Regulating Perennial Plant Growth With Controlled Phosphorous Levels

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Nature of Work: Many perennials make rapid growth in spring and quickly become overgrown in their pots. There is little time to get the plants from the production nursery to the retail outlet. The shelf life of these plants in the retail store is relatively short. Many of these vigorous perennials do no respond well to plant growth regulators. There has been little that can be done to regulate the plant growth of these perennials. Also, there is a great concern about reducing the amount of phosphorous leaching from containers and contaminating the surface and ground waters. The production of quality crops with reduced phosphorous levels would help growers better manage their nutrient run off.

There have been crop reports where low phosphorous has an effect on the growth of perennials. Low levels of phosphorous have reduced the amount of growth without causing deficiency symptoms or greatly reducing quality. There was interest by Harrell's representatives to begin initial evaluation of low phosphorous fertilizers on vigorous growing perennials. They provided the funding and products for this project.

Growers at McCorkle Nurseries identified the following as likely perennials to evaluate. Plants included in the trial were *Armeria pseudoarmeria* 'Joystick Red', *Coreopsis auriculata* 'Zamphir', *Gaillardia grandiflora* 'Burgundy', *Leucanthemum* 'Becky' and *Rudbeckia speciosa* 'Viettes Little Suzy'. Perennial plugs were potted on November 6, 2003 into trade gallons filled with 6:1 bark:sand mix amended with 4#/yd^3 dolomitic lime, 1.5 #/yd^3 gypsum and 2 #/yd^3 talstar. The fertilizer treatments included 1) Blended 12.9-0-19.3 (0# P_2O_5/yd^3), 2) Blended 9.06-0-28.11 (0# P_2O_5/yd^3), 3) Blended 11.54-2.05-17 (0.29# P_2O_5/yd^3), 4) Blended 12.2-3.18-16 (0.43# P_2O_5/yd^3), and 5) Osmocote 18-6-12 (0.55# P_2O_5/yd^3). All treatments supplied 1.65 # actual nitrogen / cubic yard of substrate. Minor elements were supplied with each treatment. Plants were wintered over in sun on a gravel pad. Plants were covered with a frost blanket when winter temperatures were expected to cause damage.

Soil samples were collected on March 18, 2004 for all treatments and perennials. Samples were taken from three separate pots and combined into a single sample. Growth, height and spread were recorded during spring. Production of flower buds and open blooms were recorded when applicable. Seventeen replicates of each treatment were used.

Results and Discussion: The height and spread of the perennials were monitored from mid March through mid May 2004. Treatment 1 and 2 produced the least growth while Treatment 5 produced the greatest growth. The growth on Treatment 5 was excessive for *Armeria*, *Gaillardia* and *Leucanthemum*. The *Coreopsis* cultivar was a dwarf form and the *Rudbeckia* produced little growth until the end of the monitoring period. The two intermediate phosphorous levels looked very good as a method of reducing growth of some vigorous perennials.

Figures 1-6 graphically illustrate the research results and photos of each treatment are included. The *Armeria* height was due to the length of the flowering stems. Treatments 2, 3 and 4 show great promise in reducing plant growth over treatment 5 (the normal rate). Treatment 2 with 0% P_2O_5 was slightly better than treatment 1, with 0% P_2O_5. This may be the result of the increased potassium levels or the formulations used. It also appears that the crops could be all planted at one time in substrates with different phosphorous levels and stagger the dates of maturity.

Photo 1. *Armeria* treatments from left to right - Treat 5, 2, 1, 3 and 4 on April 1, 2004.

The *Coreopsis* 'Zamphir' developed into a dwarf spreading form. Treatments 1 and 2 were unacceptable. Treatments 3, 4 and 5 produced acceptable plants, with treatment 3 and 4 producing shorter plants with delayed flowering.

Photo 2. *Coreopsis* treatments from left to right - Treat 5, 2, 1, 3 and 4 on April 1, 2004.

Gaillardia 'Burgundy' produced a linear increase in growth and flowering as the phosphorous rates increased. The zero rates produced little early growth, however the higher rates worked well. *Gaillardia* looks like a good crop for production under staggered phosphorous rates. Testing more of the intermediate rates are needed.

Leucanthemum 'Becky' did not flower but overgrew the pots in treatment 5. Treatments 1 and 2 were very week and slow to develop. Treatment 3 and 4 were acceptable at the termination of the trial.

Photo 3. *Gaillardia* treatments from left to right - Treat 5, 2, 1, 3 and 4 on April 1, 2004.

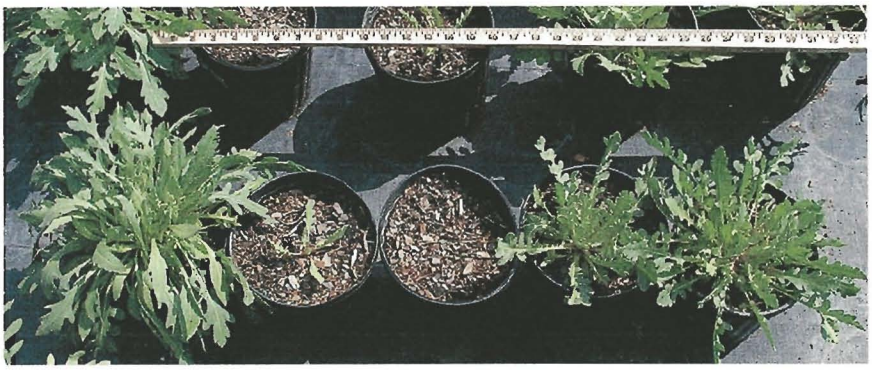
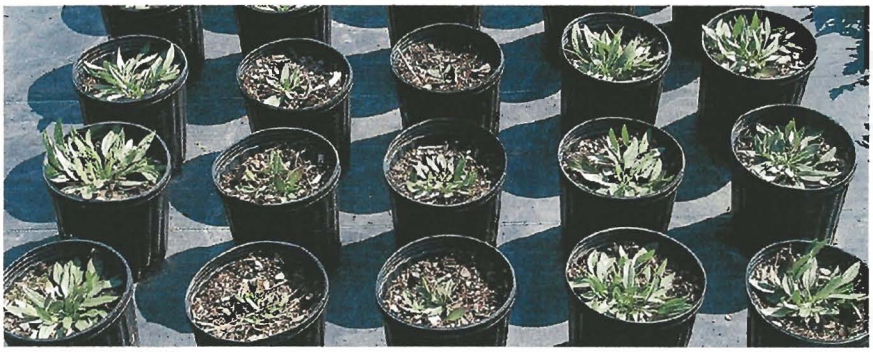


Photo 4. *Leucanthemum* treatments from left to right - Treat 5, 2, 1, 3 and 4 on April 1, 2004.

Rudbeckia 'Little Suzy' was very slow for all treatments. This crop matures late in the season. By May 13, the pots had filled in but there was no flower bud development. Treatments 3, 4 and 5 had filled the pots at termination.

Photo 5. *Rudbeckia* treatments from left to right - Treat 5, 2, 1, 3 and 4 on April 1, 2004.



Significance to the Industry: The use of reduced phosphorous levels may be used to regulate growth of excessively vigorous perennials without detrimental effects. Reduced levels could help reduce phosphorous run off from production nurseries. Staggered phosphorous levels in the potting substrate could stagger the maturity dates of perennial crops. The entire crop could be planted all at one time rather than staggering the planting dates. Further investigation of a range of intermediate rates are necessary to determine their effectiveness under production conditions.

Figure 1. ***Armeria*** **'Joystick Red' - Height & Spread (inches).**

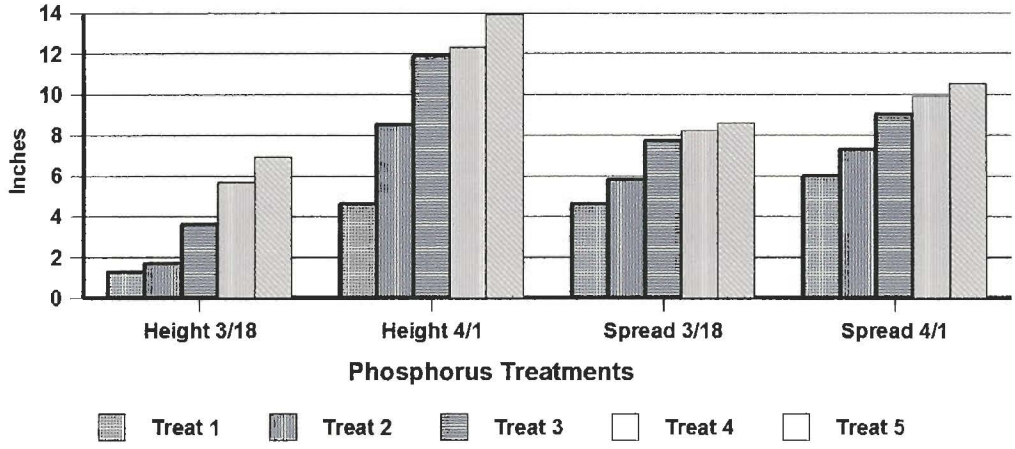


Figure 2. ***Armeria*** **'Joystick Red' - Number Buds & Flowers.**

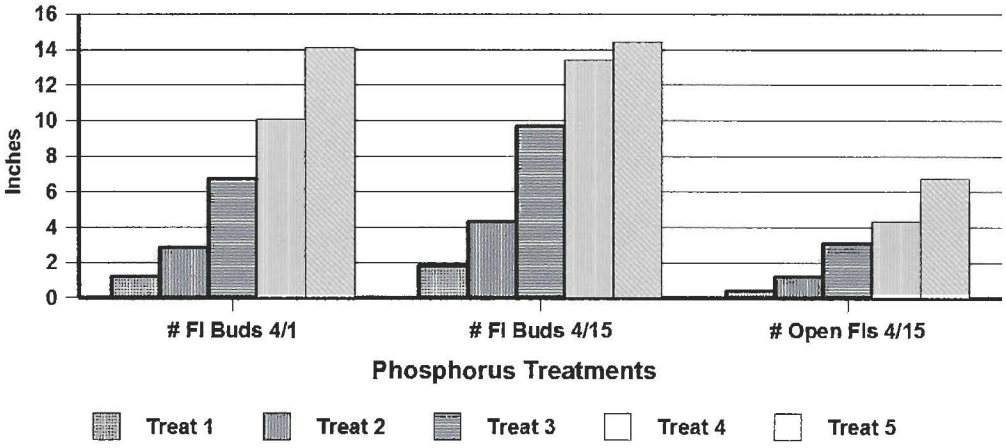


Figure 3. *Coreopsis* 'Zamphir' - Height, Spread, Buds & Flowers.

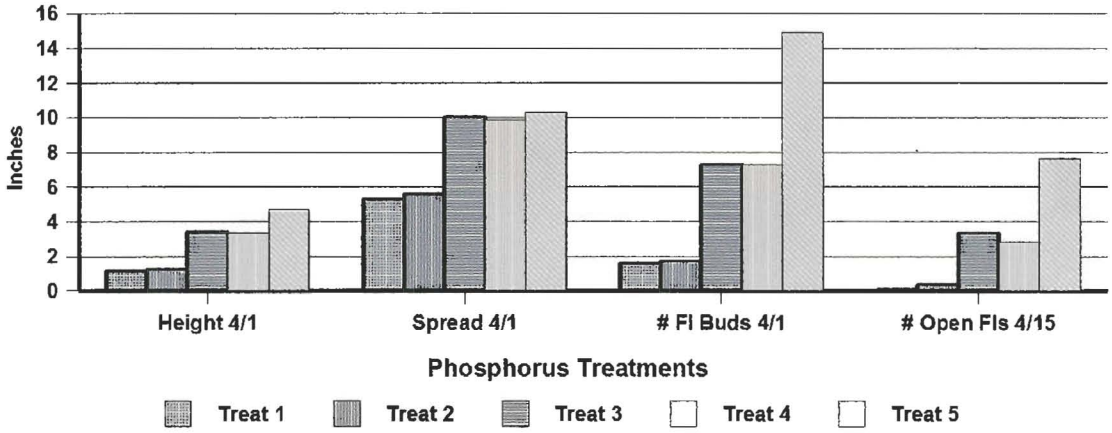


Figure 4. *Gaillardia* 'Burgundy' - Height, Spread, & Flower Buds.

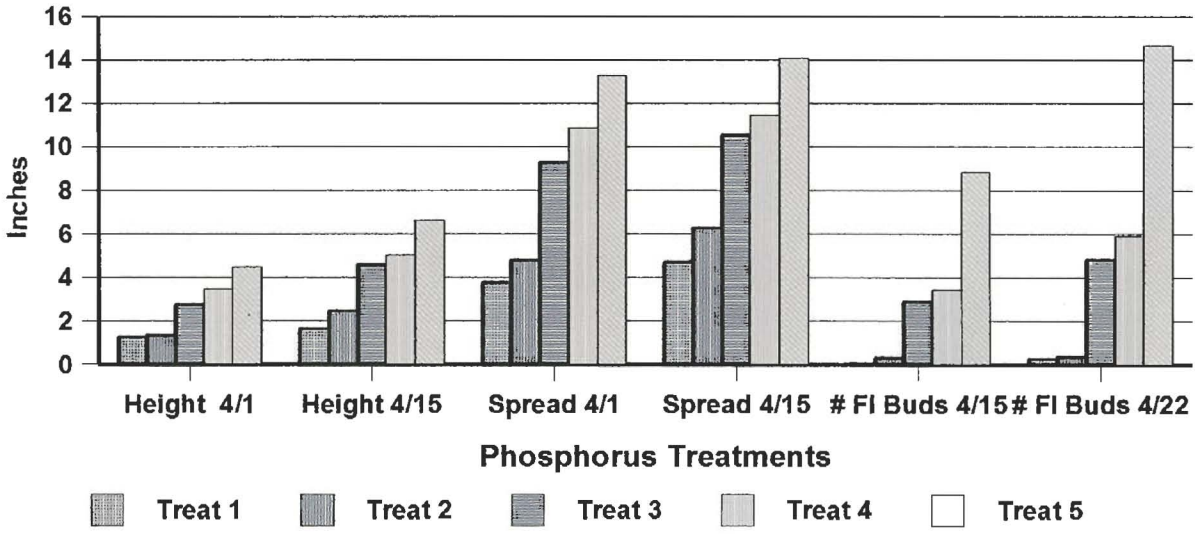


Figure 5. *Leucanthemum* 'Becky' - Height & Spread (inches).

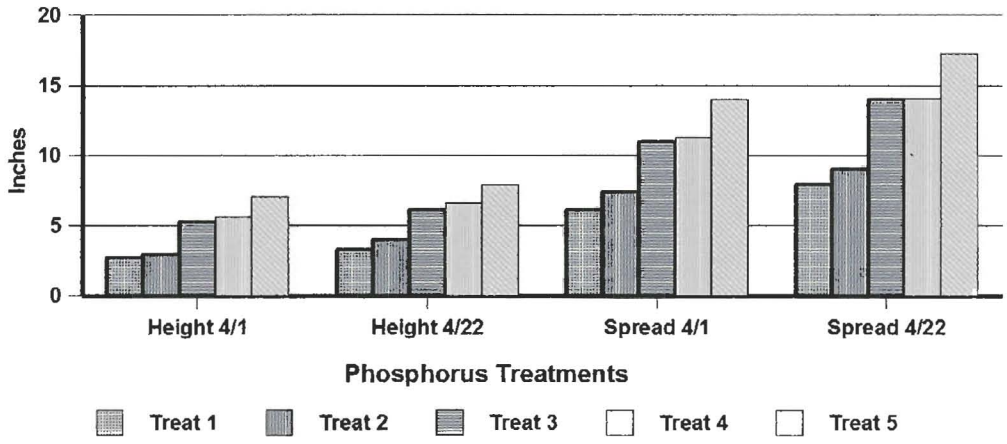


Figure 6. *Rudbeckia* 'Little Suzy' - Height & Spread (inches).

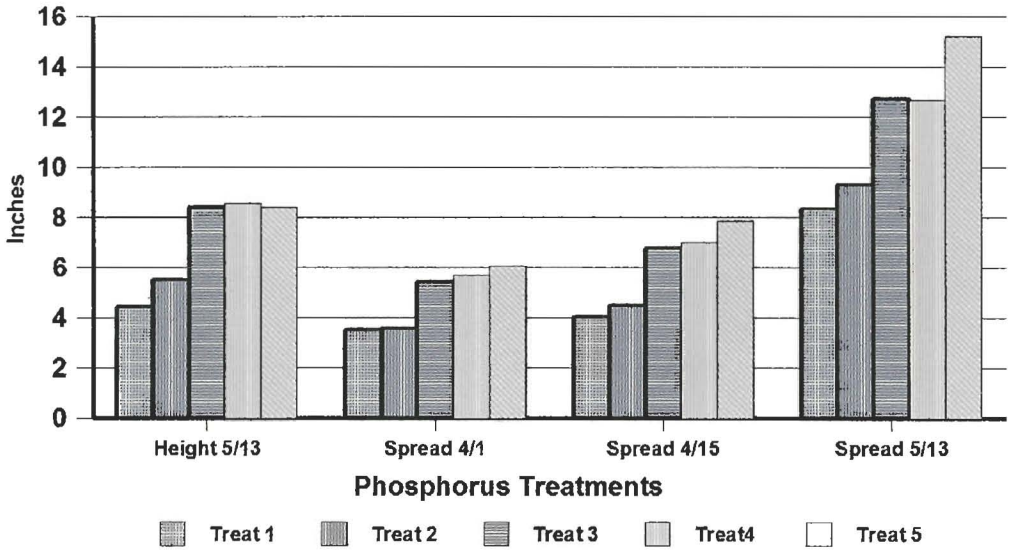


Table 1. Phosphorous Levels (ppm) in Potting Substrate for Each Crop and Treatment on 3-18-04.

Treatments	Armeria	Coreopsis	Leucanthemum	Gaillardia	Rudbeckia
#1 (0% P_2O_5)	0.47	2.30	0.46	0.40	0.47
#2 (0% P_2O_5)	0.68	2.30	0.82	0.64	0.64
#3 (0.29% P_2O_5)	0.71	2.30	0.55	NA*	1.83
#4 (0.43% P_2O_5)	3.05	2.20	1.18	NA*	2.43
#5 (0.55% P_2O_5)	6.36	16.30	14.49	NA*	9.84

* Not Available