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IDT9-023 | Genetically transformed chickpea (*Cicer arietinum* L.) carrying transcription factor, *AtDREB1a* improves drought tolerance through modifying water relation and photosynthesis

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Drought tolerance is a polygenic character resulting from expression or upregulation of genes modifying the response of crops to drought stress. *AtDREB1A* are an important APETALA2 (AP2)/ ethylene responsive factor (ERF) group of plant transcription factors that induce set of abiotic stress tolerant genes involved in various absicic acid (ABA) dependent as well as independent regulatory mechanisms. Transgenic chickpea lines harbouring the transcription factor, *AtDREB1A* gene driven by stress inducible promoter *rd29a,* were developed and phenotyped under *dry down* conditions. The results revealed modification of many physiological processes in genetically modified chickpea variety, DCP 92-3, which have cumulatively affected the water relation characteristics. These transgenic lines exhibited higher relative water content (RWC) and longer chlorophyll retention capacity, under declining soil moisture at root zone (approx. 7% closer to wilting point), as compared to control non transformed cultivar, DCP 92-3. Some of the transgenic lines exhibited higher osmotic adjustment, which was inherently lacking in the chickpea cultivar, DCP92-3. The enhanced osmotic solute accumulation imparted tolerance through higher membrane stability as evidenced by intact membrane bound photosynthetic electron transport preventing photo inhibition at high irradiance levels with reduced minimal fluorescence (*Fo*) and maintained enhanced quantum yield (Fv/Fm). Based on precise phenotyping, involving non-invasive chlorophyll fluorescence imaging, followed by carbon isotope discrimination ($\Delta^{13}C/^{12}C$), osmotic adjustment and membrane stability, it can be concluded that *AtDREB1A* transgenic chickpea lines are physiologically better adapted to water deficit.

IDT9-024 | Isolation and characterization of stress inducible promoters from *Pennisetum glaucum* and their role in abiotic stress adaptation

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Abiotic stresses including drought, salinity, oxidative stress, extreme temperatures and a combination of these stresses cause immense loss to agricultural crop production. These losses could be immensely reduced if the crops were able to tolerate these above mentioned conditions. This can be overcome by developing transgenic plants with stress inducible promoters with specific genes. Stress-inducible promoters have previously been identified, but there is a shortage of efficient promoters for gene expression that display favorable characteristics in their native plants as well as in xenogeneic species. In the present study five stress inducible promoters PgApx, PgDhn and PgHsc70, PgLea, PgHsp10 were isolated and functionally validated in the tobacco plants. Five stress inducible promoters were isolated using genome-walking method. Further, all five promoters were subjected to *cis*-motif analysis and identified several stress inducible and tissue specific *cis*-acting elements. These five full-length promoters were fused with *uid*A gene in plant transformation vector pMDC164 and transferred to tobacco. Putative transgenic positive plants were confirmed by PCR and positive plants advanced for T1 and T2 generations. Homozygous T2 transgenic plants were analysed for their tolerance to these stresses. The PgApx pro, PgDhn pro, PgHsc70, PgLea, PgHsp10 pro offers advantages over constitutive promoters to produce genetically modified tolerant crops to these adverse conditions. In summary, PgHsc70 pro is active in high temperatures, PgDhn pro in heat, cold and drought and PgApx pro in drought stress, PgLea pro in heat and drought, PgHsp10 pro in control, heat, cold, salt and drought stress treatments.