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Effect of Tryptophan , Ascorbic Acids and Super Max Different Rates on Vegetative Growth and Flowering Spathiphyllum Wallsi l.

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ABSTRACT

A pot experiment was conducted at greenhouse in Ornamental Horticulture, Res, Inst, Agric. Res Center, Giza Egypt, during two successive seasons of 2014 and 2015. The aim of this investigation was to study the effect of amino acids (tryptophan, ascorbic acids and super max) at different rates 250, 500 and 750 ppm on *Spathiphyllum* productivity and quality. Seedlings cultivated in pot with 30 cm diameter filled with 10 (kg) mixture of compost: clay: sand, 1:1:1). The statically analysis of experiment were a complete randomized design with three replicates for each treatment and each replicate had six plants. The results indicated that the different foliar treatments increased growth measured parameters, i.e. plant height (cm^2), number of leaves/ plant, number of branches/plant, leaf area (cm), fresh and dry weight of leaves (g/plant), length of root (cm), number of root /plant, fresh and dry weight of root, Spathe length (cm) and fresh and dry weight of Spathe (g/plant), in *Spathiphyllum* plants with increasing super max , tryptophan and ascorbic acid foliar spray rates during two seasons. Flowering stalk (cm) and flowering date of *Spathiphyllum* significantly affect by super max, treptophan and ascorbic acids than control. On the other hand, the concentrations of N, P and K (%) and carbohydrates in *Spathiphyllum* plants increased with increasing different rates of super max than other amino acids and control. Finely, from these results could use super max with 750 ppm foliar spray gave best growth and flowering parameters and quality of *Spathiphyllum* plants.

Keywords: Tryotophan, ascorbic acid, super max; *Spathiphyllum*.

INTRODUCTION

Spathiphllum plant is very popular flowering plants for an indoor, it grows in tropical region. *Spathiphllum* is important oramental foliage which has a beast and creative leaves and white spadix, Hernnen and Hotchkiss (1995). *Spathiphyllum* is a genus of about 40 species of monocotyledonous flowering plants in the family Araceae, native to tropical regions of the Americas and southeastern Asia. Certain species of *Spathiphyllum* are commonly known as Spath or Peace Lilies, Parivz et al (2014). *Spathiphyllum* is friend of environment which cleans indoor air; beast cleans at 10 m^3 one per plant; many environmental contaminants, and other pollutants, (Hartman *et al*., 2002). *Spathiphyllum* cleans indoor air of many environmental contaminants, including benzene, formaldehyde, and other pollutants. It is watered approximately once a week. The soil is best left moist but only needs watering if the soil is dry, Kakoel and Hassan (2013).

Aminos acid foliar application has been proved to be a successful strategy to promote growth of many crops grown under low fertile soils, Abdel-Mawgoud *et al* (2011).

Ascorbic acid is impotent in plant growth and development, cell division, cell wall metabolism, root development, photosynthesis, regulation of florescence, regulation of leaf senescence and enzyme activity. The molecular formula of ascorbic acid is $C_6H_3O_6$. Ascorbic acid is organic compound with antioxidant properties, Zhang (2013). Ebrahim *et al*. (2014) indicated that the ascorbic acid foliar on plant gave increase of plant height than control within. Khalil *et al*.(2010) reported that the foliar application of ascorbic acid on *Ocinum bosilicum* plants significantly increased growth component (no. of branches, leaves, flowers and fruit set as well as dry weight of shoots per plant than control. Khafagy *et al* (2009) found that ascorbic acid foliar application caused improve plant growth parameters , total yield and the content of macronutrients of sweet pepper. Hifny and El-Sayed (2011) suggested that the ascorbic acid foliar application increase N, P and K content in leaves and leaf tissue with increasing rate of ascorbic acid by rate of 400 mg/L.

The tryptophan acid plays role in stimulating the plants growth and effect on auxin synthesis. Nahed *et al* (2009) found that plant height, number of branches, fresh and dry weight of plant and yield increased by increasing different levels of tryptophan acid foliar spray. Nahed *et al* (2010) reported that the foliar spray of tryptophan significantly promoted stem length, stem diameter, root length, fresh and dry weights of shoots and roots than the untreated plants. The foliar application of tryptophan led to increase in the total chlorophyll (a+b) and carotenoids content in plants, Abou Dahab and Nahed (2006), Hassanein (2003) suggested that foliar application of amino acids caused an increase in contents of photosynthetic pigments.

Super max is a compound of amino acids and macro- micronutrients, Hagag *et al* (2012) showed that the foliar of super max increase rate led to increasing plant height, leaf number per plant , shoot number per plant , stem diameter, leaves dry weight , root number and root length.

The aim of this study was to investige the effect of different amino acids (ascorbic, tryptophan acids and super max) in different rates on *Spathiphyllum* productivity and quality.

MATERIALS AND METHODS

A pot experiment was carried out during two successive seasons 2014 and 2015 at glass greenhouse in Ornamental Horticulture, Res, Inst, Agric. Res Center at Giza Egypt, to study the effect of foliar spray of ascorbic, tryptophan acids and Super max each at rates of 250, 500 and 750 (mg/L) on *Spathiphyllum* plants

productivity and quality. Super max is a component (citric acid 7 %, chelate calcium 1.8 % , magncium 3 % , sulfur Makrony 0.02 % , chelate zinc 3.4 % , iron 3.4 % , manganese 1.4 % , cupper 0.05 % , boron 0.02, molybdenum 0.02 % , cobalt 0.01 % and nickel 0.01%). The control plants were foliar sprayed with fresh water. Seedlings cultivated in pots with 30 cm diameter failed with 10 kg soil (mixture of compost: silt: sand, 1:1:1). The main physical and chemical properties of the cultivated soil were determined before planted seedling according to the methods described by Cotteine *et al* (1982) and Page *et al* (1982). The obtained data were recorded in Table (1).

Table (1) Physical and chemical properties of the soil used the experiment

Crosse sand (%)	Fin sand (%)	Silt (%)	Clay (%)	Texture	O.M (%)	$CaCO_3$ (%)
12.45	48.23	14.22	25.10	Sandy clay loam	0.68	1.85

pH	EC	Cations (meq/l)				Anions (meq/l)		
(1:2:5)	(dS/m)	Ca^{++}	Mg^{++}	Na^{+}	K^{+}	HCO^{-}_3	Cl^{-}	SO^{--}_4
7.89	1.52	4.85	1.96	7.54	0.85	1.20	5.98	8.02

Available of Macronutrients (mg/kg)		
N	P	K
44.85	4.90	193.00

The treatments of experiment were arranged in complete randomized design with three replicates for each treatment and each replicate plant.

Seedlings of *Spathiphyllum* (average height of 25 cm, four leaves and 2 rhizomes) were planted in first March 2014 to October 2015. Sowing was one seeding plant/pot. The foliar application of ascorbic, Tryptophan acids and super max on plants were sprayed each month after transplants.

Super phosphate (15.5 P_2O_5%) was applied at rate 2g/pot before seedling transferred. Ammonium nitrate (33 % N) was applied at rate 1.5 g/pot on three doses and potassium sulphate (48 % K_2O) was applied 1.5 K_2O g/pot. The control was mixed with N, P and K fertilizers of recommended doses direct soil application at rate of 5 g/plant/pot after 21, 45 and 60 days from seedling plants in all pots.

The seedlings were grown under greenhouse glass conditions for 8 month. Sowing has on first March to the beginning of flowering in first July and harvest in October in both seasons. After end of the both seasons growth parameters including, number of leaves/plant, plant height (cm), number of branches/plant, leaf area (cm^2) , leaves fresh and dry weight of (g/plant), length of roots (cm), number of root/plant, fresh and dry weight of roots (g/plant), flowering parameters, Spathe length (cm)and fresh and dry spathe (g/plant). Dry matter was obtained oven dried at 70 C^o for 72 hrs.

The Nitrogen, phosphorus and potassium contents in plants were determined using methods described by Cottenie *et al* (1982) and Page *et al* (1982). Chlorophyll (a+b) was determined in plant using methods by Lichatenthaler (1987). A total carbohydrate was determined in dry leaves using method described by Dubois et al (1956).

Statically analyzed was according to using the MSTAT- Statistical according to Gomez and Gomez (1984).

RESULTS AND DISCUSSION

Effect of ascorbic and tryptophan acids and super max on *Spathiphyllum* plants productivity:

Data presented in Table (2) show that the effect of amino acids and super max on growth of *Spathiphyllum* plants parameters i.e. plant height (cm) was significant in first season, while the leaf area (cm^2) significantly increased with increasing rates of ascorbic , tryptophan acids and super max in both seasons . As well as, the number of branches /plant and number of leaves/ plant were not significant in both seasons. This may be due to the regulation of cell division and reflected to enzyme actives. The corresponding relative increases of mean two season's values were 15.97, 10.99 and 32.27 % for plant height; 32.91, 26.10 and 40.57 % for number of leaves /plant; 80.00; 66.80 and 133.20 % for number of branches/plant and 42.26, 38.00 and 52.10 % for leaf area as affected by tryptophan, ascorbic acids and super max foliar spray different rates compared with control.

Table (2). Effect of amino acids and super max on *Spathiphyllum* plants parameters.

Treatments		Plant height (cm)			No. leaves /plant			No. of branches /plant			Leaf area (cm^2)		
	Rate (mg/L)	2014	2015	Mean	2014	2015	Mean	2014	2015	Mean	2014	2015	Mean
Control		35.62	37.00	36.31	10.63	11.55	11.09	2.00	3.00	2.50	48.52	51.20	49.86
	250	38.52	39.40	38.96	12.47	13.87	13.17	3.00	4.00	3.50	66.25	68.75	67.50
Tryptophan acid	500	42.36	43.10	42.73	14.60	15.22	14.91	4.00	5.00	4.50	69.52	73.44	71.48
	750	44.29	45.00	44.65	15.88	16.40	16.14	5.00	6.00	5.50	72.41	75.20	73.81
Mean		41.72	42.50	42.11	14.32	15.16	14.74	4.00	5.00	4.50	69.39	72.46	70.93
	250	36.99	38.81	37.90	12.00	13.10	12.55	3.00	4.00	3.50	63.85	66.81	65.33
Ascorbic acid	500	40.80	41.20	41.00	13.55	14.66	14.11	4.00	5.00	4.50	67.90	69.88	68.89
	750	41.66	42.33	42.00	14.85	15.70	15.28	4.00	5.00	4.50	70.21	74.13	72.17
Mean		39.82	40.78	40.30	13.47	14.49	13.98	3.67	4.67	4.17	67.32	70.27	68.80
	250	45.96	46.55	46.26	13.59	14.33	13.96	5.00	6.00	5.50	69.53	71.69	70.61
Super max	500	47.59	48.92	48.26	15.66	16.75	16.21	5.00	6.00	5.50	75.48	77.90	76.69
	750	49.25	49.88	49.57	16.00	17.20	16.60	6.00	7.00	6.50	79.32	81.14	80.23
Mean		47.60	48.45	48.03	15.08	16.09	15.59	5.33	6.33	5.83	74.78	76.91	75.84
LSD. 0.05		7.54	ns		ns	ns		ns	ns		8.25	7.25	

Generally, from this result could be increase of plant height, number of leaves/plant, number of branches /plant and leaf area for *Spathiphyllum* plant with increasing super max followed by tryptophan and ascorbic acids respectively. These results are in agreement by Hagag *et al* (2012) they found that the plant height, leaf number/plant, shoots number/plant and stem diameter increased with increasing spraying super max rates. El-Dean *et al* (2009) reported the increase of number of leaves and leaf area with increasing tryptophan acid rate. These results may be due to the physiological roles of tryptophan acid in plant growth which stimulate cell division in apical meristems. El-Quesni *et al* (2009) indicated that foliar spray of ascorbic acid to *Hipiscus rosa* L. plants led to increase of plant height, number of branches/ plant, number leaves /plant stem diameter and leaf area. These results may be due to substantial role of ascorbic acid in many metabolic and physiological processes. Abou Dahab and Nahed (2006) found that the amino acids and tryptophan had a significant effect on plant height and number of leaves /plant in first season

Effect of different rates of tryptophan , ascorbic acids and super max on fresh and dry weight of leaves.

Data presented in Table (3) showed that the foliar spray of ascorbic , tryptophan acids and super max increased fresh and dry weight of leaves with increasing rates to 500 and 750 ppm. The effect of ascorbic, tryptophan acids and super max foliar spray different rates on fresh weight of leaves was significant in both seasons. As well as, the all amino acids and different rates on fresh and dry weight leaves were positive with increasing rate. These results are in agreement with El-Hifny and El-Sayed (2012) who reported that the effect of ascorbic acid foliar spray was not significant for dry weight leaves. Nahed *et al* (2010) found that foliar spray of amino acid (tryptophan acid) caused significant increase in fresh and dry weight as compared with control (untreated).

The positive effect of amino acids and super max on fresh and dry weight of *Spathiphyllum* leaves may be the vital effect of these amino acids stimulation on the growth cells. These results may be due to the important of super max as plant hormone that regulate various processes of plant growth and development plays an important role in the regulation of cell division.

Table (3) effect of amino acids and super max treatments on fresh and dry weights of leaves for Spathiphyllum plants.

Treatments	Rate (mg/L)	fresh weight of Leaves (g)			dry weight of Leaves (g)		
		2014	2015	Mean	2014	2015	Mean
Control		39.52	40.60	40.06	10.83	11.22	11.03
	250	42.51	44.69	43.60	12.35	13.02	12.69
Tryptophan	500	44.18	46.81	45.50	12.95	13.55	13.25
	750	45.82	47.51	46.67	13.10	13.97	13.54
Mean		44.17	46.34	45.25	12.80	13.51	13.16
	250	40.83	41.35	41.09	11.85	12.68	12.27
Ascorbic acid	500	42.38	44.00	43.19	12.45	12.99	12.72
	750	43.55	46.20	44.88	12.69	13.25	12.97
Mean		42.25	43.85	43.05	12.33	12.97	12.65
	250	44.90	45.66	45.28	13.15	13.87	13.51
Super max	500	45.35	48.22	46.79	13.89	13.98	13.94
	750	49.20	52.30	50.75	14.22	14.88	14.55
Mean		46.48	48.73	47.61	13.75	14.24	14.00
LSD. 0.05		1.95	3.25		ns	1.82	

Effect of amino acids and super max on root characters of *Spathiphyllum* plants:

Results in Tables (4 and 5) showed that increasing rates of ascorbic, tryptophan acids and super max foliar spraying had positive effect on root length , number of roots/plant, fresh and dry weight (g/plant). The maximum values of length root , number of root/plant, fresh and dry weight (g/plant) were obtained with all treatments at a rates (750 ppm) with 51.40 cm and 29.10 for root length and number of roots/plant respectively ; 62.41 and 28.20 (g/plant) for plants fresh and dry weight. The effect of different rates of tryeptophan, ascorbic acids and super max on length of roots was significantly increases with increasing rate. Also, the effect of ascorbic, tryptophan acids and super max on length of roots and number of roots/plant were significant in both seasons. The highest mean values of length of roots (cm) and number of roots /plant as affected with super max spraying compared with other treatments. The No. of roots /plant and root length (cm) were significantly increased with increasing rates of tryptophan, ascorbic acids and super max in both seasons respectively.

These results are in agreement by Hagag *et al* (2012) they suggested that the root length (cm) and number of root increase with super max spray on Manzanelo olive seedling. The increase of root length (cm), number root /plant, fresh and dry root (g/plant) may be due to effect of citric acid and some nutrients contents in super max. These result may be due to increase in fresh and dry weight of roots attributed which may to the numbers of increasing cells due to the increasing of micronutrients iron, Boron , Zinc and Manganese, which super max content with amino acids and macronutrients.

Table (4). Effect of amino acids and super max treatments on roots and No. of root/plant of Spathiphyllum plants.

Treatments	Rate (mg/L)	Length of roots (cm)			No. of roots /plant		
		2014	2015	Mean	2014	2015	Mean
Control		30.25	33.66	31.96	18.62	19.00	18.81
	250	39.50	42.80	41.15	22.34	23.54	22.94
Tryptophan	500	42.30	45.88	44.09	23.69	24.38	24.04
	750	45.10	49.23	47.17	24.10	25.30	24.70
Mean		42.30	45.97	44.14	23.38	24.41	23.89
	250	38.52	40.21	39.37	19.65	20.51	20.08
Ascorbic acid	500	41.90	43.28	42.59	20.13	22.68	21.41
	750	43.27	45.10	44.19	22.65	23.85	23.25
Mean		41.23	42.86	42.05	20.81	22.35	21.58
	250	42.66	44.69	43.68	20.71	21.75	21.23
Super max	500	45.30	47.30	46.30	24.39	26.18	25.29
	750	48.60	51.40	50.00	26.75	29.10	27.93
Mean		45.52	47.80	46.66	23.95	25.68	24.81
LSD. 0.05		2.47	2.56		1.77	2.31	

Table (5) effect of amino acids and super max treatments on fresh and dry weight of root in Spathiphyllum plants.

Treatments	Rate (mg/L)	Fresh weight of roots (g/plant)			Dray weight of roots (g/plant)		
		2014	2015	Mean	2014	2015	Mean
Control		42.81	43.55	43.18	18.75	19.00	18.88
	250	50.81	53.64	52.23	20.63	21.45	21.04
Tryptophan	500	52.19	58.52	55.36	22.58	23.18	22.88
	750	54.22	59.32	56.77	24.19	25.00	24.60
Mean		52.41	57.16	54.78	22.47	23.21	22.84
	250	49.82	51.65	50.74	19.85	20.65	20.25
Ascorbic acid	500	50.95	52.72	51.84	20.34	22.14	21.24
	750	52.10	54.00	53.05	21.85	23.10	22.48
Mean		50.96	52.79	51.87	20.68	21.96	21.32
	250	53.47	55.39	54.43	22.63	23.48	23.06
Super max	500	55.96	58.26	57.11	24.19	25.69	24.94
	750	59.34	62.41	60.88	27.34	28.20	27.77
Mean		56.26	58.69	57.47	24.72	25.79	25.26
LSD. 0.05		2.16	2.13		2.39	2.82	

Effect of amino acids and super max on flowering of Spathiphyllum plant.

Data presented in Tables (6 and 7) show that the foliar amino acids and super max increased flowering stalk length (cm), flowering date (days) , Spathe length (cm) , Spathe fresh and dry weight (g/plant) with increasing rates of application and decreased flowering days period. Effect of tryptophan, ascorbic acids and super max foliar spray on flowering stalk length (cm), flowering days and spathe length were significant in both seasons. On the other hand, the flowering date of *Spathiphyllum* significantly by the all treatments compared with control. The highest rates of tryptophan, ascorbic acid and super max foliar application led to decreased flowering period for days, which, the increase of rate for amino acids foliar application was decrease flowering period. The highest mean values of flowering period for un treated plant with amino acids and super max. These results are in agreement with Talaat et al (2005) how reported that foliar spray of amino acids enhanced plant growth and flowering on various ornamental plants. Aly and Swedan, (2009) suggested that increase of tryptophan rate (150 ppm) was significantly affected the number of stalk / plant and stalk length of *Hippeastryum vittatum,* Herb compared with other concentrations in both seasons. Youssef and Ibrahim (2016) found that flowering date of Hedychium significantly increased by tryptophan and methionine amino acid at rate of 100 ppm compared with control at the same time it delayed flowering initiation in the first season.

Concerning the fresh and dry weight (g/plant) of Spathe was significantly increased due to foliar with different rates of amino acids such as tryptophan, ascorbic acids and super max; especially super max with different rate was increase fresh and dry weight (g/plant) of Spathe compared with other treatments during both seasons. The relative increase of mean combined two seasons values were 43.11, 33.95 and 116.79 % for stalk length (cm) and 39.88, 27.62 and 91.24 % for Spathe length (cm) as treated with tryptophan, ascorbic acids and super max different rates respectively, compared with control. It can be observed that foliar spray with 500 or 750 ppm amino acids and super max gave increasing effect on Spathe length, flowering stalk , weight fresh and dry Spathe

Also, the relative increase of mean combined two seasons values were 69.76, 62.79 and 129.30 % for fresh weight of Spathe (g/plant) and 110.34, 63.22 and 189.65 % for dry weight of Spathe (g/plant) as affected by spray tryptophan , ascorbic acids and super max respectively, compared with control. These results are in agreement with Neeraja *et al*., (2005) found that the using of amino acids foliar spray led to increase of flowers parameters of different plants.

Table (6) effect of fertilization treatments on flowering stalk, flowering days and spathe length of Spathiphyllum plant

Treatments	Rate (mg/kg)	Flowering stalk length (cm)			Spathe length (cm)			Flowering date (days)		
		2014	2015	Mean	2014	2015	Mean	2014	2015	Mean
Control		7.56	8.39	7.98	4.66	5.61	5.14	151.00	151.00	151.00
	250	9.68	11.30	10.49	6.22	6.88	6.55	131.33	128.67	130.00
Tryptophan acid	500	10.60	12.55	11.58	6.85	7.71	7.28	128.33	129.00	128.67
	750	11.55	12.85	12.20	7.30	8.18	7.74	127.67	129.33	128.50
Mean		10.61	12.23	11.42	6.79	7.59	7.19	129.11	129	129.06
	250	9.27	10.20	9.74	5.80	6.35	6.08	140.33	142.00	141.17
Ascorbic acid	500	10.00	11.60	10.80	6.14	6.75	6.45	139.00	141.67	140.34
	750	10.95	12.11	11.33	6.85	7.45	7.15	135.69	134.67	135.18
Mean		10.0733	11.30	10.69	6.26	6.85	6.56	138.34	139.447	138.89
	250	14.85	16.33	15.59	9.00	9.55	9.28	122.00	123.67	122.84
Super max	500	16.88	18.52	17.70	9.32	10.38	9.85	121.22	122.44	121.83
	750	17.34	19.88	18.61	9.88	10.85	10.73	120.67	121.67	121.17
Mean		16.3567	18.24	17.30	9.4	10.26	9.83	121.297	122.593	121.95
LSD. 0.05 Rate		1.89	1.77		0.88	1.35		6.18	2.68	

Table (7) effect of amino acids and super max treatments on fresh and dry weight of spathe in Spathiphyllum plants.

Treatments	Rate (mg/kg)	Spathe fresh weight (g/plant)			Spathe dry weight (g/plant)		
		2014	2015	Mean	2014	2015	Mean
Control		1.85	2.45	2.15	0.79	0.94	0.87
	250	2.75	3.56	3.16	1.50	1.85	1.68
Tryptophan acid	500	3.75	3.91	3.83	1.80	1.94	1.87
	750	3.90	4.00	3.95	1.89	1.97	1.93
Mean		3.47	3.82	3.65	1.73	1.92	1.83
	250	2.92	3.24	3.08	0.98	1.15	1.07
Ascorbic acid	500	3.55	3.75	3.65	1.30	1.75	1.53
	750	3.68	3.85	3.77	1.50	1.81	1.66
Mean		3.38	3.61	3.50	1.26	1.57	1.42
	250	3.91	4.83	4.37	1.90	2.24	2.07
Super max	500	4.31	5.81	5.06	2.50	2.85	2.68
	750	4.81	5.90	5.36	2.70	2.92	2.81
Mean		4.34	5.51	4.93	2.37	2.67	2.52
LSD. 0.05		1.14	0.96		0.79	0.54	

It is worthy to mention that the superiority of flowering parameters treated with super max , tryptophan and ascorbic acid was mainly due to increasing rate of all treatments in both seasons. Tantawy (2007) reported that the mixture of amino acids proved to be effective in improving plant growth under a biotic stress. Also, amino acids may be play an important role in plant metabolism and consequently increase all parameters of *Spathiphyllum*. From this result positive effect of the amino acids with high rate on the plant growth traits might be due to the stimulating effect of the amino acids on the plant cells , regulation of plant growth and development..

Effect of amino acids on macronutrients concentration in Spathiphyllum plants.

Effect of tryptophan, ascorbic acids and super max foliar spray on N, P and K (%) concentration in *spathiphyllum* plants in both seasons were positive effect Data obtained in Table (8) show that foliar spray of the amino acids and super max caused significant increase in the concentration of N, P and K for *spathiphyllium* plants. The highest mean values of N, P and K concentration in *Spathiphyllum* plants treated with super max followed by tryptophan acid followed by ascorbic acid compared to control, respectively.

Table (8) effect of amino acids and super max treatments on macronutrient concentration) in Spathiphyllum plants.

Treatments	Rate (mg/kg)	N (%)			P (%)			K (%)		
		2014	2015	Mean	2014	2015	Mean	2014	2015	Mean
Control		١.31	1.42	1.37	0.25	0.28	0.27	1.18	1.22	1.20
	250	١.45	1.53	1.49	0.33	0.36	0.35	1.21	1.26	1.24
Tryptophan acid	500	١.64	1.71	1.68	0.38	0.42	0.40	1.24	1.29	1.27
	750	١.73	1.78	1.76	0.44	0.47	0.46	1.27	1.33	1.30
Mean		١.61	1.67	1.64	0.38	0.42	0.40	1.24	1.29	1.27
	250	1.44	1.49	1.47	0.28	0.30	0.40	1.20	1.25	1.23
Ascorbic acid	500	1.53	1.65	1.59	0.35	0.38	0.29	1.22	1.27	1.25
	750	1.63	1.72	1.68	0.41	0.44	0.37	1.25	1.30	1.28
Mean		1.53	1.62	1.58	0.35	0.37	0.36	1.22	1.27	1.25
	250	1.68	1.73	1.71	0.46	0.48	0.47	1.27	1.33	1.30
Super max	500	1.72	1.78	1.75	0.48	0.52	0.50	1.32	1.36	1.34
	750	1.78	1.82	1.80	0.49	0.54	0.52	1.38	1.42	1.40
Mean		1.73	1.78	1.75	0.48	0.51	0.50	1.32	1.37	1.35
LSD. 0.05		0.019	0.042		0.024	0.042		0.049	0.044	

These results are in agreement with Sarojnee *et al*. (2009) who, found that amino acids can improve fertilizer assimilation, increase uptake of nutrients and water. Talaat (2003) suggested that foliar spray of ascorbic acid increased the content of macronutrients N, P and K of sweet pepper. Nahed *et al* (2010) found that the effect of different amino acids foliar application at a rate of 100 ppm on N, P and K gave an increase of macronutrients in shoots and roots as compared with untreated plants. Youssef and Talaat (2003) indicated that foliar spray of thiamine increased the concentration of N, P and K (%) in rosemary plants. Bekheta and Mahgoub (2005) illustrated that the increase of N, P and K content in plant may be due to quantities changes in amino acids and specific proteins which acted positively in cell division and cell elongation. Zewail (2014) found that the effect of amino acids as the main components of novavol and vegimax might be due to their roles in enhancing many physiological processes including nutrients uptake by roots and their metabolism in treated plants.

Effect of amino acids and super max on *spathiphyllium* chlorophyll (a, b), caroteniods contents and carbohydrate .

Data presented in Table (9 &10) the effect of tryptophan, ascorbic acids and super max foliar application with different rates of carbohydrate (mg/g f.w), chlorophyll (a+b) (mg/g f.w) and Carotenoids (mg/g f.w) content in *spathiphyllium* plants caused an increased with increasing different amino acids and super max rate.

The different rates of amino acids and super max gave significant increased of total carbohydrate in both seasons. Concerning, the effect of amino acids and super max foliar spray with different rate on Chlorophyll a, b and Carotenoids content in *spathiphyllium* plants there was significantly increase in both seasons. Finely, this result may be attributed, to the reduction effect of amino acids on potassium, lead to an increased of carbohydrate storage and reduced proteins, alteration in amino acid balance and consequently change in the quality of proteins which are the main element in chlorophyll production.

Table (9) effect of amino acids and super max treatments on carbohydrate content in Spathiphyllum plants.

Treatments	Rate (mg/kg)	Total carbohydrate (mg/g. d.w.) 2014	2015	Mean
Control		11.50	12.25	11.88
	250	14.70	15.20	14.95
Tryptophan acid	500	15.10	15.55	15.33
	750	15.89	16.72	16.31
Mean		15.23	15.82	15.53
	250	13.58	14.52	14.05
Ascorbic acid	500	14.12	15.00	14.56
	750	14.85	15.50	15.18
Mean		14.18	15.01	14.60
	250	18.95	19.10	19.03
Super max	500	19.20	19.40	19.30
	750	19.80	19.90	19.85
Mean		19.32	19.47	19.39
LSD. 0.05 .		2.35	2.14	

These results are in agreement with Hassanian (2003) who reveled that the foliar application of amino acids caused an increase in photosynthetic pigments content in *Foeniculum vulgare* plants, Abou Dahab and Nahed (2006) on *Philodendron erubescens* plants and El-Dean et al (2009) on pollanthes tuberose L. Amino acids in essential quantities are well known as a means have positive effects on quality of different crops. Amino acids are fundamental ingredients in the process of formation of plant tissue and chlorophyll synthesis, Abo Sedra et al., (2010). Amino acids are precursors or activators of phytohormones and growth substance (i.e., alternative routes of IAA synthesis exist in plants, all starting from Tryptophan, Opike and Rolfe (2005). Foliar spray of tryotophan acid at 100 ppm on *Pollanthes* tuberose L. plant led to increase of chlorophyll a, b, carotenids *and* protein contents in plants, El-Dean et al (2009). Aly and Swedan (2009) found that applying 150 ppm, tryptophan concentrations gave the highest content of carbohydrates.

Table (10) effect of amino acids and super max treatments on chlorophyll (a and b) and caroteniods) content in Spathiphyllum plants.

Treatments	Rate (mg/kg)	Chlorophyll (a) (mg/g.f.w.) 2014	2015	Mean	Chlorophyll (b) (mg/g.f.w.) 2014	2015	Mean	Carotenoids (mg/g. f.w.) 2014	2015	Mean
Control		1.26	1.31	1.29	1.35	1.39	1.37	0.26	0.29	0.28
	250	1.44	1.48	1.46	1.53	1.73	1.63	0.30	0.32	0.31
Tryptophan acid	500	1.53	1.55	1.54	1.75	1.82	1.79	0.41	0.44	0.43
	750	1.63	1.78	1.71	1.88	1.91	1.90	0.44	0.47	0.46
Mean		1.53	1.60	1.57	1.72	1.82	1.77	0.38	0.41	0.40
	250	1.35	1.37	1.36	1.50	1.61	1.56	0.28	0.30	0.29
Ascorbic acid	500	1.45	1.49	1.47	1.68	1.70	1.69	0.32	0.35	0.34
	750	1.53	1.65	1.59	1.72	1.75	1.74	0.41	0.43	0.42
Mean		1.44	1.50	1.47	1.63	1.69	1.66	0.34	0.36	0.35
	250	2.21	2.32	2.27	2.34	2.38	2.36	0.35	0.36	0.36
Super max	500	2.31	2.35	2.33	2.45	2.47	2.46	0.40	0.43	0.42
	750	2.35	2.41	2.38	2.60	2.63	2.62	0.45	0.48	0.47
Mean		2.29	2.36	2.33	2.46	2.49	2.48	0.40	0.42	0.41
LSD. 0.05 .		0.52	0.027		0.050	0.045		0.048	0.043	

CONCLUSION

Amino acids are currently considered to be a regulator of plant growth and development as they affect cell division and differentiation and important function as antioxidant defense, photo-protection and regulation of photosynthesis processes and growth. The enhancement of super max is a bast parameter for many improvement indices. Therefore, amino acids (tryptophan, ascorbic acids and super max) at 750 ppm may be recommending for amino acids and super max had growth regulators led to increase of *spathiphyllium* plants parameters and a good quality.

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تأثير معدلات مختلفة من التربتوفان والاسكوربيك والسوبر ماكس علي النمو الخضري والزهري لنبات الاسبثيفليم

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قسم بحوث الزينة وتنسيق الحدائق – معهد البساتين – مركز البحوث الزراعية

أجريت تجربة فى اصص فى صوبة زجاجية بمعهد بحوث البساتين – مركز البحوث الزراعية فى موسمين زراعين ٢٠١٤-٢٠١٥ لدراسة تقيم اضافة الاحماض الامنية (حمض التربتوفان- حمض الاسكوربيك الامينية – السوبر ماكس) بمعدلات مختلفة (٢٥٠ ، ٥٠٠ و ٧٥٠ جزء فى المليون)على انتاجية وجودة نبات الاسبثفليم . تمت زراعة الشتلات فى اصص قطرها ٣٠ سم بها مخلوط من الكمبوست والرمل و طمى بنسبة (١:١:١). كان تصميم التجربة فى قطاعات عشوائية تامة واخذ ثلاث مكررات كل مكررة تحتوى على ٥ نباتات . اظهرت النتائج : ان رش النباتات بمعدلات مختلفة من الأحماض الامينية ادى الى زيادة فى صفات النمو مثل طول النبات – عدد الافرع - عدد الجذور- طول الجذور – الوزن الطازج والجاف للجذور والاوراق- عدد الازهار- و الوزن الجاف والرطب للزهر. وجد ان اضافة السوبر ماكس بمعدلات مرتفعة ادى الى زيادة كل عوامل النمو لنبات الأسبثيفليم . من ناحية اخرى وجد ان الرش باحماض امينية ادى الى زيادة النتروجين والفوسفور والبوتاسيوم والبروتين والكربوهيدات .وجد ان الرش بالسوبر ماكس ادى الى زياده كل الصفات المحصولية لبنات الاسبثفليم بالمقارنة بالمعاملات المدروسة. من الدراسة يمكن ان نوصى باستخدام سوبر ماكس بمعدل ٧٥٠ جزء فى المليون حيث انة اعطى اعلى انتاجية وجودة لنبات الاسبثيفليم.