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Molecular, anatomical and physiological properties of a genetically modified soybean line transformed with *rd29A:AtDREB1A* for the improvement of drought tolerance

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ABSTRACT. We evaluated the molecular, anatomical and physiological properties of a soybean line transformed to improve drought tolerance with an *rd29A:AtDREB1A* construct. This construct expressed dehydration-responsive element binding protein DREB1A from the stress-inducible *rd29A* promoter. The greenhouse growth test included four randomized blocks of soybean plants, with each treatment performed in triplicate. Seeds from the non-transformed soybean cultivar BR16 and from the genetically modified soybean P58 line (T_2 generation) were grown at 15% gravimetric humidity for 31 days. To induce water deficit, the humidity was reduced to 5% gravimetric humidity (moderate stress) for 29 days

and then to 2.5% gravimetric humidity (severe stress). *AtDREB1A* gene expression was higher in the genetically modified P58 plants during water deficit, demonstrating transgene stability in T_2 generations and induction of the *rd29A* promoter. Drought-response genes, including *GmPI-PLC*, *GmSTP*, *GmGRP*, and *GmLEA14*, were highly expressed in plants submitted to severe stress. Genetically modified plants had higher stomatal conductance and consequently higher photosynthetic and transpiration rates. In addition, they had more chlorophyll. Overexpression of *At*DREB1A may contribute to a decrease in leaf thickness; however, a thicker abaxial epidermis was observed. Overexpression of *At*DREB1A in soybean appears to enhance drought tolerance.

Key words: Anatomy; Gene expression; *Glycine max*; Physiology; Water deficit; DREB1A

