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Stress Inducible Overexpression of *AtHDG11* Leads to Improved Drought and Salt Stress Tolerance in Peanut (*Arachis hypogaea* L.)

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Peanut is an important oilseed and food legume cultivated as a rain-fed crop in semi-arid tropics. Drought and high salinity are the major abiotic stresses limiting the peanut productivity in this region. Development of drought and salt tolerant peanut varieties with improved yield potential using biotechnological approach is highly desirable to improve the peanut productivity in marginal geographies. As abiotic stress tolerance and yield represent complex traits, engineering of regulatory genes to produce abiotic stress-resilient transgenic crops appears to be a viable approach. In the present study, we developed transgenic peanut plants expressing an *Arabidopsis* homeodomain-leucine zipper transcription factor (*AtHDG11*) under stress inducible *rd29A* promoter. A stress-inducible expression of *AtHDG11* in three independent homozygous transgenic peanut lines resulted in improved drought and salt tolerance through up-regulation of known stress responsive genes (LEA, HSP70, Cu/Zn SOD, APX, P5CS, NCED1, RRS5, ERF1, NAC4, MIPS, Aquaporin, TIP, ELIP) in the stress gene network, antioxidative enzymes, free proline along with improved water use efficiency traits such as longer root system, reduced stomatal density, higher chlorophyll content, increased specific leaf area, improved photosynthetic rates, and increased intrinsic instantaneous WUE. Transgenic peanut plants displayed high yield compared to non-transgenic plants under both drought and salt stress conditions. Holistically, our study demonstrates the potentiality of stress-induced expression of *AtHDG11* to improve the drought, salt tolerance in peanut.

Keywords: peanut, *AtHDG11* (*Arabidopsis Homeodomain globarous11*), drought stress, high-salinity stress, water use efficiency, yield potential

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INTRODUCTION

Peanut or groundnut (*Arachis hypogaea* L.) is globally important legume crop belonging to the Fabaceae family. Grown for its oil content, feed for both human, and livestock, it forms a major revenue source for marginal farmers as well as for the commercial producers. About 60% of the world peanut production comes from the semi-arid tropics (SAT) such as Africa, Asia, North, and South America, where extremes of temperature, drought, and soil salinity are predominant