2004 NCR-101 Annual Report from Georgia
Research Activities at the Georgia Envirotron
College of Agricultural and Environmental Sciences, Griffin Campus

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Cryptosporidium and *Cyclospora* contamination of Produce

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Cryptosporidium and *Cyclospora* are coccidian parasites that can cause diarrheal illness in humans and can be acquired via water and food. Contaminated fresh produce containing these parasites have been implicated in foodborne outbreaks in the U.S. The objective of this study was to determine the viability of these parasites in produce. Introduction of these parasites would most likely happen during field irrigation or application of pesticides with contaminated water. Raspberries, green leaf lettuce and basil were grown in an Envirotron greenhouse. Once raspberries and blackberries flowered and produced fruits, they were transferred to Envirotron plant growth chambers where the berries ripened under controlled conditions. Berries were inoculated with various concentrations of *Cryptosporidium* and *Cyclospora* oocysts then collected at various periods of time and viability of the oocysts determined. Berries ripened in the chambers, but the color of the fruits were not the same as those plants grown in the green houses. Oocyst viability for *Cryptosporidium* was as long as 7 days and *Cyclospora* as long as 15 days. This information suggests that produce does provide a microclimate where oocysts can remain viable and infectious longer than on other non-produce surfaces where oocyst viability would be short.

Conservation and Regeneration of Wing Bean (*Psophocarpus tetragonolobus*)

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The Plant Genetic Resources Conservation Unit, a federal-state cooperative effort, is mandated to acquire, maintain, evaluate, document, and distribute the genetic resources of crops, including wild species, wild and weedy relatives, landraces, obsolete and current cultivars, and genetic stocks. As part of the special purpose legumes project a wing bean *Psophocarpus Tetragonolobus* regeneration experiment was conducted in two CG-72 chambers resulting in some seed production among the various accessions. This experiment will be repeated while looking at several different photoperiod regimes.

Seasonal Variation and Environmental effects on Endophyte Transmission in Tall Fescue

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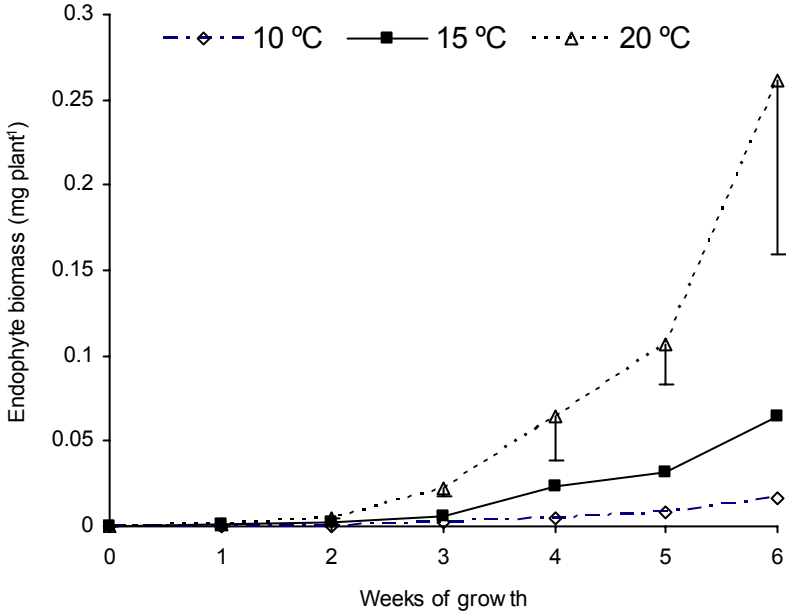
Tall fescue (*Festuca arundinacea* Schreb.) is the predominant cool season forage species and grown in the United States. Typically, tall fescue is infected with the endophyte, *Neotyphodium coenophialum,* which produces toxic alkaloids to animals, resulting in reduced animal performance. Non-toxin endophyte-infected cultivars of tall fescue have been developed and to maximize their impact on pasture ecosystems a better understanding of mechanisms affecting seed and tiller transmission is

needed to maintain endophytes in seed. Little research has been conducted on the endophyte transmission mechanism *in planta*. Seasonal variation of endophyte in established tall fescue pastures in Watkinsville, GA, and seed fields near Salem, Oregon was examined. Growth chamber experiments at the Envirotron were conducted to examine temperature effects on plant and endophyte growth and to determine the cardinal minimum temperatures for each. Greenhouse experiments were conducted to examine water stress effects on transmission by imposing soil moisture deficits at different stages of panicle development. Endophyte frequency varied over months in both GA and OR. Frequency averaged 93.4% when sampled April through December but was 80.5 % when sampled January through March in GA. Frequency average 64.5% when sampled February through April but was 88.6% during other months in OR. Cardinal minimum temperature for plant growth was 5.16°C (+/- 0.47) but for endophyte was 10.28 °C (+/- 0.70). There was no water stress effect on endophyte frequency or concentration in tall fescue. Endophyte genotype and plant genotype affected endophyte frequency and concentration. Temperature appears to be a major variable affecting endophyte frequency in field-grown plants.



Carbon use efficiency depends on growth respiration, maintenance respiration, and relative growth rate. A case study with lettuce

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Carbon use efficiency (C_{UE}, the ratio between the amount of carbon incorporated into dry matter and the amount of carbon fixed in gross photosynthesis) is an important parameter in estimating growth rate from photosynthesis data or models. It previously has been found to be relatively constant among species and under different environmental conditions. Here it is shown that C_{UE} can be expressed as a function of the relative growth rate (r_{GR}) and the growth (g_r) and maintenance respiration coefficients (m_r): $1/C_{UE} = 1 + g_r + m_r/r_{GR}$. Net daily carbon gain (C_{dg}), r_{GR}, and C_{UE} were estimated from whole-plant gas exchange measurements on lettuce (*Lactuca sativa* L.) ranging from 24 to 66 days old. Carbon use efficiency decreased from 0.6 to 0.2 with increasing dry mass, but there was no correlation between C_{UE} and C_{dg}. The decrease in C_{UE} with increasing dry mass was correlated with a simultaneous decrease in r_{GR}. From the above equation, g_r and m_r were estimated to be 0.48 mol mol^{-1} and 0.039 g glucose g^{-1} dry matter d^{-1}, respectively. Based on the g_r estimate, the theoretical upper limit for C_{UE} of these plants was 0.68. The importance of maintenance respiration in the carbon balance of the plants increased with increasing plant size. Maintenance accounted for 25% of total respiration in small plants and 90% in large plants.