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EFFECTS OF HUMIDITY ON ROSE YIELD, AVERAGE STEM LENGTH AND LEAF AREA.

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During the 1987-88 winter there was no significant effect of humidity on 'Royalty' and 'Red Success' yield in rockwool over the range of 5 to 20 mb VPD (ca 90 to 40% RH). But, there was a distinct effect on leaf area from 20 to 15 mb VPD, with greater leaf area as humidity increased. General observation showed that humidity control settings did not, in fact, mean that such humidities were achieved in the greenhouse, except at humidities below 10 mb VPD (>80% RH).

Due to the high altitude, semi-arid climate of the front range, low humidities are a frequent and normal occurrence. Excessively dry air has been shown to cause high transpiration which may induce a water deficit in the foliage if the root system or water supply is inadequate. (Grange and Hand, 1987: Ford and Thorne, 1974). However, according to Bakker (1984) and Ford and Thorne (1974) air which is near saturation may also have deleterious effects on plant morphology, disease resistance and growth rate.

The main effects of humidity on plant growth has been found mainly as a result of low humidity whereas high humidities, below 0.3 mb VPD[2] (ca. 99% RH), tend to have little effect on growth and carbon assimilation. The most obvious effect of low humidity is moisture stress when there is inadequate uptake of water through the root system (Grange and Hand, 1987; Krizek et al., 1971).

Humidity has also been reported to have an effect on leaf area in some crops (Ford and Thorne, 1974). This difference arises not from an increased number of leaves but from an increase in the area of individual leaves with increasing humidity. This increase in leaf size is associated with thinner leaves which may be less capable of efficient photosynthesis according to Ford and Thorne (1974). However, the leaf area ratio increased which should increase photosynthesis and carbon assimilation.

Materials and Methods

During the winter months from 30 August 1987 to 16 April 1988 humidity experiments were conducted to moniter the effects of humidity on average stem length and yield in *Rosa hybrida*. On two dates during the experiment, leaf area measurements were also collected.

Four separate quonset greenhouses measuring 20 × 50 ft. in a north-south orientation were used for this experiment. In each greenhouse four benches of roses were oriented in an east-west direction. Each bench measured 3.5 × 12 ft. and were planted with 'Royalty', 'Red Success' and 'Sonia' roses at a 0.9 ft^2 spacing. All the benches were planted using 'Sonia' in border rows of two rows at either end of the benches and one row between the plots of the other two varieties. Data was collected from the plots of 'Royalty' and 'Red Success' in the two center benches. The outer two benches served as border rows to prevent edge effects.

The climate in the greenhouses was controlled using Hewlett-Packard computer equipment and a climate control program as developed at Colorado State University (Hanan, 1985; Hanan et al., 1987). All the roses were grown in rockwool with automatic irrigation set for 8 minutes whenever accumulated radiation exceeded 3000 kilojoules m^{-2}. Fertilization, using the Colorado State University standard solution (Hanan, 1984), occurred with every irrigation. The humidity for the experiment was controlled by injecting high

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[2] *VPD – vapor pressure difference between saturation (100% RH) and actual at the same temperature in millibar units of pressure.*

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ments of a mini pot plant (1,4,5,6). Those treated with 0.075, 0.1 and 0.12 ppm uniconazole were in the desired height range of 16 to 18 cm. Plants treated with 0.15 and 0.175 ppm uniconazole had heights of 14 to 15 cm, respectively, which were inhibited too much. The stems of plants treated with doses of 0.1 ppm and greater were epinastic **(Fig. 2)**. The most desirable uniconazole soil treatment was 0.075 ppm per plant **(Fig. 3)**. No shoot bypass was observed on any uniconazole treated plants during flowering time.

The uniconazole treated plants that were "re-pinched" after all original main stems had flowered, developed a second "flush" of flower shoots. The resulting shoots were almost identical in length to the original stems, creating compact plants in similarly described height ranges. All stems of plants treated with 0.1 ppm or more uniconazole continued to be epinastic. The results suggest that applications of uniconazole as a soil drench are extremely residual in nature and effect plant growth for a long period of time.

There was no delay in the time to flower between uniconazole treated and untreated plants and the flower diameter did not differ.

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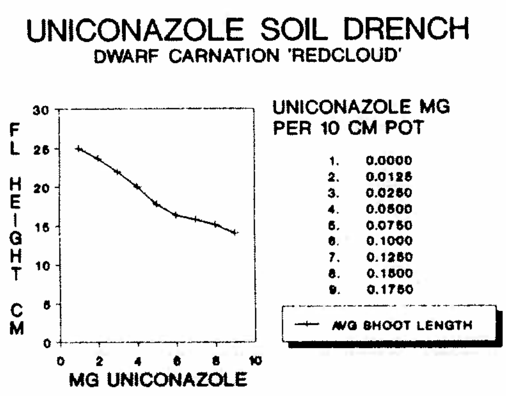

Figure 1. The dwarf carnation 'Redcloud' treated with uniconazole solutions of either 0, 0.0125, 0.025, 0.05, 0.075, 0.1, 0.125, 0.15, or 0.175 mg per plant.

Figure 2. The average plant height response of dwarf carnation 'Red Cloud' at flowering time due to soil drench treatments of Sumagic™ solutions 0, 0.0125, 0.025, 0.050, 0.075, 0.1, 0.125, 0.15, and 0.175 mg a.i. per 4-inch pot (L to R).

Figure 3. Dwarf carnation 'Redcloud' treated with a soil drench of 0.075 mg uniconazole (R) and untreated plant (L).