Involvement of BrNAC041 in ABA-GA antagonism in the leaf senescence of Chinese flowering cabbage

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Abstract

Phytohormone abscisic acid (ABA) and gibberellins (GAs) are well-known to be antagonistic in mediating plant development processes. However, the underlying molecular mechanism of this antagonism in leaf senescence of economically important leafy vegetables is largely unclear. In this study, we report that a Chinese flowering cabbage NAC transcription factor BrNAC041, mediated the ABA-antagonized GA accumulation in ABA-induced leaf senescence. Exogenous ABA treatment accelerated Chinese flowering cabbage leaf senescence, with decreasing maximum quantum yield (Fv/Fm) and total chlorophyll content, as well as up-regulating the expressions of senescence-associated genes. Notably, ABA treatment enhanced endogenous ABA accumulation and reduced GA_3 level in senescing leaves. Consistently, down-regulation of one ABA catabolism gene *BrCYP707A3* and two GA biosynthesis genes *BrKAO2* and *BrGA20ox2* was observed following ABA application. Furthermore, a NAC transcription factor, BrNAC041, a homolog of Arabidopsis ANAC041, was isolated and characterized. BrNAC041 was senescence-/ABA-up regulated and localized in the nucleus acting as a transcriptional repressor. Further *in vitro* and *in vivo* experiments demonstrated that BrNAC041 repressed *BrCYP707A3*, *BrKAO2* and *BrGA20ox2* transcription by targeting their promoters via the NAC-binding sequence (NACBS). Collectively, our findings reveal BrNAC041 as a novel regulator involved in the antagonism of ABA on GA in the leaf senescence of Chinese flowering cabbage, through the transcriptional repression of ABA catabolic and GA biosynthetic genes.