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Mist-Fertilizer In Poinsettia Propagation

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The use of intermittent mist in the propagation of poinsettias is superior to older methods of propagation. Full sunlight rooting is possible because the mist provides adequate moisture at the cutting base while maintaining an approximately 100% relative humidity around the tops. In full sunlight they produce more food through increased photosynthetic activity. The cuttings root faster as a result of more food production; and the costly labor of watering or the even costlier neglect of watering is left to the more dependable, economical facet of automation.

Even with these advantages, mist propagation is far from perfect. Tukey et al. (2) have shown that poinsettias as well as other leafy plants readily lose stored mineral elements from their leaves when continually bathed with mist. This leaching yields rooted cuttings which are deficient in the essential mineral elements and which may show pronounced symptoms of these deficiences—such as yellowing of the leaves, and severe drop by the time cuttings are removed from the propagation bench. It is evident, therefore, that the young plant is at a nutritive disadvantage from the beginning, and must recover from these deficiencies before new growth can be expected. Delayed growth early in the production period of poinsettias, and in many cases, permanent stunting can be observed.

Since mineral elements are readily removed through misting, could they not be replaced in the leaf by employing a mist composed of a dilute mineral element solution? Meyer (1) has demonstrated conclusively that mineral elements absorbed by the leaves aid in partially fulfilling the nutrient requirements of poinsettias.

Objective

Experiments were designed to study the effect of applying small amounts of water soluble fertilizers through the mist system. Fertilizer combinations were based on recommendations made by Meyer, and on preliminary studies done in direct connection with this problem. Various types of fertilizers, rooting media, and containers were used in the many studies of which a general composite of the findings is reported below.

Materials and Methods

The variety Barbara Ecke Supreme has been used throughout the study. Three, 16-foot greenhouse benches equipped with one-inch mist lines having "White Shower 100" mist nozzles spaced 38 inches apart were employed. One bench. the control or check bench, was connected directly into city water main; the other two benches received their water from a tank by means of individual turbine pressure pumps which pumped dilute nutrient solutions from the tanks into the mist lines. The pumps were donated for this study by Gould Pump Company, Seneca Falls, New York. Concentrations of the fertilizers used were determined by trial and error. Technical grade urea at a rate of four ounces per 100 gallons of water was applied to another bench, Treatment I. The third bench received a commercial water soluble complete fertilizer with an anaylsis of 23-21-17 applied at the rate of four ounces per 100 gallons of water, Treatment II.

Output of water per bench was synchronized as much as possible. The misting cycle used was 10 seconds in every two and one-half minutes. At the end of each rooting period, the misting cycle was gradually cut down to allow a hardening-off of the rooted cuttings.

Five media-container combinations were employed during this study. They are as follows:

(A) 9:6:4:2 Soil, Peatmoss, Perlite, and Sand in a 2¼" Peat Pot.
(B) 9:6:4:2 Soil, Peatmoss, Perlite, and Sand in a 2¼" Clay Pot.
(C) 9:6:4:2 Soil, Peatmoss, Perlite and Sand in a 2¼" Plastic Pot.
(D) 1:1 Peatmoss and Vermiculite in a Flat
(E) 1:1 Peatmoss and Perlite in a Flat.

Twenty-five unrooted, four-inch poinsettia cuttings freshly cut from existing stock plants were used per treatment. Propagation date for most of the data reported here was October 13, 1961. A total of 375 cuttings were used in that given experiment, *i.e.*, 25 in each media-container combination per bench. No rooting hormone was employed. All treatments were well rooted at the time of removal from the bench for evaluation.

At the time the cuttings were removed from the mist bench, measurements were made of the individual height, fresh weight, and degree of rooting. Roots were evaluated as follows:

(0) =No Callus Tissue Present.
(1) =Callus Tissue Present Only.
(2) =Poor Rooting, Just a Few or Very Short Roots.
(3) =Fair Rooting.
(4) =Good Rooting.
(5) =Excellent Rooting.

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Some of the cuttings were dried in a warm air oven to determine the dry weight of the cuttings, and to provide material for leaf analysis. The leaves were analyzed for nitrogen, potassium, phosphorus, calcium, and magnesium content. Others were planted into four-inch pots with a 9-6-4-2 soil mixture plus superphosphate used at the standard rate of application, to be grown on to maturity. From the time the rooted cuttings left the propagation bench until they were in bloom, all plants were fertilized weekly and watered the same regardless of what particular treatment they may have received during rooting. The weekly applications of fertilizer were alternated between 20-20-20 and potassium nitrate at a rate ½ lbs. per 100 gallons of water. Date of bloom, height, bract diameter, and fresh weight were recorded at maturity. However, for this introductory report, only the results observed on the height (both at the time of rooting and at maturity), root evaluation, date of bloom and bract diameter, will be discussed.

Results

Height of Rooted Cuttings—The four to five-inch cuttings rooted under the Control Mist made no apparent increase in height during the rooting period. It was found, however, that those rooted under Treatment I averaged 13.6% taller at the time of potting, and that those rooted under Treatment II averaged 29.5% taller at the time of potting than those in the Control.

Degree of Rooting—Within any given treatment the degree of rooting for the individual cuttings ranged from mere callus tissue to roots evaluated as excellent. The average degree of rooting was approximately the same for any given treatment, falling between 3 and 4 in every case.

Date of Bloom—Those cuttings rooted under Treatment II bloomed an average of 14 days earlier, than those rooted under plain water. Those rooted under Treatment I bloomed an average of four days earlier. Figures 1, 2, and 3 show that at the time the plants in Treatment II were mature, plants in the Control and the Treatment I were considerably retarded in reaching maturity.

Mature Height—Those cuttings rooted under plain water averaged 12.2 inches in final height. Those rooted under Treatment I averaged only 3.8% higher than the Control plants at maturity. However, those rooted under Treatment II averaged 18.1% higher than those from the Check bench. It should be pointed out that the height measurements were taken at the time of bloom. Since the plants in Treatment II bloomed two weeks earlier than the controls, the height measurements were taken two weeks earlier also. Had all the measurements been taken at the time the plants in Treatment II were in bloom, even greater differences would have been observed. Height differences can be observed in Figs. 1, 2, and 3.

There were differences in the height among the various media-container combinations within a given bench; nevertheless, these differences could be accounted for in terms other than the media themselves.

Bract Diameter—The diameter of the bracts on all three benches averaged 13.2 inches, with little difference between treatments. These measurements were taken at the time of bloom on each plant. It can be seen from the pictures, however, that at the time the measurements were taken on the plants in Treatment II, the bracts of the check and Treatment I groups were not fully expanded.

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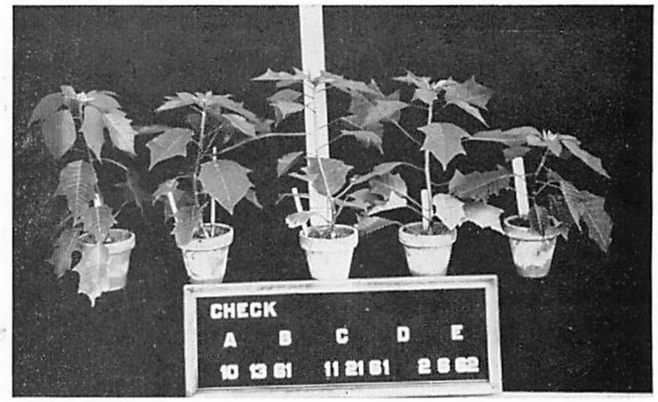

Figure 1: Barbara Ecke Supreme propagated under tap water mist in 5 media-container combinations. Prop. 10-13-61, potted 11-21-61, photographed 2-6-62.

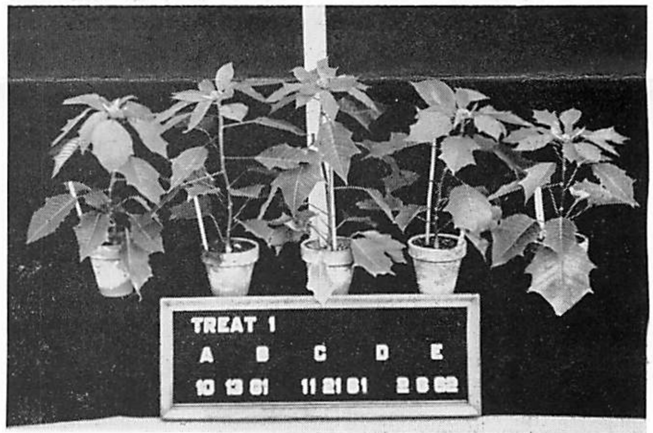

Figure 2: Barbara Ecke Supreme propagated under urea, 4 ounces/100 gallons mist in 5 media-container combinations. Prop. 10-13-61, potted 11-21-61, photographed 2-6-62.

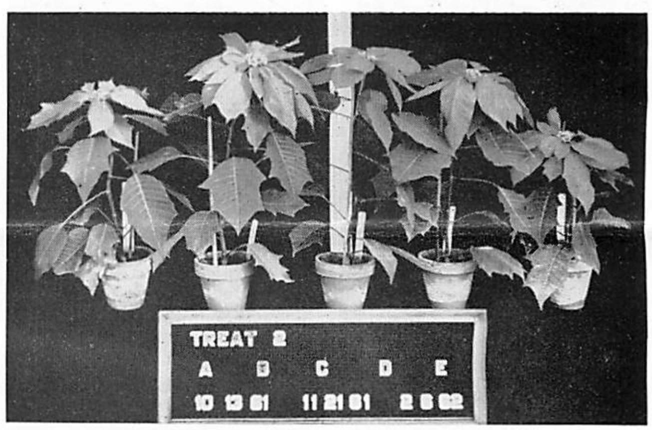

Figure 3: Barbara Ecke Supreme propagated under 23-21-17, 4 ounces/100 gallons mist in 5-media container combinations. Prop. 10-13-161, potted 11-21-61, photographed 2-6-62.

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Discussion and Conclusion

The use of intermittent nutrient mist has been shown to be of definite value in the propagation of poinsettia plants. Rooted cuttings emerge from the propagation bench exhibiting a darker green and more succulent type of growth than those having received no nutrients in the mist. The mist-fertilized plants bloom two weeks earlier and are on the average larger than the control plants.

However, since this work is still in progress, no definite recommendations can be made. Before any attempt is made to use nutrient misting for poinsettia propagation it should be understood that the concentration of the nutient used can be critical. Too great a concentration of the mineral nutrient or insufficient mist to effect runoff on the leaves and the resultant accumulation of salts on their surfaces can cause severe burning of the leaf margins, or indeed the whole leaf. Mineral nutrients used must be readily water soluble and nontoxic to the leaves.

The use of commercial proportioners to inject a concentrated nutrient solution into the mist line must be approached with caution. Since most proportioners operate on a minimum flow value, the amount of mist being delivered must be carefully calculated. If a large mist propagation house is operating then the minimum flow requirements may be met. However, if only a single bench or two is under mist, the minimum flow requirements may not be met and the system will not function properly. For small installations a direct pump operation is probably best. After one year of mist-fertilization, there has been no corrosion of the water lines or plugging of the mist nozzles.

Further work is in progress on poinsettias and chrysanthemums using this propagation technique.

References

1. Meyer, Jr., M. M., 1961. Some studies of the responses of *Chrysanthemum morifolium* and *Euphorbia pulcherrima* to foliar applications of nitrogen, phosphorus, and potassium. M. S. Thesis, Cornell University.
2. Tukey, H. B. and H. B. Tukey, Jr. 1959. Practical implications of nutrient losses from plant foliage by leaching. *Proc. Amer. Soc. Hort. Sci.* 74: 671-676.