipremnum aureum* plant during 2001-2002 and 2002-2003 seasons.

Media / Solofert fertilizer @	Sand	Peat moss	Vermiculite	Peat moss +Sand (1:1 v/v)	Vermiculite +Sand (1:1 v/v)	Mean	Sand	Peat moss	Vermiculite	Peat moss +Sand (1:1 v/v)	Vermiculite +Sand (1:1 v/v)	Mean
	2001-2002 Season						2002-2003 Season					
	Vine length (cm)											
Control	18.9 a	21.6 a	12.7 a	22.0 a	16.4 a	**18.3 C**	21.6 a	25.9 a	13.9 a	29.0 a	16.3 a	**21.3 C**
1 gm/L	21.6 a	23.4 a	16.2 a	27.4 a	18.9 a	**21.5 B**	25.1 a	27.4 a	18.1 a	29.7 a	18.8 a	**23.8 B**
2 gm/L	25.5 a	26.0 a	20.2 a	28.1 a	22.2 a	**24.4 A**	28.3 a	29.1 a	21.5 a	34.8 a	26.9 a	**28.1 A**
Mean	**22.0 B**	**23.7 B**	**16.3 D**	**26.8 A**	**19.2 C**		**25.0 B**	**27.5 B**	**17.8 D**	**31.1 A**	**20.6 C**	
	Leaves number/pot											
Control	11.1 bcd	9.8 def	5.5 g	12.5 bc	2.8 h	**8.3 B**	9.9 cd	9.2 cd	4.3 f	13.6 b	3.0 f	**8.0 B**
1 gm/L	11.1 bcd	13.1 b	8.4 ef	16.2 a	9.4 def	**11.7 A**	11.2 c	13.4 b	6.8 e	15.5 ab	6.3 e	**10.6 A**
2 gm/L	10.5 cde	10.5 cde	8.1 f	16.3 a	12.4 bc	**11.6 A**	10.7 c	10.8 c	8.2 de	16.6 a	11.0 c	**11.5 A**
Mean	**10.9 B**	**11.1 B**	**7.3 C**	**15.0 A**	**8.2 C**		**10.6 B**	**11.2 B**	**6.4 C**	**15.2 A**	**6.8 C**	
	Area/leaf (cm^2)											
Control	35.4 a	48.2 a	33.8 a	46.2 a	29.1 a	**38.5 B**	34.2 efg	47.0 bc	25.4 hi	42.4 cd	27.7 hgi	**35.3 C**
1 gm/L	41.2 a	46.8 a	30.4 a	58.4 a	30.2 a	**41.4 B**	45.9 bc	49.6 b	23.0 i	52.3 ab	30.2 fgh	**40.2 B**
2 gm/L	51.9 a	55.9 a	47.6 a	54.0 a	44.7 a	**50.8 A**	51.1 ab	57.6 a	36.2 def	50.6 ab	38.7 de	**46.8 A**
Mean	**42.8 B**	**50.3 A**	**37.2 BC**	**52.9 A**	**34.7 C**		**43.7 B**	**51.4 A**	**28.2 D**	**48.4 A**	**32.2 C**	
	Leaves area/pot (cm^2)											
Control	393 ef	474 de	186 gh	578 cd	102 h	**346.0 C**	341 a	419 a	108 a	573 a	83 a	**305 C**
1 gm/L	460 de	616 ed	256 fgh	951 a	285 fg	**514.0 B**	516 a	667 a	156 a	817 a	196 a	**470 B**
2 gm/L	548 de	725 bc	381 ef	882 ab	556 cde	**618.0 A**	549 a	623 a	298 a	847 a	427 a	**549 A**
Mean	**467 C**	**605 B**	**274 D**	**804 A**	**314 D**		**469 C**	**570 B**	**187 D**	**746 A**	**235 D**	

@ Solofert fertilizer (N, P_2O_5, and K_2O at 20%for each+ Fe, Zn, Mn, Mg, Cu and B at 600,400,400, 50, 50and 50 ppm, respectively) was used as weekly foliar spraying, control plants were sprayed with tap water.

Means having same alphabetical letter(s) within each column did not significantly differ according to Duncan multiple range test at 5% level.

Table 2: Effect of potting media, fertilization, and their interactions on *Epipremnum aureum* shoot and root fresh and dry weights as well as pot grade during 2001-2002 and 2002-2003 seasons.

Media / Solofert® fertilizer	Sand	Peat moss	Vermiculite	Peat moss +Sand (1:1 v/v)	Vermiculite +Sand (1:1 v/v)	Mean	Sand	Peat moss	Vermiculite	Peat moss +Sand (1:1 v/v)	Vermiculite +Sand (1:1 v/v)	Mean
	2001-2002 Season						2002-2003 Season					
	Shoot fresh weight/pot (gm)											
Control	12.7 fg	14.2 ef	4.2 j	19.3 bc	3.1 j	**10.8 C**	11.6 a	14.2 a	5.6 a	19.6 a	6.2 a	**11.4 C**
1 gm/L	14.7 ef	18.2 bcd	7.2 i	26.7 a	10.3 gh	**15.4 B**	14.2 a	18.3 a	7.7 a	26.1 a	9.6 a	**16.2 B**
2 gm/L	16.8 cde	20.3 b	9.7 hi	27.8 a	16.1 de	**18.1 A**	15.8a	21.4 a	12.0 a	27.3 a	15.2 a	**18.3 A**
Mean	**14.7 C**	**17.5 B**	**7.0 E**	**24.1 A**	**10.1 D**		**13.9 C**	**17.9B**	**8.4 E**	**24.3 A**	**10.3 D**	
	Shoot dry weight/pot (gm)											
Control	1.56f g	1.73 efg	0.80 h	2.50 cd	1.33 fgh	**1.68 B**	1.96 a	2.00 a	1.13 a	3.03 a	1.83 a	**1.99 B**
1 gm/L	1.90 def	3.30 ab	1.03 gh	3.46 a	1.53 fg	**2.24 A**	2.30 a	3.43 a	1.76 a	4.23 a	2.03 a	**2.75 A**
2 gm/L	2.33 cde	2.70 bc	1.60 fg	3.23 ab	2.33 cde	**2.44 A**	2.40 a	3.73 a	2.16 a	4.16 a	2.53 a	**3.00 A**
Mean	**1.93 C**	**2.58 B**	**1.14 D**	**3.06 A**	**1.73 C**		**2.22 C**	**3.05 B**	**1.68 D**	**3.81 A**	**2.13 C**	
	Root fresh weight/pot (gm)											
Control	1.73 a	2.26 a	0.33 a	1.93 a	0.50a	**1.35 C**	1.96 de	1.93 de	0.73 i	2.43 bc	0.80 i	**1.57 C**
1 gm/L	1.70 a	2.83 a	0.67 a	2.50 a	1.20a	**1.78 B**	1.83 ef	2.60 bc	0.96 hi	2.66 bc	1.20 gh	**1.85 B**
2 gm/L	1.76 a	4.66 a	1.30 a	2.93 a	1.67a	**2.46 A**	2.30 cd	5.90 a	1.50 fg	2.80 b	1.83 ef	**2.86 A**
Mean	**1.73 C**	**3.25 A**	**0.77 D**	**2.45B**	**1.12D**		**2.03 C**	**3.47A**	**1.06 D**	**2.63B**	**1.27 D**	
	Root dry weight/pot (gm)											
Control	0.61 a	0.64 a	0.29 a	0.71 a	0.37a	**0.52 B**	0.77 a	0.90 a	0.33 a	1.15 a	0.48 a	**0.72 B**
1 gm/L	0.60 a	0.84 a	0.32 a	0.88 a	0.45a	**0.62 B**	0.64 a	1.01 a	0.27 a	1.79 a	0.46 a	**0.83 B**
2 gm/L	0.84 a	1.44 a	0.62 a	1.06 a	0.47a	**0.88 A**	1.05 a	1.89 a	0.60 a	1.97 a	0.63 a	**1.21 A**
Mean	**0.68 B**	**0.97 A**	**0.41 C**	**0.88 A**	**0.43C**		**0.82 C**	**1.27 B**	**0.40 D**	**1.62 A**	**0.52 CD**	
	Pot grade											
Control	2.83 a	3.83 a	1.16 a	4.66 a	1.67a	**2.83 B**	3.27 a	4.00 a	1.83 a	4.83 a	2.00 a	**3.18 A**
1 gm/L	3.16 a	4.16 a	1.16 a	5.00 a	2.17a	**3.23 A**	3.33 a	4.33 a	2.00 a	5.00 a	2.17 a	**3.37 A**
2 gm/L	3.33 a	4.16 a	1.16 a	5.00 a	2.83a	**3.40 A**	3.53 a	4.00 a	2.16 a	4.50 a	3.16 a	**3.47 A**
Mean	**3.11 C**	**4.05 B**	**1.50 E**	**4.88 A**	**2.22D**		**3.38 C**	**4.11 B**	**2.00 E**	**4.78 A**	**2.44 D**	

® Solofert fertilizer (N, P_2O_5, and K_2O at 20%for each+ Fe, Zn, Mn, Mg, Cu and B at 600,400,400, 50, 50and 50 ppm, respectively) was used as weekly foliar spraying, control plants were sprayed with tap water.

Pots were graded on a scale of 1 = dead; 2 = poor quality, unsalable; 3 = moderate, salable; 4 = good, salable; and 5 = excellent, salable.

Means having same alphabetical letter (s) within each column did not significantly differ according to Duncan multiple range test at 5% level.

Table 3: Effect of potting media, fertilization, and their interactions on N,P,K and total carbohydrate percentages in *Epipremnum aureum* leaves during 2001-2002 and 2002-2003 seasons.

Media / Solofert fertilizer®	Sand	Peat moss	Vermiculite	Peat moss +Sand (1:1 v/v)	Vermiculite +Sand (1:1 v/v)	Mean	Sand	Peat moss	Vermiculite	Peat moss +Sand (1:1 v/v)	Vermiculite +Sand (1:1 v/v)	Mean
	2001-2002 Season						2002-2003 Season					
					Nitrogen (%)							
Control	1.73 f	2.02 e	1.24 h	2.02 e	1.53 g	**1.71 C**	1.97 a	1.83 a	1.31 a	1.98 a	1.89 a	**1.80 B**
1 gm/L	2.67 bc	2.60 c	1.97 e	2.68abc	1.94 e	**2.37 B**	2.40 a	2.32 a	1.95 a	2.55 a	2.36 a	**2.32 A**
2 gm/L	2.78abc	2.89 a	2.24 d	2.83 ab	1.98 e	**2.54 A**	2.27 a	2.71 a	2.25 a	2.79 a	2.63 a	**2.53 A**
Mean	**2.39 B**	**2.50 AB**	**1.82 C**	**2.51 A**	**1.81 C**		**2.21AB**	**2.29 A**	**1.84 B**	**2.44 A**	**2.29 A**	
					Phosphorus (%)							
Control	0.29 a	0.31 a	0.23 a	0.29 a	0.29 a	**0.28 B**	0.30 a	0.34 a	0.21 a	0.35 a	0.31 a	**0.30 B**
1 gm/L	0.33 a	0.36 a	0.30 a	0.33 a	0.35 a	**0.33 A**	0.32 a	0.36 a	0.29 a	0.37 a	0.32 a	**0.33 A**
2 gm/L	0.35 a	0.35 a	0.31 a	0.34 a	0.36 a	**0.34 A**	0.34 a	0.35 a	0.31 a	0.37 a	0.33 a	**0.34 A**
Mean	**0.33 A**	**0.34 A**	**0.28 B**	**0.32 A**	**0.33 A**		**0.32B**	**0.35 A**	**0.27 C**	**0.36 A**	**0.32 B**	
					Potassium (%)							
Control	1.70 g	1.81efg	1.70 g	1.89 ef	1.72 fg	**1.76 C**	1.98 e	1.56 f	1.51 f	2.05 e	1.51 f	**1.72 B**
1 gm/L	2.16 cd	1.99 de	1.94 e	2.31 bc	1.93 e	**2.07 B**	2.30 d	2.92 a	2.65 b	2.70 b	2.40cd	**2.59 A**
2 gm/L	2.65 a	2.46 b	2.19 c	2.41 b	2.18 c	**2.37 A**	2.55 bc	2.66 b	2.57 bc	2.68 b	2.57bc	**2.60 A**
Mean	**2.17 AB**	**2.09 B**	**1.94 C**	**2.20 A**	**1.94 C**		**2.27 B**	**2.38 A**	**2.25BC**	**2.47 A**	**2.16 C**	
					Total carbohydrate (%)							
Control	10.6 g	13.9 cde	10.7 g	13.9 cde	11.0 g	**12.0 C**	13.0 g	15.5de	8.4 i	16.8 cd	10.5 h	**12.8 C**
1 gm/L	14.5cd	16.4 ab	11.6 fg	17.6 a	12.2 efg	**14.5 B**	13.4 fg	19.1 a	14.5ef	19.1 a	12.9 g	**15.8 B**
2 gm/L	14.2cd	17.8 a	15.2 bc	16.5 ab	13.2 def	**15.4 A**	15.9 d	18.2 ab	15.7de	17.2 bc	14.6 e	**16.3 A**
Mean	**13.1 B**	**16.1 A**	**12.5 B**	**16.0 A**	**12.1 B**		**14.1 B**	**17.6 A**	**12.9 C**	**17.7 A**	**12.7 C**	

® Solofert fertilizer (N, P_2O_5, and K_2O at 20%for each+ Fe, Zn, Mn, Mg, Cu and B at 600,400,400, 50, 50and 50 ppm, respectively) was used as weekly foliar spraying, control plants were sprayed with tap water.

Means having same alphabetical letter(s) within each column did not significantly differ according to Duncan multiple range test at 5% level.

The promotive effect of fertilization on pothos shoot and root growth was reflected on produced pot quality, since fertilization enhanced pot grade (Table, 2) comparing to unfertilized plants. There were no significant differences between using 1 or 2 gm fertilizer/liter levels. This trend was significant only in the first season. This result is in line with those obtained by Chase and Poole (1991b) using K fertilization on golden pothos.

Data represented leaves chemical composition in Table 3 show that foliar fertilizer treatments significantly increased N, P, K and total carbohydrate percentages, comparing to unfertilized plants during two seasons of study. The highest fertilization level, the highest values were obtained. The effect of the two used fertilizer levels did not significantly differ in several cases during the two seasons. The increments of leaves N, P and K percentages of fertilized plants may be due to the direct supply of these elements through foliar fertilization (Lovatt, 1999). In turn, good feeding may enhance photosynthesis processes and carbohydrate accumulation in leaves of fertilized plants.

3- Effect of interaction treatments between potting media and foliar fertilization:

Generally, the effects of interaction treatments between potting media and foliar fertilizer on pothos growth as well as pot grade in Tables 1 and 2 were not confirmed during the two seasons, with the exception of leaves No./pot. Since, growth responses to fertilizer levels did not alter under the effect of used potting media and vice versa, used fertilizer levels did interfere with the effect of used potting media in most cases. However, the combined effect between peat moss + sand (1:1 v/v) medium and 1 or 2 gm fertilizer/ liter levels showed the superior effect in enhancing pothos growth measurements and pot grade during the two seasons, comparing to control or the most of all other combined treatments. There was no significant difference resulted from the interacted fertilizer level (1 or 2 gm/ liter). Chase and Poole (1991a) stated that interaction treatments between K fertilization and potting media (Vergro or mixture of Canadian peat and pine bark 1:1, v/v) had no significant effect on pothos vine length, vine weight, number of vines and number of breaks/plant, while enhanced pot grade. At the same time, Conover *et al.* (1991) stated that potting media composed large amounts of sand may require slightly higher fertilizer levels because of low nutrient retention ability, especially where frequently or heavy leaching occurs. So, this may explain the results regarding the positive effect of fertilization when plants grow in peat moss + sand (1:1, v/v) medium.

Effect of interaction treatments between potting media and fertilizer levels on chemical composition (Table, 3) supports the above results represented plant growth in most cases. Since, plants grow in peat moss + sand (1:1, v/v) medium and sprayed with 1 or 2 gm fertilizer/ liter level (the interaction treatments which resulted in the highest growth values) contained the highest percentages of N, P, K and total carbohydrate in their leaves, comparing to control or the most other interaction treatments during the two seasons.

4- Correlation study:

The correlation coefficients between the studied characters under the interaction effect of the used potting media with foliar fertilization treatments, as a pool data of the two seasons, in Table 4 clear that the determined pot grade was correlated positively with high significant values with the growth characters; *i.e.,* vine length, leaves number/pot, average leaf area, leaves area/ pot as well as shoot and root fresh and dry weight/ pot. This means that the applied treatments which enhanced those characters will reflect in enhancing pot grade. From the previous data it was found that the highest values of those characters were recorded in plants grown in mixture of peat moss + sand (1/1, v/v) and foliar sprayed with 1 gm fertilizer/ liter. As such the highest pot grade was recorded. In addition, it is clear that the determined percentages of N, P, K and total carbohydrate in leaves were positively highly significant correlated with the studied vegetative growth characters, so the enhancing absorption rate of these elements in addition to total carbohydrate in the leaves which resulted from proper medium [peat moss + sand (1:1, v/v)] combined with adequate fertilizer rate (1 gm/liter) will reflect positively on plant growth, consequently produced plants with high grade. Considering that the high carbohydrate synthesis is the output of proper N percentage as it a major constituent of chlorophyll, besides the role of phosphors and potassium in enhancing carbohydrate metabolism functions in plant (Devilin, 1979).

Table 4: Simple correlation coefficients between some growth characters and leaf chemical constituents of *Epipremnum aureum* plant under the effect of interaction treatments between potting media and foliar fertilization levels (pooled data of 2001-2002 and 2002-2003 seasons).

The character	1	2	3	4	5	6	7	8	9	10	11	12
Y-Pot grade	0.838	·.840	·.767	0.875	·.714	·.841	0.706	·.729	·.597	0.621	·.375	·.743
1-Vine length (cm)		0.824	0.803	0.859	0.697	0.891	0.727	0.854	0.753	0.792	0.657	·.852
2-Leaves No. / pot			0.752	0.937	0.627	0.804	0.581	0.651	0.663	0.671	0.513	0.730
3-Area/leaf (cm^2)				0.903	0.644	0.732	0.770	0.738	0.707	0.635	0.483	0.786
4-Leaves area/ pot (cm^2)					0.735	0.853	0.715	0.756	0.740	0.679	0.539	0.805
5Shoot F.W./ pot (gm)						0.728	0.542	0.651	0.532	0.560	0.382	0.612
6-Shoot D.W./ pot (gm)							0.740	0.858	0.737	0.745	0.654	0.857
7-Root F.W./ pot (gm)								0.831	0.675	0.590	0.489	0.747
8-Root D.W./ pot (gm)									0.631	0.642	0.535	0.776
9-N%										0.744	0.737	0.748
10-P%											0.584	0.759
11-K%												0.738
12-Total carbohydrate %												-

r at 5% = 0.362 r at 1% = 0.463 F.W. = fresh weight D.W. = dry weight

Conclusion and Recommendation:

It could be concluded that the best results for pothos growth characters (vine length, leaves number/pot, average leaf area, leaves area/ pot as well as shoot and root fresh and dry weight/ pot), consequently the highest pot grade were recorded in plants grown in medium contain mixture of peat moss + sand (1:1, v/v) and weekly sprayed with soluble fertilizer commercially named Solofert (contains 20% N, 20% P_2O_5, 20% K_2O and 600 ppm Fe, 400 ppm Zn, 400 ppm Mn, 50 ppm Mg, 50 ppm Cu and 50 ppm B) at rate of 1 or 2 gm/ liter. There were no significant differences in pot grades resulted from using high or low fertilizer level. So, to reduce the amount and cost of used fertilizer, it could be recommended that using the foliar application of low fertilizer level (1 gm/liter) for pothos plants grown in mixture medium contain peat moss + sand (1:1, v/v).

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تأثير بيئات النمو والتسميد الورقي على نبات البوتس

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قيم تأثير خمس بيئات نمو وثلاث مستويات من التسميد الورقي في تجربة عامليه على نمو وجودة نبات البوتس الناتج . كانت بيئات النمو المختبرة عبارة عن : رمل ، بيت موس، فيرمكيوليت ، بيت موس + رمل (بنسبة ١: ١ حجما) ، فيرمكيوليت + رمل (بنسبة ١: ١ حجما) ؛ أما معدلات التسميد الورقي فكانت : ١- رش بماء الصنبور للمقارنة ، ٢- رش النباتات مرة كل أسبوع بمحلول يحتوى على ١ جم /لتر من سماد تجارى سولوفيرت(يحتوى على ٢٠٪ ن، ٢٠٪ فو٢أ٥ ، ٢٠٪ بو٢أ + ٦٠٠ جزء فى المليون حديد، ٤٠٠ جزء فى المليون زنك، ٤٠٠ جزء فى المليون منجنيز، ٥٠ جزء فى المليون مغنسيوم، ٥٠ جزء فى المليون نحاس، ٥٠ جزء فى المليون بورون) ، ٣- رش النباتات مرة كل أسبوع بمحلول يحتوى على ٢ جم / لتر من نفس السماد .

أدى التسميد الورقي إلى دفع نمو النباتات وزيادة جودتها ، حيث زادت قيم كل من طول الكرمة وعدد الأوراق الناتجة / أصيص ومتوسط مساحة الورقة الواحدة ومساحة الأوراق الناتجة / أصيص والوزن الجاف والغض لكل من المجموع الخضري والجزري / أصيص بالإضافة الى درجة جودة الأصيص فى النباتات المسمدة. ارتبط ذلك بزيادة النسب المئوية لكل من عناصر النيتروجين والفسفور والبوتاسيوم والكربوهيدرات الكلية فى أوراق النباتات المسمدة، وعموما لم تظهر فروق معنوية بين مستويين التسميد المرتفع أو المنخفض(١ أو٢ جم / لتر).

أعطت النباتات النامية فى بيئة خليط بيت موس مع الرمل (بنسبة ١: ١ حجما) أعلى قيم للنمو الخضري وجودة الأصص الناتجة وكذلك للتحليل الكيمياوى للأوراق مقارنة بالنباتات النامية فى كل بيئات النمو المستخدمة الأخرى.

أظهرت معاملات التفاعل بين بيئة خليط البيت موس مع الرمل (بنسبة ١: ١ حجما) وبين معدلى التسميد ١ جم/لتر أو ٢ جم/لتر أعلى تأثير فى دفع نمو النباتات وزيادة جودة الأصص الناتجة.

سجلت دراسة معاملات الارتباط بين الصفات المختلفة تحت تأثير معاملات التفاعل بين بيئات النمو ومعدلات التسميد الورقي ارتباطات موجبة معنوية جدا بين النسب المئوية لكل من النيتروجين والفسفور والبوتاسيوم والكربوهيرات الكلية فى أوراق النباتات وبين كل قياسات النمو التى درست ، وانعكس ذلك ايجابيا على درجة جودة الأصص الناتجة.