

content of OsPIP2 protein was decreased in Oszf1 overexpression (OE) plants. MG132 can inhibit the degradation of OsPIP2. The Oszf1 OE plants, with higher leaf related water content (LRWC) and lower leaf water loss rate (LWLR), exhibit enhanced drought resistance.

Whereas, the RNAi plants of Oszf1, with increased LWLR, were more sensitive to drought. These data illustrated that Oszf1 positively regulates the rice drought resistance through promoting the degradation of OsPIP2 protein to enhance water retention capacity.

ID 1247 | Genetic variation in screening upper mid-south soybean lines for a drought tolerant trait: The limited transpiration rate (TRLim)

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Drought conditions in the United States are estimated to result in average annual losses in the range of \$10 to \$14 billion. Identification and integration of genetic traits enabling increased water conservation in plants could provide increased water availability and plant performance during drought. In the upper mid-south of the U.S., soybean is most often grown under rainfed conditions. Therefore, years in which drought and high evaporative demand occur can result in decreased final seed yield. The objective of this study was to develop a high-throughput protocol for phenotyping for drought-tolerance in soybean in the upper mid-south. An aquaporin inhibitor (i.e., silver nitrate) was used to determine the expression of the limited transpiration (TRLim) trait among soybean lines under high vapor pressure deficit (VPD). The advantage of the TRLim trait is that it allows plant water conservation to increase available soil water during late-season drought. A soybean population of 122 recombinant inbred lines

(RIL) derived from crossing of Jackson $\times$ KS4895 was tested by applying 200 μ M silver nitrate to de-rooted soybean shoots under high VPD (>2.5 kPa). Among 122 RILs, half of the population showed higher sensitivity to silver ion than KS4895 (a parent line). However, several lines showed no or limited changes in water loss with the silver treatment. It appears that the silver screening for RILs population DTR offers the initial capacity for discrimination among the studied soybean lines. Therefore, after initial silver ion screening 26 lines were selected for direct measurement of transpiration rate under varying levels of VPD. Among lines with the low DTR rates, 71% expressed the TRLim, with VPD BP ranging from 1.7 to 2.9 kPa, under high VPD. The soybean RILs expressing low DTR should be studied further under field conditions for evaluation as potential drought tolerant parents in a breeding effort.

ID 1248 | How can we use computational models to extend our understanding of water relations in plants

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In the recent years, many computational tools, such as image analysis, data management, process-based simulation and upscaling tools, were developed to help quantify and understand water flow in the soil-root system, at multiple scales (tissue, organ, plant and population). Several of these tools work together or, at least, are compatible. However, for the un-informed researcher, they might

seem disconnected, forming a unclear and disorganised succession of tools. In this presentation, we present how different pieces of work can be further developed by connecting them to analyse soil-root-water relations in a comprehensive and structured network. This explicit network of soil-root computational tools informs the reader about existing tools and help them understand how

their data (past and future) might fit within the network. We also demonstrate the novel possibilities of scale-consistent parameterizations made possible by the

network with a set of case studies from the literature. Finally, we discuss existing gaps in the network and how we can move forward to fill them.

ID 1255 | Multiple integrated root phenotypes are associated with enhanced drought tolerance in maize

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Drought is a primary limitation for crop productivity worldwide. Multiple root phenes have been identified conferring enhanced performance under water deficit stress. Here, we test the hypothesis that multiple distinct integrated root phenotypes are co-optimizing solutions to crop fitness under drought. Using shovelomics and laser ablation tomography, we phenotyped the root anatomy and architecture of 400 mature maize genotypes under well-watered and water-stressed conditions in the field. We found substantial variation in all 23 root architectural and anatomical phenes measured. A phenotypic bulked segregant analysis revealed that bulks representing the best and worst performers under water stress in the field displayed distinct integrated root phenotypes. In contrast to the bulk of poor performers, the integrated root phenotype of the best-performing bulk under drought consisted of greater cortical

aerenchyma formation, more numerous and narrower metaxylem vessels, and thicker nodal roots. Partition against medians (PAM) clustering revealed several clusters of unique root phenotypes related to plant performance under water stress. Clusters associated with improved drought tolerance consisted of phenes that enabled greater soil exploration by reallocating internal resources to greater root construction (increased aerenchyma content, larger cortical cells, fewer cortical cell files), restricted uptake of water to conserve soil moisture (reduced hydraulic conductance, narrow metaxylem vessels), and greater penetrability of hardening, drying soils (thick roots with a larger proportion of stele, smaller distal cortical cells). We propose that integrated root phenotypes associated with improved performance under water stress merit consideration as breeding ideotypes.

ID 1279 | Soil-root hydraulic constraints on transpiration and stomatal regulation in crops

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Although 80 per cent of terrestrial evapotranspiration passes through stomata and transpiration represent by far the largest water flux globally, the fundamental question as to what triggers stomatal closure during drought remains controversial. Droughts is projected to increase in many regions as a results of climate change, yet current models are mainly empirical and hardly capture plant drought responses. It has been shown that closing stomata at high VPD, and hence

conserving water early in the season, confer drought tolerance in specific drought scenarios. Thus, we urgently need to improve our understanding of stomatal response to water deficits in soil and atmosphere.

We propose that stomata close when the water potential at the root-soil interface drops and the soil-plant hydraulic conductance starts to decrease. We used a root pressure chamber to measure the relationship between