Cereal roots enact austerity measures during drought to bank water

Jose Sebastian

Carnegie Institution for Science, Stanford, USA

Shoot-borne nodal roots often called crown roots form the bulk of the root systems in cereal crops such as maize and rice. While this post-embryonic root system represents the major conduit for water uptake, little is known regarding what effect water availability has on its development. Data demonstrate that in the newly developed cereal crop model plant *Setaria viridis*, the crown locally senses water availability and suppresses post-emergence crown root growth under water deficit. This response was observed in field and growth room environments and in all cereal species tested. Luminescence-based imaging of root systems grown in soil revealed a shift in root growth from crown to primary-root derived branches, suggesting that primary-root-dominated architecture can be induced in *S. viridis* under certain stress conditions. Crown roots of maize and *Setaria italica*, domesticated relatives of teosinte and *S. viridis*, respectively, show reduced sensitivity to water deficit, suggesting that this response may have been influenced by human selection. Enhanced water status of maize mutants lacking crown roots suggests that, under water deficit, stronger suppression of crown roots may actually benefit crop productivity. Several approaches including forward genetics screens are currently employed to explore the interaction between crown root development and water availability.