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EFFECT OF PLANTING MEDIA AND BORON SPRAY ON GROWTH OF *(Adiantum tenerum* **'Scutum Roseum'** *)* **plant.**

Yousif H. Hammo Abduljabar I. Saeid Shawkat M. Muhammad

Hort. Dept., College of Agriculture, Dohuk Univ., Iraq

ABSTRACT

This study was conducted in Agricultural College/ Dohuk University during the period 1st Sep 2004 and 30th Jun 2005. The objective was to improve the growth of maidenhair plant (*Adiantum tenerum* 'Scutum Roseum) by selecting a suitable and available media and boron nutrition requirement. Two kinds of media were used, loamy soil : manure, and loamy soil : peat moss (2:1 by volume) and boron foliar application (boric acid) in concentrations (0, 30, 60, 90,120) mg / L. Results showed in vegetative dry weight, root dry weight, leaf length, leaves number for plants growing in peat moss media increased by 25%, 9%, 16%, 28% consecutively comparing with those grown in manure media. While chemical content cannot effected by this factor except nitrogen 4.02% which increased significantly in plants growing in animals manure media. Spray plants with the medium concentration of boron 60 mg/L give highest values which a superiority significant for most of vegetative and chemical characters when comparing with the others and reached 5.71 g, 0.548 g, 44.30 cm, 4.20%, 0.535% for vegetative dry weight, root dry weight, leaf length, nitrogen, and phosphorus consecutively except leaves number when spread with 30 mg/L and boron content 0.140% when spray with highest concentration 120mg/L. Interactions between the two factors have significantly effected all vegetative and chemical characters and highest values obtained when plant grown in peat moss media and sprayed with 60 mg/L and reached 6.08 g, 0.550 g, 47.40 cm, for vegetative dry weight, root dry weight, leaf length, consecutively except leaves number when plant grown in the same media and spread with 30 mg/L while nitrogen and phosphorus gave higher concentration when plants grown in animals manure and sprayed with 60 mg/L as well as boron content 0.153% when spray with highest concentration 120 mg/L. and grown in peat moss media .

INTRODUCTION

Maidenhair fern (***Adiantum tenerum*** **'Scutum Roseum'**) is a fine-textured**,** delicate, and small to medium-sized plant of the perennial, herbaceous which belongs to Adiantaceae family. It is widely distributed through hot regions and rain forests of South- America, it need a humid and warm atmosphere (Abou Dahab, 1978, Tropical plant database, 1996). Although Maidenhair fern, which propagates by division or spores, grows in partial to full shade on well-drained soils with high organic matter it does not tolerate dry soil (Gilman, 2003). They are planted as ornamental landscape fern for shade gardens. Although their Leaves and rhizomes are used to kill viruses, bacteria they are used for many medicinal purposes such as cough suppressant, decongestant, expectorant, menstrual stimulant, and for hair loss as well as there has been no specific research on this plant to isolate and test its chemicals compounds are such as

triterpenes, flavonoids, phenylpropanoids, carotenoids, astragalin adiantone, and adiantoxide, (Taylor, 2005).

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Boron is one of the seven essential micronutrients required for the normal growth of most plants (Keren and Bingham, 1985), and its presence low in sandy soils and in organic matter (Rosen and Eliason, 2002). Its deficiency cause a breakdown of the growing tip tissue or a shortening of the terminal growth (Vitosh *et al*., 1994 and Uchida, 2000). However, this element plays a big role in plant metabolism such as sugar transport, cell wall synthesis, lignifications, carbohydrate metabolism, RNA metabolism, respiration and amino acid (Vitosh *et al.*, 1994). Marzadori *et al.* (1991) reported that after the organic matter has been removed the amount of Boron adsorbed by soil is considerably greater while adding organic matter to soil will increase Boron content and its availability to plants. Bin-salman (2000) found that foliar spray of boron on potato leaves with two concentrations 625 and 1250 mg/L have significant effect on plant length, number of aerial branch, dry weight of vegetative growth with the increase in concentrations whereas nitrogen and phosphorus concentration decreases.

For potted plants production, the use of pure field soil is not recommended for the soil tends to become compacted and therefore, it decreases drainage and aeration so that soil must be amended or completely replaced with various organic materials, such as peat moss (Reed, 2005) or animal manures which are most commonly available organic material and excellent fertilizer for crops and forages, there material contains nitrogen, phosphate, potash, and micronutrients that are essential for plant growth (Savoy, 2000). Peat moss alone or combined in equal volume amounts with sand constitutes an effective for root substrate and assist in conserve moisture a help maintain a uniform soil temperature (Nelson, 2003). Yermiyahu *et al.* (2001) found that adding organic matter to sandy soils will increase Boron in plants, where leaching sandy soils will cause losing in Boron. Al-mukhtar (2003) found that there were no significant differences between the results which obtained from the growing of plants in media that contained a peat moss instead of manure. Conover (1991) defined that Pteridophytas growth is best in media that contains organic maters. Ponton *et al.* (1990) found that, media contains peat moss, are most suitable for nephrolepis plant.

The objective of this study was to improve the growth of maidenhair plants brought from the high shady and moisterous locations in the northern areas of Iraq by selecting suitable and available media because of so necessary and valid for greenhouse producers, as well as, there were no previous studies in this plant.

MATERIALS AND METHODS

This study was carried out in the greenhouse of College Of Agriculture/ Dohuk University during the period between 1st Sep 2004 and 30th Jun 2005. The plants brought from the high shady and moisterous locations in the northern areas of Iraq and planted on Sep. 1st 2004 in (1×1×0.5) m woody box filled with

sandy soil media and covered with plastic. When the plants give (2-3) branches they have been transplanted to (15) cm pots with two kinds of a mixture media. The first was loamy soil: peat moss (2:1 by volume) while the second was loamy soil: animal manure: (2:1 by volume).

Physical and chemical analysis of Media has been done on laboratory of horticulture department in Agriculture college table (1). Two months after first planting, the plants was foliar sprayed with five levels of boron fertilizer (boric acid source) (0, 30, 60, 90, 120 mg/L) then was putted in greenhouse for growing. Nutrient concentration ranges for asparagus is 40-100 mg/L (Jones *et al.*, 1991). The suggested rate for foliage application is 137 and 46 gram of boron in 135 litters of water per acre 1018, 341 mg/L for highly and low to medium responsive crops consecutively (Vitosh *et al.*, 1994). All required agricultural managements were carried out as usually recommended for foliage plant production.

The statistical layout of this experiment was Random Complete Block Design (RCBD) with three replicated each one 4 pots. The recorded data, at the end of experiment after 7 months of planting, are vegetative dry weight , root dry weight , leaf length, leaves number and chemical analysis was done for the determination of nitrogen (Modified Micro-Kjeldahi) as described by Black (1965), phosphorus as describe by Matt (1970) with use of Spectrophotometer, and boron with Carmine Method which is described by Black (1965). The data, however, were statistically analyzed using Duncan Multiple test at 5% level (SAS, 1996).

Table (1): physical and chemical properties of the media.

Soil characters	Media kind	
	loamy soil : peat moss	loamy soil : animals manure
pH	7.48	7.19
Ec mmoh/cm	0.85	0.94
Sand%	71.72	72.72
Silt%	21.60	20.60
Clay %	6.68	6.68
Texture	Silty sand	Silty sand
Organic Mater %	4.47	2.76
$CaCO_3$ %	12.40	10.01
N%	0.600	0.111
P%	0.120	0.880
K%	0.010	0.053
B mg/L	1.4	1.5

RESULTS AND DISCUSSION

Data, presented in table (2), showed that all vegetative characters vegetative dry weight, root dry weight, leaf length, leaves number for plants growing in loamy soil: peat moss media are superior significantly on that growing in loamy soil : animals manure. And the percentage of increase are

25%, 9%, 16%, 28% consecutively which may be due to the chemical analysis of the media table (1) which shows increase in nitrogen, organic mater percentages in loamy soil: peat moss media in comparison with the other media.

These results are in agreement with Conover (1991), Ponton *et al.*(1990) and Bin-salman (2000) on potato . Data in the same table indicated that the highest values of vegetative dry weight, root dry weight and leave length 5.71g, 0.548g, and 44.30cm are obtained in plants sprayed with 60 mg/L boron which differ significantly in comparison with the other concentration. While the 30 mg/L gave highest numbers of leaves 50.50 which was significantly different from other concentrations. These results are in agreement with those found by Toma (2001) óóóóóWhich obtained that foliar application of boron with (0.250 kg/donum) caused a significant effect on yield quality and quantity of potato. The significant effect of the medium concentration of boron 60 mg/L when compared with the lower one on vegetative growth characters may be refer to the big role of this element in plant metabolism and its effect on the cell plant growth and activity (Bonilla et al, 1980). While the significantly decreases in the high concentration 90,120 mg/L may refer to its toxic effect on growth Which found by Pergon and Aromour (1992) on potato how showed decrease in length and number of stem when raise boron level to 2.0, 3.0 kg/donum because of toxicity happens in plants.

The interaction between the levels of studied factors have a significant influence on all vegetative characters as shown in table (2) and the highest value obtained in plants growing in mixture of loamy soil : peat moss and sprayed with 60 mg/L boron while the lowest values are obtained in plants growing in mixture of loamy soil :manure. The increasing percentage of highest to lowest values reach (85.29, 57.14, 173.36, and 103.57) % for the vegetative dry weight, root dry weight, leaf length, leaves number consecutively. These results are in agreement with Al-Layla (2006) on rubber plant who found increasing in plant height, leaves number, leave area when (2) dosages per week of micronutrient fertilizer contain 0.250 mg/L boron.

Table (2): Effect of boron and media on some vegetative and root characters of *Adiantum tenerum* plant.

Vegetative Characters	Media	Boron concentration (mg/L)					Means
		0	30	60	90	120	
Vegetative dry weight(g)	M*	3.67d	4.01cd	4.63b-d	4.82bc	4.40b-d	4.30b
	P•	5.35b	5.31b	6.80a	4.63b-d	4.80bc	5.38a
	Means	4.51 b	4.66 b	5.71 a	4.72 b	4.60 b	
root dry weight(g)	M	0.350e	0.375de	0.545a	0.530ab	0.370de	0.434b
	P	0.380de	0.464bc	0.550a	0.537ab	0.432cd	0.473a
	Means	0.365c	0.420b	0.548a	0.533a	0.401bc	
leave length (cm)	M	17.34d	19.04d	41.20b	47.13a	25.44c	30.03b
	P	27.22c	46.46a	47.40a	26.13c	27.22c	34.89a
	Means	22.28e	32.75c	44.30a	36.63b	26.33d	
Leaves Number	M	32.33de	44.00bc	33.00de	29.00e	28.00e	33.27b
	P	36.00c-e	57.00a	49.00ab	38.33cd	32.67de	42.60a

	Means	34.17c	50.50a	41.00b	33.67c	30.34c

Each means in row for one or interactions factors with different letters are significantly different at P = 0.05 using Duncan's multiple range test.
*M= loamy soil: animals manure.
•P= loamy soil: peat moss.

The results in table (3) indicated that growing mixture media showed no significant effect on maidenhair fern plant contents of phosphorus and boron percentage, While nitrogen percentage was significantly increased by using manure mixture (4.02)% when compared with peat moss mixture(3.63)% .these results are in agreement with those found by Al-mukhtar, (2003) on ***Nephrolepis.***

Furthermore table (3) shows that the low concentration of foliar boron (30,60) mg/L to this plant causes an increased in nitrogen percentage while the high concentration reduce it. These results are in agreement with those found by Toma (2001). Phosphorus and boron percentage also increase significantly when the plants foliar with medium to high concentration of boron (60, 90, 120) mg/L when compared with other. The highest means of phosphorus and boron reach 0.535%, 0.140% for plants foliar with 60,120 mg/L respectively. This was in agreement with Bin-salman (2000) on potato. Vitosh *et al*. (1994) found that average boron concentrations in mature leaf tissues are deficient-less than 15 mg/L; sufficient-20 to 100 mg/L; and excessive or toxic-over 200 mg/L and with Gupta and Sanderson (1993) which found that the boron contain was increase in plant tissues with increasing boron application to plants.

Data present in table (3) show that only the plants foliar with 120 mg/L boron concentration and grown in peat moss mixture are significantly decrease in nitrogen percentage 2.80% when compared with high value 4.40% which obtained in plant grown in animal manure and spray with 30 mg/L. While the highest percentage of phosphorus 0.536% obtained in plants grown in animal manure media and foliar with 60 mg/L boron. As well as the highest percentage of boron 0.153% is found in plants grown in peat moss and foliar with 120 mg/L boron.

Table (3): Effect of boron and media on chemical content of *Adiantum tenerum* plant.

Chemical Characters	Media	Boron concentration (mg/L)					Means
		0	30	60	90	120	
Nitrogen%	M*	4.00a	4.07a	4.40a	3.87ab	3.80ab	4.02a
	P•	4.27a	3.80ab	4.00a	3.26bc	2.80c	3.63b
	Means	4.13a	3.94ab	4.20a	3.56bc	3.30c	
Phosphorus%	M	0.361e	0.374de	0.536a	0.530a	0.366e	0.433a
	P	0.369e	0.449c	0.533a	0.490b	0.411cd	0.450a
	Means	0.365c	0.412b	0.535a	0.510a	0.389bc	
Boron%	M	0.058d	0.088c	0.105bc	0.115bc	0.127ab	0.099a
	P	0.054d	0.089d	0.106bc	0.143a	0.153a	0.109a
	Means	0.056 d	0.089 c	0.106bc	0.129ab	0.140a	

Each means in row for one or interactions factors with different letters are significantly different at P=0.05 using Duncan's multiple range test.

*M= loamy soil: animals manure.
•P= loamy soil: peat moss.

الخلاصة

تأثير أوساط الزراعة والرش بالبورون في نمو نبات كزبرة البئر (*Adiantum tenerum* 'Scutum Roseum)

يوسف حسين حمو عبد الجبار أحسان سعيد شوكت مصطفى محمد

قسم البستنة / كلية الزراعة / جامعة دهوك / العراق

أجريت هذه الدراسة في كلية الزراعة/جامعة دهوك للفترة من ١- أيلول ٢٠٠٤ ولغاية ٣٠- حزيران ٢٠٠٥. تهدف الدراسة إلى تحسين النمو الخضري لنبات كزبرة البئر وذلك باختيار الوسط المناسب والمتوفر وتلبية احتياج النبات من عنصر البورون .تضمنت الدراسة استخدام وسطين. الأول تربة مزيجية والبيتموس بنسبة حجمية ٢:١ والثاني تربة مزيجية وسماد حيواني وبنفس النسبة. وتضمن العامل الثاني خمسة تراكيز من البورون هي (٠، ٣٠، ٦٠ ،٩٠ ، ١٢٠) ملغم/لتر رشت على النبات. وتضمنت النتائج زيادة معنوية في معظم الصفات الخضرية في النباتات التي زرعت في الوسط المؤلف من تربة المزيجية والبتموس حيث بلغت نسبة الزيادة مقارنة بالوسط الآخر والمؤلف من تربة المزيحية والسماد الحيواني ٩، ٢٥، ٢٨، ١٦% للصفات، الوزن الجاف للمجموع الخضري، الوزن الجاف للمجموع الجذري، طول الورقة، عدد الأوراق على التوالي. بينما لم تتأثر النسبة المؤية للفسفور والبورن باختلاف الوسط. وأدى رش النباتات بتركيز ٦٠ ملغم/لتر بورون إلى إعطاء أعلى القيم المعنوية ولمعظم الصفات الخضرية والكيمياوية المدروسة عند مقارنتها بالتراكيز الأخرى وبلغت ٥,٧١ غم ، ٠,٥٤٨غم، ٤٤,٣٠ سم ، ٤,٢٠%، ٠,٥٣٥% لصفات الوزن الجاف للمجموع الخضري، الوزن الجاف للمجموع ألجذري، طول الورقة، النسبة المؤية للنيتروجين والفسفور وعلى التوالي باستثناء عدد الأوراق ٥٠,٥٠ ورقة والتي تفوقت معنويا عند رشها بالتركيز ٣٠ ملغم/لتر والمحتوى من البورون ٠,١٤٠% عند رش النباتات بالتركيز العالي ١٢٠ ملغم/لتر. وكان للتداخل بين مستويات العوامل المدروسة تأثير معنوي على معظم الصفات المدروسة وأعطت النباتات النامية في الوسط الحاوي على البتموس والتي رشت بالبورون بتركيز ١٢٠ ملغم/لتر أعلى المتوسطات ٠,١٥٣% مقارنة بأقل تركيز ٠,٠٥٤% وجد في النباتات التي لم تسمد ومزروعة في نفس الوسط.

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