EFFECT OF MICRONUTRIENT NUTRITION DURING PROPAGATION ON CONTAINER PLANT PRODUCTION[1]

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As work progresses, effects of micronutrient fertilizers on all aspects of plant growth becomes more clear. Preliminary studies with several species of shrubs suggest that the micronutrient level in the parent plant, and/or increased plant growth and vigor associated with improved parent-plant micronutrient nutrition affects rooting of cuttings and subsequent growth. Taking cuttings from the existing container crop is expanding as container production continues to expand across states in the sun belt. Many growers feel it is impractical to maintain stock plants specifically for cuttings. Stock plants can be reduced or eliminated without sacrificing plant quality, if the performance of cuttings taken from existing container stock can be improved.

The objectives of this study were: 1) to determine the optimum rate of a micronutrient fertilizer for container nursery stock, and 2) to determine if the level of micronutrients provided to the parent plant influences the rooting and subsequent growth of cuttings.

METHODS AND MATERIALS

Experiment 1: On April 3, 1978, an experiment was set up to compare plant growth in a micronutrient-free growing medium with plant growth in a medium containing 4, 6, and 8 lbs/cu yd of Esmigran[3] and 1, 2 and 3 lbs of experimental O.S.U. micronutrients (now sold as Micromax[4]). The growing medium was 2 parts ground pine bark, 1 part peat, and 1 part sand by volume, with 14 lbs 18-5-11 Osmocote, 8 lbs dolomite, and 1½ lbs 0-46-0 per cu yd incorporated. Test species were Hetz Japanese holly, *Ilex crenata* 'Hetzii'; Hetzii juniper, *Juniperus chinensis* 'Hetzii', and Fashion azaleas, *Rhododendron* 'Fashion'. Azaleas and hollies were grown under 30% saran shade while the junipers were in full sun. Watering was by overhead sprinklers, approximately one inch every other day during the growing season.

Cuttings were taken from the holly and junipers and stuck in a 1:1 peat and perlite mixture with 9 lbs of 18-6-12 Osmocote added per cubic yard and placed under intermittent mist on

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[3] A micronutrient fertilizer manufactured by Mallinckroadt Chemical Co, St Louis, Missouri
[4] Manufactured by Sierra Chemical Company, Milpitas, California

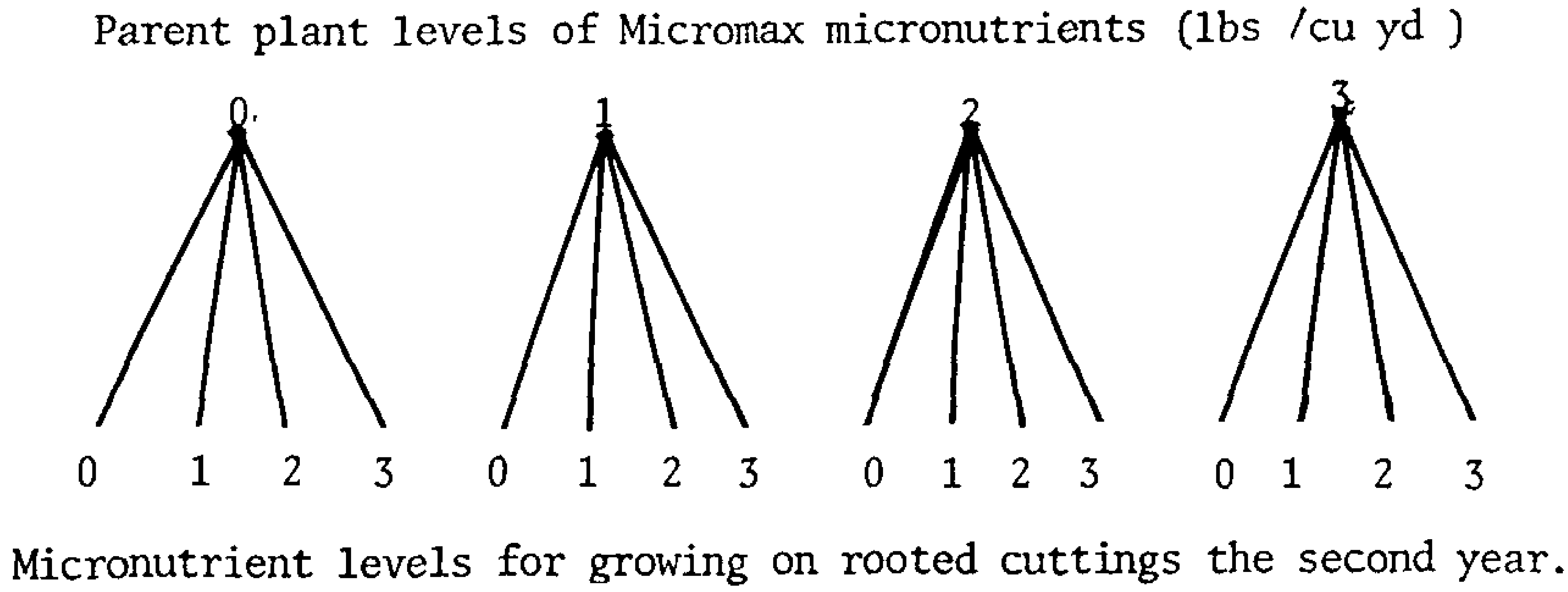

Figure 1. Treatment combinations used to determine parent plant micronutrient level effect on growth of rooted cuttings from those parents An identical treatment combination was used with Esmigran at 0, 4, 6, and 8 lbs/ cu yd

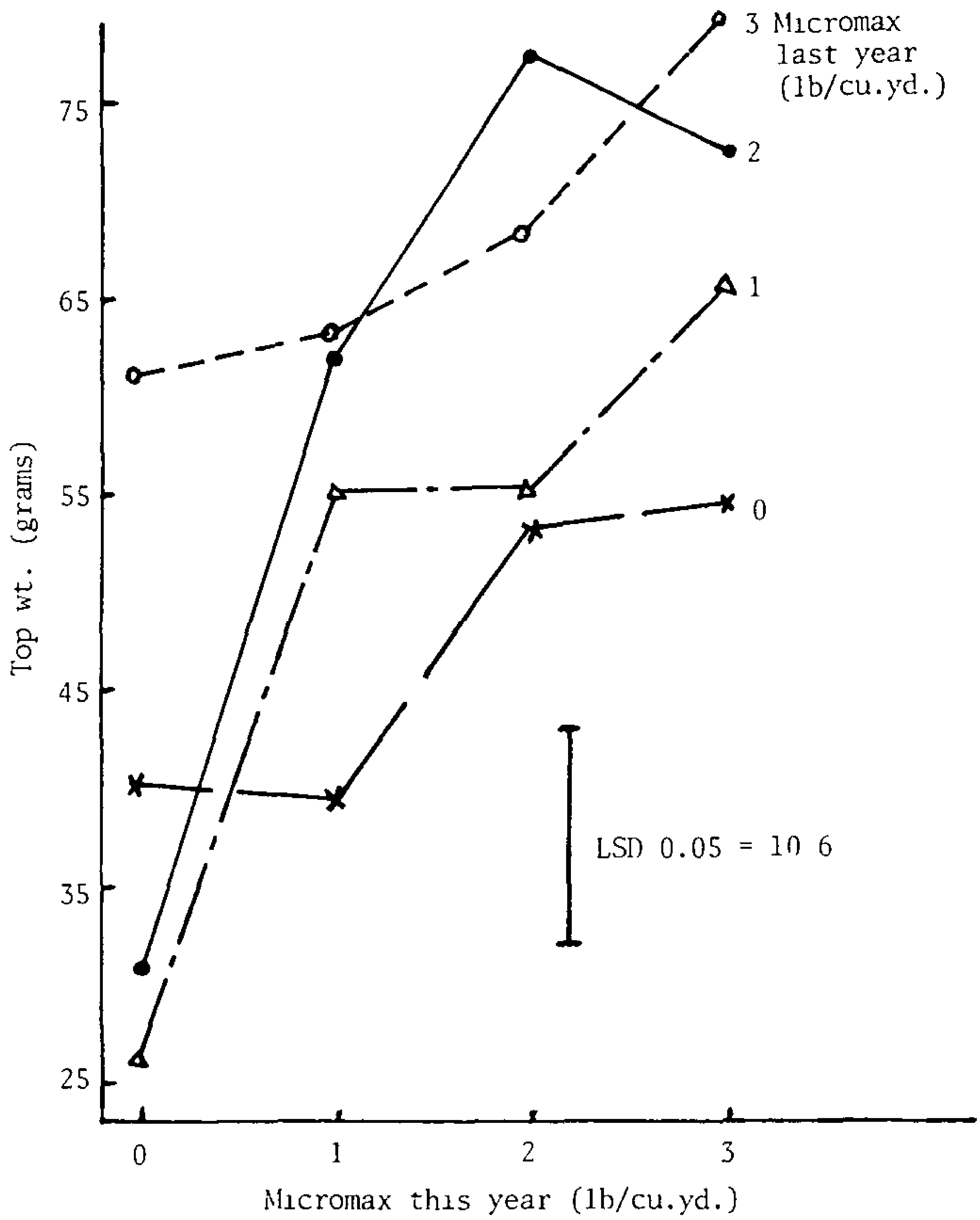

Figure 2. Effects of Micromax micronutrients on growth of Hetzii Japanese holly plants from cuttings in which parent plants received 0, 1, 2, or 3 lbs last year and 0, 1, 2, or 3 lbs this year in all combinations.

October 28, 1978. All cuttings were evaluated after 8 weeks for rooting and held in the propagation greenhouse until they were planted on April 10, 1979.

Rooted cuttings from each parent plant-micronutrient fertilizer treatment were planted into 1 gallon containers having different micronutrient levels (Figure 1). All other factors were held constant: 14 lbs 18-5-11 Osmocote, 8 lbs dolomite, 3 lbs gypsum, and 1½ lbs 0-46-0 per cu yd in a growing medium of 2 parts ground pine bark, 1 part peat, and 1 part sand. All plants were grown under 30% shade.

RESULTS

Experiment 1. Micronutrients incorporated into the growing medium of the parent plants not only stimulated plant growth but also improved rooting of cuttings taken from those plants. All rates of Esmigran and Micromax increased the root grade and the percent of liners graded 4 (minimum acceptable roots) or better (Table 1). Esmigran at 6 and 8 lbs and all Micromax rates also increased the number of liners showing new growth prior to the spring planting (Table 1).

At the end of the 1979 growing season, benefits from Micromax micronutrients applied to the parent plants in 1978 were apparent (Figure 2). Rooted cuttings from parent plants grown with Esmigran produced erratic growth the second year and data is not presented. Hetzii Japanese holly parents grown with no

Table 1. Rooting response of cuttings taken from parent plant *Ilex crenata* 'Hetzii' grown with varying micronutrient levels

	Control	Esmigran lbs/cu yd			Micromax lbs/cu yd		
Average	0	4	6	8	1	2	3
root grade[z]	$4\,2^{y}_{a}$	$5\,2_{b}$	$5\,8_{b}$	$5\,4_{b}$	$5\,5_{b}$	$5\,8_{b}$	$6\,7_{c}$
Percent graded #4 on higher	64 0	83 9	81 4	95 2	81 5	85 1	96 4
Percent of liners showing new growth	58 1	57 6	71 4	66 5	66 4	66 5	81 5

[z] Based on a grade scale of 1 = no roots to 10 = excellent rooting

[y] *Values are averages of 80 observations (10 reps × 8 subsamples)* Values followed by the same letter are not significantly different at 5% level

micronutrients and rooted cuttings from those parents receiving no micronutrients the second season were very stunted and chlorotic (Figure 3). By contrast, plants from parents receiving 4 lbs Esmigran/cu yd and grown the second season with the same treatment as the parent plants were somewhat better. However, plants from parents grown with 1 or 2 lbs Micromax and grown the second season with the same treatment were of excellent quality (Figure 3).

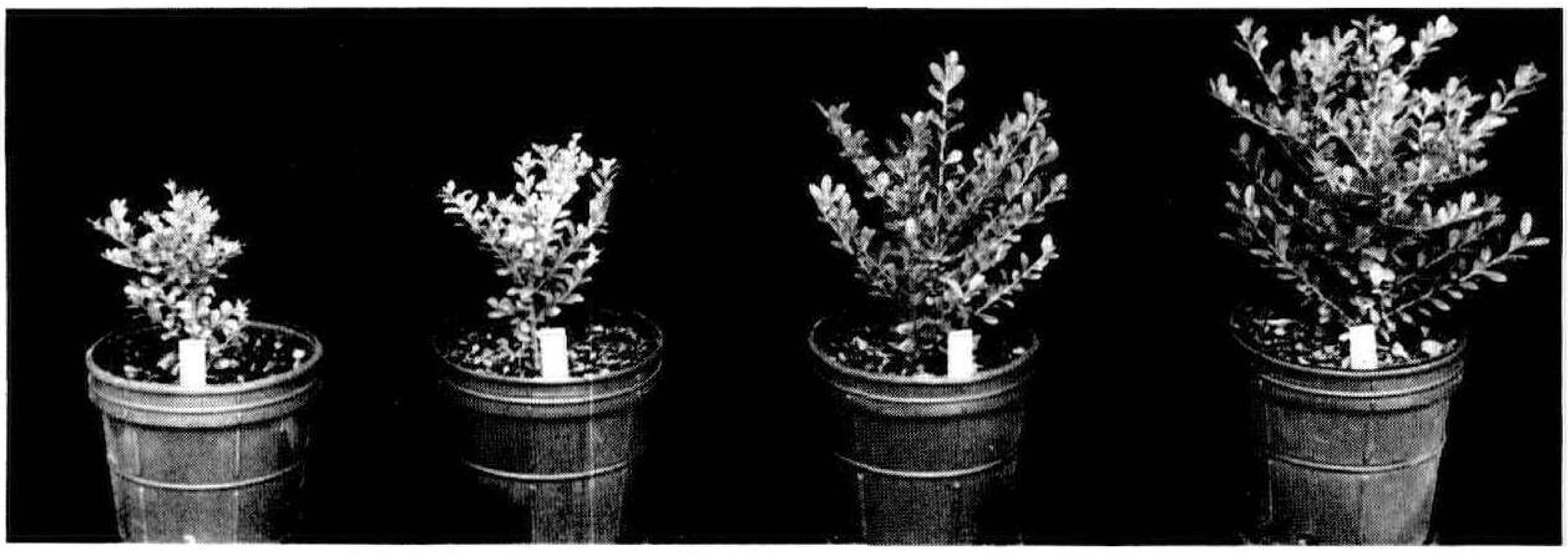

Figure 3. Plants from cuttings from treated parents. No micronutrients for parent or 2nd year (left); Esmigran @ 4 lbs parent and 2nd year (2nd from left); 1 lb. Micromax parent and 2nd year (2nd from right); and 2 lbs. Micromax, parent and 2nd year (right). Photo taken August, 1979.

METHODS

Experiment II. Japanese holly cuttings were taken from a standard block of plants on October 29, 1978 and rooted in a peat-perlite rooting medium. The cuttings were held during the winter in a heated propagation house following rooting and were planted into 1 gallon containers with treatments of 0, ¾, 1½, or 3 lbs Micromax or 0, 4, or 6 lbs Esmigran/cu yd on April 16, 1979. The growing medium and other nutrient levels were the same as in Experiment I.

RESULTS

At the end of the growing season, the plants receiving no micronutrients were nearly as good as the plants receiving 1.5 lbs of Micromax in the growing medium (Figure 4). Plants grown with 4 lbs Esmigran were far superior to plants in Experiment 1 study (Figure 3). All micronutrient sources and rates had produced Hetzi Japanese holly plants of similar quality. This was in direct conflict with data from the parent — second year carryover study (Experiment I) and previous studies comparing sources and rates of micronutrients.

After investigating several factors, i.e. calculations, rates, and mixing procedures, the reason for the difference in plant response was found. Plants in Figure 3, the parent—2nd year carryover study (Experiment 1) had been rooted in a propagation mix of 1-1 peat and perlite with 9 lbs 18-6-12 Osmocote but with no micronutrients added. However, plants in Figure 4 were rooted in the standard 1-1 peat and perlite mix for general use in various experiments which contained, in addition to the 9 lbs of 18-6-12 Osmocote, 1 lb Micromax micronutrients/cu yd. No visual differences could be detected between the 2 sources of liners at planting time (April, 1979). However, the effect of the 1 lb of Micromax during propagation had a pronounced effect on plant

Figure 4. Hetzii Japanese holly grown with, left to right, 0, 4 lbs Esmigran, and 1.5 lbs Micromax/cu yd. Photo taken late October, 1979.

Figure 5. Hetzii Japanese holly grown with 1.5 lbs. Micromax micronutrients per cu yd in both one-gallon containers, with no micro's during propagation (left) and with 1 lb Micromax during propagation (right). Both plants were grown under identical conditions and are the same age. The liner in the center is typical of the size of liner and propagation container used in both studies. Photo taken late October, 1979.

quality at the end of the growing season (Figure 5).

Because the plants were from separate experiments some doubt remained, even though our records confirmed the difference in propagation mixes, concerning the cause of the substantial difference in plant growth and quality. A study was set up for the 1980 season to measure the effects of 0, ¾, 1.5, and 2.25 lbs of Micromax micronutrients during propagation in combination with 0, ¾, 1.5, and 2.5 lbs Micromax in the one gallon containers. Results confirmed our suspicions regarding the beneficial effects of micronutrients during propagation.

Micronutrients in the propagation medium provided substantial benefit to plant growth and quality at an extremely low cost. However, plants must be kept clearly labeled during the entire growing season to observe the differences since no visually detectable difference exists between rooted cuttings with or without micronutrients at planting time.

PROPAGATION WITHOUT MIST

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INTRODUCTION

Motherhood, apple pie, and mist propagation — guess which isn't sacred? Since misting revolutionized the propagation of softwood and semi-hardwood cuttings, innovators have devised many types of control systems trying to perfect misting cycles to fit virtually every situation. Seldom do we see any two propagators using exactly the same system, nor should they, because water sources, media differences, geographic location, plant species and many, many other variables dictate unique systems.

After many years of trying to help growers perfect their misting systems, we finally decided that mist wasn't sacred. As a result we stumbled onto a system without mist that you may want to try. It eliminates the major problem propagators encounter when using many misting systems; i.e., too much water. Also, concerns about power failure, clogged nozzles, iron and/or other solids deposits on leaves, nutrient leaching, and variable weather are eliminated.

Preventing moisture loss from the plant material is the primary objective of any system used when propagation is by cuttings. Misting prevents moisture loss by maintaining a film of water on leaf and stem surfaces. High humidity systems as described by Milbocker (1) use foggers to create 100% relative humidity and thus prevent or minimize transpiration losses. In this paper we are describing a very simple system of providing 100% relative humidity without the use of foggers or misting systems. Time and method of taking cuttings, rooting media, hormones, and fertilization are not discussed here because it is not necessary to change any of these to use the system described below

[1] Consulting Horticulturist