Low Phosphorous and Slow Release Iron Effects on Hydrangea Production

James T. Midcap
Department of Horticulture - Athens
The University of Georgia

Nature of Work: *Hydrangea macrophylla* is not an easy crop to produce year after year. Summer growth is often excessive resulting in the need for heavy pruning. Plants frequently yellow out in the heat of summer due to over watering or the lack of iron uptake. Our goal is to develop a program that would slow the excessive summer growth of hydrangea without reducing the quality of the crop while providing a supplemental source of iron.

Summer growth could be slowed by using fertilizers low in phosphorous. Low levels of phosphorous can reduce the amount of growth without causing deficiency symptoms or without reducing quality. Lower phosphorous applications could effectively reduce the amount leaching from containers, which would reduce contamination to surface and ground water. Extra iron would be supplied using a coated slow release product. Harrell's supplied the funding, blended fertilizers and the slow release iron for this project.

Two *Hydrangea macrophylla* cultivars, 'Nikko Blue' and 'Endless Summer', were propagated from cuttings in the spring of 2004. Rooted cuttings were potted into three gallon containers on July 13, 2004. The incorporated treatments for the low phosphorous trial included:

1. Blended 12.9-0-19.3 (0# P_2O_5/yd^3)
2. Blended 11.54-2.05-17 (0.29# P_2O_5/yd^3)
3. Blended 12.2-3.18-16 (0.43# P_2O_5/yd^3)
4. Harrell's 19-6-12 (0.535# P_2O_5/yd^3)

The treatments for the coated iron trial included:

1. Harrell's 19-6-12 without supplemental coated iron
2. Harrell's 19-6-12 with 2#/yd^3 coated iron

Minor elements were added to the 19-6-2 treatments. All blended materials contained minor elements. Each treatment had 15 single plant replicates and were placed in a completely randomized design within each cultivar. Data was statistically analyzed with ANOV and Student-Newman-Keuls test to separate means. Plants were produced under shade with normal nursery production practices.

Treatments were evaluated for growth and quality. Data included height, average spread, growth index and a quality rating. The upper most fully developed leaves were sampled from ten plants for each treatment. The leaf tissue analysis was done on November 10, 2004.

Results and Discussion: In the phosphorous trial, Nikko Blue Hydrangea Treatment 1 - 0# P_2O_5/yd^3 was significantly lower in height and average spread, and poorest growth index and quality rating. Treatments 2 - 0.29 # P_2O_5/yd^3 and 4 - 0.535# P_2O_5/yd^3 produced equal spread and growth index. All other treatments were equal for height and quality rating. Therefore, no differences were detected for the treatments containing phosphorous levels above zero. The low 0.29# P_2O_5/yd^3 treatment produced growth and quality as good as the normal 0.53# P_2O_5/yd^3 rate for Nikko Blue hydrangea (Photo 1 and Figure 1).

Photo 1. Nikko Blue Hydrangea low phosphorous treatments. From left to right - Treatments 1, 2, 3, and 4 on November 10, 2004.

In the Endless Summer phosphorous trial, Treatment 1 - 0# P_2O_5/yd^3 produced significantly lower height and average spread, and the poorest growth index and quality rating. Treatment 2 - 0.29# P_2O_5/yd^3 produced significantly greater spread and quality rating than Treatment 4 - 0.53# P_2O_5/yd^3 while producing equal height and growth index to Treatment 4 - 0.53# P_2O_5/yd^3. The low 0.29# P_2O_5/yd^3 rate for Endless Summer hydrangea produced as good or better growth and quality as the normal 0.53# P_2O_5/yd^3 (Photo 2 and Figure 2).

Photo 2. Endless Summer Hydrangea low phosphorous treatments. From left to right - Treatments 1, 2, 3, and 4 on November 10, 2004.

The leaf tissue analysis results are shown in Table 1. Endless Summer showed an increase in the tissue phosphorous levels with the increase in phosphorous fertilization rate. The Nikko Blue rates were rather erratic, with treatment 4 and 5 being lower than expected.

The coated iron treatments showed no difference for growth and quality for Nikko Blue and Endless Summer hydrangea. The iron levels in the leaf tissue (Table 2) were very similar. The late planting of the crop with a initial full charge of minor elements appears to have supplied sufficient iron to satisfy the plants needs and lack of response to the supplemental iron..

Significance to the Industry: The use of reduced phosphorous levels may be used to produce plants of equal quality when compared to plants produced at today's recommended rates. Reduced levels could help reduce phosphorous in run off water from production nurseries. Further investigation of a range of low rates on the major nursery crops is necessary to determine if these crops will preform the similarly to the hydrangeas used in this trial.

Table 1. Phosphorous Levels (%) in Leaf Tissue for Each Hydrangea Crop and Treatment on 11-10-04.

Treatments	Nikko Blue (% P)	Endless Summer (% P)
#1 (0#/yd^3 P_2O_5)	0.12	0.13
#3 (0.29#/yd^3 P_2O_5)	0.29	0.25
#4 (0.43#/yd^3 P_2O_5)	0.26	0.31
#5 (0.55#/yd^3 P_2O_5)	0.15	0.34

Table 2. Iron Levels (ppm) in Leaf Tissue for Each Hydrangea Crop and Treatment on 11/10/04.

Treatments	Nikko Blue (ppm Fe)	Endless Summer (ppm Fe)
#1 (With out Fe Supplement)	53.0	122.5
#2 (With Fe Supplement)	80.64	119.8

Figure 1. ***Hydrangea macrophylla*** **'Nikko Blue' - Height, Spread, Growth Index and Quality Rating.**

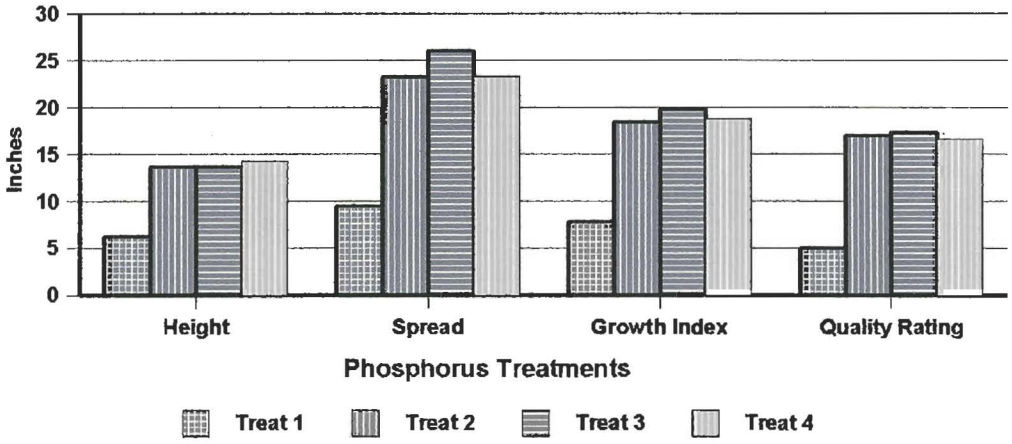

Figure 2. ***Hydrangea macrophylla*** **'Endless Summer' - Height, Spread, Growth Index and Quality Rating.**