TRANSCRIPTIONAL REGULATION UNDER SULFUR STARVATION IN ARABIDOPSIS AND MAIZE


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Sulfur is an essential macronutrient for plants growth; it is required for stress-related metabolites and protein biosynthesis. Sulfur assimilation is a multi-step pathway whose first step consists in the uptake of inorganic sulfate from soil. Under S-starvation, early uptake response is mediated by high-affinity sulfate transporter (ST1;1), and then sulfate is activated to adenosine 5'-phosphosulphate (APS) by ATP-Sulfurylase. Genes coding for these enzymes are key point of regulation in sulfur uptake. After activation, sulfate is either reduced for biosynthesis of cysteine or phosphorilated to produce secondary metabolites such as flavonoids. The family of sulfate transporters comprises many isoforms, belonging to 5 groups, according to their cellular localization and function. Arabidopsis and rice have 14 and 15 isoform respectively, whereas only the sequence of the ST1;1 isoform is known in maize.

Aim of this work is to relate transcription regulation of key genes of sulfur metabolism to S-Starvation. We analyzed maize inbred lines and their hybrid to investigate heterosis at gene expression level in sub-optimal growth conditions such as low macronutrient availability. We set out to determine whether gene expression levels of key genes were differently expressed at specific sulfur concentration of growth between inbred lines and hybrid by Real Time PCR. Data clearly show that the F1 hybrid responds much faster to stress condition than either parental lines.

We tested and identified different arabidopsis ecotypes tolerant or susceptible to S-Starvation. Given the accurate annotation of arabidopsis genome, we were able to study the expression levels of many sulfur transporters (ST1;1, ST1;2, ST2;1, ST5;2) and ATP-Sulfurylase by Real Time PCR in different ecotypes.

The existance of epigenetic regulation in these genes was also investigated. Northern analysis and NESTED-RACE-PCR suggest that miR395 regulates ATP-Sulfurylase in maize and arabidopsis.