THE EFFECT OF NUTRIENT SPRAY ON THE PROPAGATION OF CHRYSANTHEMUM CUTTINGS

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Abstract

Unrooted cuttings* of Chrysanthemum morifolium 'Bright Golden Anne' were subjected to fertilizer (KNO₃, NH₄NO₃, 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 NH₄NO₃, 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.

References


* Supplied through the courtesy of Stafford Conservatories, Stafford Springs, Connecticut.
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 initiated two days after sticking the cuttings. They were as follows: Treatment 1, tap water control; 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 KNO₃ and NH₄NO₃ 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.
Stomach and Contact Poison

Carbaryl (Sevin) 50 WP
Methoxychlor (Marlate) 50 WP

Fungicide

Captain 50 WP or 30 WP
Ferbam 76 WP
Mancozeb (Fore) 80 WP
Chlorothalonil (Daconil 2787) 75 WP
Zineb (Uithane Z-78) 80 WP
Folpet (Phaltan) 50 WP
Sulfur WP or dust
Maneb (Uithane M22) 80WP

Aphicide

Pirimicarb (Pirimor) 50 WP (use 1/2 part)*
Lindane 25 WP

* These materials are effective at lower concentrations in the mixture.

Some common materials cannot be used. Benomyl (Benlate) clogs the duster. Many pesticides are not formulated as wettable powders that can be used as dusts.

Once the mixture is made, it is blown into the greenhouse atmosphere over the crops. The particles are so fine that they remain suspended in the air for hours. The tiny particles appear to acquire a positive charge as they leave the duster and as a result, or since they remain suspended so long, the lower surfaces of the leaves are also protected. Uniform coverage is enhanced in greenhouses equipped with horizontal air flow. No research has been reported on the individual components to ascertain whether or not all the wettable powders listed above provide the same coverage on both upper and lower plant surfaces.

To reduce exposure to personnel, most greenhouse operators prefer to use wettable powder dusts prior to a relatively inactive day each week, possibly the last thing Friday or Saturday. They find that it is essential to dust every week since this is a minimal pesticide application used only as a preventative measure. Less material is generally required for exclusion than for eradication of a pest.

During the summer, when temperatures are high, it may be necessary to dust late at night since ventilators should be closed for at least 4 hours.

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

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Total Cutting Weight (gms.)</th>
<th>Root Weight (gms.)</th>
<th>Height of Cutting (cm.)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Trial</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1) Tap water (Control)</td>
<td>4.75±0.19</td>
<td>0.93±0.05</td>
<td>12.41±0.30</td>
</tr>
<tr>
<td>2) Complete Fertilizer</td>
<td>5.03±1.00</td>
<td>1.15±0.08</td>
<td>13.60±0.30</td>
</tr>
<tr>
<td>3) KN03</td>
<td>5.14±0.13</td>
<td>1.16±0.05</td>
<td>14.1±0.18</td>
</tr>
<tr>
<td>4) NH4NO3</td>
<td>5.09±0.20</td>
<td>1.33±0.10*</td>
<td>14.01±0.40*</td>
</tr>
<tr>
<td><strong>Second Trial</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1) Tap water (Control)</td>
<td>3.12±0.14</td>
<td>1.02±0.09</td>
<td>7.42±0.39</td>
</tr>
<tr>
<td>2) Complete Fertilizer</td>
<td>3.24±0.15</td>
<td>1.04±0.06</td>
<td>8.00±0.21</td>
</tr>
<tr>
<td>3) KN03</td>
<td>3.01±0.13</td>
<td>1.16±0.05</td>
<td>7.99±0.22</td>
</tr>
<tr>
<td>4) NH4NO3</td>
<td>3.81±0.22*</td>
<td>1.42±0.07*</td>
<td>9.33±0.30*</td>
</tr>
</tbody>
</table>

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.

**Literature Cited**


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**WETTABLE POWDER DUSTS**

_Jay S. Koths_  
Extension Floriculturist

Wettable powder formulations of fungicides, insecticides and miticides have been used as dusts in greenhouses for more than 40 years. The practice has slowly gained popularity even though little research has been published and chemical companies have not included this usage on their labels.

For a few years, such a use of wettable powders was considered illegal since it was not labelled. This now appears to have been resolved with the FIFRA (Federal Insecticide, Fungicide and Rodenticide Act) interpretation of 1979 (10,11,12). Applying a rate of less than that on the label in conjunction with air as the conveyance medium instead of water is now considered to be legal.

Advantages of wettable powders as dusts:

1. Less pesticide is consumed.
2. Exposure time for the applicator is less than 5% of that required for spraying.
3. Residues on plants are decreased and spray spotting is not present.
4. Plant coverage is excellent.
5. Residual activity of the pesticide is enhanced.
6. Labor requirement is lower.
7. Costs of pest control are greatly reduced.

The procedure is simple. Mix equal parts of materials selected from the following incomplete list. Then dust weekly at a rate of only 1 to 2 oz. of the mixture per 1000 sq. ft.

**General Contact**

Bendiocarb (Ficam) 76 WP  
Malathion 25 WP  
Endosulfan (Thiodan) 5J WP  
Uiazinon 5J WP  
Hticide

Dienochlor (Pentac) 50 WP (use 1/2 part)*  
Cyhexatin (Plictran) 50 WP  
Fenbutatin-oxide (Vendex) 50 WP  
Propargite (Omite) 30 WP  
Uicofol (Keltname) 18.5 WP