

2004 Soil Moisture and Freezing Study

Andrea Luchini and Leonard Perry
Graduate Research Assistant and Extension Professor
University of Vermont

This study was conducted to determine if water stress had an effect on a plant's ability to survive freezing temperatures. It is believed that plants experiencing water stress before overwintering are able to harden more effectively and thus survive the winter better. Plants used for this study were *Coreopsis verticillata* 'Moonbeam', *Coreopsis* 'Tequila Sunrise', *Geranium x cantabrigiense* 'Cambridge' and *Astilbe simplicifolia* 'Sprite'.

Beginning in October of 2003, one set of plants (30 plants) for each cultivar used were labeled as "dry" plants and another set (30 plants) was labeled as "wet" plants. These plants were potted in Classic 100 pots with Pro-Mix soilless media. Soil moisture levels were monitored using a Field Scout TDR 100 soil moisture meter (Spectrum Technologies, Plainfield, IL). This meter has a 12cm long measurement rod which was inserted fully into the soil in the pot. The device reported volumetric water content (VWC) in percentages with saturation being around 50% volumetric water.

Plants in the "dry" group were maintained mostly between 5% and 15% VWC with more frequent light waterings. Plants in the "wet" group were maintained mostly between 10% and 45% VWC. These plants were allowed to dry to around 10% VWC and then watered to capacity. (Waterings for the "dry" *Astilbe* had to be adjusted slightly as the "dry" VWC was too dry for those plants and they all would have died before freezing.) In the middle of January 2004, plants were subjected to controlled freezing treatments. Six plants of each treatment were subjected to temperatures of -2°C, -5°C, -8°C, -11°C, and -14°C each, for a total of 30 plants per treatment. Following regrowth, (time allowed for regrowth varied for each cultivar) plants were evaluated by a rating scale of 1 to 5 with 5 being the highest. Plants rated 3 and above were considered "saleable". Dry weights were then taken of all above ground plant material.

The statistics do not show a common theme for all plants in the study. Moisture levels had no significance on *Coreopsis* 'Moonbeam' winter survival. However, temperature did have an effect on those plants. Most plants died at -14°C; plants at -2°C and -5°C survived the best and the plants at -8°C and -11°C were not rated well and had very small dry weights. (Although not considered statistically significant, the mean rating of plants from the "wet" group was above 3 while the mean rating of those from the "dry" group was below 3. The dry weights were actually slightly bigger for the "dry" group than for the "wet" group.)

The *Coreopsis* 'Tequila Sunrise' had different results. Moisture level had a statistically significant effect on both rating and dry weight results. Practically, the ratings results were not very different, with both groups having a mean rating above 3 (4.2 for the "wet" group and 3.6 for the "dry" group). In the dry weight results, both moisture and temperature had an effect. Plants from the "wet" treatment were larger than those from the "dry" group and plants were larger at the higher temperatures.

All *Geranium* 'Cambridge' from both treatments were rated at 5 as they all appeared to be good sized, healthy plants. There was some significance in the dry weights for the two moisture treatments with plants from the "wet" treatment being larger than those from the "dry" treatment.

Results from the *Astilbe* plants are still being analyzed. This study will be repeated in this coming year with the Cambridge and Tequila Sunrise, plus a COFa1bells.