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atsmr17 modulates glucose responses through cysteine- and AMP-dependent manner in Arabidopsis

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Cysteine (Cys) and AMP are products of sulfate metabolism. Cys is an essential amino acid for protein and peptide synthesis or reduced sulfur donor for biosynthesis of methionine, coenzyme or cofactor, while AMP (Adenosine Monophosphate) is a monomer in the production of RNA and joins in many metabolism processes. However, whether theirs metabolism involved in abiotic stress adaptation in Arabidopsis remains largely unclear. Here, we identified atsmr17 (Arabidopsis thaliana sulfate metabolism related 17), a double mutant, that suppressed the insensitively of the parental line atrzf1 (Arabidopsis thaliana ring zinc finger 1) to glucose (Glc) treatment via reducing Cys and AMP accumulations. Under high Glc condition, the level of atsmr17 was significant induced. Losing function of atsmr17 leads to decrease the physiological phenotype including the germination rate, cotyledon greening, root and shoot differentiation. Interestingly, Glc response differently exhibited between root and shoot depend on atsmr17 levels. Besides, qPCR analysis of the genes involved in primary sulfate pathway exhibited significantly lower in atsmr17 leads to reduced 60% and 80% Cys contents compare to WT and atrzf1, respectively. Moreover, the atsmr17-overexpressing line displayed hyper-insensitive under high Glc concentration treatment manifested by the stress insensitive parameters and also by increased the proline, Cys, and AMP contents. Noticeably, apply exogenous Cys and AMP lead to rescue the phenotype of atsmr17 under high Glc treatment. Taken together, our results indicate that atSMR17 plays a role in high Glc response through modulating the sulfate metabolism in which related to Cys and AMP accumulations in Arabidopsis.

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