

Uptake Efficiency of Phosphorus in Different Light Environments by *Zinnia (Zinnia elegans)* and *Vinca (Catharanthus roseus)*

The influence of light on plant growth, flowering, and crop quality has been well studied and documented. Reduction of light is often accompanied by a reduction in whole plant photosynthesis. On the other hand, flowering and plant height has been reported to increase with increased concentrations of phosphorus (P). The goals of the research were to determine: 1) if P supply should be adjusted or lowered as light decreases; 2) if deficiency and/or oversupply symptoms would be apparent at different P rates when growth rates decreased as a result of different light levels; and 3) the influence of P and light on overall P uptake efficiency and water use efficiency (WUE).

Two warm-season floriculture crops, vinca (*Catharanthus roseus*) and zinnia (*Zinnia elegans*), were grown in a greenhouse with and without shading, and at varying concentrations of P (0.1, 0.2, 0.5, 1, 2, or 4 mM P) along with complete nutrient solution as needed.

Plant growth was greatly reduced by P supply below 0.5mM, and optimum plant growth and flower development rate was observed at a P supply of 0.5 mM, both regardless of the light supply (Figure 1). Tissue P concentration was not influenced by light, but overall P content (mg P per plant) was higher when plants were grown without shading as a result of larger plants in higher light environments (Figure 2). The appearance or severity of deficiency symptoms was not influenced by light and there was no evidence of nutrient stress symptoms as a result of different plant growth rates. Water use efficiency was maximized when growth was not limited by P supply (at or above 0.5mM). One hundred percent recovery of applied P was obtained at the 0.5 mM P supply in vinca, whereas recovery was less at the same P supply in zinnia. These results indicated no benefit for plant growth and flowering to P supply above 0.5 mM and illustrate how P content is demand-driven.

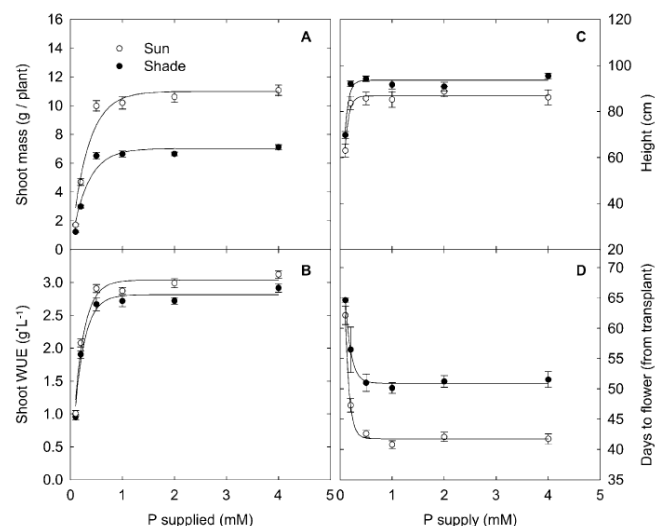
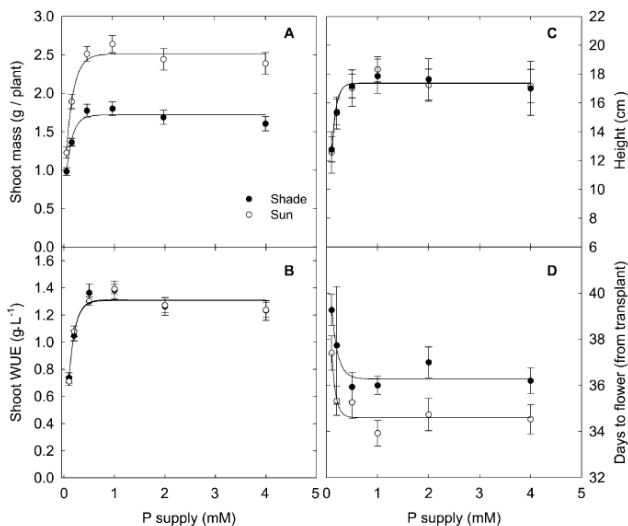


Figure 1. Vinca (L) and zinnia (R) mass of shoot (leaf and stem combined, A), shoot water use efficiency (shoot WUE, B), height at harvest (C), and days to flower (D). Plants were grown in a greenhouse in either full sun (open circles) or nearly 50% shade (closed circles) and irrigated with a complete nutrient solution that contained a phosphorus (P) concentration of between 0.1 to 4.0 mM. Values are means (n = 18) with \pm 1 SEM.

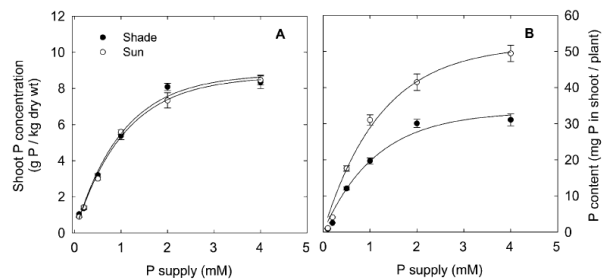
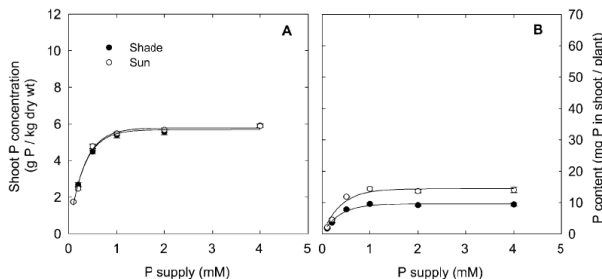


Figure 2. Vinca (L) and zinnia (R) phosphorus (P) concentration of the shoot (leaf and stem combined, A) and P content (concentration times plant size, B).