Using Sugarcane as a Biofactory for Therapeutic Proteins

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Transgenic plants represent a promising system for expressing recombinant proteins due mainly to the low risk of contamination and environmental footprint. Plant-based recombinant proteins should be produced in commercially viable quantities to make the production system rentable. Sugarcane is one of the most efficient field crops in converting sunlight and water into biomass, and hence it has a great potential as a biofactory for the production of high-value therapeutic proteins at commercial levels. The specific goal of this project is to develop an efficient expression system in sugarcane for the production of a recombinant protein with antiviral and antitumor activities. We have previously generated several varieties of transgenic sugarcane by overexpressing the therapeutic protein under the control of the constitutive *maize ubiquitin 1* (Ubi1) promoter, and we have recovered protein expression levels up to 0.1% of total soluble protein (TSP). Currently, we have transformed the same varieties with the therapeutic protein under the control of stem-regulated promoters to boost expression to levels that are higher than those obtained with the Ubi1 promoter. We expect that this new approach will result in economic protein expression of 0.5-1% TSP in sugarcane stalks.