A novel stress-induced sugarcane gene confers tolerance to drought, salt and oxidative stress in transgenic tobacco plants

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Plants are frequently subjected to variable periods of water deficits during their life cycle. Additionally, in numerous areas on the earth high soil salinity is observed. Many novel stress-induced genes putatively linked to drought and salt stress have been identified and theirs function in stress response remains unknown. These genes have the potential to contribute to develop plant with higher tolerance to harmful conditions such as drought and salt stress. New plant varieties with increased tolerance to water scarcity would benefit growers and could be important to increase agricultural sustainability. In a previous work, we identified a sugarcane gene encoding a protein with unknown function that was differentially expressed under drought stress. This gene was named *Scdr1* (for sugarcane drought-responsive) and encodes a protein with unknown function. We used transgenic tobacco plants overexpressing *Scdr1* gene to evaluate its role in protecting plant from drought and salt stress. Photosynthetic parameters in the transformed and non-transformed plants under control and stressed conditions were measured: transpiration rate (E), net photosynthesis (A), stomatal conductance (gs), internal leaf CO_2 concentration (Ci) and respiration (R). Daily measurements were taken along ten days (time of stress) and also for three days after a recovery period (hydration). Under stressed conditions, all these physiological variables were negatively affected by both drought and salt stress in wild type (WT) and transgenic *Scdr1* plants. However, in transgenic plants all the physiological variables returned close to control conditions once they were allowed to recover from drought and salt stress. Drought and salt stress also reduced the water content in both WT and *Scdr1* transgenic plants. Nevertheless, *Scdr1* transgenic plants retained more water than WT plants. Additionally, tolerance to oxidative stress was analyzed by exposing leaf discs to different concentration of H_2O_2 for 12, 24, 36, and 48 h. *Scdr1* transgenic plants showed higher percentage of total chlorophyll in all the times evaluated in comparison with WT plants. Finally, the overexpression of this gene increased germination of transgenic tobacco seeds under drought and salt stress. Our data indicated that overexpression of *Scdr1* have a positive impact on plant tolerance to drought and salt stress and highlight the potential of genes with unknown function for biotechnological purposes. Further work will be performed to elucidate how this gene aids to improve tolerance to abiotic stress in crop species such as sugarcane.

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