

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

Truyen Ngoc Quach

Dr. Henry T. Nguyen, Dissertation Supervisor

ABSTRACT

Several NAC transcription factors 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. It is possible that drought inducible soybean NAC may be involved in the regulation of this enhanced LR number.

Two drought responsive soybean *GmNAC003* and *GmNAC004* genes were included in the study. They were moderately induced by abscisic acid (ABA) and *GmNAC004* but not *GmNAC003* showed a response to 2,4-dichlorophenoxyacetic acid (2,4-D) treatment. Arabidopsis transgenic plants overexpressing *GmNAC003* did not show response, while the transgenic *GmNAC004* plants showed an increase in LR number and length under non-stress. The *GmNAC004* plants also maintained higher LR number and length than the wild-type (WT) under mild water-stress conditions. ABA treatment suppressed LR number more in the wild type than in the *GmNAC004* transgenic plants suggesting that *GmNAC004* counteracts ABA-induced inhibition of LR number. 2,4-D treatment increased LR in both *GmNAC004* transgenic and WT plants but the promotion was higher in the transgenic plants. Conversely, Naphthylphthalamic acid treatment 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*.