THE EFFECT OF NUTRIENT SPRAY ON THE PROPAGATION OF CHRYSANTHEMUM CUTTINGS

By Barbara A. Stiehl
Graduate Student
and Sidney Waxman
Professor of Plant Science

Abstract

Unrooted cuttings* of Chrysanthemum morifolium 'Bright Golden Anne' were subjected to fertilizer (KNO_3, NH_4NO_3 and 20-20-20) and a water spray control to determine if there would be any difference in root weight, total cutting weight, leaf number and linear cutting height. A solar controlled (Solatrol) water mist system was used before and after treatment application. Nutrient sprays, especially NH_4NO_3, positively influenced the growth and rooting response of the cuttings.

Introduction

It is generally recognized that the propagation of plants under a water mist causes leaching of metabolites, both organic and inorganic, from the exposed plant surfaces. Long (1956) found a ten percent reduction in calcium, potassium, magnesium, nitrogen and phosphorus in green beans when exposed to mist. Tukey (1962) surveyed an assortment of plant species for leachability under mist. He found leaching to be greater in mature leaves and in herbaceous cuttings than in immature leaves and in hardwood cuttings. Tukey also related leachability to the nutrients' function within the plants' metabolic processes and to environmental factors such as light intensity and humidity.

As a means of reducing nutrient losses through leaching, nutrients can be applied to cuttings during propagation through intermittent mist (Wott and Tukey, 1967). Dick (1960) found faster and greater root formation, increased weight, better color and faster growth of chrysanthemums under nutrient mist resulting in an increase in productivity.

This paper studies the effect on the rooting and vigor of chrysanthemum cuttings when sprayed on the cuttings rather than in the mist.

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Methods and Materials

The 'Bright Golden Anne' cuttings were graded to a uniform fresh weight (between 2.3 and 2.9 grams) and leaf number in October, 1983.

Three fertilizer treatments plus a control were replicated three times with 10 cuttings per treatment for a total of 120. A 14 x 20" greenhouse wooden flat was used with cuttings stuck two inches apart in rows (other species in the flats are not reported here). The rooting medium was 1:2 sand:perlite. Before sticking into the medium, the cuttings were dipped in Hormodin 1.

The flats were placed under mist in a greenhouse where temperatures ranged from 60°F at night to 70°-80° in the daytime. Overhead incandescent lights provided an extended photoperiod.

Treatments were intiated two days after sticking the cuttings. They were as follows: Treatment 1, tap water contol; Treatment 2, 100 ppm N from 20-20-20; Treatment 3, 130 ppm N from potassium nitrate and Treatment 4, 264 ppm N from ammonium nitrate.

The dilution of .01 mole of fertilizer per liter of water was used because it approximated the strength of fertilizer solution (ounces per gallon) used in the experiments in the literature. Because potassium and nitrogen are two of the nutrients most easily leached from plant tissue it was decided to use KNO_3 and NH_4NO_3 mono-nutrient fertilizer sprays. A complete fertilizer spray was also applied as a second form of control.

The treatments were randomized in each replication. Each treatment was applied with a plastic trigger spray bottle and amounted to about 1 ml per cutting. One hour before each treatment, a plastic canopy was placed over each flat to intercept the water mist and allow the foliage to dry. This prevented dilution of the treatment sprays with water from the mist system. The plastic sheets were removed during treatments and replaced until the plant surfaces were dry once again. To prevent spray drift between treatments, a cardboard barrier was held between each treatment during spray application.

The cuttings received one treatment per day at random times (from 9:00 a.m. to 4:00 p.m.) five days a week.

The temperature of the propagation medium was maintained at about 70°F with bottom heat during the experiment.

Results and Discussion

Fifteen days after treatment, the chrysanthemum cuttings were lifted and measured for total weight, root weight, height (not including roots) and leaf number.

Immediately after the data was recorded, the cuttings were recut above the roots and stuck back into the rooting medium and the treatments were continued for thirty additional days when they were evaluated on the same basis.

The data was evaluated by finding the mean ± the standard error for each treatment in both trials. By comparing this information significant statistical difference between groups was determined (See Table 3).

Table 3. Effect of Nutrient Sprays on the Total Weight, Height and Root Weight of Chrysanthemum morifolium Cuttings Under Propagation

Treatments	Total Cutting Weight (gms.)	Root Weight (gms.)	Height of Cutting (cm.)
		First Trial	
1) Tap water (Control)	4.75±0.19[1]	0.98±0.05	12.41±0.30
2) Complete Fertilizer	5.03±1.00	1.15±0.58	13.60±0.30*
3) KNO_3	5.14±0.13	1.16±0.05	14.1±0.18*
4) NH_4NO_3	5.09±0.20	1.33±0.10*	14.01±0.40*
		Second Trial	
1) Tap water (Control)	3.12±0.14	1.02±0.09	7.42±0.39
2) Complete Fertilizer	3.24±0.15	1.04±0.06	8.00±0.21
3) KNO_3	3.01±0.13	1.16±0.05	7.99±0.22
4) NH_4NO_3	3.81±0.22*	1.42±0.07*	9.33±0.30*

[1] Each datum represents the mean ± SE of three replications for a total of thirty cuttings in each treatment.

* Datum significantly varied from the control.

In this experiment the results indicated that nutrient sprays made a positive difference in the growth and rooting of the cuttings.

The treatment most effective was the ammonium nitrate spray. In both trials it significantly enhanced root weight and height of cuttings and in trial 2 it also increased total cutting weight. Leaf numbers were also counted with the other data. Fertilizer treatments averaged seven or eight leaves while the control averaged six leaves per cutting.

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