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Voltage-dependent Anion Channel (*TaVDAC*) from *Triticum aestivum* Regulated Seed Germination by Interacting with Endogenous GA Biosynthesis Pathway

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[Introduction]

Damage to wheat pre-harvest sprouting (PHS) is emerging as a major problem due to climate change. PHS and seed germination are regulated through various genetic mechanisms and interactions. In a previous study, we found that the expression of voltage-dependent anion channel (*VDAC*) was altered under PHS conditions through transcriptome analysis. VDAC is a mitochondrial outer membrane protein and is a gene involved in apotosis and pre-mature. However, the correlation between *VDAC* and PHS and seed germination has not been studied. We analyzed the association of *VDAC* with PHS and early germination stages.

[Materials and Methods]

PHS and seed germination experiments were performed using monocotyledonous crops (wheat and barley) and model plant (*brachypodium distachyon*). For wheat, 'Keumgang' a cultivar susceptible to PHS, and 'Woori' a cultivar resistant to PHS, were used. In the case of barley, a pre-mature cultivar 'K800' was used. *Brachypodium* was used as mutants in which the *VDAC* gene was overexpressed and knocked out. Seed germination experiments were carried out by adding plant growth-related hormones in half-MS medium. Each treated spike and seed were sampled for qRT-PCR analysis, and the endogenous GA content of *vdac* knockout lines was measured to analyze the association between *VDAC* and GA.

[Results and Discussion]

It was confirmed that *VDAC* expression was increased in wheat germination occurred in 'Keumgang' and 'Woori', treated with PHS, and expression was suppressed when ABA, a growth inhibitory phytohormone, was treated. in germinated barley, the expression pattern of *VDAC* was changed by exogenous GA, and it was confirmed that it was in tissues with active cell division such as shoots and roots. It was confirmed that germination was restored by exogenous GA in *brachypodium vdac* knockout lines, and a significant change was shown in the expression of genes in the early stage of GA biosynthesis. In contrast, overexpression lines did not show changes in the expression of GA biosynthesis genes and germination levels. Knockout lines showed delayed growth and resistance to PHS. In addition, as a result of measuring endogenous GA content in knockout lines, a decrease in active GA, and an increase in inactive GA were confirmed, supporting the previous results. Through this, *VDAC* will affect the change of endogenous GA content by regulating the expression of genes in the early stage of GA biosynthesis during seed germination.

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