A-129

Controlled-environment assessment of soybean [*Glycine max* (L.) Merr.] yield response to soil water deficits using 1-m rooting columns

*Michael Gebretsadik Gebre**, Department of Plant Agriculture, University of Guelph, Ontario, Canada

Hugh J. Earl, Department of Plant Agriculture, University of Guelph, Ontario, Canada

Drought stress significantly limits soybean yields in Ontario, Canada, with demonstrated losses ranging from 8-24%. The most important determinant of soybean yield is pod number, and this yield component is determined by the availability of concurrent photosynthate during the first pod (R3) to first seed (R5) growth stages. Controlled-environment phenotyping of soybean germplasm for traits related to drought tolerance is often carried out in artificial media in small pots, where roots easily explore the entire pot volume. Identification of physiological traits, especially rooting traits, to improve drought tolerance in soybean would benefit from controlled environment phenotyping methods that permit the use of mineral soils and produce field-like soil water distributions. We evaluated a controlled environment drought stress simulation method that makes use of lightly amended mineral soil in 1 m long, 10-cm diameter rooting columns. Volumetric soil water content was monitored at multiple depths in the profile using time domain reflectometer. The soybean cultivar *OAC Bayfield* was exposed to three different watering regimes beginning at the R1 stage; tubes were watered to 100, 75 or 50% of the maximum soil water holding capacity. Compared to watering to 100%, watering to 50% significantly reduced biomass accumulation, pods per plant, seed yield, and water use by 49, 41, 38, and 52%, respectively. The 75% treatment was intermittent between the other two treatments for all measured parameters. The overall coefficient of variation for seed yield was low, at 5.6%, suggesting good repeatability of the treatments. These results suggested that the 50% watering protocol was the best treatment for subsequent phenotyping studies. Water stress treatments imposed in this culture system affect yield components in a manner similar to what is observed in the field, with pod number being the yield component most strongly affected.