EFFECT OF GROWTH LOCATION AND NPK FERTILIZATION RATE ON GROWTH OF CHAMAEDOREA ELEGANS AND CH. CONSTRICTA

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Abstract

Plants of C h a m a e d o r e a e l e g a n s were grown in the Lath-house (55% shade), the glass greenhouse (70% shade) and the plastic greenhouse (44% shade) while plants of Ch. c o n s t r i c t a were grown in the Lath-house and glass greenhouse only. The plants at each growth location were supplied with three different rates of an NPK fertilizer (having an N : P : K ratio of 28 : 9 : 19). The, rates used were 2.5, 5.0 and 7.5 gm fertilizer / pot /3 weeks. Ch. e l e g a n s and Ch. c o n s t r i c t a plants gave the best greenhouse, with 70% shade.
The lowest fertilization rate (2.5 gm NPK / pot/ 3 weeks) resulted in the best growth, regardless of the growth location.

1- Introduction

C h a m a e d o r e a plants are famous for having a special kind of attraction and for their ability to grow under extremely low light intensities. C h a m a e d o r e a e l e g a n s plants had the highest tolerance to light intensities and so may be recommended for use in light intensities down to 200 Lx, (Larsen, 1979). Poole and Conover, 1980; concluded that, reducing light levels increased plant height and width and leaf size in P i t t o s p o r u m t o b i r a and P. t o b i r a cv. v a r i g a t a. Also, plant colour and grade were improved. The chlorophyll and carotenoid contents in C o d i a e u m v a r i g a t u m var. p i c t u m cv. Philipp Geduldig decreased by increasing light intensity and/or duration, (Preissel et al., 1980). Poole and Henley, 1981; obtained a reduction in growth of C h a m a e d o r e a e l e g a n s at N P K levels of 500 : 220: 400 or 750 : 330 : 600 mg/litre when compared to 250 : 11: : 200 mg/litre. Increasing fertilizer levels decreased leaf size and visible quality of young plants of F i c u s b e n j a m i n a. On the other hand, the chlorophyll content per unit of leaf area increased with increasing the fertilizer level (Ceulemans et al., 1983). Therefore, this experiment was carried out to study the effect of growth location, chemical fertilization and the interaction between them, on the growth and chemical composition in C h a m a e d o r e a e l e g a n s and Ch. c o n s t r i c t a.

2. Material and methods

This study was carried out at the nursery of floriculture, Fac. of Agric., Cairo University, Giza, Egypt aiming to study the effect of growth location and chemical fertilization on the growth and

pigment contents of C h a m a e d o r e a e l e g a n s and C h. c o n s t r i c t a. The seeds, which were obtained through the Developming Agric. Systems Project (Egypt/ AIDS), were germinated and one-year-old plants were planted in a mixture of sand and peat (1:1) . C h. e l e g a n s plants were planted in 20 cm. pots and were placed in three different locations (Lath-house with 55% shade, glass green-house with 70% shade and plastic green-house with 44% shade). However, C h. c o n s t r i c t a plants were placed in two locations, viz. the lath-house (55% shade) and glass green-house (70% shade). The plants were supplied with 3 different fertilization treatments/ location at 3 replicates. Fertilizer mixture ratio of 28 : 9 : 19 (N : P_2O_5 : K_2O, respectively), was applied at the rates of 2.5, 5.0 and 7.5 gm/plant / 3 weeks . Data on plant height, number of leaves were recorded. Pigments (Chlorophyll a, b and carotenoids) contents were determined.

3. Results

3.1 Effect of Planting location

3.1-1 Plant height

The growth location affected the plant height of C h a m a e d o r e a plants. The greatest increase in plant height was recorded in the glass green-house, on both C h a m a e d o r e a species , followed by Lath-house . In case of C h . c o n s t r i c t a, the increase in height of plants grown in the glass greenhouse was higher than that obtained from plants grown in Lath-house. However, the difference was not significant (Table 1).

3.1-2 Number of leaves :

The location, had a highly significant effect on the number of leaves. The highest increase was obtained from plants grown in the glass green -house, followed by those grown in the Lath-house, whereas plants grown in the plastic green-house gave the lowest increase.

3.2 Effect of NPK fertilization

3.2-1 Plant height

The NPK fertilization rate was found to have a highly significant effect on the increase in plant height of C h. e l e g a n s . The highest increase was obtained from plants receiving the lowest fertilization rate (2.5 gm NPK/pot). Increasing the fertilization rate caused a steady and significant reduction in the rate of increase in plant height; and so the lowest increase obtained was found in plants receiving the highest fertilization rate. This rate was found to cause a reduction of about 40% in the increase in average plant height, compared to plants supplied with the lowest rate. C h . c o n s t r i c t a followed the same trend as C h . e l e g a n s in response to different fertilization rates.

3.2-2 Number of leaves

The highest increase in number of leaves/plant was obtained by

supplying the plants with the lowest NPK rate (2.5 gm/pot), this is the case in C h. e l e g a n s , however, in Ch. c o n s t r i c t a, the data show that, fertilization rate had no significant effect on the increase in number of leaves/plant ,

3.3 Pigments content

3.3-1 Chlorophyll A

The data (Table 3) show that, the growth location had a marked effect on the chlorophyll A content in leaves of C h . e l e g a n s. The highest chlorophyll A content was obtained from plants grown in the glass green-house, while plants grown in the Lath-house or the plastic greenhouse contained lower concentration of chlorophyll A. In the Lath-house increasing the fertilization rate from 2.5 to 5.0gm NPK / pot increased the chlorophyll A content. However, a further increase in the fertilization rate to 7.5 gm NPK/pot caused a reduction in the chlorophyll A content In the glass green-house, increasing the fertilization rate caused a steady increase in the chlorophyll A content. Moreover, plants grown in the plastic green-house gave the highest chlorophyll A content when they were supplied with the highest rate of NPK fertilization (7.5 gm/pot).

3.3-2 Chlorophyll B

The data (Table 3), show that, plants grown in the plastic green-house had the highest chlorophyll B content followed by plants grown in the glass green-house. In the Lath-house, the highest chlorophyll B content was obtained from plants receiving NPK fertilization at the rate of 5.0 gm / pot. In glass green-house, the chlorophyll B content increased steadily with increasing the fertilization rate.

An opposite trend was observed in plants grown in the plastic green-house.

3.3-3 Carotenoids

The highest carotenoids content was obtained in leaves of plants grown in the glass green-house, followed by plants grown in the plastic green-house while the lowest content was obtained from leaves of plants grown in the Lath-house.

The effect of NPK fertilization rate on the carotenoids content followed the same trend in plants grown in the glass green-house. In the plastic green-house, the highest carotenoids content was obtained in leaves of plants receiving the lowest fertilization rate (2.5 gm NPK/pot).

In general, it can be concluded that, high shade levels encouraged the formation of pigments in the leaves of Ch. e l e g a n s and C h. c o n s t r i c t a. Thus, the highest content of chlorophyll A, B and carotenoids were usually found in the leaves of plants grown in the glass green-house (70% shade).

It can also be concluded that, either the plants were grown under favourable shade conditions, increasing the NPK fertilization rates generally increased the chlorophyll A, B and carotenoids contents.

4. Discussion

The results concerning effect of growth location on plant height indicate that, C h. e l e g a n s grew faster when the shade level was increased to 70% (glass green-house), i.e. C h . e l e g a n s has a low light saturation point (LSP), as described by (Conover and Poole, 1981), as the intensity above which light becomes excessive and photooxidation beings, i.e., the reversal of the photosynthetic process.

Glass green-house, in which the shade level relatively high, had favourable effects on C h . e l e g a n s and C h . c o n s t r i c t a plants. Thus, C h a m a e d o r e a plants can be described as shade tolerant plants, and so may be recommended for use in low light intensities. This was, also, concluded by Larsen (1979), on C h . e l e g a n s , A g l a o n e m a s p p and P h o e n i x c a n a r i e n s i s .

The NPK fertilization which showed that, the highest increase was obtained at the lowest NPK level, whereas, the lowest increase was recorded at the highest NPK level, this effect may be due to genetical characteristics of both C h a m a e d o r e a s p e c i e s or to an increase in the osmotic pressure of the soil solution which caused dwarfing of the cells and consequently of the whole plants. Similar , results were recorded by Poole and Henley, 1981; and Martinez et al., 1982. The number of leaves/plant was decreased at the NPK rate increased. The lowest NPK rate (2.5 gm/plant/3 weeks) is sufficient to supply the plants with their needs.

Pigments content was increased as NPK level increased under favourable shade conditions. Similar, results were obtained by Ceulemans et al., 1983, on F i c u s b e n j a m i n a.

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Table 1 . Effect of growth location and NPk fertilization rate on growth of Chamaedorea elegans.

Character	Increase in average plant height (cm)				Increase in average number of leaves/ plant			
Fertilization rate / Growth location	2.5 gm /pot	5 gm /pot	7.5 gm / pot	Mean	2.5 gm /pot	5 gm /pot	7.5 gm / pot	Mean
Lath-house	16.7	12.2	10.7	13.2 a	1.4	1.0	0.4	0.9 b
Glass green-house	16.7	13.3	11.1	13.7 a	2.2	1.8	0.8	1.6 a
Plastic green-house	15.3	11.6	7.7	11.5 b	0.5	0.8	0.0	0.4 c
Mean	16.2 a	12.4 b	9.8 c		1.4 a	1.2 a	0.4 b	

Table 2 . Effect of growth location and NPK fertilization rate on growth of Chamaedorea constricta.

Character	Increase in average plant height (cm)				Increase in average number of leaves/ plant			
Fertilization rate / Growth location	2.5 gm /pot	5 gm /pot	7.5 gm / pot	Mean	2.5 gm / pot	5 gm / pot	7.5 gm /pot	Mean
Lath-house	13.9	14.7	8.7	12.4 a	1.0	1.1	1.2	1.1 a
Glass Green-house	17.0	13.8	11.3	14.0 a	2.0	0.9	0.9	1.3 a
Mean	15.5 a	14.3 a	10.0 b		1.5 a	1.0 a	1.1 a	

Table 3 : Effect of growth location and NPK fertilization rate on chlorophyll A, B and carotenoids contents (mg./gm fresh matter) in leaves of Chamaedorea elegans.

Pigment / Treatment		Chlorophyll A	Chlorophyll B	Total Chlorophyll (A+B)	Caroten-oids
Lath-house	2.5 gm NPK/pot	1.07	0.43	1.51	0.74
	5 gm NPK/pot	1.46	0.59	2.05	0.86
	7.5 gm NPK/pot	1.18	0.41	1.59	0.94
Glass Green-house	2.5 gm NPK/pot	1.35	0.54	1.89	0.93
	5 gm NPK/pot	1.53	0.61	2.14	1.11
	7.5 gm NPK/pot	2.17	1.01	3.18	1.76
Plastic Green-house	2.5 gm NPK/pot	1.47	1.27	2.74	1.15
	5 gm NPK/pot	1.06	0.94	2.00	0.84
	7.5 gm NPK/pot	1.70	0.60	2.29	0.97

Table 4 . Effect of growth location and NPK fertilization rate on Chlorophyll A, B and carotenoids contents (mg./gm. fresh matter) in leaves of Chamaedorea constricta.

Treatment	Pigment	Chlorophyll A	Chlorophyll B	Total Chlorophyll (A+ B)	Carotenoids
Lath-house	2.5 gm NPK/pot	1.42	0.64	2.05	1.11
	5 gm NPK / pot	1.24	0.46	1.70	0.85
	7.5 gm NPK/pot	1.04	0.40	1.44	0.81
Glass green-	2.5 gm NPK/pot	1.47	0.88	2.35	0.90
house	5 gm NPK/pot	1.62	0.41	2.03	1.31
	7.5 gm NPK/pot	1.68	0.58	2.26	1.28