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EFFECT OF N-SOURCES ON GROWTH AND CHEMICAL COMPOSITION OF *Dieffenbachia maculata* CV."EXOTICA"

El-Khateeb, M. A.*; Amal A. M. Nasr*; Amal A. Hagag ** and Abla H. Dorgham **

*** Ornamental Horticulture Dept., Fac. of Agric, Cairo Univ.,Egypt.**

****Bot.Garden,Hort.Res.Instit.,Agric.Res.Centre.,Ministry of Agric.,Egypt.**

ABSTRACT

This study was carried out at the greenhouse of Ornamental Hort. Depart, Fac. of Agric.,Cairo Univ.,during two seasons : 2002 and 2003 to investigate the response of *Dieffenbachia maculata* cv."Exotica" to some nitrogen sources.On 3rd March, 2002 and 2003, uniform terminal rooted cuttings (4 leaves and 20 cm height) were planted in 18 cm plastic pots filled with a mixture of peat moss + sand + perlite (4 : 2 : 1 v / v / v).The fertilizer treatments of N-sources were applied, as a soil drench at the rate of 1gm N./pot,at 2-week intervals, starting from 15 th April and were continued till 15 th November. The results revealed that the tallest plants were obtained when amm. nitrate, amm. sulphate and their mixture were used as N-sources. These N-sources also increased the formation and dry weight of leaves and length as well as fresh weight of the roots. amm. nitrate gave the thickest and the heaviest stems. The combined treatment of amm. sulphate + amm. nitrate was the most effective in increasing the area and fresh weight of leaves. The application of amm. sulphate or amm. nitrate markedly increased the percentages of chlorophyll-a and b, whereas, the percentage of total carbohydrates in the leaves was greatly increased to amm. sulphate, calcium nitrate or urea. All N-sources increased the N- percentage of leaves and amm. sulphate was the most effective. Fertilizing the plants with calcium nitrate increased the accumulation of P in leaves. The treatments of amm. nitrate, urea and the mixture of amm. nitrate + amm. sulphate gave the highest accumulation of K in leaves.

INTRODUCTION

Dieffenbachia plants (Family:Areceae)are about 30 species, natives of tropical America and the West Indies (Bailey,1976),the plants are sturdy, thick-stemmed plants with colorful, oblong, pointed, glabrous leaves which are generally green and cream colored which make a more aesthetic plant.*Dieffenbachia maculata* Schott cv."Exotica (Dumb Cane) plants, is an interesting foliage plant, are widely cultivated for their decorative foliage, being commonly seen in hotel lobbies, waiting rooms, restaurants, and such places.Nitrogen in plants is critical to amino acids, proteins, and chlorophyll. It is required in very large amounts. Plants deficient in nitrogen will have characteristic yellowing (chlorosis) of the leaves starting with the older leaves. Indoor plants, like most other plants, need fertilizers containing three major plant food elements: nitrogen , phosphorus and potassium, Most foliage plant producers often use urea , ammonium (NH_4) or nitrate (NO_3),alone or in various combinations to supply crop nitrogen requirements. Determination of best N form for foliage plant production should be made after weighing several factors including cost, availability, plant response

under various environmental conditions.So,in any fertilization programme, it is important to understand how N forms can impact plant performance (Joiner *et al* ,1981).

MATERIALS AND METHODS

This study was carried out at the greenhouse of Ornamental Hort. Dept., Fac. of Agric., Cairo Univ., during two successive seasons of 2002 and 2003 to investigate the response of *Dieffenbachia maculata* to nitrogen sources: Uniform terminal rooted cuttings (4 leaves and 20 cm height) were used. The following N-sources used in this study were: Ammonium. nitrate 33%N- Ammonium sulphate 21%N- A mixture from Amm. nitrate .+ Amm. sulphate (1:1) - Calcium nitrate 15.5%N- Urea 48% N. On 3rd March ,2002, the cuttings were planted in 18 cm plastic pots filled with a mixture of peat moss + sand + perlite (4 : 2 : 1 v / v / v). A mixture of P and K (1:1 w/w) was applied as a soil drench at rate of 1 g/ pot . The fertilizer treatments of N-sources were applied at 2-week intervals, starting form15th of April and was continued until of November.

Data were Recorded on: plant height, stem diameter -number of leaves/ plant, leaf area (using leaf area meter), root length and fresh and dry weights of leaves, stem and roots.

Chemical Composition Determination: Chlorophyll a & b and caroteniods content (mg/gm. F.W.) were according to Saric *et al* (1967) - Total carbohydrates percentage in leaves (% D.W.) was according to Herbert *et al.,* (1971) The wet digestion procedure was performed (Piper, 1947)to determine N, P, K and Mg . Nitrogen was determined using Nesslar method (Koch and McMeekin,1924), phosphorus was determined according to Troug and Meyer (1939) and ,potassium and magnesium were determined by using Atomic Absorption Flame Spectrophotometer.

Statical Analysis :The treatments(9 pots/ treatment) were replicated 3 times(3 plants/replicate).The treatments were arranged in a complete randomized design .The differences between the means were compared by using L.S.D test at 5%, according to Snedecor and Cochran(1980).

RESULTS AND DISCUSSION

Plant Height :

In the first season, (Table,1) plants fertilized with ammonium. sulphate or ammonium. nitrate gave almost the same plant height , which was insignificantly higher than the control. In the second season, all N-sources significantly increased the plant height. The treatments of amm.nitrate+ amm. sulphate and amm. nitrate gave the tallest plants (49.00and 48.67cm),against 43.67cm for the control plant.Similar findings were reported by Conover and Poole (1980) on *Dieffenbachia maculata* and *Peperomia obtusifolia*,they found that plants grown with amm. sulphate were taller than those received urea-N .Also, Papenhagen (1986) stated that the heights of *Aphelandra squarrosa,Ficus benjamina, Dieffenbachia* cv.

Marianne or *Fatshedera lizei* were greater with amm.-N, El-Khateeb and El-Malt (1994) on *Ficus benjamina*, found that amm.-N gave the tallest plants. El-Fouly (1994) found that, Peperomia plants fertilized with 2 N gm/pot amm. nitrate or amm. sulphate were the tallest.

Table (1): Effect of N-sources on plant height, stem diameter , fresh and dry weights of stems of *Dieffenbachia maculata* plants, during 2002 and 2003 seasons

Treatments	Plant height (cm)		Stem diameter (cm)		Fresh weight of stem (gm.)		Dry weight of stem (gm.)	
	2002	2003	2002	2003	2002	2003	2002	2003
Control	28.37	43.67	1.73	1.80	49.08	56.02	12.56	14.48
Ammonium nitrate	30.83	49.00	2.30	2.13	81.90	78.03	18.17	18.31
Ammonium sulfate	30.20	47.67	2.33	2.11	70.36	75.40	17.56	18.03
Amm nitrate+Amm sulfate	34.67	48.67	2.20	2.09	76.27	74.24	17.60	17.70
Calcium nitrate	26.57	47.00	2.20	2.11	58.45	69.49	15.70	16.28
Urea	33.57	46.67	1.39	2.00	46.66	63.38	13.22	16.60
LSD at 5%	2.96	1.70	0.28	0.23	4.88	5.58	1.74	2.33

2-Stem diameter:

Data on diameter of stems of plants in response to the different treatments of N-sources (Table,1)revealed that in both seasons, the different N-source (except urea) significantly increased the thickness of stems compared with the control and amm. nitrate as well as amm. sulphate were the most effective (2.30 and 2.33 cm)in the first season , the control plants gave 1.73 cm, whereas amm. nitrate was the most effective treatment in the second season(2.13 cm),the control plants gave 1.80cm stem thickness. Generally, the treatments of amm. nitrate and amm.sulphate gave the thickest stems of Dieffenbachia plants. These findings are in agreement with those of Crater *et al.* (1973) on chrysanthemum, found that amm .nitrate produced more growth than urea or amm. sulphate. But, Tsujita *et al.* (1974) on the same plant, found that amm. sulphate produced stronger and larger stem diameter compared with amm. nitrate.El-Khateeb and El-Malt (1994) on *Ficus benjamina*, found that amm-N gave the thickest stems. On *Brassaia arboricola* cv. "Gold Capella plants, Mohamed (1996) found that amm sulphate at 5 gm N/pot monthly increased stem diameter.

Fresh and dry weights of stems :

As shown in Table (1), fertilizing Dieffenbachia plants with amm. nitrate or amm. sulphate + amm. nitrate as N- source , were very effective in increasing fresh weight of stems in the first season, a marked reduction in fresh weight of stem was recorded with the application of urea., as compared with the control. In the second season, a significant increase in fresh weight of stems was recorded when with the application of all N-sources however amm. nitrate, amm. sulphate as well as their mixture were the most effective in increasing fresh weight of stems. The response of dry weight of stems to N-sources (Table, 1) indicated in the first season that, fertilizing plants with from the different sources used in this study significantly increased the dry weight of stems as compared with the

control. The application of amm. sulphate or the mixture of amm. sulphate + amm. nitrate were very effective in increasing dry weight of stems as compared with the control. In the second season, also ,all N-sources applied increased the dry weight of stems as compared with the control and amm. nitrate followed by amm. sulphate gave the heaviest dry weight of leaves (18.31and 18.03 gm, respectively.

From the above mentioned results , it may be concluded that treating Dieffenbachia plant with amm. nitrate was very effective in increasing dry weight of stems as compared with the control. Various works pointed out the role of amm. nitrate in improving the growth of the foliage plants

Number of leaves:

In the first season (Table,2), the application of amm. nitrate , amm. sulphate and the mixture of them increased the formation of leaves,compared with the control. In the second season, fertilizing the plants with the different N-sources had no significant effect on leaf formation. But, it is evident that the formation of leaves greatly responded to the application of amm. sulphate. In this respect, Beel *et al*., (1991) found that the number of leaves in Dieffenbachia was increased with increasing nitrate-N than of amm.-N. Whereas,El-Khateeb and El-Malt (1994) on *Ficus benjamina*, found that fertilizing with amm. sulphate or amm. nitrate increased the leaf area and number of leaves. El-Fouly(1994) on *Peperomia obtusifolia* plants, stated that different N sources increased the formation of leaves.

Table (2): Effect of N-sources on number of leaves, leaf area and fresh and dry weight of leaves of *Dieffenbachia maculata* plants, during 2002 and 2003 seasons.

Treatments	Number of leaves/ plant		Leaf Area $(cm)^2$		Fresh Weight of Leaves (gm)		Dry Weight of leaves (gm)	
	2002	2003	2002	2003	2002	2003	2002	2003
Control	7.67	9.63	48.88	60.79	13.56	20.93	1.42	1.76
Ammonium nitrate	7.92	10.67	42.40	62.47	14.68	21.79	1.96	2.14
Ammonium sulfate	9.12	10.87	45.57	67.08	15.22	24.24	1.97	2.68
Amm nitrate+Amm sulfate	9.22	10.33	53.89	75.29	17.56	24.33	2.07	2.21
Calcium nitrate	7.50	10.00	52.14	73.86	16.99	24.15	1.89	2.57
Urea	6.77	10.67	46.04	68.60	13.07	24.08	1.69	2.23
LSD at 5%	1.68	N.S	3.65	3.30	2.33	2.47	0.34	0.18

Leaf area :

As shown in Table (2), in the first season, most of N-sources increased the average leaf area of Dieffenbachia plants compared with the control, but plants fertilized with amm. sulphate + amm. nitrate gave significantly the largest leaves. In the second season, also all treatments of different N-sources (except calcium nitrate) produced larger leaves than the control, and plants treated with amm. sulphate + amm. nitrate as well as urea gave significantly the largest leaves , giving 75.29 and 68.60 cm2 leaf areas, respectively. In conclusion ,in both seasons the application of amm. sulphate + amm. nitrate as N- source to Dieffenbachia plants was the most effective treatment in increasing the leaf area, as compared with the control.

Similar findings were reported by El-Khateeb and El-Malt (1994) on *Ficus benjamina*, since found that fertilizing with amm. sulphate or amm. nitrate increased the leaf area. Mohamed (1996) on *Brassaia arboricola* found that supplying the plants with amm. sulphate + amm. nitrate at the level of 4 gm/pot gave the largest leaves.

Fresh and dry weights of leaves :

Data in Table (2) indicate in the first season that, fertilizing Dieffenbachia plants with of amm. sulphate + amm. nitrate as N- source , as well as amm. sulphate were very effective in increasing fresh weight of leaves. A significant increase in fresh weight of leaves was also recorded with the application of calcium nitrate. In the second season, a significant increase in fresh weight of leaves was recorded when the plants were fertilized with all N-sources(except amm. nitrate) and the mixture of amm. sulphate + amm. nitrate followed by amm. sulphate were the most effective in increasing fresh weight of leaves. Concerning the effect of N-sources on dry weight of leaves,

Data in Table (2) indicate in the first season that, fertilizing Dieffenbachia plants with all N-sources increased the dry weight of leaves. The application of amm. sulphate + amm. nitrate as well as amm. nitrate or amm. sulphate as N- sources , were very effective treatments in increasing dry weight of leaves as compared with the control. In the second season, also ,all N-sources applied increased the dry weight of leaves as compared with the control. and amm. sulphate as well as calcium nitrate gave the heaviest dry weight of leaves (2.68 and 2.57gm), there was also an immense accumulation of leaves dry matter when the plants were fertilized with amm. nitrate + amm. sulphate and giving 2.21gm against 1.76 gm for the control.

From the above mentioned results , it may be concluded that treating Dieffenbachia plant with amm. sulphate, amm. sulphate + amm. nitrate as well amm. nitrate as N- source , were very effective in increasing dry weight of leaves as compared with the control. Various works pointed out the role of amm. nitrate in improving the growth of the leaves, such as Beaujard (1982) found that amm. sulphate was more effective in increasing fresh weights of leaves in *Erica cinerea* plants. White *et al.* (1984) on Calceolaria hybrida, found that the dry weight decreased as the rate of amm. sulphate increased. El-Khateeb and El-Malt (1994) on *Ficus benjamina*, found that. N-fertilization increased plant fresh and dry weights. El-Fouly (1994) on Peperomia plants found that different N sources produced heavier fresh weight of leaves, while amm. nitrate increased the dry weight of leaves. Mohamed (1996) on *Brassaia arboricola* cv. “Gold Capella”, found that supplying the plants with amm. sulphate at 5 gm N/pot monthly increased the fresh and dry weight of leaves.

Root length:

Table (3) indicate that, in the first season, fertilizing Dieffenbachia plants with amm. nitrate+ amm. sulphate or amm. sulphate gave the longest roots whereas, amm. nitrate or calcium nitrate decreased it to 12.80 and 12.67 cm, respectively, as compared with the control(13.67 cm). In the second season, amm. nitrate alone or a mixture of amm. nitrate+ amm. sulphate were the most effective N-sources in increasing the root length .On the other

hand, calcium nitrate or urea formed the shortest roots and it can be concluded that amm. nitrate or amm. sulphate alone or a mixture of them were the effective in increasing the root length. In this regard, Beaujard (1982) found that amm. sulphate was more effective in increasing root growth in *Erica cinerea* plants. McCall (1983) on *Dieffenbachia oerstedii*, found that plants grew better with nitrate and urea gave poor root growth.Conover and Poole(1986)on *Chamaedorea elegans, Dieffenbachia maculata* 'Camille' *and Peperomia obtusifolia.* Plants of *D. maculata* cv. Camille stated that root development was not affected by the N source. Meinken and Fischer (1989)on Elatior begonia, found that root injury increased as nitrite concentration (due to nitrification of NH_4) around the root ball. El-Fouly (1994) on Peperomia plants, found that the application of one gm N/20 cm-pot amm. nitrate increased the root length .

Table (3): Effect of N-sources on root length , fresh and dry weight of roots of *Dieffenbachia maculata* plants, during 2002 and 2003 seasons.

Treatments	Root length (cm.)		Fresh weight of roots (gm.)		Dry weight of roots (gm.)	
	2002	2003	2002	2003	2002	2003
Control	13.67	17.29	8.12	13.10	1.51	1.60
Amm. Nitrate	12.80	18.90	6.41	13.25	1.39	1.92
Amm. Sulphate	16.33	17.50	9.18	14.09	1.83	1.98
Amm.Nitrate +Amm. Sulphate	15.57	19.13	8.67	12.44	1.34	1.77
Calcium Nitrate	12.67	16.31	6.28	10.04	0.92	1.59
Urea	14.00	15.40	6.65	10.84	0.91	1.58
LSD at 5 %	1.93	1.41	1.38	0.78	0.22	0.28

Fresh and dry weights of roots :

As shown in Table (3), in the first season, amm. sulphate and its mixture with amm. nitrate greatly affected the fresh weight of the roots, ,the other N-sources reduced it ,as compared with the control. In the second season, the heaviest fresh weights of roots were obtained with amm. sulphate and amm. nitrate.The treatments of urea and calcium nitrate significantly decreased it.Table(3) data indicates ,in both seasons, that the roots dry weights were significantly increased with amm.sulphate. El-Fouly (1994) on Peperomia plants,found that amm. nitrate increased the root length and dry weight of roots. Mohamed (1996) on *Brassaia arboricola,* found that amm. sulphate (10 gm/pot) increased dry weight of roots more than amm. nitrate. Fenn and Feagley (1999)found a significant growth increases root growth from increasing NH4 absorption.The application of urea or calcium nitrate reduced the dry weight of roots ,similar finding was reported by Prabhat (2000) on gladiolus.

Chemical composition

Pigments content:

Data in Table (4) show in the first season, that all N-sources increased the content of chlorophyll-a as compared with the control. Plants treated with amm. sulphate or the mixture of amm. sulphate+ amm. nitrate gave the

highest values of chlorophyll-a. In the second season, all treatments of nitrogen increased the content of chlorophyll-a , and the highest value (2.226 mg/gm FW) was recorded with amm. sulphate and the mixture of amm. sulphate+ amm. nitrate .

Concerning, the effect of N-sources on the content of chlorophyll-b ,the results in the first season , indicated that amm. nitrate and amm. sulphate + amm. nitrate were the most effective in this respect. In the second season, amm. nitrate was the most effective treatment . The data also indicated that the application of calcium nitrate resulted in the lowest value of chlorophyll-b.

Table (4): Effect of N-sources on the contents chlorophyll –a, b and carotenoids in leaves of *Dieffenbachia maculata* plants, during 2002 and 2003 seasons.

Treatments	Chlorophyll –a mg/gm F.W		Chlorophyll –b mg/gm F.W		Carotenoids mg/gm F.W	
	2002	2003	2002	2003	2002	2003
Control	1.379	1.048	1.224	1.348	1.563	1.318
Amm. Nitrate	1.673	1.512	1.922	1.756	1.668	1.718
Amm. Sulphate	2.180	2.226	1.586	1.473	1.346	2.009
Amm. Nit+Amm.sulphate	2.072	1.591	1.639	1.513	1.208	1.531
Calcium Nitrate	1.872	1.442	1.388	1.318	1.766	1.829
Urea	1.643	1.322	1.095	1.346	1.349	1.396

Table (4) shows that in the first season there were marked increases in carotene content with amm. nitrate and calcium nitrate . In the second season, all treatments of nitrogen increased the content of carotene in comparison with the control, and the highest value was recorded with amm.sulphate and calcium and amm. nitrate.

In conclusion , amm. sulphate was the most effective treatment in increasing chlorophyll-a, whereas amm. nitrate was the most effective for chlorophyll-b . Similar findings were reported by Conover and Poole (1982) on Calathea , El-Khateeb *et al.* (1994) on tuberose, Mohamed (1996) on *Brassaia arboricola* ,Preeti *,et al* (1999) on gladiolus, But, Saleh *et al* (2000) on *Epipremnum pinnatum cv.* Aureum, stated that urea increased chlorophyll a and b, and total chlorophyll contents. On the other hand, Mak and Yeh (2001) and Fan *et al.* (2002) on Spathiphyllum plant, found that leaf chlorophyll content increased with increasing N concentration.

Total cabohydrates percentage :

As in Table (5), the obtained data indicated in the first season, that the percentage of total carbohydrates was greatly responded to the application of all N-sources and applying N as amm. sulphate, calcium nitrate or urea markedly increased the percentage of total carbohydrates in the leaves. The accumulation of total carbohydrates reached the maximum value in the second season, with urea and calcium nitrate .In this regard, Barker and Millis (1980) reported that the balance between NO3- and NH_4^+ fertilization increased photosynthetic capabilities. Saleh *et al* (2000) on *Epipremnum pinnatum* cv. Aureum, reported that urea increased the content of sugars. Mohamed (1996) proved that the amm. sulphate increased the total

carbohydrates percentage in the leaves of *Brassaia arboricola* plants. Whereas, El-Khateeb *et al.* (1994) found that the different N sources (amm. nitrate, amm. sulphate and urea) decreased the percentage of total carbohydrates in tuberose leaves.

N, P and K percentages

N- content :In the first season(Table, 5) all N-sources increased N content , as compared with the control . Amm. sulphate and calcium nitrate gave the highest nitrogen percentage (1.70 and 1.73 %DW,respectively.) against 1.19% DW for the control plants In the second season, the percentage of nitrogen in leaves increased with al N-sources used in this experiment,the highest N- percentage (2.03%DW) was recorded with amm. sulphate. There was a marked increase in the percentage of nitrogen with calcium nitrate as well as urea. In this respect, Gillian *et al.* (1980) found that NH4+-N treatments increased total tissue N levels in Cottneaster, Pyracantha and Weigelia. Cox and Seely (1984) on poinsettia plants, found good N absorption, with 75 and 100% NH4-N.El-Khateeb and El-Malt (1994) on *Ficus benjamina*, El-Fouly (1994) on *Peperomia obtusifolia*, and Mohamed (1996) on *Brassaia actinophylla* plants, found a marked accumulation in N% in the leaves with amm. nitrate. Saleh *et al* (2000) on *Epipremnum pinnatum* cv. Aureum, found that urea increased the percentage of N. Ruamrungsri, *et al* (2000) on Narcissus, reported that amm.-N was more rapidly absorbed by roots than nitrate-N. Mikkelsen (2003) on some foliage plants, found that N applied as amm. nitrate markedly increased N. percentage in the leaves.

Table (5): Effect of N-sources on the percentages of total carbohydrates, N, P and K in leaves of *Dieffenbachia maculata,* plants, during 2002 and 2003 seasons.

Treatments	Total carbohydrates DW%		N-content DW%		P-content DW%		K-content DW%	
	2002	2003	2002	2003	2002	2003	2002	2003
Control	18.78	20.94	1.19	1.30	0.224	0.290	1.708	1.682
Amm. Nitrate	19.25	23.25	1.24	1.32	0.302	0.295	1.575	1.960
Amm. Sulphate	24.89	25.86	1.70	2.03	0.164	0.208	1.502	1.698
Amm.Nit+Amm.sulphate	19.29	22.42	1.45	1.42	0.265	0.387	2.120	1.986
Calcium Nitrate	27.67	27.50	1.73	1.59	0.356	0.410	1.726	1.669
Urea	26.22	31.14	1.42	1.57	0.182	0.209	1.928	1.712

P- percentage: The results of the first season (Table, 5), indicate that there were pronounced accumulation of P in the leaves with Calcium. nitrate,amm. nitrate and the mixture of amm. sulphate + amm. Nitrate as compared with the control. In the second season, also calcium nitrate resulted in the highest P percentage (0.410 %DW)). The treatment of amm. sulphate + amm. nitrate markedly increased it. Similar findings were reported by McCall (1983) on *Dieffenbachia oerstedii*, stated that plants grew better with nitrate as the N source than amm. N or urea .Poole and Conover (1976) stated that all N-sources produced good tissue levels of macro- and micronutrients within the ranges recommended for production of healthy plants. Also, El-Fouly (1994)

on *Peperomia obtusifolia*, found that amm. sulphate and amm. nitrate increased P percentage.

K- percentage: As in Table (5), the percentage of potassium in the first season, was greatly responded to the mixture of amm. nitrate + amm. sulphate and urea, giving 2.12 and 1.928 % D.W, respectively. The potassium percentage in the leaves of plants treated with amm. nitrate or amm. sulphate reached the minimum values(1.575 and 1.502 %D.W, respectively, as compared with the control. In the second season , amm. nitrate and the mixture of amm. nitrate + amm. sulphate had a great effect on increasing the percentage of potassium in the leaves than the other N-treatments and the control. These findings are in agreement with Poole and Conover (1976), Haron and Trinklein (1982) on poinsettia and Saleh *et al* (2000)on *Epipremnum pinnatum*.

Conclusively, using ammonium nitrate, ammonium sulphate and their mixture increased the plant length, number of leaves, leaf area, the fresh and dry weight of leaves ,roots and stems. Ammonium nitrate, ammonium sulphate and their mixture increased the chlorophyll content, total carbohydrates, N and K percentages in the leaves, while fertilizing with calcium nitrate increased P percentage.

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تاثيرمصادر التسميد النتروجيني علي النمو الخضري والتركيب الكيماوي لنبات الديفنباخيا صنف "Exotica"

محمد عبد الخالق الخطيب * ، امل عبده محمد نصر * ، امال عبد العزيزحجاج ** و عبلة حسين درغام **

***قسم بساتين الزينة – كلية الزراعة – جامعة القاهرة**

****معهد بحوث الحدائق النباتية – مركز البحوث الزراعية – وزارة الزراعة - مصر**

أجريت هذه الدراسة في الصوبة الزجاجية بكلية الزراعة - جامعة القاهرة – قسم بساتين الزينة خلال الموسمين المتتاليين ٢٠٠٢ – ٢٠٠٣ وتهدف الدراسة إلى معرفة مدي استجابة نباتات الديفنباخيا لبعض مصادرالتسميد النتروجينية. تم زراعة نباتات ديفنباخيا ماكيولاتا " اكزوتيكا"(عقل مجذرة ذات ارتفاع ٢٠سم وتحمل ٤ أوراق) في ٣ مارس ٢٠٠٢ – حيث زرعت في أصيص بلاستيك قطرها ١٨سم مملوءة بمخلوط من البيتموس والرمل والبيرليت (بنسبة ٤ : ٢ : ١ حجم). وقد اضيفت المصادر النيتروجينية التالية بمعدل ١جم عنصر نيتروجين/للأصيص.: سماد سلفات الامونيوم و نترات الامونيوم ومخلوطهما ونترات الكالسيوم واليوريا بعد حوالي ٦ اسابيع من الزراعة(١٥ إبريل)كل أسبوعين حتى ١٥ نوفمبر.

أدي تسميد نباتات الديفنباخيا بسماد نترات الأمونيوم اوسلفات الأمونيوم اوالمخلوط منهم كمصادر نيتروجينية ،الي زيادة معنوية في طول النباتات وزيادة تكوين الأوراق ووزنها الجاف وطول الجذور والوزن الطازج لها .

كما ادي تسميد نباتات الديفنباخيا بسماد نترات الأمونيوم الي زيادة سمك ساق النباتات واوزانها الطازجة والجافة. واستخدام مخلوط سلفات الأمونيوم + نترات الأمونيوم كمصدر نتروجيني لنباتات الديفنباخيا كان أكثر المعاملات فعالية في زيادة مساحة الأوراق والوزن الطازج لها ٠

إستعمال سماد سلفات الأمونيوم اونترات الأمونيوم كمصادر نيتروجينية كانا ذو فعالية في زيادة محتوي الاوراق من كلوروفيل أ ، ب على التوالي.بينما زاد محتوي الكربوهيدرات بالأوراق مع استخدام سلفات الأمونيوم أو نترات الكالسيوم.

كل المصادر النيتروجينية أدت إلى زيادة محتوى النيتروجين في أوراق الديفنباخيا وكان سماد سلفات الأمونيوم الأكثر فاعلية.ادي تسميد نباتات الديفنباخيا بنترات الكالسيوم إلى زيادة تراكم الفوسفورفي الأوراق.بينما سماد نترات الأمونيوم اواليوريا والخليط من نترات الأمونيوم مع سلفات الأمونيوم ادي زيادة كبيرة في تراكم البوتاسيوم في الاوراق ٠