e-GRO Research Update

Coleus: Optimizing Phosphorus

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Coleus (*Plectranthus scutellarioides)* is a popular herbaceous annual that people grow for its wide variety of colors. Coleus cultivars also vary from one another in growth that forms to fit both full to partly sunny environments. Several companies offer a wide array of excellent cultivars.

When plants receive inadequate P fertility, growth can range from being compact to stunted. Earlier research conducted by Dr. Paul Nelson at NC State University laid the foundation for a low P fertilization strategy in floriculture production (Nelson et al., 2002). His research determined that P had the greatest impact on internode stretch of annual plugs and not ammoniacal-nitrogen. His work promoted the concept of limiting P applications to avoid excessive internode stretch in plugs (Fig 1).

A concern today is the over application of phosphorus (P) and the environmental effects of over application in a time of diminishing supply. In addition, excessive P results in plant stretch and other NC State University researchers have reported that for many species only 5 to 15 ppm of P is needed for healthy growth (Henry et al., 2017). Plants tend to visibly respond to the amount of P being applied and it is easy to chart the overall growth. One way to combat this is by utilizing an optimum rate for specific plants.

Summary of Findings

- Coleus growth was maximized with 14 to 15 ppm P.
- Rates higher than 15 ppm P did not result in more growth, therefore the economic cost of applying higher rates is not justified.
- Rates between 5 to 13 ppm will result in smaller sized plants and can be used as an alternative to plant growth regulator applications.

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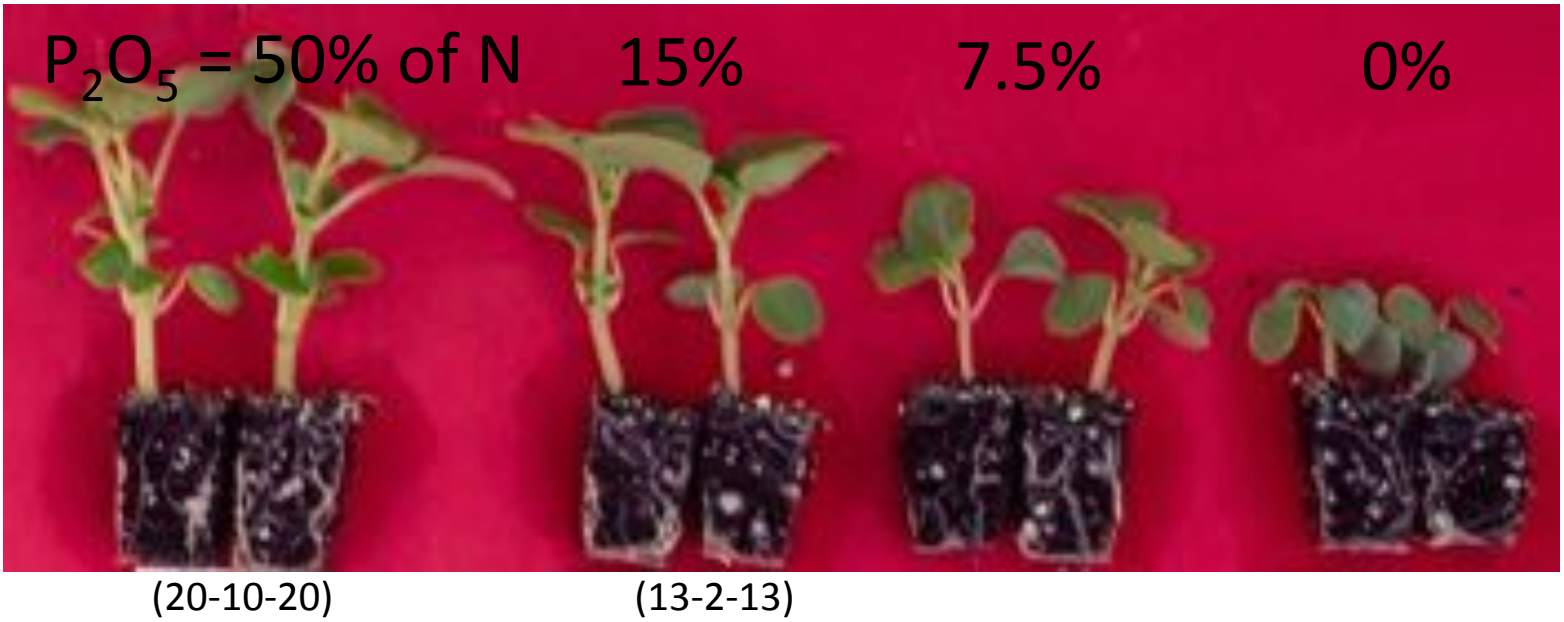

Figure 1. Utilizing a low phosphorus strategy on plugs for compactness. Percentages are presented as P_2O_5 as a percentage of the amount of nitrogen (N) provided. (Photo: Paul Nelson)

Coleus' plant growth is highly dependent upon phosphorus levels, which is why we conducted an experiment at North Carolina State University to determine the response to six P fertility rates (2.5, 5, 10, 15, 20, and 40 ppm P) to measure the growth response across two different cultivars. This trial was completed using the cultivars 'Salsa Verde' (Ball Horticulture, West Chicago, IL) (green) and 'Wall Street' (Dummen Orange, Columbus, OH) (orange).

When examining various P fertility rates on coleus, plant height was significantly limited for plants that received a P fertility rate of 2.5, 5, and 10 ppm P (Fig. 2). Thus, we would recommend a higher fertility rate to achieve adequate growth. Plant dry weight and diameter increased linearly on plants that received a P fertility rate of 2.5, 5, and 10 ppm P, but then a diminished rate of plant growth occurred with higher P rates. The growth of the plants

Figure 2. Growth response to phosphorus rates in "Wall Street."

plateaued. When data was subjected to nonlinear regression, 'Wall Street' plants exhibited a plateau point (Xo) at 14.72 ppm P, and 'Salsa Verde' exhibited an Xo of 13.94 ppm P in regards to growth index (GI) (which takes into account plant height, plant diameter, and shoot dry weight) (Fig. 3).

There are other reasons that phosphorus deficiency can occur even when there is an adequate amount of P being supplied by the fertilizer. Cold, wet, and drought conditions can lead to plants exhibiting signs of deficiency. Often those conditions lead to other deficiencies which in turn effect P uptake by the plant. Other plant health issues such as root rot can lead to deficiency within a plant. Regardless of what is causing the deficiency, the plants will still exhibit the same symptoms as a lack of applied phosphorus. It is important to take note of all the available information before deciding that there should be an increase in applied phosphorus.

Reducing phosphorus fertilization rates can have many benefits for growers such as reducing expenses on fertilizer and runoff. Decreasing applied P rates lowers the chance of runoff which has a negative effect to water quality and leads to eutrophication in larger bodies of water. Another benefit is compact growth due to lower phosphorus fertilization. This allows for an increase in available space, if managed correctly, during both growth and shipment. Many consumers also prefer to buy plants that appear more compact.

References

Henry, J.B. 2017. Beneficial and adverse effects of low phosphorus fertilization of floriculture species. NC State University M.S. thesis. https://repository.lib.ncsu.edu/handle/1840.20/33600

Nelson, P.V., C.Y. Song, and J.S. Huang. 2002. What really causes stretch? Greenhouse Product News. https://gpnmag.com/article/what-really-causes-stretch/

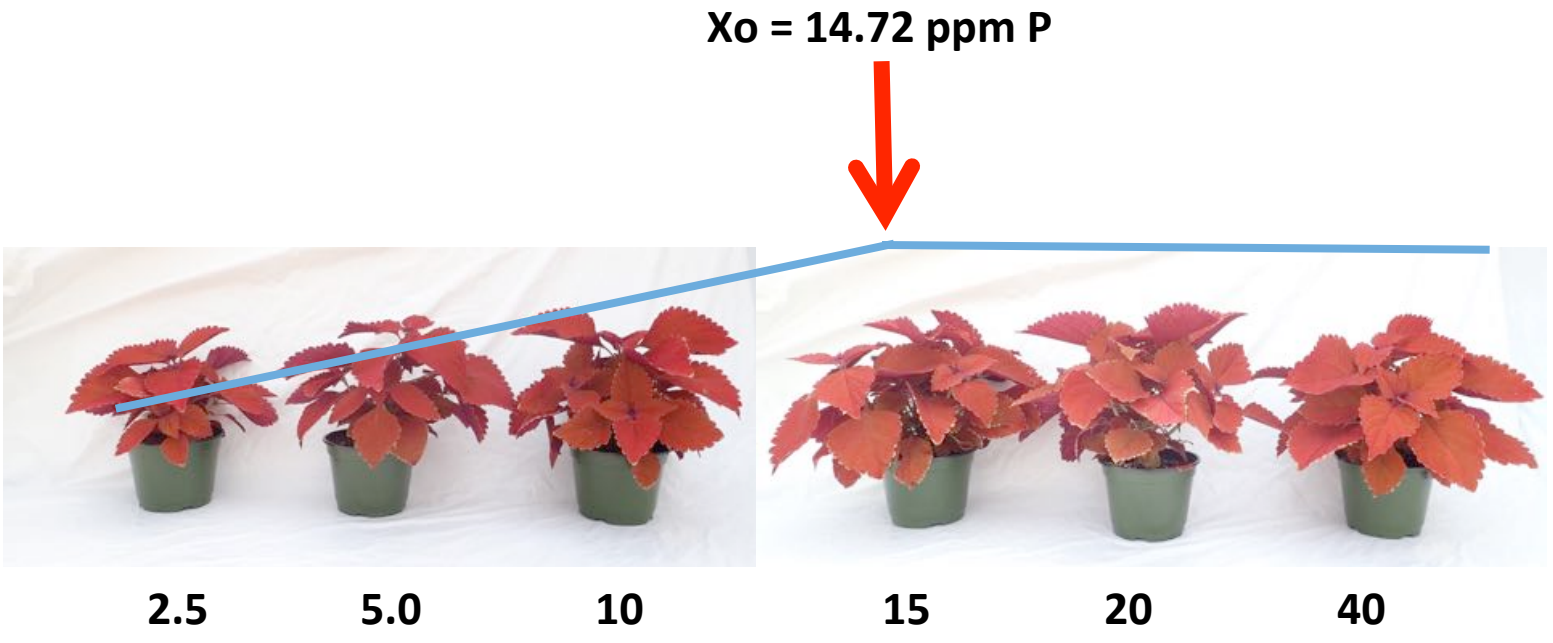

Figure 3. Impact of phosphorus (P) fertility rate on growth index by nonlinear regression. 'Wall Street' growth increased with P rate up to the almost 15 ppm P (Xo= 14.72 ppm P), which is indicated by the linear trend above that point.

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