

NCR-101 Report for 2001 Utah State University

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Research Projects

1. Effects of atmospheric ethylene on growth and development

We are continuing studies to establish dose/response curves for ethylene effects on wheat, rice, and lettuce. An ethylene concentration of only 0.05 ppm caused a 20% reduction in seed set in both wheat and rice, and 0.75 ppm caused complete sterility.

2. Failure analysis of biological systems in controlled environments

We have examined the effect of prolonged darkness on lettuce and soybeans. Low PPF (5 to 10 micromoles per m² per s) and low temperatures during the dark period dramatically improve tolerance to darkness.

3. Effect of high levels of ammonium on plant growth

We examined ammonium effects on the growth of wheat. Our data indicate that supplying 85% of the N as NH₄⁺ did not decrease plant biomass, or yield, compared to controls with a 70/30% NO₃/NH₄⁺ ratio. The key to using high levels of NH₄⁺ is to maintain a stable pH and to supply high levels of calcium and potassium in the root-zone.

4. Modeling Carbon Use Efficiency using continuous canopy gas exchange

Jonathan Frantz is studying the factors controlling carbon use efficiency in crop plants. Preliminary data indicate that carbohydrate supply is far more important than night temperature in determining night time respiration rates.

Publications in Refereed Journals: 2000

Orchard, B.J., W.J. Doucette, J.K. Chard and **B. Bugbee**. 2000a. A novel laboratory system for determining the fate of trichloroethylene in plants. *Environmental Toxicology and Chemistry* 19:888-894.

Orchard, B.J., W.J. Doucette, J.K. Chard and **B. Bugbee**. 2000b. Uptake of trichloroethylene by hybrid poplar trees grown hydroponically in high rate, flow-through plant growth chambers. *Environmental Toxicology and Chemistry* 19:895-903.

J. Cavazzoni, T. Volk, **B. Bugbee**, and T. Dougher 2000 Phasic temperature and photoperiod control for soybean using a modified Crop Gro model. *Life Support and Biosphere Science* 6:273-278.