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## MISTING EXTERNAL SHADE CLOTHS PART II: DOES IT MATTER WHAT KIND OF CLOTH?

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Part I of this series addressed the basic limitations of shade cloths for cooling greenhouses and suggested misting as a means of overcoming those limitations. This article (Part II) will extend the results presented earlier by considering shade percentage, type of weave and color, and how shade cloth misting is affected by those factors.

Early on, we assumed that color would play a major role in shade cloth performance, and some of our laboratory tests seemed to confirm that assumption. Unfortunately, we were unable to model the effects of color (which is just another way of saying that we didn't understand it). We had a better feel for shade percentage, but almost no feel for what to expect from type of weave. To investigate these parameters further, we initiated a study in the summer of 1993 in which we added the three factors mentioned above (shade percentage, cloth color and type of weave) to a study similar to that reported on in Part I (*in the April, 1994 NCFG Bulletin*). What we found in

this second study was as surprising as it was interesting.

### Materials and Methods

As in the previous year, the 1993 experiments were conducted in two, 22' × 40', double-poly covered Quonset greenhouses located at the Horticulture Field Laboratory in Raleigh. In the 1992 experiment, a black polyethylene 55% shade cloth (flat weave) was applied alternately to each greenhouse on a weekly schedule. The shaded house was considered to be the test house and the unshaded house the control. The shade cloth was alternated between the houses to allow the statistical removal of house differences.

Differences in 1993 included the introduction of a 60% knitted black cloth, a white cloth of the same weave and thread count as the 60% black cloth, and a 30%, flat-weave, black cloth, in addition to the original 55% black cloth used in the 1992 study. Table 1 shows the cloths used,

the shade ratings listed by the manufacturer, and the shade ratings we measured using both a black-and-white pyranometer (for total solar radiation) and a Li-Cor PAR (photosynthetically-active radiation) sensor. Note that even though the black and white knitted cloths had the same thread count, they did not have the same measured shade ratings. All shade ratings were obtained with the cloths oriented perpendicular to the radiation of the sun.

The PAR values (Table 1) represent the blockage of only that part of the solar spectrum used by plants and would be expected to correspond closely to the published shade ratings (which are generally based upon visible light). These values tell us how the cloths will perform with regard to the reduction of "light," but they do not tell us much about how performance with respect to cooling. The solar radiation values represent the blockage of a larger portion of the spectrum including some, but not all, of the infrared energy, but still do not give us much insight as to how well the cloths will cool a greenhouse. Only actual testing can provide that information.

The shade cloths listed in Table 1 were applied to the greenhouses in the combinations outlined

in Table 2, each cloth being applied to the appropriate house during the first week of a two-week period, after which time the cloths were switched to the opposite house for the second week of the period. As before, switching was done to facilitate statistical separation of house differences from shade cloth differences. A one week period where no shade was applied to either house was included to facilitate statistical separation as well.

As in 1992, the shade cloth on the "test" house was misted every other day for the entire period (Table 2). Usually, the misted shade cloth was the black cloth; however, when the white cloth was compared to "no cloth," the white cloth was misted. The "control" house was always dry. Also as in 1992, misting was accomplished using three commonly available, flat-profile sprinkler irrigation hoses mounted at the top of the "test" greenhouse. The feed pressure was regulated to 12 psi. Misting was intermittent, 30 seconds out of every 3 minutes whenever solar radiation was greater than 400 W/m<sup>2</sup> (the level of a mostly cloudy summer day at noon or of a bright sunny day at 9 AM).

The houses were planted with tomatoes on 29 June 1993 to provide plant material for transpiration. One hundred and forty-four plants were transplanted into 5 gallon bags containing Pro-Mix BX supplemented with 50% by volume aged pine bark. Water was supplied via drip irrigation at the rate of 2 to 3 quarts per day per plant. Liquid fertilizer (20-20-20) was supplied every two weeks using a hozon applicator.

Temperatures inside the greenhouse were measured using thermocouples. Leaf temperatures were measured on six plants (two leaves each) per house. Indoor air temperature and relative humidity conditions were monitored with dry and wet bulb temperatures that were

Table 1. Manufacturers' and measured shade ratings of the cloths used in this study.

| Cloth        | Mfrs' shade rating (%) | Measured shade rating (solar rad.) (%) | Measured shade rating (PAR) (%) |
|--------------|------------------------|--|---------------------------------|
| 40% white*   | 40                     | 33                                     | 39                              |
| 30% black**  | 30                     | 27                                     | 31                              |
| 55% black**  | 55                     | 54                                     | 53                              |
| 60% black*** | 60                     | 53                                     | 55                              |

\*This is a knitted weave with the same thread count per inch as the 60% black cloth.

\*\*These cloths are flat weave materials.

\*\*\*Knitted weave cloth.

Table 2. Shade cloth combinations presented in the order of testing.

| “Test”<br>(mist) | “Control”<br>(dry) | Duration<br>(weeks) |
|------------------|--------------------|---------------------|
| 55% black        | 40% white          | 2                   |
| 40% white        | none               | 2                   |
| none             | none               | 1                   |
| 30% black        | 40% white          | 2                   |
| 60% black        | 40% white          | 2                   |

taken in aspirated boxes at four locations: two at the inlet, one at the center of the house, and one at the exhaust fan inlet. Dry bulb temperatures above and within the canopy were measured with thermocouples mounted in 2" pvc pipe elbows with small axial bladed fans mounted in one end.

Treatments were initiated on 19 July 1993 and continued for 9 weeks, including a week with no shade cloth on either house. At the end of the experiment, both houses were left unshaded (and unmisted) for an additional week. The unshaded periods were then used to adjust for house differences. After the study was completed, water flow rates were measured using a flow meter inserted into the line ahead of the pressure regulator. The average flow rate was determined to be about 9 gpm. Knowing this, and the total misting time recorded by the computer, water consumption was estimated.

### Results and Discussion

The shade treatment effects were analyzed by comparing differences in: ❶ overall energy gain; ❷ air temperature rise; ❸ leaf temperatures at the exhaust end of the house; and ❹ electrical energy consumption. For all but leaf temperature in the “white cloth vs. none” case, misting improved performance (Table 3). For the “30% black vs. white” case, the dry white cloth outperformed the misted 30% black cloth; however, the other black cloths outperformed the dry white cloth when they were misted (Table 3).

Water consumption was higher than expected. The estimate of 200 to 300 gallons per day determined in the 1992 study was found to be low by a factor of about 3 (daily usage was about 600 to 900 gallons per day). The discrepancy between years was attributed to errors in the 1992 measurements and the higher flow is thought to be a more realistic estimate of the usage in both years. It should be noted that no optimization of flow was attempted in either year; however, studies conducted in 1994 show that daily flows can easily be curtailed to about 170 gallons per day, less than that used by the evaporative pads, without affecting performance.

Differences in overall energy gain, air temperature rise and leaf temperature were evaluated only during times when identical equipment was running in both houses. Electrical energy consumption differences were determined on an overall basis. Percentage reductions of these factors were calculated using the “control” condition as a base.

The results for the various test combinations are tabulated in Table 3. Considering the “white cloth vs. none” case first, the dry white cloth reduced energy gain and air temperature rise by 30% and 27%, respectively. Misting improved those reductions to 40% and 42%, about the same reduction observed for the misted 55% black cloth in 1992. Leaf temperatures at the exhaust end of the house were reduced by 6% when the cloth was dry and that value did not significantly change when the cloth was misted. Reduction in energy consumption was affected by misting, with a 25% reduction in energy consumption observed when the cloth was dry and a 33% reduction when it was misted, both compared to no shade at all.

Note that the misted reductions in energy gain and air temperature rise were equal to or greater than the PAR shade rating for the white cloth (38%). Defining a cooling performance factor as the amount of energy or temperature reduction divided by the shade rating, we see that when misted the white cloth would be expected

Table 3. Mean percentage reductions in energy gain, air temperature rise, maximum leaf temperature, and electrical energy consumption. Comparisons of each material when dry and wet were made with respect to the "control" condition listed; controls were always dry.

| Cloth combinations<br>(test vs. control) | % reduction<br>in energy<br>gain |     | % reduction<br>in air<br>rise |     | % reduction<br>in leaf<br>temperature |     | % reduction<br>in energy<br>consumption |     |
|--|----------------------------------|-----|-------------------------------|-----|---------------------------------------|-----|---|-----|
|  | dry                              | wet | dry                           | wet | dry                                   | wet | dry                                     | wet |
| white vs. none                           | 30                               | 40  | 27                            | 42  | 6                                     | 7*  | 25                                      | 33  |
| 30% black vs. white                      | -23                              | -8  | -24                           | 6   | -2                                    | 0   | -21                                     | -8  |
| 55% black vs. white                      | -19                              | 14  | -20                           | 20  | 0                                     | 3   | -2                                      | 13  |
| 60% black vs. white                      | -4                               | 22  | -17                           | 31  | 0                                     | 4   | -7                                      | 14  |

\*Not significantly different from the dry case ( $\alpha = 0.05$ ).

to reduce energy and temperature gains by as much as 1.0 to 1.05 times the shade rating.

**Black vs. White.** The remaining data in Table 3 show the performance of the black cloths compared to the white cloth. In all cases, the black cloth was the one that was misted. Note that when the 30% black cloth was dry, the white cloth outperformed it in all respects. This agrees with some of our earlier laboratory and field tests, and to some degree, with intuition. When misted, however, the 30% black cloth performed nearly as well as the dry white cloth. Considering the higher cost of the white cloth (generally 2 to 3 times that of an equivalent weave black cloth) and the higher PAR blockage by the white cloth (38% vs. 30%), misting a 30% black cloth might make more sense than using an unmisted 40% white cloth. On the other hand, if misting cannot be used, say in a situation where the shade cloth is mounted inside the greenhouse, a 40% white cloth should perform significantly better than a 30% black cloth.

Comparing the two heavier black cloths to the white, note that the white cloth generally outperformed the black when dry (except for leaf temperature), but when either black cloth was misted it outperformed the white by a substantial margin. Note also that the dry 55% black cloth

performed only marginally better than the dry 30% black cloth (both were of the same material and weave). When dry, energy gains were 19% and 20% greater, respectively; and air temperature rises were 20% and 24% larger, respectively, than under the dry white cloth. When misted, however, the performance of the 55% black cloth jumped dramatically. This is undoubtedly due to the fact that the "dry" performance was inhibited by the greater amount of energy "trapped" in the heavier cloth. When misted, however, that energy was removed by the evaporating water yielding the advantage to the heavier cloth.

**Knitted vs. flat weave.** One interesting feature of the data in Table 3 is the apparent increased performance of the 60% knitted black cloth compared to the 55% flat weave black cloth. When dry, the 60% black cloth produced greater reductions in all categories except electrical energy consumption. If the performance of the misted 60% black cloth is adjusted for the expected performance of a "misted" 40% white cloth (derived from the comparison of "white vs. none" above), the misted black cloth reduced energy, air temperature, leaf temperature and electrical energy consumption by 9%, 3% and 4%, compared to that of the misted 40% white cloth. Making the same adjustment for the misted 55%

black cloth shows that it performed about the same as the misted 40% white cloth, which agrees with the results of the 1992 study where the same 55% black cloth (when misted) reduced energy gains and air temperature rises by about 40% (compared to no shade).

There are several possible reasons for the difference in performance between the two black cloths. One possibility is the knitted cloths were identical in size, covering the entire greenhouse with a few inches to spare, whereas the flat-weave cloth was slightly smaller, leaving a space uncovered at the base of the greenhouse when it was in position. Another possible reason is that the knitted cloths were considerably thicker than the flat weave cloths. Preliminary measurements suggest that this produces a higher shade rating when the sun strikes the cloth at an angle. Rather than speculate at this point, however, I would prefer to wait for the analysis of the 1994 study, in which one of the objectives was a direct comparison between the 60% black knitted and the 55% black flat-weave.

### Conclusions

The results of this study, along with those of previous years, have finally provided some insight into shade cloth behavior we feel support some general comments: ❶ It is apparent that shade cloths used for cooling do not perform as well as their shade ratings suggest, regardless of color; ❷ White cloths do out-cool black cloths when both are dry; ❸ However, when two cloths of identical thread count and weave are misted (black vs. white), the black will reduce temperatures about 13% more than the white cloth; ❹ On the other hand, black shade cloth appears to allow less light (PAR) into the greenhouse (about 25% less) than white cloth.

Water usage for the 1992 and 1993 studies was higher than expected, but the method of water application in those two years was designed for simplicity of implementation, not water conservation. Although the sprinkler hoses functioned reasonably well (after pressures were reduced to eliminate blowouts), they suffered from several limitations and will probably be applicable only for small greenhouses or situations where the cost of water is not a factor. Where they are found to be applicable, almost certainly some type of water reclamation will need to be employed (none was used in either the 1992 or 1993 studies), as nearly 80% of the water applied was wasted. Preliminary results from the 1994 study using inexpensive sprinkler heads mounted in a PVC header suggest that water usage can be reduced to an inconsequential amount, even without water reclamation.

The feasibility of shade cloth misting does not appear to be in question in those situations for which it is suited; i.e., externally mounted shade cloths which remain in place for extended periods (months). Recent funding obtained from the Fred C. Gloeckner Foundation will be used to finalize design recommendations and to pursue a few remaining unanswered questions.

Misting will not be an answer to all cooling problems, but is an improvement over non-misted external shading. Water quality is still an issue that cannot be avoided. Water with high iron or other mineral content will generally not be suitable for misting. Retractable shade is also an issue. Although there are presently some designs for retractable external shade, I am not aware of any that are commercially available. Since misting, as a solution, is confined to externally mounted shade, further developments (which we will be pursuing) will be necessary before misting can be used when retractable shade is needed.

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### GROWTH REGULATORS FOR FLORICULTURAL CROPS

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| Crop   | Purpose  | Chemical                                    | Rate  | Precautions and Remarks   |
|--|--|---|---|---|
| <b>AGERATUM</b>  | To control plant height  | A-Rest                                      | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)  | Plug culture and flat culture differ in recommended rates. Apply ALL foliar sprays of plant growth regulators using 0.5 gallon per 100 square feet of bench area. Growers should refer to Horticulture Information Leaflet #528, Height Control of Greenhouse Crops, for application techniques and timing for growth regulators on floricultural crops. Contact floricultural specialists at N. C. State University for further application information. |
|  |  | B-Nine                                      | 2,500 to 5,000 ppm spray (0.39 to 0.79 oz/gal)  |   |
|  |  | Bonzi                                       | 5 to 45 ppm spray (0.16 to 1.44 fl oz/gal)  |   |
|  |  | Sumagic                                     | 20 to 30 ppm spray (5.12 to 7.68 fl oz/gal)   |   |
| <b>ALTERNANTHERA (Joseph's-Coat)</b>   | To control plant height  | A-Rest                                      | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)  |   |
| <b>AMARYLLIS</b>   | To control plant height  | Bonzi                                       | 23.66 mg a.i. drench for a 6 in. pot (6.4 fl oz/gal of drench solution; apply 4 fl oz/6 in. pot)  | Application volumes vary with pot size. Contact floricultural specialists at N. C. State University.  |
| <b>ASTER</b>   | To control plant height  | A-Rest                                      | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)  | See Ageratum.   |
|  |  | B-Nine                                      | 5,000 ppm spray (0.79 oz/gal)   |   |
| <b>AZALEA</b>  | To control plant height  | A-Rest                                      | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)  | Contact floricultural specialists at N. C. State University.  |
|  | To promote flower initiation   | B-Nine                                      | 1,500 to 2,500 ppm spray (0.24 to 0.39 oz/gal)  | Apply solution when new growth from final pinch is 1 to 2 inches long.  |
|  |  | Cycocel                                     | 1,800 to 2,800 ppm spray (2 to 3 fl oz/gal)   | Apply when new growth is approximately 1 inch long.   |
|  | To promote lateral shoot growth on vegetative plants                                       | Off-Shoot-O                                 | Use a 3 to 5% solution (8.6 to 14 fl oz/gal) solution in greenhouses; use 5 to 7% (14 to 20 fl oz/gal) outdoors. Apply as a foliar spray.               | Be certain chemical covers shoot tip. Ineffective if microscopic flower buds are present.   |
|  | To increase lateral branching  | Atrimmec                                    | 3,125 to 6,250 ppm spray (2 to 4 fl oz/gal)   | Contact floricultural specialists at N. C. State University.  |
|  |  | Florel                                      | 2,471 to 4,943 ppm spray (8 to 16 fl oz/gal)  |   |
|  | To control plant height, reduce bypass shoot elongation, and promote flower bud initiation | Bonzi                                       | 100 to 200 ppm spray (3.2 to 6.4 fl oz/gal)   | To control plant height and promote flower bud initiation, apply final shaping, when new growth is 1.5 to 2 inches long. To reduce bypass shoot development, apply after bud set, when bypass shoots are barely visible.  |
| 0.59 to 1.77 mg a.i. drench for a 6 in pot (0.16 to 0.48 fl oz/gal of drench solution; apply 4 fl oz/6 in pot) |  |   | Drench application volumes vary with pot size. Contact floricultural specialists at N. C. State University.   |   |
| To control plant height  | Sumagic  | 10 to 15 ppm spray (2.56 to 3.84 fl oz/gal) | Apply at 1.5 quarts per 100 square feet of bench area. Contact floricultural specialists at N. C. State University for further application information. |   |
| <b>BALSAM</b>  | To control plant height  | A-Rest                                      | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)  | See Ageratum.   |
| <b>BEDDING PLANTS (Not specifically listed in this table)</b>  | To control plant height  | Bonzi                                       | 30 ppm spray (0.96 fl oz/gal)   | Users should conduct trials on a small number of plants, adjusting the rates as needed for desired final plant height and length of height control.   |
|  |  |   | 0.118 mg a.i. drench for a 6 in. pot (0.032 fl oz/gal of drench solution; apply 4 fl oz/6 in. pot)  | Drench applications are recommended only for bedding plants in 6 inch or larger containers.   |
| <b>BEDDING PLANT PLUGS (Not specifically listed in this table)</b>   | To control plant height  | Bonzi                                       | 5 ppm spray (0.16 fl oz/gal)  | Users should conduct trials on a small number of plants, adjusting the rate as needed for desired final plant height and length of height control. Plants should develop 1 to 2 true leaves prior to first application.   |
| <b>BEGONIA</b>   | To control plant height  | B-Nine                                      | 5,000 ppm spray (0.79 oz/gal)   | See Ageratum.   |
| <b>BEGONIA, ELATIOR</b>  | To increase lateral branching  | Atrimmec                                    | 781 to 1,562 ppm spray (0.5 to 1.0 fl oz/gal)   |   |
| <b>BLEEDING HEART</b>  | To control plant height  | A-Rest                                      | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)  |   |
| <b>BLUEBELL (Campanula rotundifolia)</b>   | To control plant height  | A-Rest                                      | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)  |   |
| <b>BOUGAINVILLEA</b>   | To increase lateral branching  | Atrimmec                                    | 1,562 ppm spray (1 fl oz/gal)   |   |
| <b>BROMELIADS</b>  | To promote flower initiation   | Florel                                      | 2,471 ppm spray (8 fl oz/gal)   | Contact floricultural specialists at N. C. State University.  |

| Crop   | Purpose                                      | Chemical   | Rate   | Precautions and Remarks   |
|--|--|--|--|---|
| <b>BULB CROPS</b><br>(Not specifically listed in this table) | To control plant height                      | Bonzi  | 100 ppm spray (3.2 fl oz/gal)  | Users should conduct trials on a small number of plants, adjusting the rate as needed for desired final plant height and length of height control.                                      |
|  |  |  | 1.183 mg a.i. drench for a 6 in. pot (0.32 fl oz/gal of drench solution; apply 4 fl oz/6 in. pot)                    | Drench application volumes vary with pot size.  |
|  |  |  | 20 ppm bulb soak (0.64 fl oz/gal)  | Soak for 15 minutes. Users should conduct trials on a small number of bulbs, adjusting the rate and soaking period (up to 1 hour) as needed for desired final plant height.             |
| <b>CALADIUM</b>  | To control plant height                      | Bonzi  | 100 to 200 ppm spray (3.2 to 6.4 fl oz/gal)  | First spray applications should be made when plants are 2 to 4 inches tall.   |
|  |  |  | 1.183 to 2.366 mg a.i. drench for a 6 in. pot (0.32 to 0.64 fl oz/gal of drench solution; apply 4 fl oz/6 in. pot)   | First drench applications should be made when plants are 1 to 2 inches tall. Drench application volumes vary with pot size.   |
| <b>CALLA LILY</b>  | To control plant height                      | Bonzi  | 1.183 to 3.549 mg a.i. drench for a 6 in. pot (0.32 to 0.96 fl oz/gal of drench solution; apply 4 fl oz/6 in. pot)   | See Caladium.   |
|  |  |  | 20 ppm rhizome/tuber soak (0.64 fl oz/gal)   | Soak the rhizomes/tubers for 15 minutes prior to planting.  |
| <b>CELOSIA</b>   | To control plant height                      | A-Rest   | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)   | See Ageratum.   |
|  |  | B-Nine   | 2,500 ppm spray (0.39 oz/gal)  |   |
|  |  | Bonzi  | 4 to 50 ppm spray (0.13 to 1.60 fl oz/gal)   |   |
|  |  | Sumagic  | 10 to 20 ppm spray (2.56 to 5.12 fl oz/gal)  |   |
| <b>CHRYSANTHEMUMS, CUT</b>                                   | To reduce "neck" stretching                  | B-Nine   | 2,500 ppm spray (0.39 oz/gal)  | Spray upper foliage 5 weeks after start of short-day treatment.   |
| <b>CHRYSANTHEMUMS, POTTED</b>                                | To control plant height                      | A-Rest   | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)   | Contact floricultural specialists at N. C. State University.  |
|  |  |  | 0.25 to 0.5 mg a.i. drench for a 6 in. pot (1 to 2 fl oz/gal of drench solution; apply 4 fl oz/6 in pot)             | Drench rates and application volumes vary with pot size. Contact floricultural specialists at N. C. State University.   |
|  |  | B-Nine   | 1,000 ppm preplant foliar dip (0.16 oz/gal)  | Contact floricultural specialists at N. C. State University.  |
|  |  |  | 1,250 to 5,000 ppm spray (0.20 to 0.79 oz/gal)   | Spray when new growth from pinch is 1 to 2 inches long. Some varieties may require another application 3 weeks later.   |
|  |  | Bonzi  | 50 to 200 ppm spray (1.6 to 6.4 fl oz/gal)   | Contact floricultural specialists at N. C. State University.  |
|  |  |  | 0.118 to 0.433 mg a.i. drench for a 6 in. pot (0.032 to 0.128 fl oz/gal of drench solution; apply 4 fl oz/6 in. pot) | Drench rates and application volumes vary with pot size. Contact floricultural specialists at N. C. State University.   |
| Sumagic  | 2.5 to 10 ppm spray (0.64 to 2.56 fl oz/gal) | Contact floricultural specialists at N. C. State University. |  |   |
| <b>CHRYSANTHEMUMS, GARDEN</b>                                | To increase lateral branching                | Florel   | 500 ppm spray (1.619 fl oz/gal)  | Florel applications will provide some growth retardant effects. A delay in flowering will also occur with the use of Florel. Read the label for restrictions on timing of applications. |
| <b>CLEMATIS</b>  | To control plant height                      | A-Rest   | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)   |   |
| <b>CLEOME</b>  | To control plant height                      | A-Rest   | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)   | See Ageratum.   |
| <b>CLERODENDRUM</b>  | To increase lateral branching                | Atrimmec   | 1,042 to 2,083 ppm spray (0.67 to 1.33 fl oz/gal)  |   |
| <b>COLEUS</b>  | To control plant height                      | A-Rest   | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)   | See Ageratum.   |
|  |  | Bonzi  | 5 to 45 ppm spray (0.16 to 1.44 fl oz/gal)   |   |
|  |  | Sumagic  | 10 to 20 ppm spray (2.56 to 5.12 fl oz/gal)  |   |
| <b>COLUMBINE</b>   | To control plant height                      | A-Rest   | 66 to 132 ppm spray (32 to 64 fl oz/gal)   |   |
| <b>CORNFLOWER</b>  | To control plant height                      | A-Rest   | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)   | See Ageratum.   |
| <b>COSMOS</b>  | To control plant height                      | B-Nine   | 5,000 ppm spray (0.79 oz/gal)  | See Ageratum.   |

| Crop  | Purpose                       | Chemical | Rate   | Precautions and Remarks   |
|---|-------------------------------|----------|--|---|
| CROSSANDRA  | To control plant height       | B-Nine   | 2,500 ppm spray (0.39 oz/gal)  |   |
| DAFFODIL  | To control plant height       | Bonzi    | 2,366 to 4,732 mg a.i. drench for a 6 in. pot (0.64 to 1.28 fl oz/gal of drench solution; apply 4 fl oz/6 in. pot) | See Caladium.   |
|   |                               | Florel   | 1,000 to 2,000 ppm spray (3.24 to 6.47 fl oz/gal)  | Contact floricultural specialists at N. C. State University.  |
| DAHLIA  | To control plant height       | A-Rest   | 0.25 to 0.5 mg a.i. drench for a 6 in. pot (1 to 2 fl oz/gal of drench solution; apply 4 fl oz/6 in. pot)          | Drench rates and application volumes vary with pot size. Contact floricultural specialists at N. C. State University.   |
|   |                               | B-Nine   | 5,000 ppm spray (0.79 oz/gal)  | See Ageratum.   |
|   |                               | Bonzi    | 5 to 45 ppm spray (0.16 to 1.44 fl oz/gal)   |   |
|   |                               | Sumagic  | 10 to 20 ppm spray (2.56 to 5.12 fl oz/gal)  |   |
| DELPHINIUM  | To control plant height       | A-Rest   | 33 to 132 ppm spray (16 to 64 fl oz/gal)   | See Ageratum.   |
|   |                               |          | 0.25 to 0.5 mg a.i. drench for a 6 in. pot (1 to 2 fl oz/gal of drench solution; apply 4 fl oz/6 in. pot)          | Drench rates and application volumes vary with pot size. Contact floricultural specialists at N. C. State University.   |
| DIANTHUS  | To control plant height       | A-Rest   | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)   | See Ageratum.   |
|   |                               | Bonzi    | 5 to 60 ppm spray (0.16 to 1.92 fl oz/gal)   |   |
| DRACAENA  | To control plant height       | A-Rest   | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)   |   |
| DUSTY MILLER  | To control plant height       | B-Nine   | 5,000 ppm spray (0.79 oz/gal)  | See Ageratum.   |
| EASTER LILY   | To control plant height       | A-Rest   | 33 to 66 ppm spray (16 to 32 fl oz/gal)  | Contact floricultural specialists at N. C. State University.  |
|   |                               |          | 0.25 to 0.5 mg a.i. drench for a 6 in. pot (1 to 2 fl oz/gal of drench solution; apply 4 fl oz/6 in. pot)          | Drench rates and application volumes vary with pot size. Contact floricultural specialists at N. C. State University.   |
|   |                               | Sumagic  | 10 to 25 ppm spray (2.56 to 6.4 fl oz/gal)   | Contact floricultural specialists at N. C. State University.  |
|   |                               |          | 0.03 to 0.06 mg a.i. drench for a 6 in. pot (0.065 to 0.13 fl oz/gal of drench solution; apply 4 fl oz/6 in. pot)  | Drench rates and application volumes vary with pot size. Contact floricultural specialists at N. C. State University.   |
| EXACUM  | To control plant height       | B-Nine   | 2,500 ppm spray (0.39 oz/gal)  |   |
| FATSHEDERA  | To control plant height       | A-Rest   | 66 to 132 ppm spray (32 to 64 fl oz/gal)   |   |
| FLOWERING/<br>FOLIAGE PLANTS<br>HERBACEOUS<br>SPECIES<br>(Not specifically listed<br>in this table) | To control plant height       | Bonzi    | 30 ppm spray (0.96 fl oz/gal)  | Users should conduct trials on a small number of plants, adjusting the rate as needed for desired final plant height and length of height control.                                      |
|   |                               |          | 0.118 mg a.i. drench for a 6 in. pot (0.032 fl oz/gal of drench solution; apply 4 fl oz/6 in. pot)                 | Drench application volumes vary with pot size.  |
| FLOWERING/<br>FOLIAGE PLANTS,<br>WOODY SPECIES<br>(Not specifically listed<br>in this table)        | To control plant height       | Bonzi    | 50 ppm spray (1.6 fl oz/gal)   | Users should conduct trials on a small number of plants, adjusting the rate as needed for desired final plant height and length of height control.                                      |
|   |                               |          | 0.237 mg a.i. drench for a 6 in. pot (0.064 fl oz/gal of drench solution; apply 4 fl oz/6 in. pot)                 | Drench application volumes vary with pot size.  |
| FREESIA   | To control plant height       | Bonzi    | 100 to 300 ppm corm soak (3.2 to 9.6 fl oz/gal)  | Soak corms in the solution for 1 hour before planting.  |
| FUCHSIA   | To increase lateral branching | Atrimmec | 781 to 2,343 ppm spray (0.5 to 1.5 fl oz/gal)  |   |
|   |                               | Florel   | 500 ppm spray (1.619 fl oz/gal)  | Florel applications will provide some growth retardant effects. A delay in flowering will also occur with the use of Florel. Read the label for restrictions on timing of applications. |
| GARDENIA  | To control plant height       | A-Rest   | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)   |   |
|   |                               | B-Nine   | 5,000 ppm spray (0.79 oz/gal)  |   |
|   | To increase lateral branching | Atrimmec | 2,343 to 4,687 ppm spray (1.5 to 3.0 fl oz/gal)  |   |
| GERANIUMS   | To control plant height       | A-Rest   | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)   | See Ageratum.   |

| Crop                         | Purpose                       | Chemical | Rate   | Precautions and Remarks  |
|------------------------------|-------------------------------|----------|--|--|
| <b>GERANIUMS, continued.</b> | To control plant height       | Bonzi    | 10 to 30 ppm spray (0.32 to 0.96 fl oz/gal)  | Apply to zonal geraniums when new growth is 1.5 to 2 inches long. Apply to seed geraniums approximately 2 to 4 weeks after transplanting.  |
|                              |                               | Cycocel  | 750 to 2,500 ppm spray (0.8 to 2.7 fl oz/gal)  | Labeled for seed geraniums only. See Ageratum.   |
|                              |                               | Sumagic  | 3 to 6 ppm spray (0.77 to 1.54 fl oz/gal) for cutting geraniums and 2 to 4 ppm spray (0.51 to 1.02 fl oz/gal) for seed geraniums | See Ageratum.  |
|                              | To increase lateral branching | Atrimmec | 1,562 ppm spray (1 fl oz/gal)  | Labeled for ivy geraniums only.  |
|                              |                               | Florel   | 500 to 1,000 ppm spray (1.619 to 3.24 fl oz/gal)   | Labeled for zonal and ivy geraniums. Use the lower concentration for ivy geraniums. Florel will also provide some growth retardant effect. A delay in flowering will also occur with the use of Florel. Read the label for restrictions on timing of applications. |
| <b>GERBERA DAISY</b>         | To control plant height       | A-Rest   | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)   |  |
| <b>GRAPE IVY</b>             | To increase lateral branching | Atrimmec | 781 to 1,562 ppm spray (0.5 to 1 fl oz/gal)  |  |
| <b>HIBISCUS</b>              | To control plant height       | Bonzi    | 30 to 150 ppm spray (0.96 to 4.8 fl oz/gal)  | Application should be made when laterals are 1 to 4 inches long. Single applications control lateral growth for 3 to 6 months.   |
|                              |                               | Cycocel  | 460 ppm spray (0.5 fl oz/gal)  |  |
| <b>HOLLY</b>                 | To control plant height       | A-Rest   | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)   | Drench rates and application volumes vary with pot size. Contact floricultural specialists at N. C. State University.  |
|                              |                               |          | 0.25 to 0.5 mg a.i. drench for a 6 in. pot (1 to 2 fl oz/gal of drench solution; apply 4 fl oz/6 in. pot)                        |  |
| <b>HYACINTH</b>              | To reduce stem topple         | Florel   | 1,000 ppm spray (3.24 fl oz/gal)   | Contact floricultural specialists at N. C. State University.   |
| <b>HYBRID LILY</b>           | To control plant height       | Bonzi    | 250 to 500 ppm spray (8.0 to 16.0 fl oz/gal)   | See Caladium.  |
|                              |                               |          | 1.183 to 2.366 mg a.i. drench for a 6 in. pot (0.32 to 0.64 fl oz/gal of drench solution; apply 4 fl oz/6 in. pot)               |  |
|                              |                               |          | 20 to 30 ppm bulb soak (0.64 to 0.96 fl oz/gal)  |  |
| <b>HYDRANGEA</b>             | To control plant height       | B-Nine   | 2,500 to 7,500 ppm spray (0.39 to 1.18 oz/gal)   | Contact floricultural specialists at N. C. State University.   |
| <b>IBERIS</b>                | To control plant height       | A-Rest   | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)   | Drench rates and application volumes vary with pot size. Contact floricultural specialists at N. C. State University.  |
|                              |                               |          | 0.25 to 0.5 mg a.i. drench for a 6 in. pot (1 to 2 fl oz/gal of drench solution; apply 4 fl oz/6 in. pot)                        |  |
| <b>IMPATIENS</b>             | To control plant height       | Bonzi    | 5 to 45 ppm spray (1.44 to 2.02 fl oz/gal)   | See Ageratum.  |
|                              |                               | Sumagic  | 5 to 10 ppm spray (1.28 to 2.56 fl oz/gal)   |  |
| <b>KALANCHOE</b>             | To increase lateral branching | Atrimmec | 1,042 to 2,343 ppm spray (0.67 to 1.5 fl oz/gal)   |  |
| <b>LANTANA</b>               | To increase lateral branching | Atrimmec | 781 to 1,562 ppm spray (0.5 to 1 fl oz/gal)  | Florel applications will provide some growth retardant effects. A delay in flowering will also occur with the use of Florel. Read the label for restrictions on timing of applications.  |
|                              |                               | Florel   | 500 ppm spray (1.619 fl oz/gal)  |  |
| <b>LIATRIS</b>               | To control plant height       | A-Rest   | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)   | Drench rates and application volumes vary with pot size. Contact floricultural specialists at N. C. State University.  |
|                              |                               |          | 0.25 to 0.5 mg a.i. drench for a 6 in. pot (1 to 2 fl oz/gal of drench solution; apply 4 fl oz/6 in. pot)                        |  |
| <b>LIPSTICK VINE</b>         | To increase lateral branching | Atrimmec | 521 to 1,042 ppm spray (0.33 to 0.67 fl oz/gal)  |  |
| <b>MARIGOLD</b>              | To control plant height       | A-Rest   | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)   | See Ageratum.  |
|                              |                               | B-Nine   | 2,500 to 5,000 ppm spray (0.39 to 0.79 oz/gal)   |  |
|                              |                               | Bonzi    | 10 to 60 ppm spray (0.32 to 1.92 fl oz/gal)  |  |

| Crop   | Purpose  | Chemical   | Rate   | Precautions and Remarks   |
|--|--|--|--|---|
| <b>MARIGOLD, continued.</b>                      | To control plant height  | Sumagic  | 10 to 20 ppm spray (2.56 to 5.12 fl oz/gal)  | See Ageratum.   |
| <b>MONSTERA</b>                                  | To control plant height  | A-Rest   | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)   |   |
| <b>MONTBRETIA</b>                                | To control plant height  | Bonzi  | 20 to 30 ppm corm soak (0.64 to 0.96 fl oz/gal)  | Soak corms in the solution for 15 minutes prior to planting.  |
| <b>NEPHTHYTIS, GREEN &amp; GREEN GOLD</b>        | To control plant height  | A-Rest   | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)   |   |
| <b>PANSY</b>                                     | To control plant height  | Bonzi  | 1 to 15 ppm spray (0.03 to 0.48 fl oz/gal)   | See Ageratum.   |
|  |  | Sumagic  | 1 to 6 ppm spray (0.26 to 1.54 fl oz/gal)  |   |
| <b>PETUNIA</b>                                   | To control plant height  | A-Rest   | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)   | See Ageratum.   |
|  |  | B-Nine   | 2,500 to 5,000 ppm spray (0.39 to 0.79 oz/gal)   |   |
|  |  | Bonzi  | 5 to 60 ppm spray (0.16 to 1.92 fl oz/gal)   |   |
|  |  | Sumagic  | 25 to 50 ppm spray (6.4 to 12.79 fl oz/gal)  |   |
| <b>PHILODENDRON</b>                              | To control plant height  | A-Rest   | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)   |   |
| <b>PHLOX</b>                                     | To control plant height  | B-Nine   | 5,000 ppm spray (0.79 oz/gal)  |   |
| <b>PILEA</b>                                     | To control plant height  | A-Rest   | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)   |   |
| <b>POINSETTIA</b>                                | To control plant height  | A-Rest   | 0.25 to 0.5 mg a.i. drench for a 6 in. pot (1 to 2 fl oz/gal of drench solution; apply 4 fl oz/6 in. pot)            | Contact floricultural specialists at N. C. State University.  |
|  |  | B-Nine   | 2,000 to 3,000 ppm spray (0.31 to 0.47 oz/gal)   |   |
|  |  | B-Nine + Cycocel   | 2,000 to 2,500 ppm B-Nine (0.31 to 0.39 oz/gal + 1,500 ppm Cycocel (1.6 fl oz/gal) spray                             | Contact floricultural specialists at N. C. State University.  |
|  |  | Bonzi  | 10 to 30 ppm spray (0.32 to 0.96 fl oz/gal)  | Contact floricultural specialists at N. C. State University.  |
|  |  |  | 0.237 to 0.473 mg a.i. drench for a 6 in. pot (0.064 to 0.128 fl oz/gal of drench solution; apply 4 fl oz/6 in. pot) |   |
|  |  | Cycocel  | 1,000 to 3,000 ppm spray (1.1 to 3.3 fl oz/gal)  | Labeled for red poinsettias only.   |
| Sumagic  | 2.5 to 10 ppm spray (0.64 to 2.56 fl oz/gal)   | Contact floricultural specialists at N. C. State University. |  |   |
|  | 523 mg a.i. drench for a 6 in. pot (3.2 fl oz/gal of drench solution; apply 6 fl oz/6 in. pot) |  |  |   |
| <b>POTHOS</b>                                    | To control plant height  | A-Rest   | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)   |   |
| <b>PURPLE PASSION (<i>Gynura aurantiaca</i>)</b> | To control plant height  | A-Rest   | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)   |   |
| <b>SALVIA</b>                                    | To control plant height  | A-Rest   | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)   | See Ageratum.   |
|  |  | B-Nine   | 5,000 ppm spray (0.79 oz/gal)  |   |
|  |  | Bonzi  | 5 to 60 ppm spray (0.16 to 1.92 fl oz/gal)   |   |
|  |  | Sumagic  | 5 to 10 ppm spray (1.28 to 2.56 fl oz/gal)   |   |
| <b>SCHEFFLERA</b>                                | To control plant height  | A-Rest   | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)   | Drench rates and application volumes vary with pot size. Contact floricultural specialists at N. C. State University. |
|  |  |  | 0.25 to 0.5 mg a.i. drench for a 6 in. pot (1 to 2 fl oz/gal of drench solution; apply 4 fl oz/6 in. pot)            |   |
|  | To increase lateral branching  | Atrimmec   | 3,125 ppm spray (2 fl oz/gal)  | Labeled for <i>Schefflera arboricola</i> only.  |
| <b>SHRIMP PLANT</b>                              | To increase lateral branching  | Atrimmec   | 781 to 1,562 ppm spray (0.5 to 1 fl oz/gal)  |   |

| Crop  | Purpose                       | Chemical | Rate   | Precautions and Remarks  |
|---|-------------------------------|----------|--|--|
| SNAPDRAGON  | To control plant height       | Bonzi    | 5 to 90 ppm spray (0.16 to 2.88 fl oz/gal)   | See Ageratum.  |
|   |                               | Sumagic  | 25 to 50 ppm spray (6.4 to 12.79 fl oz/gal)  |  |
| TULIP   | To control plant height       | A-Rest   | 0.125 to 0.5 mg a.i. drench for a 6 in. pot (0.5 to 2 fl oz/gal of drench solution; apply 4 fl oz/6 in. pot)       | Drench rates and application volumes vary with pot size. Contact floricultural specialists at N. C. State University.  |
|   |                               | Bonzi    | 0.591 to 4.732 mg a.i. drench for a 6 in. pot (0.16 to 1.28 fl oz/gal of drench solution; apply 4 fl oz/6 in. pot) | Drench application volumes vary with pot size.   |
|   |                               |          | 2 to 5 ppm bulb soak (0.064 to 0.16 fl oz/gal)   | Soak bulbs for 1 hour prior to planting.   |
| VERBENA   | To control plant height       | B-Nine   | 5,000 ppm spray (0.79 oz/gal)  | See Ageratum.  |
|   | To increase lateral branching | Atrimmec | 521 to 1,042 ppm spray (0.33 to 0.67 fl oz/gal)  |  |
|   |                               | Florel   | 500 ppm spray (1.619 fl oz/gal)  | Florel applications will provide some growth retardant effects. A delay in flowering will also occur with the use of Florel. Read the label for restrictions on timing of applications.  |
| VINCA<br>( <i>Catharanthus roseus</i> )                           | To control plant height       | A-Rest   | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)   | See Ageratum.  |
|   |                               | B-Nine   | 2,500 ppm spray (0.39 oz/gal)  |  |
|   |                               | Sumagic  | 1 to 3 ppm spray (0.26 to 0.77 fl oz/gal)  |  |
| VINCA VINE<br>( <i>Vinca spp.</i> )                               | To increase lateral branching | Florel   | 500 ppm spray (1.619 fl oz/gal)  | Florel applications will provide some growth retardant effects. A delay in flowering will also occur with the use of Florel. Read the label for restrictions on timing of applications.  |
| VIOLA   | To control plant height       | Sumagic  | 1 to 5 ppm spray (0.26 to 1.28 fl oz/gal)  | See Ageratum.  |
| WANDERING JEW   | To control plant height       | A-Rest   | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)   |  |
| WOODY LANDSCAPE PLANTS<br>(Not specifically listed in this table) | To control plant height       | Bonzi    | 100 ppm spray (3.2 fl oz/gal)  | Users should conduct trials on a small number of plants, adjusting the rate as needed for desired height and length of height control. Bonzi is labeled for use on containerized woody landscape plants both in greenhouses and shadehouses. |
|   |                               |          | 0.473 mg a.i. drench for a 6 in. pot (0.128 fl oz/gal of drench solution; apply 4 fl oz/6 in. pot)                 |  |
| ZINNIA  | To control plant height       | A-Rest   | 26 to 132 ppm spray (12.6 to 64 fl oz/gal)   | See Ageratum.  |

This table includes all label changes as of November 1994. It replaces the table given in the October 1993 issue of the Bulletin (N.C. Flower Growers' Bul. 38(5):1-5).

Growers who desire more information on how to properly use plant growth regulators should refer to "Height Control of Greenhouse Crops," in the October 1990 Bulletin (N.C. Flower Growers' Bul. 35(5):10-13) and "Chemical Growth Retardants for Bedding Plants," in the April 1991 Bulletin (N.C. Flower Growers' Bul. 36(2):1-6). These articles summarize best management practices for application and effective use of plant growth regulators.

Also, consider purchasing "Tips on the use of chemical growth regulators on floriculture crops,"

published by the Ohio Florists' Association. This four-color 92-page manual features chemical growth regulator application recommendations for azaleas, bedding plants, begonias, bulb crops, potted chrysanthemums, cut-flowers, Easter lilies, foliage plants, seed geraniums, zonal geraniums, gloxinias and other gesneriads, hydrangeas, kalanchoes, minor crops, plugs, and poinsettias. It also contains comprehensive sections on mechanisms of action, calculations, and weed control of outdoor floriculture crops. The cost of the guide including shipping is \$21. To purchase a copy, send a check, payable to O.F.A. Services, Inc. to 2130 Stella Court, Suite 200, Columbus, OH 43215-1033. You can call 614-487-1117 or FAX 614-487-1216 for VISA or MasterCard orders.

# IS POWDERY MILDEW A THREAT TO POINSETTIA PRODUCTION IN NORTH CAROLINA?

Ronald K. Jones  
Extension Plant Pathologist  
North Carolina State University

**P**owdery mildew, a new fungus disease on poinsettia in the United States, has received a lot of attention in trade magazines over the past few years. There are documented cases of severe powdery mildew damage on poinsettia from several states over the past three years. Is this a real threat to the production of poinsettias in North Carolina? Poinsettias are the number one floral crop in North Carolina. Several diseases are of major concern to poinsettia growers every year. Where does powdery mildew fit into this puzzle?

Powdery mildew is a common fungus disease that occurs on many plants. There are several genera and numerous species of the fungi that cause the powdery mildew disease. Some of these species are very host specific (attack only a few very specific species of plants) while others attack many different plants. These fungi are identified by microscopic examination of the sexual spore producing structures. So far, no one has been able to find the sexual state of powdery mildew that occurs on poinsettia in the United States. This leaves us with many questions about what is going on with poinsettia; such as, where is the fungus inoculum coming from; what are the environmental conditions that favor this powdery mildew species, etc.

Powdery mildew diseases are characterized by the white fluffy fungus growth on leaves, flowers, and stems. The powdery mildew on poinsettia appears as white spots, 1/4 to 1/2 inch in diameter on leaves, stems, and bracts. It is particularly obvious on red bracts. It is often first observed in a crop either when plants are moved to a final spacing or as plants are removed from benches for shipment. The presence of the fungus

on the leaves and bracts reduces the quality of the plants. The disease can increase in severity after shipment. It can also easily be confused with white spray residues on leaves and bracts but it is possible to see the difference between spray residue and powdery mildew colonies with good hand lens. Another problem that is commonly confused with powdery mildew on poinsettia is sooty mold growing on leaves. Sooty molds colonize in the honeydew excreted by whiteflies.

What should North Carolina growers do about this new disease? How many times should growers spray and what chemicals are effective? How common is this disease in North Carolina?

In 1992, 51 poinsettia samples were examined in the Plant Disease and Insect Clinic and only two samples had powdery mildew. In 1993, no powdery mildew was found on 38 samples; and in 1994, only one case of powdery mildew was confirmed on 35 samples. The week before Thanksgiving, Doug Bailey and I saw over 2 million poinsettias in the State, but we did not see any powdery mildew.

Is there much difference in susceptibility between cultivars? The data to date indicates most cultivars are susceptible. Therefore, resistant cultivars is not a control option.

What control program should North Carolina growers implement in 1995?

① Keep up with the literature on this disease in trade magazines.

② Carefully and regularly inspect your 1995 crop, particularly as the canopy begins to coalesce, creating a "closed cover."

③ Keep a good hand lens handy during scouting.

④ Examine any white spots on leaves.

⑤ Examine both top and bottom surfaces and leaves within the canopy.

⑥ This examination can be done at the same time you are scouting for white flies.

⑦ If you observe any white spots and with your hand lens you cannot be sure whether the spots are powdery mildew or spray residue, submit samples of the suspect leaves to the Plant Disease and Insect Clinic in a plastic bag.

Powdery mildew is a disease that can generally be controlled with fungicide applications made promptly after the first signs are detected.

Fungicides such as Strike, Terraguard, and Phyton 27 are reported to be effective.

In summary: We do not need any new diseases on poinsettia. This new disease, at this time, does not appear to be widespread on the crop in North Carolina. Most of the reports of serious powdery mildew on poinsettia have been from more northern states. However, growers must be vigilant in scouting for the disease. At this time, it is my opinion that powdery mildew is not a major threat to poinsettia production in North Carolina.

## NCCFGA NEWS

### Bob Luther III, NCCFGA President

**H**appy New Year! I hope your holiday season went as well as ours. The poinsettias were great this year and sold even better!

Although the holiday season is winding down, most of us are gearing up for spring. Please keep abreast of what your flower growers' association is offering for you this winter as well. The combined North Carolina Green & Growin' Show and Floral Expo Exposition is coming up January 12-15 at the Benton Convention Center in Winston-Salem. Here is your opportunity to exhibit your product line to landscapers, retail nurseries and garden center clients. Take advantage of the over 1,500 people foot traffic that visits the trade show each year. Let's kick this first combined show off with a big bang. Come and see what's happening in the industry and be a part of the future. Call Bill Wilder at 919-266-3322 for registration and exhibitor information.

By now you should have received a Goodness Grows in North Carolina credit card offer from NCDA. Please consider joining up. First Union will contribute 0.5% of every dollar spent on the card to a floriculture marketing fund for use to

promote N.C. floriculture. For more information, contact Ron Fish at 919-733-7887.

It is time once again to renew your membership in the North Carolina Commercial Flower Growers' Association. Please fill out and return your membership renewal (on page 15 of this month's bulletin) and membership dues as soon as possible. YOUR association works for you. We cosponsor educational events such as the bedding plant field day, the Southeast Greenhouse Conference and Trade Show, and the Green and & Growin' Show. The Bulletin you receive six times a year can only be produced with your membership. It only takes one small bit of new information to save you and your business ten times the cost of membership in your association. Please rejoin as soon as possible to make sure you continue to receive the Bulletin and notices of upcoming events. We need your help in recruiting new members, too. An organization is never stagnant; it is either growing or shrinking. Recruit new members to assure our future. Once again, happy holidays and best of luck in the upcoming growing months!

*Bob Luther III*

## NEW PUBLICATIONS FOR GROWERS

**Tips on Growing and Marketing Hanging Baskets** is now available from the Ohio Florists' Association. The 88-page text contains 69 color figures, 29 tables, and several illustrations to offer growers precise information and growing recommendations for hanging basket production. Topics covered in the manual include the production environment, containers, growing media, nutrition, irrigation, production growth regulators, insect and disease control, marketing, and production cost accounting.

The manual is \$23 (including shipping and handling) and can be ordered by calling 614-487-1117. Credit card orders can be FAX'ed to OFA at 614-487-1216. For more information, contact O.F.A. Services, Inc. at 2130 Stella Court, Suite 200, Columbus, OH 43215-1033.

**A Greenhouse Pesticide Safety Training Video** is now available from the Professional

Plant Growers' Association (PPGA), Society of American Florists' (SAF), and Roses, Inc. With assistance from Florists' Mutual Insurance, these three organizations have compiled an excellent hour-long video for use in Worker Protection Standard (WPS) safety training compliance. There are three parts to the video: 1) general pesticide safety; 2) additional training for early-entry workers and pesticide handlers; and 3) additional training for pesticide handlers. This video is EPA-APPROVED as a training mechanism that satisfies the WPS pesticide safety training requirements for workers and handlers. It is available in English and Spanish (please specify which version when ordering). The video (including shipping) is \$34.95 for PPGA, SAF, and Roses, Inc. members; it is \$54.95 for nonmembers. To order a copy, call PPGA at 800-647-7742 or FAX your order to 517-694-8560.

### COMING EVENTS

| <u>Event</u>   | <u>Date</u>                           | <u>Time</u>          | <u>Location and Contacts</u>  |
|--|---------------------------------------|----------------------|---|
| Mid-Atlantic Nurserymen's Trade Show                             | Wednesday–Friday<br>4–6 January 1995  |                      | Baltimore, Maryland. Call Carville Akehurst at 410-256-6474 for more information  |
| Grower Expo Business Conference                                  | Thursday–Sunday<br>5–8 January 1995   |                      | Chicago, Illinois. Contact GrowerTalks magazine at 1-800-456-5380 for more information  |
| Poinsettia Growers Association Biannual International Conference | Thursday–Sunday<br>12–15 January 1995 |                      | San Diego, California. Call 800-572-0000 for more information   |
| 1995 N.C. Green and Growing Show                                 | Thursday–Sunday<br>12–15 January 1995 |                      | Benton Convention Center, Winston-Salem, N.C. Contact Bill Wilder at 919-266-3322 for further information   |
| NCSU Labor Management Workshop                                   | Wednesday<br>25 January 1995          | 9:00 am –<br>4:00 pm | Charlie Rose Center, Fayetteville, N.C. Contact Chuck Moore, Dept. of Agr. and Res. Economics, NCSU at 919-515-2607 for further information       |
| NCSU Labor Management Workshop                                   | Friday<br>27 January 1995             | 9:00 am –<br>4:00 pm | Iredell County Agr. Center, Statesville, N.C. Contact Chuck Moore, Dept. of Agr. and Res. Economics, NCSU at 919-515-2607 for further information |
| Bedding Plant Production Update                                  | Wednesday<br>8 February 1995          |                      | Human Resources Center, Morganton, N.C. Contact Reagan Ammons, Burke County Cooperative Extension Center at 704-439-4460                          |



# DUES NOTICE



**N • C • C • F • G • A**

**N • C • C • F • G • A**

**NORTH CAROLINA COMMERCIAL FLOWER GROWERS' ASSOCIATION**

**FOR MEMBERSHIP FROM:**

January 1, December 31,

**1995 - 1995**

Company: \_\_\_\_\_

Contact Name: \_\_\_\_\_ Telephone: \_\_\_\_\_

Additional Employees: \_\_\_\_\_ Fax: \_\_\_\_\_  
(\$20.00 each)

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

1995 Dues Categories (please check appropriate categories):

- Company Memberships
- \_\_\_ 0 to 10,000 ft<sup>2</sup> of greenhouses . . . . . \$ 40.00
- \_\_\_ >10,000 ft<sup>2</sup> to 1 acre of greenhouses . . . . . \$ 60.00
- \_\_\_ >1 acre to 5 acres of greenhouses. . . . . \$100.00
- \_\_\_ >5 acres of greenhouses. . . . . \$125.00
- \_\_\_ Allied Trades. . . . . \$ 60.00
- \_\_\_ Additional Employees (each). . . . . \$ 20.00
- \_\_\_ Educators . . . . . \$ 20.00
- \_\_\_ Students . . . . . \$ 1.00

Contributions to NCCFGA are not deductible as a charitable contribution for federal income tax purposes. Dues may be deductible to members for federal income tax purposes as ordinary and necessary business expenses.

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Please Indicate Your Categories:**

- Wholesale Grower
- Retail Grower
- Retail Associate
- Allied Trades
- Research
- Extension
- Municipal
- Landscaping
- Garden Center
- Educator
- Student
- Other \_\_\_\_\_

- If a Grower,  
Please Indicate:**
- Total Heated ft<sup>2</sup>** \_\_\_\_\_
- Bedding Plants
  - Cut Flowers
  - Potted Flowering Plants
  - Hanging Baskets
  - Foliage
  - Hardy Chrysanthemums
  - Perennials
  - Herbs
  - Other \_\_\_\_\_

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**You will receive a membership confirmation and dues receipt in the next issue of the Bulletin**

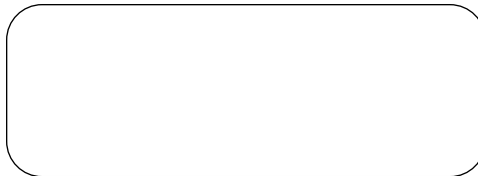


**NORTH CAROLINA  
COMMERCIAL FLOWER GROWERS' ASSOC.**

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