

Plant transglutaminases. Cloning and characterization of the rice transglutaminase TGO

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Abstract

Transglutaminases (TGases, EC 2.3.2.13) catalyze post-translational modification of proteins by establishing ϵ -(γ -glutamyl) links and producing high molecular weight conjugates. Their interest is focussed on clinical applications (neurodegenerative diseases, blood coagulation, etc.), food additives (texturing agents), wool textiles and biopolymers. Plant TGases are poorly characterized and only the maize plastidial TGase gene (*tgz*) related to photosynthesis processes had been cloned. As part of a project to characterize new TGases in plants, here we present the identification, cloning and characterization of rice (*Oryza sativa*) TGase gene. From the two maize *tgz* cDNA clones encoding maize chloroplast TGases (*tgz*), and using differential primers designed from the rice *tgz* homologous DNA sequence, a 1767 bp cDNA was obtained. A homologous DNA fragment in chromosome 4 of the rice karyotype was localized. The deduced protein sequence contained the TGase catalytic triad (Cys-His-Asp), three repeats, some myristoylation domains, and a leucine zipper motif. Confocal and MET immunolocalization indicated that the protein is not only in the grana chloroplasts but, as a differential characteristic, in protein vesicles near the chloroplasts and in the bulliform cells wall. The *E.coli* over-expressed TGO protein showed specific activity regulation characteristics, such as calcium and light dependence, plant substrate preference and cross-linking activity. In rice leaves, *tgo* mRNA expression, TGase activity and immunoblot analyses indicated that TGO expression was light dependent and regulated by the illumination period. Using proteomic and transcriptomic approaches, the related TGO chloroplastic proteins are analyzed. Results are discussed with respect to rice TGase functionality, and possible applications.

Biography

Mireya Santos is actually a collaborator researcher at the Department of Chemical and Biomolecular Nanotechnology of the Institute of Applied Chemistry of Catalonia (Barcelona, Spain). She got his Ph D in Biology at the Universit of Barcelona in 1985. Until 2013, she was working as a researcher at the Plant Molecular Genetics Department of the Center of Research on Agricultural Genetics, CRAG (CSIC-IRTA-UAB-UB), working on genetics and proteomics of the enzyme Transglutaminase (TGase) on plants, the first TGase cloned in plants, including heterologous protein expression. Dr. Santos has leathered many Masters and PhD Thesis, formed part of numerous committees and national and international research groups, always working on molecular and cellular plant biology.