The Hv NAC6 transcription factor: a positive regulator of penetration resistance in barley and Arabidopsis

Pathogens induce the expression of many genes encoding plant transcription factors, though specific knowledge of the biological function of individual transcription factors remains scarce. NAC transcription factors are encoded in plants by a gene family with proposed functions in both abiotic and biotic stress adaptation, as well as in developmental processes. In this paper, we provide convincing evidence that a barley NAC transcription factor has a direct role in regulating basal defence. The gene transcript was isolated by differential display from barley leaves infected with the biotrophic powdery mildew fungus, Blumeria graminis f.sp. hordei (Bgh). The full-length cDNA clone was obtained using 5'-RACE and termed HvNAC6, due to its high similarity to the rice homologue, OsNAC6. Gene silencing of HvNAC6 during Bgh inoculation compromises penetration resistance in barley epidermal cells towards virulent Bgh. Complementing the effect of HvNAC6 gene silencing, transient overexpression of HvNAC6 increases the occurrence of penetration resistant cells towards Bgh attack. Quantitative RT-PCR shows the early and transient induction of HvNAC6 in barley epidermis upon Bgh infection. Additionally, our results show that the Arabidopsis HvNAC6 homologue ATAF1 is also induced by Bgh and the ataf1-1 mutant line shows decreased penetration resistance to this non-host pathogen. Collectively, these data suggest a conserved role of HvNAC6 and ATAF1 in the regulation of penetration resistance in monocots and dicots, respectively.

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