Entry No. 8RGS-0015

Category	: 8th Rice Genetics Symposium
Select Theme	: Genetics of Abiotic interactions: Stress tolerance and Mitigation
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Title of Entry	: Initial salt stress signaling: temporal regulation of SERF1 transcription factor activity employing ROS and MAPKs
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Select only one type of presentation	: 15 minute oral presentation
Abstract	: Salinity is one of the most prominent abiotic factors that threatens food security worldwide. Therefore, it is of utmost importance to discover genes regulating salinity tolerance to secure future crop productivity. We recently discovered a reactive oxygen species (ROS) dependent salt stress signaling pathway in rice, which is exclusively active during the initial stress sensing phase. At the heart of this network acts the transcriptional regulator SALT-RESPONSIVE ERF1 (SERF1), which acts as a hub protein for upstream signals to activate transcriptional responses within the first minutes of exposure to salt stress. Here, we present a novel MITOGEN-ACTIVATED PROTEIN KINASE (MAPK) module in rice which acts upstream of SERF1 during salt stress signaling. Activation of SERF1 by the kinase module results in increased transcription factor activity. Rice plants with decreased levels of kinase gene expression show impaired activation of SERF1 target genes and decreased tolerance to salinity stress. Interestingly, activation of the SERF1 signaling pathway requires an oxidative burst generated by NADPH oxidases (NOX). Thus, our data suggest that the identified MAPK module is induced by a NOX-derived ROS signal under salt stress to eventually activate SERF1. SERF1 shows an exquisite spatial and temporal activity that is limited to the initial hour after exposure to salt stress. To understand the temporal dynamics of SERF1 activity we aimed at identifying the underlying mechanism regulating transcription factor inactivation. Through a comprehensive yeast-two-hybrid screen we identified LATENT OPPOSER OF DREB1 (OsLORD1), an uncharacterized nuclear zinc-finger protein, which can interact with

the DNA binding domain of SERF1. Interaction between SERF1 and OsLORD1 results in loss of transcriptional activity, revealing the mechanism that restricts the activity of SERF1. Interestingly, OsLORD1 is responsive to salt stress in a ROS-dependent manner, however, its upregulation occurs independently from the SERF1 signaling module. Taken together, our findings not only reveal the first salt-related MAPK module in rice, but also suggest early branching of the initial ROS signal during salt stress.

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