



EMBRYOGENIC COMPETENCE ACQUISITION IN SUGARCANE CALLUS IS ASSOCIATED WITH DIFFERENTIAL H⁺ PUMP ABUNDANCE AND ACTIVITY

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Somatic embryogenesis is an important biological process in several plant species, including sugarcane. During somatic embryogenesis in sugarcane, it is possible to observe two callus types, embryogenic and non-embryogenic, in which only embryogenic callus have the embryogenic competence to differentiate somatic embryos. Proteomics approaches have shown that H⁺ pumps are differentially regulated during somatic embryogenesis; however, the relationship between H⁺ flux and embryogenic competence is still unclear. This work aimed to elucidate the association between extracellular H⁺ flux and somatic embryo maturation in sugarcane. We performed a microsomal proteomics analysis and analyzed changes in extracellular H⁺ flux and H⁺ pump (P-H⁺-ATPase, V-H⁺-ATPase and H⁺-PPase) activity during maturation of embryogenic and non-embryogenic callus of sugarcane. A total of 657 proteins were identified, 16 of which were H⁺ pumps. We observed that P-H⁺-ATPase and H⁺-PPase were more abundant in embryogenic callus. Compared with non-embryogenic callus, embryogenic callus showed high H⁺ influx, especially at maturation day 14 as well as higher H⁺ pump activity, mainly P-H⁺-ATPase and H⁺-PPase activity. The H⁺-PPase appears as major H⁺ pump in embryogenic callus during somatic embryos formation, presenting a dual function, vacuole acidification through H⁺ transport into to vacuole and PPi homeostasis due to its high hydrolytic activity in embryogenic callus at 14 days on maturation treatment. These results provide evidence for an association of higher abundance of H⁺ pumps proteins, and consequently a higher H⁺ flux with embryogenic competence acquisition in callus of sugarcane, in which the ionic homeostasis of the embryogenic callus is essential for the somatic embryo production.

Keywords: Somatic embryogenesis, Ion-selective vibrating probe, Microsomal proteomics.

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