Mitochondrial calcium regulation in plants literature reviews examples

Education, Discipline

In plant cells, the mitochondria are the parts that produce the energy needed for the plants' growth and development and also for the plants to perform their essential functions. (McBride, Neuspiel &Wasiak 2006; Henze &Martin 2003). It can therefore be said that Mitochondria plays a very crucial role in plant cells as it is the major producer of ATP through oxidative phosphorylation (Kuhn et al 2009). It possesses many distinctive properties enabling it to work with specialized features of plant cell metabolism. (McBride, Neuspiel &Wasiak 2006). Several metabolic processes occur in the mitochondria and chloroplasts which play a very important role in the sustainability of plants, both organelles are combined compactly into the regulatory networks of the cell. (Henze & Martin 2003)

The regulation by calcium has not been described for prokaryotes, it is therefore considered that calcium possesses an eukaryotic trait (Emelyanov 2003). However, there are evidences that assert that calcium regulations exist in mitochondria and chloroplasts, but the influence of calcium on chloroplast and mitochondrial processes is yet to be well comprehended. (Chigri et al 2006). Recent studies have shown that calcium has an impact during the import of nuclear encoded proteins into plant mitochondria. (Kuhn et al 2009). Majority of the mitochondrial proteins are encoded in the nucleus and are trans-located into the organelle where they get sorted respectively into the sub-compartments. (Cooper 2000). Proteins present in the inner membrane and in the mitochondrial matrix are trans-located by the TIM22 or TIM23 complex. (Kuhn et al 2009). This trans-location is usually inhibited by the calcium ionophores whose effect can be neutralized if an external calcium is added. (Kuhn et al 2009). It is therefore obvious that calcium's

regulation of protein import into mitochondria appears as a plant specific trait and studies have shown a similarity in calcium regulation in plants mitochondria and the protein import (Chigri et al 2005; Zielinski 1998). Another study done using Z. Mays and A. Sativa also reveals that calcium regulated NAD kinase isoform is situated in the membranes of the mithochondria. (David et al 2004)

It is therefore obvious that calcium dependent signalling pathways are involved in a huge number of biological processes in response to hormones, biotic/abiotic stress signals and a variety of developmental cues. (Johanna et al 2009; Hajnóczky et al 2006)

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