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# AtAREB1 overexpression in cotton enhances water use efficiency but not improve growth in response to mild drought

*Ana Karla Moreira Lobo, Carolina Vianna Morgante , Eliezer Araujo Guilherme, Fabricio Eulalio Leite Carvalho, Vicente Thiago C. B. Alencar, Maria Eugênia Lisei-de-Sá, Maria Fatima Grossi de Sa, Joaquim Albenisio G. Silveira,*

*Universidade Federal do Ceará, Embrapa Recursos Genéticos e Biotecnologia, Universidade Federal do Ceará, Universidade Federal do Ceará, vicentethiagro@gmail.com , Embrapa Recursos Genéticos e Biotecnologia, Embrapa Recursos Genéticos e Biotecnologia, Universidade Federal do Ceará,*

Plants have evolved complex mechanisms to cope efficiently with drought. Abscisic acid (ABA)-responsive element binding (AREB) proteins are a family of ABA-dependent transcription factors that control the expression of stress-induced genes to improve drought tolerance. It has been hypothesized that overexpression of AREB1 constitutively active is able to increase plant water deficit resistance. To test this, cotton plants overexpressing AtAREB1ΔQT, including three independent lines (OE1, OE2 and OE3), and wild type (WT) at inflorescence emergence stage were subjected to well-watered (WW, control), water deficit (WD) for 5 days and subsequently rewatered (WR) for 24-h in a greenhouse. Transgenic lines showed a stunted growth in all water treatments as compared to WT. In parallel, these transformed plants did not exhibit changes in photosynthesis and water status in comparison to WT under WW. After WD, the relative water content decreased and membrane damage increased equally in all plants by 23%, indicating a mild WD. Photosynthesis and growth were negatively affected by WD, but in less extent in OE lines than in WT. Transgenic plants exhibited higher CO2 assimilation, stomatal conductance (gS) and water use efficiency (WUE) under WD and higher gS after WR compared to WT. Nevertheless, PSII and PSI efficiencies were lower in OE lines compared to WT in WD condition. Total biomass and root/shoot ratio of rewatered plants was much lower in OE lines than WT plants. Our data suggest that AREB1 overexpression increase WUE, decrease photochemical activity, but did not improve growth under mild drought. Further studies are needed to deeply investigate the role of this gene in plant drought tolerance.

Keywords: Photosynthesis, Stress, Abscisic acid, Gossypium hirsutum L.,