NCR-101 Station Report
Montana State University
Tracy A.O. Dougher

The Montana State University Plant Growth Center is now 15 years old, but is kept in pristine condition by the hard work of the greenhouse manager, David Baumbauer. The center has a conservatory used for horticulture classes, 29 greenhouses with 8,300 square feet of bench space under Exolite all temperature controlled by microcomputer, 8 walk-in Conviron growth rooms with 7 having a temperature range of 5C-40ºC and one ultra-low room (-25ºC), 22 growth chambers ranging from 7 square feet to 36 square feet, seed potato certification lab, and a plant pathology isolation unit. More information on this facility can be found at: www.montana.edu/plantgrowth.

The Plant Growth Center houses research for the entire College of Agriculture. Research ranges from small grain breeding, legume and small grains genetics, pathology, weed competition, mini-tuber production, coal-bed methane effluent, plants with insecticidal properties, light quality effects on plant growth, bur oak propagation, and commercializing production of native Montana forbs.

Researchers in the Plant Growth Center have not had access to updated technology for controlled environment light measurement (note the footcandle measurements at the website). Researchers and greenhouse managers are slowly being educated. In the last two years we have acquired a LiCor spectroradiometer, 16 Apogee Instrument light bars, two LiCor quantum sensors, and two apogee hand-held quantum meters and borrowed an Apogee spectrometer.

Light Quality Research

Dougher, T.A.O., C.L. Moore, and R.E. Gough (*in press*) Effect of Light Quality on the Growth of Lettuce in Low Light, Proceedings of the 2002 International Horticulture Congress.
Low light levels in greenhouses and growth chambers often produce poor quality plants. The roles of red and far-red light and phytochrome are well understood, but little is known about the effects of other wavelengths of photosynthetically active radiation. We examined growth of lettuce (Lactuca sativa) under filters of seven colors (blue, dark blue, teal, yellow, red, purple, and green) and sunlight (clear filter) at equivalent, low photosynthetic photon flux. Differences in angle of stem repose, hypocotyl elongation, and leaf length were apparent within 7 days after seedling emergence. Thirty days after planting, phytochrome photoequilibrium (PPE) was not a good predictor of plant stem elongation or dry mass response to the filters. Filters transmitting a high percentage of blue light, but lower PPE, produced plants that had fresh and dry mass equivalent to or higher than the control plants. Plants receiving low levels of blue light were etiolated (low chlorophyll and long stem length), with the degree of etiolation increasing as the amount of blue light decreased.

DeVries, K.M., and T.A.O. Dougher (*abstract*) Photoselective filter for quality production of lettuce in low light. Undergraduate Scholars Program to be presented at the ASHS annual meeting 2003

Due to heightened awareness of the potential dangers of chemicals applied to food crops and ornamental plants, there has been an increased interest in other methods of growing quality, marketable plants in low-light condition. One method under investigation is the use of photoselective filters to control plant growth. In this study, lettuce seedlings (*Lactuca sativa*, cv. Grand Rapids) were subjected to four treatments. The four treatments were a low light control, a high light control, a blue colored filter treatment, and a far-red filter treatment. Each treatment was replicated four times. Plants were allowed to develop for 48 days. Light levels were monitored using light sensors measuring photosynthetic photon flux. The low light control, blue colored filter, and far-red filter treatments were controlled to equivalent photosynthetic photon flux using fiberglass screening. Upon harvest of the plants, stem length and fresh leaf and stem weights were recorded as well as dry leaf and stem weights. High light controls, as expected, had 28% higher leaf weight and stem weight than low light, while stem length was 24% shorter than under low light. Plants under far-red filters had leaf dry weight 44% less than plants under low light control and stems as long as the low-light treatment. Surprisingly, plants under blue-colored filters had dry leaf and fresh leaf weights similar to the low light control but the stem length was similar to that of the high light control. The results indicate that blue-colored filters may be better than far-red filters for controlling plant height in low-light conditions.