Isolation of the \textit{P5CS} gene from reed canary grass and its expression under salt stress

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ABSTRACT: Reed canary grass (RCG) is a perennial grass traditionally cultivated for forage. It is also used as fuel to produce energy in Finland and Sweden, and other countries have expressed interest in the cultivation of RCG. In China, arable land is limited. Salinity is considered to be a major factor limiting plant crop development and productivity. To boost biofuel production of RCG and extend its range in saline soil, we seek to improve its salt tolerance. Proline acts as an osmolyte that accumulates when plants are subjected to abiotic stress. \textit{P5CS} plays a crucial role in proline biosynthesis. We isolated a \textit{P5CS} gene from RCG, designated \textit{B231P5CS} (GenBank accession No. JQ622685). \textit{B231P5CS} is a fragment (971 bp) that encodes a 323-amino acid polypeptide. We also cloned an actin gene fragment from RCG as a reference gene in expression analysis of \textit{B231P5CS} gene. Expression analysis revealed that \textit{B231P5CS} transcripts were upregulated in leaves after treatment with salt (200 mM NaCl) and that transcript levels of \textit{B231P5CS} reached a maximum 12 h after exposure, which was 14.69
times the level in control plants. The trends of expression were exactly opposite in roots; transcripts were downregulated after salt treatment. Proline concentration increased in leaves after stress. In contrast, proline content of roots decreased up to 3.6-fold relative to controls. Changes in proline concentration after stress were correlated with $B231P5CS$ expression. Our results suggest that $B231P5CS$ is a stress-inducible gene and plays a non-redundant role in plant development. This gene may be used to improve stress tolerance of RGC and other bioenergy feedstock.

**Key words:** Reed canary grass; $P5CS$; Gene clone; Salt stress