

Enhanced Iron Accumulation in Chickpea Through Expression of Iron-Regulated Transport and Ferritin Genes

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Abstract : Iron deficiency is a worldwide problem affecting both developed and developing countries. Currently, two major approaches namely iron supplementation and food fortification have been used to combat this issue. These measures, however, are limited by the economic status of the targeted demographics. Iron biofortification through genetic modification to enhance the inherent iron content and bioavailability of crops has been employed recently. Several important crops such as rice, wheat, and banana were reported successfully improved iron content via this method, but there is no known study in legumes. Chickpea (*Cicer arietinum*) is an important leguminous crop that is widely consumed, particularly in India where iron deficiency anaemia is prevalent. Chickpea is also an ideal pulse in the formulation of complementary food between pulses and cereals to improve micronutrient contents. This project aims at generating enhanced iron accumulation and bioavailability chickpea through the exogenous expression of genes related to iron transport and iron homeostasis in chickpea plants. Iron-Regulated Transport (IRT) and Ferritin genes in combination were transformed into chickpea half-embryonic axis by agrobacterium-mediated transformation. Transgenic independent event was confirmed by Southern Blot analysis. T3 leaves and seeds of transgenic chickpea were assessed for iron contents using LA-ICP-MS (Laser Ablation - Inductively Coupled Plasma Mass Spectrometry) and ICP-OES (Inductively Coupled Plasma Optical Emission Spectrometry). The correlation between transgene expression levels and iron content in T3 plants and seeds was assessed using qPCR. Results show that iron content in transgenic chickpea expressing the above genes significantly increased compared to that in non-transgenic controls.

Keywords : iron biofortification, chickpea, IRT, ferritin, Agrobacterium-mediated transformation, LA-ICP-MS, ICP-OES

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