The Effects of Nitrogen Level and Mist Frequency on Rooting of Three *Phlox* Species©

Sinclair A. Adam Jr.
Ambler College, Landscape Architecture and Horticulture Department & The Center for Sustainable Communities, Temple University, Ambler, Pennsylvania 19002 U.S.A.

Growers and propagators are working to reduce nutrient losses from sites and to improve nutrient use efficiency for reduced environmental impact and for production efficiency (Hartmann, et al., 2000). Woody cuttings in mist systems have demonstrated benefits from the addition of nutrients in the mist, but many herbaceous perennials are undocumented with respect to nutrient requirements in mist systems (Hartmann, et al., 2000; Rowe and Cregg, 2002). Phlox species are popular herbaceous perennials typically produced from stem cuttings (Armitage, 1997). *Phlox glaberrima* 'Morris Berd' is a perennial plant of increasing interest, is easy (to moderately easy) to produce from cuttings, and blooms mid-spring to early summer. *Phlox paniculata* 'David' was The Perennial Plant Association's perennial plant of the year in 2002 and is a popular summer-blooming garden phlox with powdery mildew resistance (Perry and Adam, Jr., 1994). *Phlox paniculata* typically takes a slightly longer period to root and is more difficult to root than most other phlox species. *Phlox stolonifera* 'Home Fires', is a popular spring-blooming selection that is easy to root and that will root in a short interval.

Cuttings were selected for uniformity by species from well-developed stock plants and harvested. Cuttings were dipped for 5 sec in Woods Rooting Compound (Earth Science Products Corp., Watsonville, Oregon) at 1000 ppm a.i. (1.03% IBA and 0.66% NAA), and stuck in pre-moistened Sunshine #2 potting medium (Sungro Inc., Bellview, Washington) in an intermittent mist system in the Temple University greenhouse on 28 June 2004. The experiment was set up in a complete randomized block design, and treatment levels of 0, 75, and 150 ppm nitrogen (applied as NH_4NO_3) were applied by hand to each cell in the flat. Fifteen-milliliter (volume) treatment solutions were applied to each cell, providing for a 10% leachate fraction. Treatment solutions were applied two times per week throughout the experimental period, and mist levels were set at 10-, 20-, and 30-min mist frequencies and 12-sec duration. Greenhouse temperatures were maintained at 24 °C (day) and 15 °C (night) and light ranged from 225 $\mu m \cdot s^{-1} \cdot m^{-2}$ to 622 $\mu m \cdot s^{-1} \cdot m^{-2}$ during the experimental period. After 30 days, the experiment was harvested. Cuttings were measured for leaf chlorophyll level using a Minolta SPAD 502 chlorophyll meter (Minolta) and then removed from the rooting medium. Root number was recorded, as was root length (cm). Roots were separated from shoots and measured for fresh weight and subsequently placed into a drying oven for 48 h at 90 °C. They were then measured for dry weight, and results were recorded. Results of plant measurements were subjected to analysis of variance and regression where applicable.

Cuttings of *P. glaberrima* 'Morris Berd' exhibited significant increase in chlorophyll (SPAD) level with increasing nitrogen treatment level, but the increasing levels were only significant for the 20-min mist frequency. At all treatment levels of N and all mist frequencies, 100% of the cuttings rooted. Fresh weight significantly increased with increasing N treatment level at the 20- and 30-min mist frequencies. For the 10-min mist frequency, numerical gains in fresh weight were observed but

were not significant. Root dry weight was significantly influenced by nitrogen level at the 20-min mist frequency but was nonsignificant for the 10- and 30-min mist frequencies. Root number was not significantly influenced by nitrogen treatment level for any of the three mist frequencies tested. Root length decreased significantly with increasing N treatment level at the 10- and 30-min mist frequencies but was not significant for the 20-min mist frequency. *Phlox paniculata* 'David' cuttings were not significantly influenced by N treatment level for any mist frequency in chlorophyll (SPAD) level. Cuttings at the 10-min mist frequency rooted 100% except for the 0 ppm N treatment level, which rooted at 91.7%. Cuttings at the 20-min mist frequency rooted at 100% for all N treatment levels. Cuttings at the 30-min mist frequency rooted at 91.7% for the 75 and 150 ppm N treatment levels, and 83.3% for the 0 ppm N treatment level. Increasing N treatment level at the 10- and 20-min mist frequencies significantly influenced fresh weight of roots, but gains were not significant at the 30-min mist frequency. Root dry weight only significantly increased with the 10-min mist frequency, and was nonsignificant for the other mist frequencies. Root number and root length were not significantly influenced by N treatment at any mist frequency tested.

Cutting of *P. stolonifera* 'Home Fires' increased in chlorophyll (SPAD) level with increasing N treatment level for all mist frequencies. A 100% rooting rate occurred for all treatment levels at the 10- and 30-min mist frequencies and at 91.7% for all N treatment levels at the 20-min mist frequency. Although these gains were significant for the 10-min and 30-min mist frequencies, gains were nonsignificant for the 20 min. mist frequency. Fresh root weights generally decreased with increasing N treatment level, but this trend was only significant for the 30-min mist frequency. Dry weight of root was not significantly influenced by N treatment. Root number was not significantly influenced by N treatment level. Root length decreased with increasing N treatment level and was significant for the 10- and 30-min mist frequencies.

Nitrogen treatments were successful in increasing leaf chlorophyll levels with *P. glaberrima* 'Morris Berd' and *P. stolonifera* 'Home Fires' but had ambiguous results on *P. paniculata* 'David'. The nitrogen treatments only increased root dry weights with *P. paniculata* 'David' at the 10-min mist frequency and with *P. glaberrima* 'Morris Berd' at the 20-min mist frequency. Nitrogen treatments decreased root length with increasing treatment level for *P. stolonifera* 'Home Fires' and for *P. glaberrima* 'Morris Berd' at the 10- and 30-min mist frequencies. In agreement with the work of Rowe and Cregg, these results indicate little benefit is obtained from additions of nitrogen in intermittent mist systems for the rooting of *Phlox*. Propagators of herbaceous perennials can reduce nitrogen use by avoiding application in mists systems.

LITERATURE CITED

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