Public Abstract

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Title:FUNCTIONAL ANALYSIS OF DROUGHT RESPONSIVE SOYBEAN GmNAC003 AND GmNAC004 TRANSCRIPTION FACTORS IN LATERAL ROOT DEVELOPMENT IN ARABIDOPSIS

NAC (CUC, ATAF and NAM) transcription factors have been found to promote lateral root (LR) numbers in Arabidopsis through the auxin signaling pathway. In soybean, a majority of genotypes increased LR number in response to water deficit. With the hypothesis that drought inducible soybean NAC transcription factors may be involved in the regulation of this enhanced LR number, two soybean GmNAC003 and GmNAC004 genes were included in the study.

GmNAC003 and GmNAC004 showed a high expression level in roots, leaves and flowers of soybean cultivar Williams 82. They were strongly induced by drought stress and moderately induced by abscisic acid (ABA). GmNAC004 but not GmNAC003 showed a moderate response to treatment of 2,4-dichlorophenoxyacetic acid (2,4-D). Arabidopsis transgenic GmNAC003 plants did not show any response, while the transgenic GmNAC004 plants showed an increase in LR number and length under non-stress conditions. The GmNAC004 plants also maintained a higher LR number and length than the wild-type (WT) under mild water stress conditions. Treatment with ABA suppressed LR number more in the wild type than in the GmNAC004 transgenic plants suggesting that GmNAC004 counteracts ABA-induced inhibition of LR number. Treatment with 2,4-D increased LR in both GmNAC004 transgenic and WT plants but the promotion was higher in the transgenic plants. Conversely, treatment with Naphthylphthalamic acid inhibited LR number and resulted in no difference in the trait between the transgenic GmNAC004 and WT plants. These results suggest that GmNAC004 suppresses ABA while promoting auxin signaling to increase LR number in Arabidopsis.