J. Agric. Sci. Mansoura Univ., 32 (4): 2827 - 2847, 2007

EFFECT OF SOME FACTORS INFLUENCING ACCLIMATIZATION OF *Schefflera arboricola* POV.

Hussein, H.A.A.*; M.N. Sharaf El-Din*; M.A. Khafagy and Naema I.E. Ismaeil***

*** Veget. and Floric. Dept., Fac. of Agric., Mansoura Univ.**

**** Botany Dept., Fac. of Agric., Mansoura Univ.**

ABSTRACT

This research was carried out during two successive seasons of 1998 and 1999 at the Experimental Station of the Veget. and Floric. Dept., Faculty of Agriculture, Mansoura University on *Schefflera arboricola* plants for maintenance their quality during the indoor environment period. The research included 4 methods for acclimatization as follows : 1- Non-acclimatized plants (control plants): plants were transferred to plastichouse for 3 months (from March 1st to May 30th) and after this period plants were moved directly to the interior environment room for 4 months (from June 1st to September 30th). 2- Acclimatization method No.1: plants were transferred to lathhouse for 3 months (from March 1st to May 30th), then moved to interior environment room for 4 months (from June 1st to September 30th). 3- Acclimatization method No.2: plants were transferred to shading place for 45 days (from March 1st to April 15th). After this period, plants were moved to lathhouse for 45 days (from April 15th to May 30th) and then they were transferred to interior environment room for 4 months (from June 1st to September 30th) and acclimatization method No.3: plants were transferred to lathhouse for 45 days (from March 1st to April 15th), and then moved to shading place for another 45 days (from April 15th to May 30th). After this period, plants were transferred to the interior environment room for 4 months (from June 1st to September 30th). Each of these methods were treated with four treatments of fertilization with N, P and K at 242N-81P-161g K_2O/m^2/year and spraying with α-naphthalene acetic acid (NAA) at 200 ppm solely or in combination with NPK. Data was recorded for vegetative growth characteristics as well as leaf chlorophyll content, total soluble sugars content and leaves mineral contents.

The obtained results indicated that the highest number of new leaves formation was obtained from non-acclimatized plants when were treated with NPK comparing with the other treatments, during the acclimatization period. However, the non-acclimatized plants had no leaves abscission when treated with all chemical treatments during the acclimatization period in both seasons. The highest total number of leaves was obtained from plants acclimatized by method No.2 and fertilized with NPK at the end of interior holding period. The highest increases in plant height were achieved from non-acclimatized plants when fertilized with NPK comparing with the other treatments during the acclimatization and interior holding periods. The tallest final plants were detected in non- acclimatized plants when treated with NPK during the acclimatization period while, the shortest plants were obtained from plants treated with acclimatization method No.2 and without chemical treatments in both seasons. The largest stem thickness and tallest terminal three internodes were observed from non-acclimatized plants and without chemical treatments comparing with other treatments in both seasons. While, the longest leaves petiole and highest value of leaves area were recorded in plants acclimatized by method No.2 and fertilized with NPK comparing with other treatments in both seasons and in the first season, respectively.

The highest chlorophyll content in new and old leaves resulted from plants treated with acclimatization method No.2 and fertilized with NPK comparing with other treatments in both seasons. The significantly highest soluble sugars content was obtained from non-acclimatized plants when treated with NAA comparing with the other treatments in both seasons. Additionally, the highest nitrogen percentages were obtained from plants acclimatized by method No.2 and fertilized with NPK comparing with control plants in both seasons. The highest phosphorus percentages resulted from plants acclimatized by method No.3 and treated with NAA. Finally, the highest potassium percentages resulted from non-acclimatized plants without chemical treatments comparing with the other treatments in both seasons. Also, the results indicated that NPK fertilizer increased the thickness of leaflet blade and midrib as well as number of vessels at all acclimatization methods. Moreover, acclimatization method No.3 gave the highest thickness of blade leaflet of plants fertilized with NPK while, NAA caused a slight increase in this respect.

It is recommended that, foliage plant producers should acclimatized plants of *Schefflera arboricola* for maintaining their quality during the interior environment period by transferring plants to shading place for 45 days. Afterwards, the plants should be moved to lathhouse for another 45 days and then transfer to the interior environment room for 4 months (method No.2). Additionally, plants should be fertilized by 242g N, 81g P_2O_5 and 161g K_2O/m^2 per year during the acclimatization period.

INTRODUCTION

The use of ornamental foliage plants for the decoration of offices, stores and other indoor environments is rapidly increasing. Schefflera (umbrella tree/star leaf/parasol leaf) is one of the most beautiful indoor plants. More commonly Schefflera is used for large size specimen plants. The indoor climate conditions differ exteremly from those found in the production greenhouse. Transferring plants from production greenhouse to an interior environment occurs leaf drop, tip burn of older leaves and death of apical meristem which reduce its aesthetic appeal.

Acclimatization refers to the climatic adaptation of plant to a new environment (Conover and Poole, 1984b), specifically, moving foliage plants from the optimum conditions to the limiting conditions of an interior environment. Conover (1975) showed that acclimatization prior to placement indoors is beneficial to most foliage plants. The length of acclimatization as well as the type of acclimatization varies for foliage plants from one to another. Vlahos and Boodley (1974) stated that *Brassaia actinophylla* should be acclimatized for at least 8 weeks before being placed in rooms with low light intensities. Many environmental and cultural factors have been shown to influence acclimatization. However, the major factor considered by growers is light level during production (Conover and Poole, 1984b). Light affects numerous physiological processes such as photosynthesis, chlorophyll synthesis and absorption of water and electrolytes. Nutrition has been shown to directly influence the level of acclimatization on some foliage plants (Conover, 1987). Plant hormones and synthetic growth regulating chemicals play an important role in plant growth and development as well as shedding of plant organs. Naphthalene acetic acid (NAA) as an effective compound has been used to reduce abscission (Marini *et al*., 1993).

The objective of this research was to determine influences of fertilization, NAA spray, various acclimatization treatments and their interactions on growth and quality of *Schefflera arboricola* Pov. during the acclimatization and interior holding periods.

MATERIALS AND METHODS

The experiments were carried out in the Experimental Station of the Ornamental Plant Dept., Faculty of Agriculture, Mansoura Univ., Egypt during the two successive seasons of 1998 and 1999.

The plant used in this research was *Schefflera arboricola* Pov. Family Araliaceae. Uniform one year old plants (about 0.8 cm stem thickness and 30 cm length) were obtained from the production greenhouse of the Experimental Station of the Faculty of Agriculture at the end of February 1998 and 1999 seasons. The plants were directly grown (transplanted) in 25 cm pots filled with a mixture of clay and peat moss (1:1 v/v). The grown plants in the polyethylene greenhouse were kept under an intermittent mist. While, plants in the shading place, lathhouse, plastichouse and in the interior environment room were watered twice/week according to (Conover and Poole, 1981).

Three chemical fertilizers were used : urea (46 % N), calcium superphosphate (16 % P_2O_5) and potassium sulphate (48 % K_2O) in the following combination : 242.0 g N, 81.0 g P_2O_5 and 161.0 g K_2O/m^2 per year as recommended by Conover and Poole (1984a). The fertilizers were dissolved in irrigation water and each plant received about 100 ml. The fertilizer was added every two weeks during acclimatization period only. No fertilizers were applied during the interior holding period (Pass and Hartley, 1979). Control treatment was not treated with any fertilizer.

α-naphthalene acetic acid (NAA) was used as a foliar spray at 200 ppm to inhibit leaves abscission of plants. Plants received the NAA treatment once 5 days before plants were moved from production greenhouse except that of the non-acclimatization plants which received the NAA treatment 5 days before plants were moved to the interior holding period. The plants were sprayed in the early morning until run off.

Each experiment included 4 methods for acclimatization treatments as follows :

1- Non-acclimatized plants (control plants) : plants were transferred to the plastic house for 3 months (from March 1st to May 30th), after this period, plants were moved directly to the interior environment room for 4 months (from June 1st to September 30th).
2- Acclimatization method No.1 : plants were transferred to the lathhouse for 3 months (from March 1st to May 30th), then were moved to interior environment room for 4 months (from June 1st to September 30th).
3- Acclimatization method No.2 : plants were transferred to a shading place for 45 days (from March 1st to April 15th), after this period, plants were moved to lathhouse for 45 days (from April 15th to May 30th), and then they were transferred to interior environment room for 4 months (from June 1st to September 30th).

4- Acclimatization method No.3 : plants were transferred to the lathhouse for 45 days (from March 1st to April 15th), and then moved to shading place for another 45 days (from April 15th to May 30th). After this period, plants were transferred to the interior environment room for 4 months (from June 1st to September 30th).

Each of acclimatization methods included four treatments as follows :

1- Control plants.
2- Fertilization with 242g N, 81.0g P_2O_5 and 161.0g K_2O/m^2 per year.
3- Spraying with NAA at 200 ppm.
4- Fertilization with 242.0g N, 81.0g P_2O_5 and 161.0g K_2O/m^2 per year + spraying with NAA at 200 ppm.

Light intensity measurements :

Light intensity in the plastichouse, lathhouse, shading place and interior environment room were measured by a Lux meter (LX-101 Lux meter) 40 cm above the soil surface in the container. Means of light intensity were measured during the acclimatization and interior holding periods during 1998 and 1999 seasons as follows :

Months	Light intensity (Lux) during acclimatization period					
	March		April		May	
Season	1998	1999	1998	1999	1998	1999
Plastic house	4148	4268	5014	5340	5140	5450
Lath house	843	890	1089	1054	1372	1241
Shading place	3067	3180	3593	3770	4199	4485

	Interior holding period							
Month	June		July		August		September	
Season	1998	1999	1998	1999	1998	1999	1998	1999
Interior environment room	90	103	99	104	107	94	82	88

Temperature and humidity :

Average temperature and humidity were recorded during the acclimatization and interior holding periods for both seasons as follows :

Measurement / Month	Temperature (^oC)		Relative humidity (%)
	Maximum temp.	Minimum temp.	
1998 season			
Acclimatization period			
March	18.0	9.3	70.0
April	25.0	12.0	74.7
May	28.0	19.0	72.0
Interior holding period			
June	32.0	21.0	77.0
July	32.4	20.0	80.0
August	33.8	22.0	79.0
September	33.0	20.0	73.0
1999 season			
Acclimatization period			
March	20.5	10.3	66.0
April	25.5	9.3	73.5
May	28.5	15.0	68.0
Interior holding period			
June	31.0	18.0	73.0
July	30.5	20.0	80.0
August	31.0	22.4	80.0
September	32.0	19.0	81.0

The temperature in the production greenhouse were 31-33 ºC (at day), 24-28 ºC (at night). The humidity in the production greenhouse were 65-70% (at day), 70-80% (at night) depending on the outside conditions. Shading place is a pergola made from metal with 10 m length, 4 m width and 6 m height and covered with asbestus sheets.

In both seasons, the vegetative growth parameters were recorded at the end of the acclimatization and interior holding periods, expressed as : number of new leaves per plant, number of leaves abscission per plant, total number of leaves was recorded at the end of the experiment, the increase in plant height (cm), final plant height (cm) were obtained by measuring the length from the soil surface to the top of uppermost leaves at the end of the experiment, stem thickness (cm) was measured 15 cm above soil surface, length of the terminal three internodes (cm), petiole length (cm) was measured from recently mature leaves which were produced during interior holding period and leaf area (cm^2) from the removed five leaves for each replicate was subjected to cut 20 disks, weighed and calculated according to the following equation :

$$\textbf{Plant leaf area (cm}^2\textbf{)} = \frac{\textbf{Weight of five leaves X No. leaves/plant X area of 20 disks}}{\textbf{Weight of 20 disks}}$$

The chlorophyll contents were recorded at the end of the experiment using Minolta SPAD chlorophyll meter (Yadova, 1986). The readings of chlorophyll meter were taken as average of new and old leaves from the plant top and were done on the three middle leaflets. The chemical analysis was done at the end of the experiment in leaves taken at the end of interior holding period and were dried at 70 ºC until a constant weight was obtained and finely ground for sugars and NPK determination according to the following methods :

Sugars content was measured using spectrophotometer (Spekol) as described by Dubois *et al*. (1956). Nitrogen content was determined by improved kjeldahl method as described by A.O.A.C. (1980). Phosphorus content was determined using Ziess spectrophotometer (Spekol) as described by Jackson (1967). Potassium content was estimated as described by Jackson (1967). Sample sections for microscopic examination were taken from the central region around the midrib of terminal leaflet blade of the 3^{rd} upper internode of the main stem at the end of the acclimatization. The microscopic examination and photo-graphy were carried out as described by Gerlach (1977).

The experimental design was Factorial experiment with Experimental block design with three replicates. All the obtained data in both seasons were statistically analyzed using the analysis of variance (ANOVA) method and means were compared by L.S.D at probability of 5 % according to Gomez and Gomez (1984).

RESULTS AND DISCUSSION

From the numerous data obtained, the interactions between different treatments were only selected and presented herein.

Vegetative growth characters :

Number of new leaves per plant :

The results in Table (1) indicated that, the highest number of new leaves formation (4.50 and 5.50) was obtained from non-acclimatized plants when treated with NPK fertilization comparing with the other treatments during the acclimatization period in both seasons, respectively.

Table (1): Effect of the interaction between NPK, NAA and different acclimatization methods on number of new leaves formed on *Schefflera arboricola* during the acclimatization and interior holding periods of 1998 and 1999 seasons.

Measurement / Treatments	Number of new leaves formation (leaves/plant)							
	Acclimatization methods							
	Acclimatization period				Interior holding period			
	Control plants (non-acclim.)	Method No.1	Method No.2	Method No. 3	Control plants (non-acclim.)	Method No.1	Method No.2	Method No. 3
	1998 season							
Control	3.50	2.00	1.00	1.25	0.75	0.25	1.75	1.50
NPK at 242 N - 81 P - 161 K g/m^2/y	4.50	1.75	2.75	2.25	1.50	0.25	2.25	1.25
NAA at 200 ppm	3.50	0.50	2.25	2.50	1.75	0.25	1.75	0.50
NPK + NAA	4.00	1.00	2.00	1.00	0.50	0.75	0.50	1.25
L.S.D at 5 %	1.13				0.65			
	1999 season							
Control	3.75	1.00	1.50	1.00	0.25	0.25	1.50	1.00
NPK at 242 N - 81 P - 161 K g/m^2/y	5.50	2.50	1.50	1.50	1.75	0.25	2.00	1.00
NAA at 200 ppm	3.50	1.00	1.75	2.25	1.25	0.50	1.50	0.25
NPK + NAA	4.75	1.00	1.50	1.00	0.25	0.75	0.25	1.00
L.S.D at 5 %	0.80				0.53			

These results were in agreement with the results mentioned by Johnson *et al*. (1979) who reported that, leaf development of *Ficus benjamina* increased as N fertilization increased. The high increases in number of new leaves formation with fertilization treatment only could be attributed to the high response of acclimatized plants to an interior environment room, since the nutritional levels during the production will be very beneficial in aiding a plant to acclimatize to an interior environment room (Conover, 1987).

Number of leaves abscission per plant :

The data presented in Table (2) showed that, the non-acclimatized plants had no leaves abscission when treated with all chemical treatments during the acclimatization period in both seasons. These results coincided with the results obtained by Vlahos and Boodley (1974) who found that fertilization during acclimatization period should be kept to a minimum level to avoid leaf drop of *Brassaia actinophylla*.

Table (2) : Effect of the interaction between NPK, NAA and different acclimatization methods on number of leaf abscission of *Schefflera arboricola* during the acclimatization and interior holding periods of 1998 and 1999 seasons.

Measurement / Treatments	Number of leaf abscission (leaves/plant)							
	Acclimatization methods							
	Acclimatization period				Interior holding period			
	Control plants (non-acclim.)	Method No.1	Method No.2	Method No. 3	Control plants (non-acclim.)	Method No.1	Method No.2	Method No. 3
1998 season								
Control	---*	1.50	1.75	2.75	8.50	9.00	1.25	5.00
NPK at 242 N - 81 P - 161 K g/m^2/y	---*	0.25	0.25	1.00	8.00	5.75	0.50	3.25
NAA at 200 ppm	---*	3.00	0.75	2.75	9.25	7.25	2.25	10.2
NPK + NAA	---*	1.50	1.00	1.75	12.0	10.5	3.75	10.0
L.S.D at 5 %	1.02				1.67			
1999 season								
Control	---*	1.00	0.75	2.25	8.00	8.00	2.25	6.50
NPK at 242 N - 81 P - 161 K g/m^2/y	---*	1.00	0.50	0.75	7.00	4.25	0.25	3.5
NAA at 200 ppm	---*	2.00	1.00	3.00	9.00	6.50	3.00	8.50
NPK + NAA	---*	0.75	1.00	2.00	10.8	11.2	3.00	8.75
L.S.D at 5 %	0.94				1.46			

*** No leaves abscission**

The lowest numbers of leaf abscission (0.25 and 0.50 leaves) and (0.50 and 0.25 leaves) were obtained from treated plants with NPK fertilization and acclimatization method No.2 during the acclimatization and interior holding periods in both seasons, respectively. Similar results were obtained by Poole and Conover (1982) who reported that, plants of *Ficus benjamina* grown under 30 % shade at the higher fertilize level showed dropped of the most leaves, three times more than plants grown under 60 % shade at the lower fertilizer rate. Additionally, plants treated with acclimatization method No.2 and NAA or NPK + NAA significantly decreased the number of leaf abscission comparing with the other treatments during the interior holding period. These results may be attributed to the role of NAA to reduce leaves abscission (Gaash *et al*., 1993).

Total number of leaves per plant :

The data in Table (3) showed that, the highest total number of leaves (24.2 and 22.7 leaves) resulted from treated plants with acclimatization method No.2 and fertilized with NPK during the interior holding period in both seasons, respectively. These results may be due to increasing carbohydrate storage when plants were moved from the greenhouse to shading place for 45 days which had high light intensity. Milks *et al*., (1979) found that increasing shade decreased carbohydrate levels in *Ficus benjamina* leaves and roots during production and interior holding phases. Increasing fertilization rate during production phase leads to an increase in root carbohydrates. Moreover, root and shoot carbohydrates were reduced during interior holding phase.

Table (3) : Effect of the interaction between NPK, NAA and different acclimatization methods on total number of leaves of *Schefflera arboricola* at the end of interior holding periods of 1998 and 1999 seasons.

Measurement / Treatments	Total number of leaves per plant							
	Acclimatization methods							
	Control plants (non-acclim.)	Method No.1	Method No.2	Method No. 3	Control plants (non-acclim.)	Method No.1	Method No.2	Method No. 3
	1998 season				1999 season			
Control	15.7	11.7	19.7	16.2	16.0	12.2	19.5	15.2
NPK at 242 N - 81 P - 161 K $g/m^2/y$	17.5	16.2	24.2	18.2	20.2	18.5	22.7	18.5
NAA at 200 ppm	16.0	10.5	21.0	10.0	15.7	13.0	19.2	10.7
NPK + NAA	---*	9.2	17.8	---*	14.2	---*	17.0	11.0
L.S.D at 5 %	1.9				1.5			

*** Plants died during the interior environment period.**

Plant height (cm) :

The increase in plant height per plant :

Dealing with the results presented in Table (4), it was indicated that non-acclimatized plants when fertilized with NPK gave significant increases in plant height comparing with the other treatments during the acclimatization and interior holding periods in both seasons. The highest increases in plant height (6.50 and 6.83 cm) and (9.0 and 10.4 cm) were noticed in non-acclimatized plants fertilized with NPK during the acclimatization and interior holding periods comparing with the other treatments in both seasons, respectively. These results were in agreement with the results obtained by Joiner *et al*., (1977) who found that plant height of *Dieffenbachia amoena* was not affected by different shade levels.

The non-acclimatized plants or acclimatized by method No.3 when treated with NPK + NAA died at the end of the interior holding period in the first season. While, the treated plants with acclimatization method No.1 and NPK + NAA died at the end of the interior holding period in the second season. It may be observed that plants died in some cases. It is well known that plant growth is greatly affected by many variable factors. Prevailing environment, growth regulators and nutrient equilibrium may be the important reasons leading to plant poor growth or death. Conover (1987) concluded that, when a foliage plant grown under high light density is moved to a low light density environment, physiological stress will cause an immediate reduction in photosynthetic rate. If the combination of physiological changes and production of new leaves has raised the plant above the light compensation point, it will probably live. On the other hand, if it has not, the plant will eventually die, since most stored food would have been consumed after eight to ten weeks. Also, Min and Lee (1992) reported that, plants of *Ficus benjamina* grown under natural light were taller than those grown under shade.

Table (4) : Effect of the interaction between NPK, NAA and different accli- matization methods on the increase in plant height (cm) of *Schefflera arboricola* during the acclimatization and interior holding periods of 1998 and 1999 seasons.

Measurement	The increase in plant height (cm)															
	Acclimatization period				Interior holding period				Acclimatization period				Interior holding period			
Treatments	Control plants (non-acclim.)	Method No.1	Method No.2	Method No. 3	Control plants (non-acclim.)	Method No.1	Method No.2	Method No. 3	Control plants (non-acclim.)	Method No.1	Method No.2	Method No. 3	Control plants (non-acclim.)	Method No.1	Method No.2	Method No. 3
	1998 season								1999 season							
Control	5.25	3.13	1.00	3.00	3.63	0.63	0.63	2.50	4.00	2.75	1.25	2.88	3.90	0.75	0.43	2.50
NPK at 242 N - 81 P - 161 K g/m^2/y	6.50	2.3	2.00	2.88	9.00	1.38	1.88	2.00	6.83	2.75	2.00	2.63	10.4	1.10	1.63	2.18
NAA at 200 ppm	5.63	1.63	3.38	2.88	2.13	0.75	1.50	0.75	4.25	1.50	2.03	2.00	2.25	0.83	0.88	1.58
NPK + NAA	6.13	1.50	1.75	1.38	---*	1.13	1.25	---*	6.70	1.38	1.30	1.00	3.38	---*	0.58	1.45
L.S.D at 5 %	0.80				0.51				0.69				0.85			

*** Plants died during the interior environment period.**

Final plant height :

Data in Table (5) revealed that, the tallest final plant heights (44.5 and 47.2 cm) were obtained from non-acclimatized plants when fertilized with NPK comparing with the other treatments during the acclimatization period in both seasons, respectively. Increasing plant height may be due to the high carbohydrate rates in roots (Milks *et al*., 1979). While, the shortest final plant heights (31.6 and 31.7 cm) were obtained from treated plants with acclimatization method No.2 in both seasons, respectively.

Stem thickness (cm) :

The data in Table (6) indicated that, using different treatments of fertilization, NAA and acclimatization methods resulted in non-significant effect on stem thickness comparing with the control plants. The largest stem thickness (1.03 and 0.92 cm) was obtained from the non-acclimatized plants in both seasons, respectively. These data are in accordance with the results obtained by Conover and Poole (1977) since they reported that stem diameter of *Ficus benjamina* was significantly decreased as shading increased from 0 to 80 %.

Table (5) : Effect of the interaction between NPK, NAA and different accli- matization methods on final plant height (cm) of *Schefflera arboricola* of 1998 and 1999 seasons.

Measurement / Treatments	Final plant height (cm) – Acclimatization methods							
	Control plants (non-acclim.)	Method No.1	Method No.2	Method No. 3	Control plants (non-acclim.)	Method No.1	Method No.2	Method No. 3
	1998 season				1999 season			
Control plants	38.9	33.8	31.6	35.5	37.9	33.5	31.7	35.4
NPK at 242 N - 81 P - 161 K g/ m^2/y	44.5	33.8	32.9	34.9	47.2	33.9	33.6	34.8
NAA at 200 ppm	37.8	32.4	34.9	33.6	36.5	32.3	32.9	33.6
NPK + NAA	---*	32.6	33.0	---*	40.1	---*	31.9	32.5
L.S.D at 5 %	0.9				1.3			

*** Plants died during the interior environment period.**

Length of terminal three internodes and length of leaf petiole :

Results in Table (6) indicated that, the tallest terminal three internodes (5.58 and 5.33 cm) were produced with non-acclimatized and unfertilized plants in both seasons, respectively. Moreover, the longest leaf petiole (11.20 and 11.68 cm) resulted from plants fertilized with NPK and acclimatized by method No.2 in both seasons, respectively. These results are in harmony with the findings of Doley (1978) who found that, grown plants of *Eucalyptus grandis* in shaded habitats develop longer and narrower internodes than those in full sun counterparts. Also, Vladimirova *et al*. (1997) mentioned that, larger internodes were obtained in plants grown in 63 % shade while smaller internodes were in plants grown in 80 % shade.

Leaf area (cm^2) :

The results in Table (7) indicated that, the significantly largest leaf area (1635.1 cm^2) was observed in treated plants with NPK fertilizer and acclimatization method No.2 comparing with the other treatments in the first season. These results are in harmony with the findings of Sarracino *et al*. (1992) who stated that total leaf area increased in *Leea coccinea* plant with each increment in shade from 0 % to 63 %. Also, Vladimirova *et al*., (1997) concluded that, total leaf area displayed a quadratic response with a peak at 80 % shade.

Table (6) :Effect of the interaction between NPK, NAA and different accli- matization methods on stem thickness (cm), length of terminal three internodes (cm) and length of leaves petiole (cm) of *Schefflera arboricola* of 1998 and 1999 seasons.

Measurement / Treatments	Stem thickness (cm) Acclimatization methods: Control plants (non-acclim.)	Method No.1	Method No.2	Method No. 3	Length of terminal three internodes (cm) Acclimatization methods: Control plants (non-acclim.)	Method No.1	Method No.2	Method No. 3	Length of leaf petiole (cm) Acclimatization methods: Control plants (non-acclim.)	Method No.1	Method No.2	Method No. 3
	1998 season											
Control plants	1.03	0.77	0.92	0.94	5.58	3.75	1.58	2.35	10.38	5.45	6.25	2.00
NPK at 242 N - 81 P - 161 K g/m^2/y	0.79	0.74	0.93	0.75	4.63	2.38	2.75	3.08	4.13	9.63	11.20	10.7
NAA at 200 ppm	0.70	0.71	0.74	0.76	2.75	2.25	1.63	2.13	9.38	0.00	11.05	10.37
NPK + NAA	---*	0.70	0.70	---*	---*	2.50	2.50	---*	---*	5.38	---*	---*
L.S.D at 5 %	0.17				0.75				1.64			

Measurement / Treatments	Stem thickness (cm) Acclimatization methods: Control plants (non-acclim.)	Method No.1	Method No.2	Method No. 3	Length of terminal three internodes (cm) Acclimatization methods: Control plants (non-acclim.)	Method No.1	Method No.2	Method No. 3	Length of leaf petiole (cm) Acclimatization methods: Control plants (non-acclim.)	Method No.1	Method No.2	Method No. 3
	1999 season											
Control plants	0.92	0.85	0.71	0.77	5.33	3.80	1.73	2.18	11.25	6.58	7.25	2.50
NPK at 242 N - 81 P - 161 K g/m^2/y	0.89	0.71	0.86	0.80	4.88	2.50	2.55	3.20	5.25	10.13	11.68	12.13
NAA at 200 ppm	0.89	0.72	0.83	0.81	2.93	2.30	1.93	2.23	9.88	3.55	11.08	11.00
NPK + NAA	0.83	---*	0.76	0.76	3.05	---*	2.63	1.83	---*	---*	5.75	---*
L.S.D at 5 %	N.S				0.80				1.72			

*** Plants died during the interior environment period.**

Chemical analysis :
Chlorophyll content :

Data in Table (8) showed that, the significantly highest chlorophyll contents in the new leaves (49.7) were obtained from treated plants with NPK fertilizer and acclimatization method No.2 comparing with the control plants and other treatments in the first season. On the other hand, the same treatments produced the significantly highest chlorophyll contents in old leaves (58.0 and 55.9) comparing with the control plants and other treatments in both seasons, respectively. These results were in agreement with those of Anderson *et al*., (1973) who stated that chlorophyll content of the shaded plants of Alocasia was to be four or five times higher than spinach plants growing in full sun. Also, Conover and Poole (1977) reported that chlorophyll content (mg/cm^2) of leaf tissue of *Ficus benjamina* was highest under 40 and 80 % shade.

Table (7) :Effect of the interaction between NPK, NAA and different accli- matization methods on leaf area (cm^2/plant) of *Schefflera arboricola* of 1998 and 1999 seasons.

Measurement / Treatments	Leaf area (cm^2/plant) – Acclimatization methods							
	Control plants (non-acclim.)	Method No.1	Method No.2	Method No. 3	Control plants (non-acclim.)	Method No.1	Method No.2	Method No. 3
	1998 season				1999 season			
Control	1540.5	519.1	1076.1	1182.1	1634.4	530.0	1061.6	1130.9
NPK at 242 N - 81 P - 161 K g/m^2/y	1618.3	926.1	1635.1	1323.9	1872.7	1057.9	1519.1	1344.5
NAA at 200 ppm	962.3	683.8	1512.1	484.5	888.7	821.4	1414.2	536.2
NPK + NAA	---*	454.6	1187.7	---*	1298.7	---*	1130.8	660.8
L.S.D at 5 %	81.5				71.7			

*** Plants died during the interior environment period.**

Table (8): Effect of the interaction between NPK, NAA and different accli- matization methods on leaf chlorophyll content in old and new leaves of *Schefflera arboricola* of 1998 and 1999 seasons.

Measurement / Treatments	Total chlorophyll (SPAD) reading in new leaves – Acclimatization methods								Total chlorophyll (SPAD) reading in old leaves – Acclimatization methods							
	Control plants (non-acclim.)	Method No.1	Method No.2	Method No. 3	Control plants (non-acclim.)	Method No.1	Method No.2	Method No. 3	Control plants (non-acclim.)	Method No.1	Method No.2	Method No. 3	Control plants (non-acclim.)	Method No.1	Method No.2	Method No. 3
	1998 season				1999 season				1998 season				1999 season			
Control	36.7	45.9	38.2	46.9	40.3	37.8	42.9	36.7	37.7	48.8	49.5	47.3	43.3	50.1	49.3	48.2
NPK at 242 N - 81 P - 161 K g/m^2/y	36.8	46.6	49.7	37.0	42.9	49.9	41.6	39.5	38.1	49.6	58.0	38.7	42.5	46.0	55.9	50.5
NAA at 200 ppm	41.9	41.1	43.8	42.6	29.0	49.4	44.1	49.1	43.7	49.5	51.9	44.2	27.2	48.9	50.3	44.7
NPK + NAA	---*	28.2	37.9	---*	29.2	---*	45.4	41.2	---*	30.6	44.7	---*	40.7	---*	52.4	44.8
L.S.D at 5 %	4.0				9.7				6.9				8.1			

*** Plants died during the interior environment period.**

Total soluble sugars content :

Data in Table (9) showed that, the significantly highest soluble sugars content (20.73 and 21.56 mg/g) were obtained from non-acclimatized plants when treated with NAA at 200 ppm comparing with the other treatments in both seasons, respectively.

Table (9) :Effect of the interaction between NPK, NAA and different acclimatization methods on total soluble sugars content, nitrogen, phosphorus and potassium % of *Schefflera arboricola* of 1998 and 1999 seasons.

Measurement	Total soluble sugars content (mg/g)				Nitrogen %				Phosphorus %				Potassium %			
	Acclimatization methods								Acclimatization methods							
Treatments	Control plants (non-acclim.)	Method No.1	Method No.2	Method No. 3	Control plants (non-acclim.)	Method No.1	Method No.2	Method No. 3	Control plants (non-acclim.)	Method No.1	Method No.2	Method No. 3	Control plants (non-acclim.)	Method No.1	Method No.2	Method No. 3
	1998 season															
Control	10.94	9.64	16.21	12.48	1.80	1.08	1.40	2.16	0.044	0.092	0.152	0.250	2.20	1.76	3.08	3.75
NPK at 242 N - 81 P - 161 K g/m²/y	10.49	13.64	17.54	11.86	2.86	2.00	3.40	2.31	0.172	0.118	0.186	0.202	2.51	3.37	2.31	3.36
NAA at 200 ppm	20.73	4.84	16.61	10.65	1.62	1.20	2.41	1.76	0.110	0.102	0.256	0.314	1.80	3.46	2.69	2.50
NPK + NAA	---*	10.35	14.23	---*	---*	1.69	2.34	---*	---*	0.058	0.243	---*	---*	1.72	2.70	---*
L.S.D at 5 %	1.37				0.38				0.039				0.55			

Measurement	Total soluble sugars content (mg/g)				Nitrogen %				Phosphorus %				Potassium %			
	Acclimatization methods								Acclimatization methods							
Treatments	Control plants (non-acclim.)	Method No.1	Method No.2	Method No. 3	Control plants (non-acclim.)	Method No.1	Method No.2	Method No. 3	Control plants (non-acclim.)	Method No.1	Method No.2	Method No. 3	Control plants (non-acclim.)	Method No.1	Method No.2	Method No. 3
	1999 season															
Control	10.94	10.05	15.94	12.51	1.82	1.06	1.42	2.06	0.046	0.093	0.156	0.247	2.25	1.73	3.12	3.61
NPK at 242 N - 81 P - 161 K g/m²/y	10.88	13.66	17.05	12.11	3.03	2.10	3.45	2.36	0.167	0.120	0.172	0.202	2.62	3.41	2.00	3.40
NAA at 200 ppm	21.56	5.06	16.21	10.16	1.65	1.25	2.21	1.68	0.110	0.109	0.251	0.314	1.83	3.01	2.91	2.53
NPK + NAA	11.71	---*	15.02	11.57	1.82	---*	2.24	1.72	0.055	---*	0.240	0.052	2.33	---*	2.73	1.73
L.S.D at 5 %	1.23				0.33				0.035				0.52			

*** Plants died during the interior environment period.**

These results may be attributed to increment in chlorophyll contents and reducing respiration during the interior holding period which led to increase carbohydrate levels. Fonteno and McWilliams (1978) reported that shade reduced dark respiration resulting in lower carbohydrate requirements in plants. Moreover, Reyes *et al*., (1996b) suggested that, *Chamaderorea elegans* grown under the intermediate and lowest irradiance levels, having lower LCP, presumably had a greater photosynthetic efficiency in the low irradiance interior environment. Thus, plants were able to produce new fronds without depleting carbohydrate reserves.

Nitrogen percentage :

Data in the same Table showed that, the significantly highest nitrogen percentages (3.40 and 3.45 %) resulted from fertilized plants with NPK and acclimatized by method No.2 comparing with control in both seasons, respectively. Nitrogen percentage increases during acclimatization method No.2 was affected by fertilization with NPK which may be attributed to increasing the ammonium and nitrate uptake during the first phase of this method which is characterized with high light intensity. Van Egmond (1978) in this concern reported that ammonium and nitrogen uptake were greater in the light and increased with increasing light intensity.

Phosphorus percentage :

Data in the same Table showed that, the highest phosphorus percentage (0.314 % for each season) resulted from treated plants with acclimatization method No.3 and NAA comparing with control and the other treatments in both seasons, respectively.

Potassium percentage :

Finally, the data presented in the same Table showed that, the highest potassium percentages (3.37 and 3.41 %) were detected in plants fertilized with NPK and acclimatized by method No.1 comparing with control and the other treatments in both seasons, respectively.

Anatomical characteristics :

Data presented in Figs. (1-3) revealed that the acclimatization by method No.2 was more effective for increasing the thickness of leaflet blade comparing with the other acclimatization methods. This increase was attributed to increasing palisade and spongy tissues thickness.

Concerning the NPK fertilizer, data showed that NPK fertilizer increased the thickness of leaflet blade and midrib as well as number of vessels at all acclimatization methods, the acclimatization method No.3 gave the highest thickness of blade leaflet of fertilized plants with NPK. These increases in thickness of blade leaflet in response to fertilizer with NPK may be due to the role of nitrogen for improving plant growth by increasing division and/or elongation of cells and a part of chlorophyll molecule (Russell, 1988). In addition, increasing fertilizer application during the production phase led to improvement of growth index, chlorophyll content (Milks, 1977) and increasing light compensation point levels (Collard *et al*., 1977).

Regarding NAA, the data illustrated in the same Figs. revealed that NAA decreased the blade leaflet thickness as a result of decreasing the upper and lower epidermis thickness. Moreover, NAA had a slight effect on midribs thickness and increased the number of vessels, whereas, the same treatment decreased thickness of midrib.

On the other hand, the interaction between NPK and NAA caused decreasing in the thickness of blade, while the thickness of midrib and number of vessels were increased. The reduction in blade leaflet as affected by NPK + NAA as a result of decreasing thickness of lower epidermis and/or increasing respiration by NAA which need high energy for transport inside the plants thus consume the carbohydrate reserve in the roots (Richard, 1996).

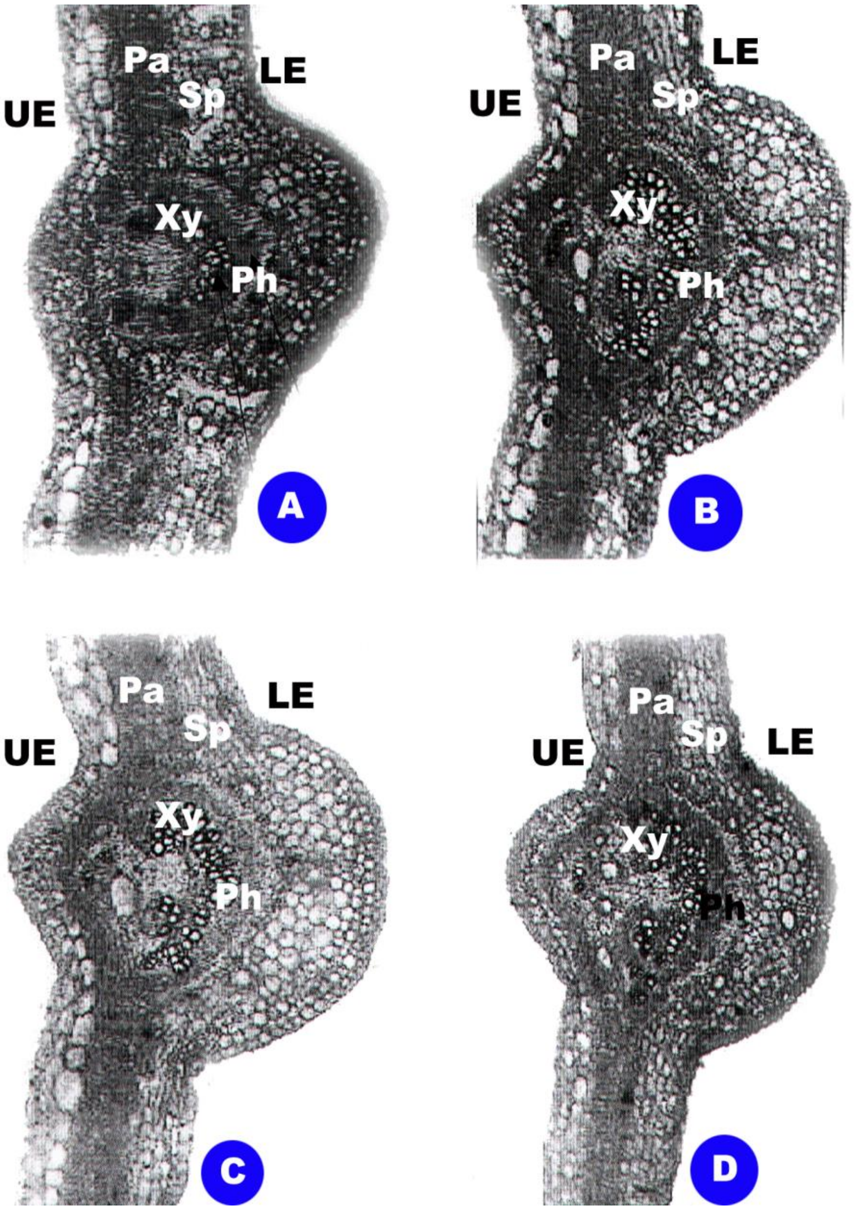

Figure (1) : Cross section of *Schefflera arboricola* leaflet under acclimatization method No.1.

A- Untreated plants (Control)	B- NPK
C- NAA	D- NPK + NAA

Abbreviations:
LE= Lower Epidermis; Pa= Palisade Parenchyma, Ph= Phloem; Sp= Spongy Parenchyma; Xy= Xylem; UE= Upper Epidermis.

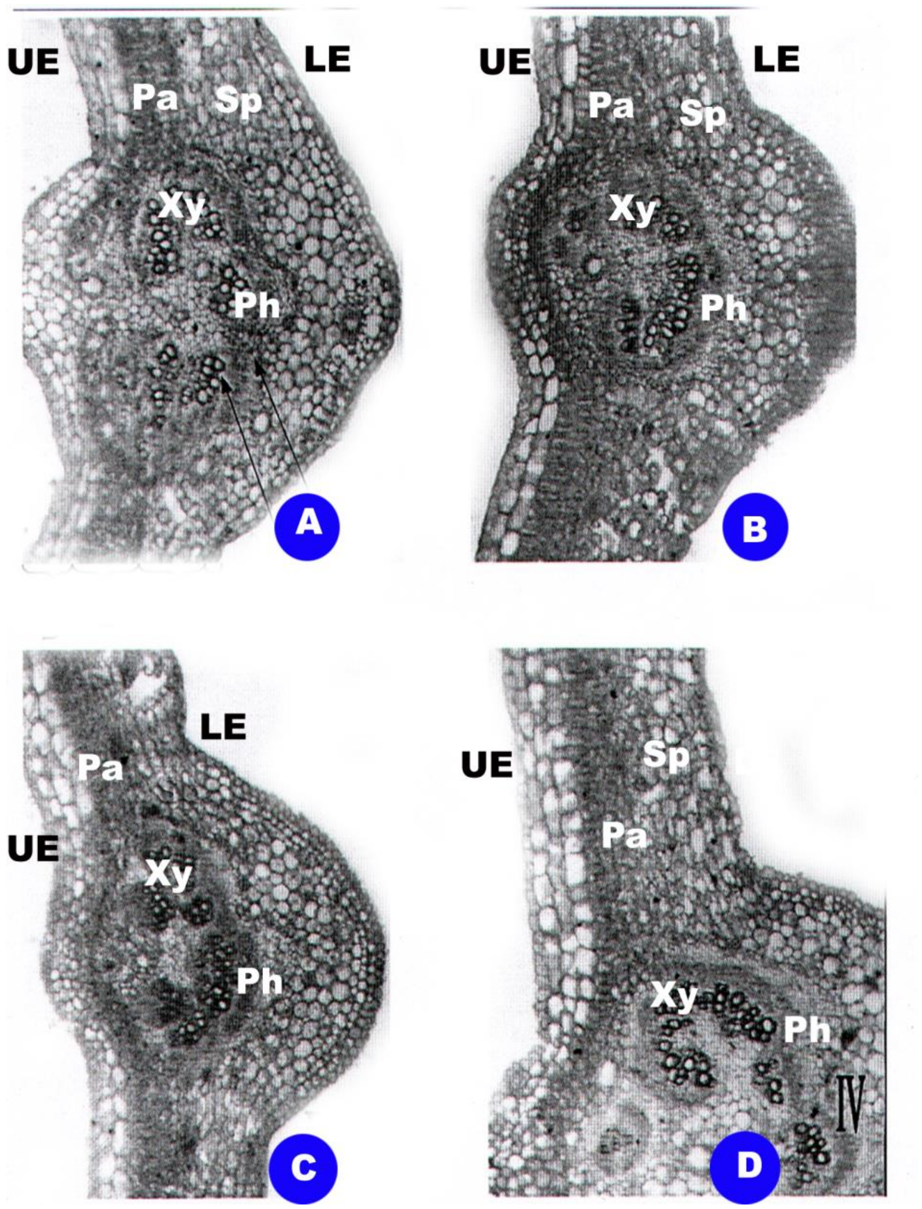

Figure (2) : Cross section of *Schefflera arboricola* leaflet under acclimatization method No.2.

A- Untreated plants (Control)	B- NPK
C- NAA	D- NPK + NAA

<u>**Abbreviations**</u>:
LE= Lower Epidermis; Pa= Palisade Parenchyma, Ph= Phloem; Sp= Spongy Parenchyma; Xy= Xylem; UE= Upper Epidermis.

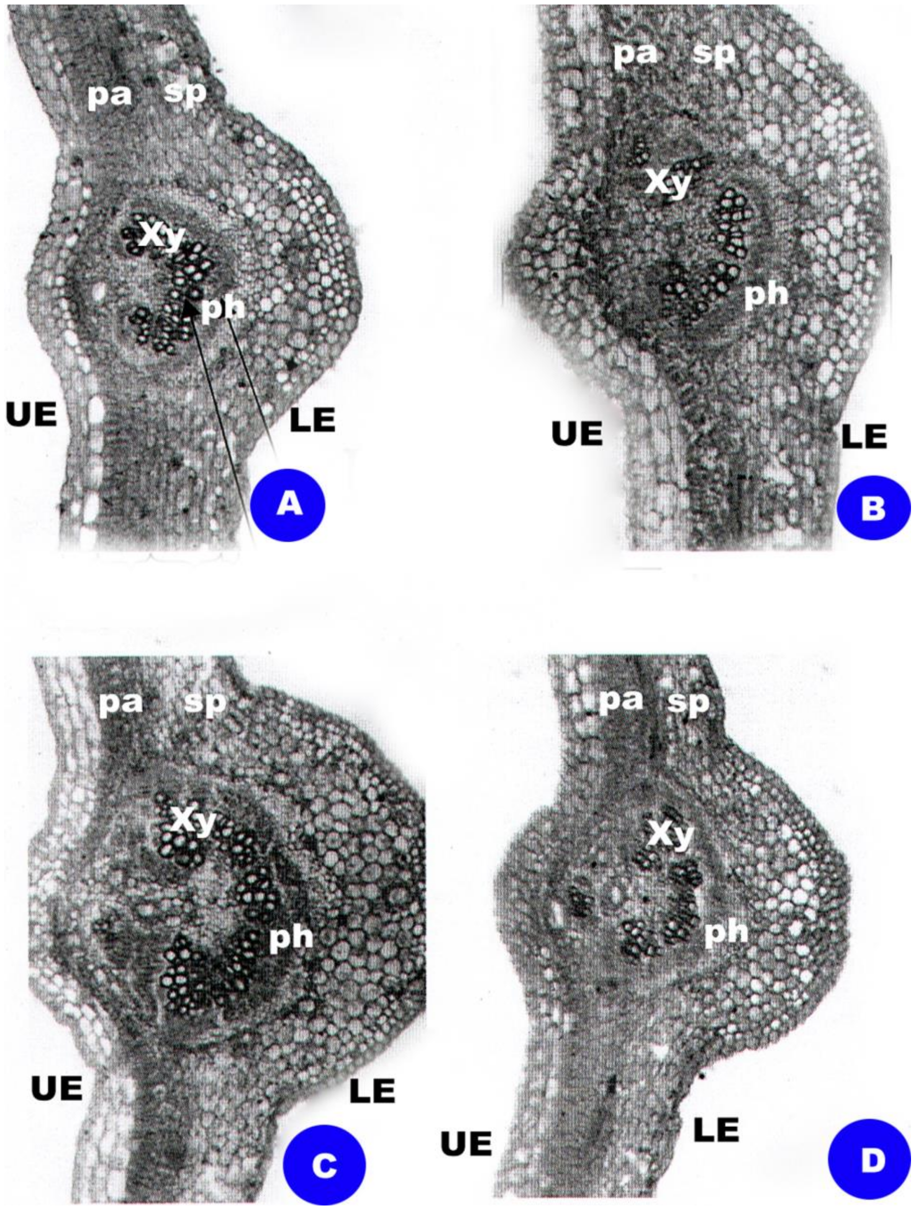

Figure (3) : Cross section of *Schefflera arboricola* leaflet under acclimatization method No.3.

A- Untreated plants (Control)	B- NPK
C- NAA	D- NPK + NAA

Abbreviations:
LE= Lower Epidermis; Pa= Palisade Parenchyma, Ph= Phloem; Sp= Spongy Parenchyma; Xy= Xylem; UE= Upper Epidermis.

It is obvious from data that, acclimatization method No.3 gave the highest thickness in blade leaflet with NPK or NAA comparing with acclimatization method No.1 and 2. This may be attributed to increasing light intensity during the second phase of acclimatization period by method No.3 which led to increasing the thickness of palisade and spongy tissues and resulted increasing the blade leaflet thickness (Zurszucki, 1953 and Conover, 1987). While, decreasing light intensity in the second phase of acclimatization in method No.2, led to decreasing the blade leaflet thickness. However, acclimatized plants by method No.2 had the best quality during the interior holding period. In addition, Reyes *et al*., (1996a) reported that leaves under high light intensity had elongated and collumnar palisade cells which resulted in increasing leaf thickness while, under low light, leaves were thinner and had poorly developed palisade layer. Also, Woods and Turner (1971) reported that leaves which contain an excess of spongy tissue are relatively thicker. In addition, Conover (1987) concluded that leaves from plants grown in high light are often thicker than shade grown leaves. This extra leaves thickness may be due to increasing the thickness of the epidermal layer and lengthening spongy mesophyll cells.

It could be concluded that the high increase in blade thickness was obtained under acclimatization method No.3 and 2 combined with NPK treatments.

REFERENCES

Anderson, J.M.; D.J. Goodchild and N.K. Boardman (1973). Composition of the photosystems and chloroplast structure in extreme shade plants. Biochim. Biophys. Acta., 325: 573-585.

A.O.A.C (1980). Association of Official Analytical Chemists. 14^{th} Ed. published by A.O.A.C., Washington 4 D.C, USA.

Collard, R.C.; J.N. Joiner; C.A. Conover and D.B. Mc Connell (1977). Influence of shade and fertilizer on light compensation point of *Ficus benjamina* L. J. Amer. Soc. Hort. Sci., 102(4): 447-449.

Conover, C.A. (1975). Conditioning and Acclimatization of Plant Material for Interior Use. Proc. From the plants point of view. SAF symposium, June 22-24. P. 70-77.

Conover, C.A. (1987). The climate indoors. In : Indoor plants. Briggs, G.B. and C.L. Calvin (1987). John Wiley & Sons, New York, pp. 175-205.

Conover, C.A. and R.T. Poole (1977). effect of cultural practices on acclimatization of *Ficus benjamina* L. J. Amer. Soc. Hort. Sci., 102 (5): 529-531.

------------ (1981). Influence of light and fertilizer levels and sources on foliage plants maintained under interior environments for one year. J. Amer. Soc. Hort. Sci., 106(5): 571-574.

------------ (1984a). Light and fertilizer recommendations for production of acclimatized potted foliage plants. ARC-A. Report RH., 84, 7-11. Apopka, fl, United States. (C.F. Post-harvest Handling and Storage of Cut flowers, Florist Greens and Potted Plants. 1990 J. Nowk and R.M. Rudnicki.

------------ (1984b). Acclimatization of indoor foliage plant. Hort. Rev., 4: 119-154.

Doley, D. (1978). Effects of shade on gas exchange and growth in seedlings of *Eucalyptus grandis* Hillex Maiden Austral, J. Plant Physiol., 5 : 723-738.

Dubois, M.; K.A. Giles, J.K. Hamilton, P.A. Rebers and F. Smith (1956). Colorimetric method for determination of sugars and related substances. Annal Chem., 28 : 350-356.

Fonteno, W.C. and E.L. Mc williams (1978). Light compensation point and acclimatization of four tropical foliage plants. J. Amer. Soc. Hort. Sci., 103 (1): 52-56.

Gaash, D.; I. David and I. Doron (1993). Various auxin alternative formulations to reduce pre-harvest drop of Apples. Adv. Hort. Sci., 7(3): 89-91.

Gerlach, D. (1977). Botanische Microtechnik. Eine Einfuhrung Thieme. Verlag, Stuttgart, BRD.

Gomez, K.A. and A.A. Gomez (1984). Statistical Procedures for the Agricultural Research, John Wiley and Sons, Inc., New York.

Jackson, M.L. (1967). Soil Chemical Analysis Prentic-hall of India 1td. New Delhi; 388-415.

Johnson, C.R.; T.A. Nell; J.N. Joiner and J.K. Krantz (1979). Effects of light intensity and potassium on leaf stomatal activity of *Ficus benjamina* L. HortScience, 14(3): 277-278.

Joiner, J.N.; C.A. Conover and R.T. Poole (1977). Factors affecting acclimatization of foliage plants. Proceeding of the Tropical Region, Amer. Soc. Hort. Sci., 21: 41-43.

Marini, R.P.; R.E. Byers and D.L. Sowers (1993). Repeated applications of NAA control pre-harvest drop of Delicious apples. J. Hort. Sci., 68(2): 247-253.

Milks, R.R. (1977). Effect of shade, fertilizer and media on the production and acclimatization of *Ficus benjamina* L. M. Sc. Thesis, Univ. of Florida, Gainesville. (J. Amer. Soc. Hort. Sci., 104(3): 335-338, 1979).

Milks, R.R.; J.N. Joiner; L.A. Garard, C.A. Conover and B. Tjia (1979). Influence of acclimatization of carbohydrate production and translocation of *Ficus benjamina* L. J. Amer. Soc. Hort. Sci., 104(3): 410-413.

Min, G.M. and J.S. Lee (1992). Growth response and acclimatization of *Ficus benjamina* L. WG-1 to changes in light conditions. J. Korean Soc. Hort. Sci., 33(1): 48-53.

Pass, R.G. and D.E. Hartley (1979). Net photosynthesis of three foliage plants under low irradiation levels. J. Amer. Soc. Hort. Sci., 104 (6): 745-748.

Poole, R.T. and C.A. Conover (1982). Influence of culture conditions on stimulated shipping of *Ficus benjamina*. Proc. Flo. State Hort. Soc., 95: 172-173 (C.F., Hort. Rev. 1984, 6: 119-154).

Reyes, T.; T.A. Nell; J.E. Barrett and C.A. Conover (1996a). Testing the light acclimatization potential of *Chrysalido carpus* Lutescens Wendl. HortScience, 31(7): 1203-1206.

Reyes, T.; T.A. Nell; J.E. Barrett and C.A. Conover (1996b). Irradiance level and fertilizer date affect acclimatization of *Chamaedorea elegans* Mart. Hort. Sci., 31(5): 839-842.

Richard, N.A. (1996). Plant Growth Substances Principles and Application. The Pennsylvania State University. QK 731. A76, 1995.

Russell, E.W. (1988). Soil Condition and Plant Growth. 11th Ed. Longman, Green and Co. Ltd. London.

Sarracino, J.M.; R. Merritt and C.K. Chin (1992). Light acclimatization potential of *Leea coccinia* and *Leea rubra* grown under low light flux. HortScience, 27(5): 404-406.

Van Egmond, F. (1978). Nitrogen nutritional aspects of the ionic balance of plants. P. 171-189. In D.R. Nielsen and J.G. Mac Donald (eds.). Nitrogen in the Environment, vol. 2 Academic Press, New York.

Vladimirova, S.V.; D.B. Mc Connell and M.E. Kane (1997). Morphological plasticity of *Dracaena sanderiana* "Ribbon" in response to four light intensities. HortScience, 32(6): 1049-1052.

Vlahos, J. and J.W. Boodley (1974). Acclimatization of *Brassaia actinophylla* and *Ficus nitida* to interior environment conditions. New York State Flower Industries Bulletin. No.50, 2-5, 7.

Woods, D.E. and W.C. Turner (1971). Stomatal response of changing light by four tree species of varying shade tolerance. New Phytol., 70: 77-84.

Yadova, U.L. (1986). A rapid and nondestructive method to determine chlorophyll in intact leaves. HortScience, 21: 1949-1950.

Zurszucki, J. (1953). Arrangement of chloroplast and light absorption in plant cells. Acta. Soc. Bot. Pol., 22: 229-320.

تأثير بعض العوامل المؤثرة على أقلمة نباتات الشفليرا (*Schefflera arboricola* Pov.)

حسين على أحمد حسين* ، محمد نزيه شرف الدين* ، محمود عبد المنعم خفاجى و نعيمة إسماعيل السيد إسماعيل***

*** قسم الخضر والزينة – كلية الزراعة – جامعة المنصورة**

****قسم النبات الزراعى – كلية الزراعة – جامعة المنصورة**

لغرض الحفاظ على جودة نباتات الشفليرا بعد نقلها إلى ظروف الغرفة أجرى هذا البحث فى المزرعة البحثية بكلية الزراعة جامعة المنصورة خلال موسمى الزراعة المتتاليين ١٩٩٨ ، ١٩٩٩ وذلك لتقييم تأثير طرق الأقلمة على النحو التالى : معاملة الكنترول وفيها نقلت النباتات إلى الصوبة البلاستيك لمدة ٣ أشهر (من ١ مارس إلى ٣٠ مايو) ثم بعد ذلك نقلت النباتات إلى الغرفة لمدة ٤ أشهر (من ١ يونيو إلى ٣٠ سبتمبر) وطريقة الأقلمة الأولى وفيها نقلت النباتات إلى الصوبة الخشبية لمدة ٣ أشهر (من ١ مارس إلى ٣٠ مايو) ثم نقلت إلى الغرفة لمدة ٤ أشهر (من ١ يونيو إلى ٣٠ سبتمبر) وطريقة الأقلمة الثانية وفيها نقلت النباتات إلى التعريشة لمدة ٤٥ يوماً (من ١ مارس إلى ١٥ أبريل) ثم نقلت إلى الصوبة الخشبية لمدة ٤٥ يوماً (من ١٥ أبريل إلى ٣٠ مايو) ثم نقلت بعد ذلك إلى الغرفة لمدة ٤ أشهر (من ١ يونيو إلى ٣٠ سبتمبر) وطريقة الأقلمة الثالثة وفيها نقلت النباتات إلى الصوبة الخشبية لمدة ٤٥ يوماً (من ١ مارس إلى ١٥ أبريل) ثم نقلت النباتات إلى التعريشة لمدة ٤٥ يوماً (من ١٥ أبريل إلى ٣٠ مايو) وبعد ذلك تم نقلها إلى الغرفة لمدة ٤ أشهر (من ١ يونيو إلى ٣٠ سبتمبر) بالإضافة إلى ذلك إشتملت كل معاملة من معاملات الأقلمة على أربعة معاملات من التسميد المعدنى (نتروجين ، فوسفور ، بوتاسيوم) بمعدل ٢٤٢ ن – ٨١ فو – ١٦١ بو جرام/م٢/سنة والرش بمنظم النمو النفتالين أستيك أسيد (NAA) بمعدل ٢٠٠ جزء فى المليون منفرده أو فى تراكيب زوجية وتأثيرها على بعض صفات النمو الخضرى ومحتوى الأوراق من الكلوروفيل والسكريات الكلية الذائبة والعناصر الغذائية لنبات الشفليرا أثناء فترة الأقلمة والغرفة.

وقد أظهرت النتائج المتحصل عليها أن معاملة النباتات الغير مؤقلمة بالتسميد المعدنى أعطت أكبر عدد من الأوراق الحديثة أثناء فترة الأقلمة مقارنة بالمعاملات الأخرى فى حين النباتات الغير مؤقلمة والمعاملة سمادياً وهرمونياً لم يحدث بها أى تساقط ورقى خلال فترة الأقلمة فى كلا الموسمين. وأدت أقلمة النباتات بطريقة التظليل الثانية مع التسميد المعدنى إلى إنتاج أكبر عدد من الأوراق أثناء فترة تواجدها بالغرفة بالإضافة إلى أن أعلى زيادة فى إرتفاع النبات قد نتجت من النباتات الغير مؤقلمة عند معاملتها بالتسميد المعدنى أثناء فترة الأقلمة والغرفة فى حين أن النباتات الغير مؤقلمة عند تسميدها بالسماد المعدنى كانت الأطول أثناء فترة الأقلمة بينما أدت أقلمة النباتات الغير معاملة سمادياً أو هرمونياً بطريقة التظليل الثانية إلى إعطاء أقصر طول للنباتات. بالإضافة إلى أن النباتات الغير مؤقلمة والغير معاملة سمادياً أو هرمونياً قد

أعطت أكبر زيادة فى سمك الساق وأطول نمو فى الثلاث سلاميات القمية فى كلا الموسمين فى حين أعطت النباتات المؤقلمة بطريقة التظليل الثانية مع التسميد المعدنى أطول عنق للورقة فى كلا الموسمين وأكبر مساحة ورقية فى الموسم الأول.

وتشير النتائج إلى أن أقلمة النباتات بطريقة التظليل الثانية مع التسميد المعدنى قد أدت إلى إعطاء أعلى زيادة لمحتوى الكلوروفيل فى الأوراق الحديثة والقديمة مقارنة بالمعاملات الأخرى فى كلا الموسمين فى حين أن معاملة النباتات الغير مؤقلمة بالنفثالين حمض الخليك بتركيز ٢٠٠ جزء فى المليون قد أعطت أكبر زيادة معنوية فى محتوى النباتات من السكريات الكلية الذائبة فى كلا الموسمين. وقد سجلت النباتات المؤقلمة بطريقة التظليل الثانية والمعاملة بالتسميد المعدنى أعلى زيادة فى محتوى النتروجين مقارنة بالكنترول فى كلا الموسمين. وبالإضافة إلى ذلك أدت أقلمة النباتات بطريقة التظليل الثالثة مع المعاملة بالنفثالين حمض الخليك بتركيز ٢٠٠ جزء فى المليون إلى إعطاء أعلى زيادة فى محتوى الأوراق من عنصر الفوسفور وأخيراً أعطت النباتات الغير مؤقلمة والغير معاملة سمادياً أو هرمونياً أعلى زيادة فى محتوى الأوراق من عنصر البوتاسيوم فى كلا الموسمين.

وعموماً يزيد تسميد النباتات بالـ ن و فو و بو من سمك نصل الورقة والعرق الوسطى وكذلك عدد الأوعية لكل نظم الأقلمة المستخدمة. كما وجد أن طريقة الأقلمة الثالثة قد أعطت أعلى زيادة فى سمك نصل أوراق النباتات التى تم تسميدها بهذه العناصر. بينما المعاملة بالنفثالين حمض الخليك أعطت زيادة طفيفة فى هذا المجال.

من النتائج السابقة يمكن لنا توصية منتجى نباتات التنسيق الداخلى بأقلمة نباتات الشفليرا قبل عرضها للبيع وذلك للحفاظ على جودتها عند المستهلك كالآتى : يتم نقل النباتات إلى التعريشة لمدة ٤٥ يوماً ثم تنقل إلى الصوبة الخشبية لمدة ٤٥ يوماً مع التسميد أثناء فترة الأقلمة بمعدل ٢٤٢ ن – ٨١ فو – ١٦١ بو جرام/م^{٢}/السنة.

2828 2829 2830 2831 2832 2833 2834 2835 2836 2837

2838 2839 2840 2841 2842 2843 2844 2845 2846 2847

2828 2829 2830 2831 2832 2833 2834 2835 2836 2837

2838 2839 2840 2841 2842 2843 2844 2845 2846 2847