

An Exhaustive Search for the Inositol 1,4,5-triphosphate Receptor Protein in Plants

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Abstract: Inositol 1,4,5-triphosphate (IP3) plays an integral role in the signal transduction cascade of the inositol phospholipid signalling pathway in eukaryotes. In humans and other animals the protein ITPR forms a ligand gated Calcium-ion channel that binds IP3, and releases a store of Calcium 2+ ions from the endoplasmic reticulum. In plants similar reactions to the introduction of IP3 to the cell cytoplasm have been described. However, in higher plants an ITPR protein homolog has not been identified, neither has a protein with similar IP3 binding activity. An exhaustive search for possible candidates with IP3 binding activity in plants has been performed. Whole protein and binding site specific hidden Markov models were built using JackHMMER3 from homologous ITPR seed sequences taken from across the tree of life. Each model was then scored against all plant protein sequences, and 6-frame translated nucleotide sequence. Major protein hits were sent to structure prediction servers to find supporting evidence for the presence of an IP3 binding core domain. A map of the distribution of ITPR homologs over all sequenced genomes is presented. Including those found to be present at the root of plant phylogeny in both single (*Chlamydomonas reinhardtii*) and multi celled (*Volvox carteri* f. *nagariensis*) green algae. However, we have found that the IP3 binding mechanism of ITPR is likely to be totally absent from higher plants.

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