A novel WD-40 gene from *Arabidopsis thaliana* involved in Zn^{2+} and cold tolerance

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Abstract

Hypozincemia (zinc deficiency) is one of the prevalent malnutrition challenges our world is facing. Conservative estimates suggest that 25% of the world's population is at risk of zinc deficiency [1,2]. As an initiative to aid biofortification research and development endeavors, we adopted a forward genetics approach to identify molecular components of the Zn homeostasis network in plants. We screened EMS mutagenized second generation seeds of *Arabidopsis thaliana* for zinc hypersensitive mutants. Mapping of one of the **I**ncreased **Z**inc **S**ensitivity mutants, IZS 288, lead to the identification of a novel WD-40 gene involved in root architecture control, chilling tolerance and zinc homeostasis. Homologs of this gene are found in humans, *D. melanogaster*, *C. elegans*, *X. laevis* etc. However, function is unknown in all of these species. A point mutation in the conserved region of one of the WD-40 motifs created a strong hypersensitivity particularly towards zinc, indicating its involvement in the regulation of zinc availability within the cell. In addition, reduction in the primary root length, increased lateral root density and high chilling sensitivity at an early stage of development are observed, which indicate involvement of the gene in phytohormone activity, in particular auxin and cytokinin.

Reference:

1. Maret W, Sandstead HH (2006). "Zinc requirements and the risks and benefits of zinc supplementation". *J Trace Elem Med Biol* **20** (1): 3–18.
2. Palmgren, M.G., Clemens, S., Williams, L.E., Krämer, U., Borg, S., Schjørring, J.K., Sanders, D. (2008) Zinc biofortification of cereals: problems and solutions. *Trends Plant Sci.* **13**: 464-473