Growth, Partitioning, and Nutrient and Carbohydrate Concentration of *Petunia* x *hybrida* Vilm. are Influenced by Altering Light, CO_2, and Fertility

Energy costs are second only to labor as the largest factor in direct costs of greenhouse production for producers in northern or cooler climates. For this reason, many growers lower temperature set points to reduce fuel use, but may inadvertently increase fuel use as a result of longer production time. Light, CO_2, and fertility are all environmental factors that can be manipulated in a greenhouse, but little research has evaluated the interactive effects of all three on growth and development.

Petunia x *hybrid* 'Madness White' were treated in 12 controlled growth chambers under one of two CO_2 regimes, 400 or 800 μ mol·mol^{-1}. Within each CO_2 block, three chambers received photosynthetic photon flux (PPF) of 230 μ mol·m^{-2}·s^{-1} and three received PPF of 420 μ mol·m^{-2}·s^{-1}. Within each chamber, half of the 24 plants received a commercial fertilizer blend diluted to 21.3 mM nitrogen and half received 7.1 mM nitrogen. Beginning at week 3 after transplant (WAT), selected plants were destructively harvested every two weeks for elemental and carbohydrate analysis.

Plants across all treatments were "marketable" at 5 WAT. Fertility had the largest influence over crop mass and allocation patterns in this study (Figures 1 and 2). Growers would face a choice between faster, larger growth of their plants with higher fertility rates and lower quantity flowers (potential decreased quality). Overall, increasing plant quantity (greater flower mass) was achieved by increasing PPF. In practice, growers can boost flower proportion either by boosting light by reducing structural or chemical (spray-on) shading or adding supplemental lighting, but a less expensive alternative would be to decrease fertility. In the production of leaf tissue, there were synergistic effects between PPF and fertility, but this came at the expense of flower mass and less proportional growth of flowers. No difference in flower timing or development rate was observed with any variables.

For more information, contact: Jonathan Frantz, jonathanfrantz319@gmail.com. Dr. Frantz now works for Dupont Pioneer.

Frantz, J.M. and P. Ling. 2011. Growth and partitioning of *Petunia* × *hybrida* Vilm. are influenced by altering light, CO_2, and fertility. HortScience. 46:228-235.

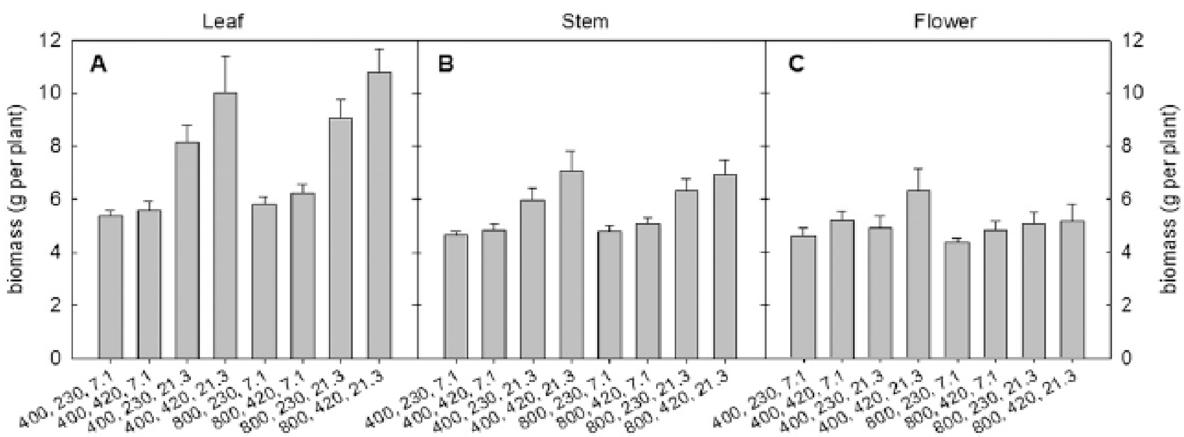

Figure 1. Week 5 leaf (A), stem (B), and flower (C) weight in grams per plant. The treatments are listed by their CO_2 (in µmol·mol^{-1}), photosynthetic photon flux supply (in µmol·m^{-2}·s^{-1}), and fertility supply (mM N), respectively. Error bars represent 1 SD.

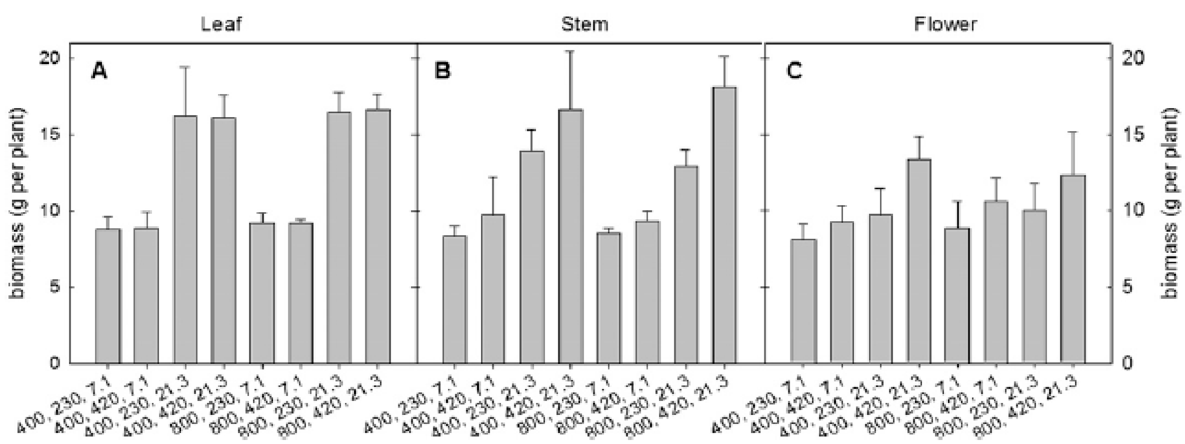

Figure 2. Week 7 leaf (A), stem (B), and flower (C) weight in grams per plant. The treatments are listed by their CO_2 (in µmol·mol^{-1}), photosynthetic photon flux supply (in µmol·m^{-2}·s^{-1}), and fertility supply (mM N), respectively. Error bars represent 1 SD.