

Public Abstract

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Title:PLASTICITY OF SOYBEAN (*GLYCINE MAX* (L.) MERRILL) ROOT DEVELOPMENT UNDER MILD WATER DEFICITS

Drought is the major abiotic stress affecting soybean yield. Under drought conditions, plant root systems may exhibit a pronounced increase in growth compared to well-watered plants (developmental plasticity). The additional growth can help sustain a high rate of soil water extraction and promote improvement in yield in dry years. Our objective is to identify soybean lines with genetic diversity in root developmental plasticity in response to soil drying, in order to study the regulatory mechanisms involved. The long-term goal is to incorporate desirable rooting traits into the breeding program to develop drought-tolerant soybeans.

Studies have been conducted at the seedling stage under precisely-controlled water deficits, and during three-week soil drying treatments of plants growing in 1.5 m-deep soil cylinders in controlled-environment chambers. Using the seedling system, native and non-native soybean genotypes were studied. The results showed substantial genetic diversity in the capacity for increased lateral root development (number and total length of roots produced) under water deficit conditions. Studies of the spatial and temporal patterns of lateral root development showed that the promotion of lateral root length under water deficit conditions is due to increased lateral root number rather than earlier root production and/or promotion of root elongation. Genotypes with either superior or inferior root plasticity responses were selected for more detailed studies using the soil cylinder system. The results showed consistent genotypic differences in lateral root development under water deficit conditions between seedlings and more mature plants.