APPROVAL SHEET

PHYSIOLOGICAL STUDIES ON CROTON PLANT

M.Sc. Thesis

By

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B.SC. (Ornamental Horticulture),Fac. Agric., Cairo Univ., Egypt,2001

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THESIS

Submitted In Partial Fulfillment of the Requirements for the Degree of

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INTRODUCTION

Codiaeum variegatum (L.)A.Juss. plants(crotons) are members of the" Euphorbiaceae" family, from the South Pacific to Australia. Crotons have been popular in tropical and sub-tropical gardens for centuries, but only in recent years have they become popular indoor plants. The croton plants are used and grown for the attractive foliages which are available in many brilliant colors. It is an ornamental evergreen shrub with alternate, simple leaves, used in containers and beds. This plant is grown for colorful and interesting leaf forms, the leaves range in shades from deepest reds and purples to bright greens, gold, and everything in between. A mature plant will grow about six feet tall and does well in sun or part shade. Planted outdoors, they are tolerate of sandy soil and will tolerate salt air near the beach. They tolerate heat extremely well(Brickell,1998). The cultivar 'Gold Star' plant is a commonly seen croton, it is a shrub that has bright green leaves with flecks of gold all over the leaves, hence the name. it is a very pretty plant and can be used to create a hedge when planted close together. It makes attractive specimens(Rodriguez & Rohde ,2006) .

The production of greenhouse plants, including croton plants, involves a number of cultural inputs. Among these, perhaps the most important is the type of growing medium used. Due to the relatively shallow depth and limited volume of a container, growing media must be amended to provide the appropriate physical and chemical properties necessary for plant growth. Selecting the appropriate growing media to use is an important step in producing a good quality croton plant. It is

well known that a good medium is made up of components that provide optimum aeration, drainage and moisture holding characteristics. These are usually made up from combinations of peat moss, perlite, vermiculite, sand or similar materials. The primary role of a medium is to provide support and moisture while the plant is developing. These requirements are quite different from plant to another, which may have to sustain a mature or growing plant over a long period of time. Generally speaking, the media used for plant production in the greenhouse will vary depending on the production approach being used. Each media has its specific properties, and resulting advantages and disadvantages.

Although micro elements are needed relatively in very small quantities for foliage plants, their deficiency or excess cause great disorders in the different physiological processes of plants. A" complete" nutritional program must take into consideration the secondary and micronutrients as well as N, P and K (macronutrients).These two classes of elements generally include: calcium (Ca), magnesium (Mg), sulfur (S), iron (Fe), zinc (Zn), copper (Cu), manganese (Mn), boron (B), molybdenum (Mo), and chloride (Cl). Although many of these may be inherently supplied by the growing medium, others require supplemental applications. Extensive research over the past 100 years has indicated that 17 elements are required for plant growth of which 7 are micronutrients (Fe, Mn, Zn, Cu, B, Mo, Ni). Each nutrient has its own specific role to play in plant biochemistry and physiology and no other element can replace the

functions of that element Each of the elements essential for plant growth perform a distinct function in the metabolism process. Plants require boron(Bo) to regulate the metabolism of carbohydrates, it is non-mobile in plants (much like calcium) meaning that a continuous supply is necessary and it is known to assist in the differentiation of meristem tissue. Magnesium is essential for photosynthesis, it is the central element of the chlorophyll molecule. Carrier of phosphorus, it is both an enzyme activator and a constituent of many enzymes sugar synthesis and ,starch translocation(Marschner,1995).The nutrients can be either mobile or immobile in the plants as well. A nutrient may or may not have the same mobility in the plant as in the soil. Mobile in Soil (leaches readily in sandy soils)N, K , Mg,S,Mn.Immobile in Soil (can buildup to toxic level)P, Ca ,Ni. Mobile in Plant (older leaves show signs first) N, P, K, Mg, Zn.Ca, S, Mn, Mo (limited mobility).Immobile in Plant (newer leaves show signs first)Fe, B, Cu. So, in any fertilization programme, it is important to understand how micronutrients can impact plant performance.

The present study was done to study the effects of growing media and as well as trace elements on growth of croton plants to provide growers with information useful about media and nutrition programme of these plants.

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عنوان الرسالة: دراسات فسيولوجية على نبات الكرتون
المشرفون: أ.د. سلوى سالم صقر و أ.د. محمد عبد الخالق الخطيب
قسم : بساتين الزينة **فرع:** الزينة **تاريخ منح الدرجة :** / /

المستلخص العربي

أجريت هذه الدراسة بالصوب الزجاجية بقسم بساتين الزينة- كلية الزراعة- جامعة القاهرة خلال موسمي 2005/2004 و 2006/2005 بهدف دراسة تأثير أوساط الزراعة المختلفة وتأثير العناصر الصغرى علي النمو والتركيب الكيماوي لنبات الكر وتن صنف " "Gold Star 0

أوضحت النتائج إن إضافة البيرليت ا و الطمي أو الفيرموكيوليت إلي مخلوط الرمل والبيتموس أدت إلي اكبر زيادة في طول النباتات وعدد الأوراق ومساحتها ، بينما مخلوط الرمل والبيتموس مع كل من الطمي و البيرليت كان الأكثر تأثيرا في زيادة سمك الساق ومعظم المخاليط المستخدمة آدت إلي زيادة التفريع0ادي استخدام مخلوط الرمل مع البيتموس المضاف إليه الطمي أو الفيرموكيوليت أدي إلي زيادة معنوية في الأوزان الطازجة والجافة للأوراق والسوق .

-وأوضحت النتائج أيضا إن مخلوط الرمل مع البيتموس المضاف إليه نشارة الخشب أو الطمي أدي إلي زيادة معنوية في طول الجذور- بينما استخدام مخلوط الرمل مع البيتموس المضاف إليه الطمي أو الفيرموكيوليت أدي إلي زيادة معنوية في الأوزان الطازجة والجافة للجذور .

- إضافة البيرليت و الطمي أو الفيرموكيوليت الي مخلوط الرمل مع البيتموس أدت الي زيادة محتوي الكلوروفيل 0 وان مخلوط الرمل مع البيتموس المضاف إلية الفيرموكيوليت كان أكثر تأثيرا في زيادة تراكم الكربوهيدرات في الأوراق ومخلوط الرمل مع البيتموس المضاف إلية الطمي أدي الي زيادة تراكم الكربوهيدرات في السوق 0 ووجد أن وإضافة البيرليت الي مخلوط الرمل مع البيتموس أدي الي زيادة محتوي الاوراق و السوق والجذور من النتروجين 0 وإضافة البيرليت و الطين أو الفيرموكيوليت الي مخلوط الرمل مع البيتموس أدت الي زيادة محتوي الاوراق من البوتاسيوم 0 وان مخلوط الرمل مع البيتموس المضاف إلية البيرليت كان أكثر تأثيرا في زيادة تراكم البوتاسيوم في السوق والجذور 0

تأثير التسميد بالعناصر الصغرى (Mg- Fe- Mn – Zn – Bo and Cu) : استخدام الزنك (Zn)بتركيز 50 جزء في المليون أدى إلى زيادة في طول النباتات ، استخدام المنجنيز (Mn) بتركيز 25 جزء في المليون (Fe) والحديد بتركيز 50 جزء في المليون إلى زيادة في قطر سيقان النباتات، استخدام البورون(Bo) بتركيز 10 جزء في المليون ادى(إلى زيادة في تفريع النباتات .استخدام الحديد بتركيز 25 جزء في المليون إلى أكبر زيادة في مساحة الأوراق. أدى استخدام النحاس (Cu) بتركيز 20 جزء في المليون إلى زيادة في عدد الأوراق.
استخدام الماغنسيوم ادي الي زيادة محتوى الاورا ق من كلوروفيل(ا)و الحديد (Fe) بتركيز 50 جزء في المليون والبور ون Bo(10) زيادة في محتوى الاوراق من الكربوهيدرات والزنك أعطى زيادة في النتروجين و الماغنسيوم في الفسفور والحديد في البوتاسيوم.معاملة النباتات بالحديد والزنك والنحاس ادي الي زياد محتوى الاورا ق من النحاس.

Name of Candidate : Sanna Esmail Ahmed Esmail **Degree:** M.Sc.
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ABSTRACT

A pot experiment was carried out during two successive seasons,2005and 2006 in the greenhouse , at Ornamental Horticulture Department, Faculty of Agriculture, Cairo University, to study the effect of growing media on growth and chemical composition of croton plant.

Generally, growing the croton plant cv. "Gold Star" in a mixture of sand+ peatmoss + clay, sand + peatmoss+ vermiculite or sand+ peatmoss + perlite resulted in the tallest plants with the greatest number of leaves and the largest leaf area. The mixture of sand + peatmoss +clay as well as sand+ peatmoss +perlite significantly increased stem diameter. Most of growing mixtures had a favorable effect on increasing the number of branches of the croton as compared with the mixtures of sand+ peatmoss+ sawdust and sand + peatmoss+ dried leaves. The fresh and dry weights of leaves and stems were heavier in the mixtures of sand + peatmoss +clay and sand+peatmoss+ vermiculite. The mixtures of sand+peatmoss+sawdust and peatmoss+perlite, sand+peatmoss+clay increased the root length and fresh and dry weights of roots of the croton plants.

The mixtures of sand + peatmoss + perlite, sand + peatmoss + clay and sand + peatmoss + vermiculite were the most effective media in increasing the contents of both chlorophyll–a and chlorophyll–b.The highest value of the carbohydrates content in the leaves of croton plants was recorded with the mixture of sand + peatmoss + vermiculite, The stem content of carbohydrates reached the highest value in sand + peatmoss + clay mixture. Using sand + peatmoss + perlite increased the accumulation of nitrogen in the leaves, stems and roots. Adding vermiculite, clay or perlite to sand + peatmoss mixtures had favorable effect on increasing the K content in the leaves of the croton plant, whereas the mixture of sand + peatmoss + perlite increased K content in the stems and roots.

Effect of trace elements on Croton cv. "Gold Star" plant. Using Zn at 50 ppm resulted in the tallest plants. Adding Mn at 25 ppm and Fe at 50 ppm increased the stem diameter. Spraying the plants with Bo at 10 ppm resulted in the greatest number of branches. Adding Fe at 25ppm was the most effective treatment for increasing the leaf area. Spraying the plants with Cu at 20ppm resulted in the greatest number of leaves / plant. Adding Mg resulted in the highest the content of chlorophyll-a in the leaves of croton**.** Whereas**,** treated with Bo10 and Fe at 25ppm the highest contents of total carbohydrates in the leaves. Using Zn at 50ppm and Mg at 50 ppm increased contents of N% in the leaves. .Spraying the plants with Fe, Zn and Cu as well as the low level of Mg increased the Cu-content in the leaves.

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I am very much obligate to all my family members for their help and encouragement.

Finally, I wish to thank all my colleagues and friends who offered me their help and encouragement.

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REVIEW OFLITERATURE

1. Effect of growing media

a. **Effect on vegetative growth**

The production of greenhouse plants involves a number of cultural inputs, among these perhaps the most important is the type of growing medium used. Due to the relatively shallow depth and limited volume of a container, growing media must be amended to provide the appropriate physical and chemical properties necessary for plant growth. Field soils are generally unsatisfactory for the production of plants in containers. This is primarily because soils do not provide the aeration, drainage and water holding capacity required. To improve this situation several "soilless" growing media have been developed.

The following is a description of some of the most commonly used amendments for the production of greenhouse crops: 1- Peatmoss is formed by the accumulation of plant materials in poorly drained areas. The type of plant material and degree of decomposition largely determine its value for use in a growing medium.2- Sand, a basic component of soil, ranges in particle size from 0.05mm to 2.0mm in diameter. Medium and coarse sand particles are those which provide optimum adjustments in media texture. Although sand is generally the least expensive of all inorganic amendments it is also the heaviest. This may result in prohibitive transportation costs. Sand is a valuable amendment for both potting and propagation media.3-Perlite is a