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# Effect of water stress on the gene expression of the HD-Zip I subfamily in soybean

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Drought is one of the major factors responsible for damage in Brazilian soybean production. The objective of this work was to analyze the gene expression of the HD-Zip I subfamily and its involvement in drought tolerance in soybean using the real time PCR technique. Trifoliate soybean leaves of drought tolerant (Embrapa 48) and susceptible (BR-16) genotypes were evaluated under three levels of water deficit: absence of water stress (mock), moderate water stress (-1.5 MPa), and severe water stress (-3.0 MPa). Total RNA was extracted and cDNA libraries were constructed according to the manufacturer's recommendations. The Gmβ-actin gene was used for an endogenous control and all reactions were repeated in triplicate. From our results, we could see that there was a differential expression of genes GmHB6, GmHB13, GmHB21 caused by drought stress. Among the three genes studied, GmHB13 was clearly induced by water stress. GmHB13 was induced only in the tolerant genotype, while it has reduced expression in the susceptible genotype. Super-expression of heterologous genes in *Arabidopsis thaliana* transgenic plants increases drought tolerance. These observations suggest that this gene is contributing to a higher drought tolerance in the tolerant genotype. Moreover, the induction of gene, GmHB21 in both genotypes, suggests that this gene may be controlling the expression of drought acclimation genes not directly related to the mechanism of tolerance. The greatest reduction in expression of the GmHB6 gene in the susceptible genotype may be related to a longer dehydration of this genotype, whereas it quickly reaches the severe water stress. The growth reduction is stronger in the susceptible genotype, which may be due to greater reduction in the expression of transcription factor GmHB6, which would have an important role in controlling cell division. The analysis of the promoters showed the presence of cis-regulatory elements related to water stress in the three genes studied. Together, these results indicate the gene GmHB13 as a strong candidate to participate in the mechanism of drought tolerance in soybean. These analyses represent the first steps towards understanding the mechanisms of control of HD-Zip gene expression in response to drought.

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