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Understanding Cassava Storage Root Development and Engineering Cassava for Improved Performance as an Industrial, Food & Energy Crop

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Abstract

Cassava or manioc (*Manihot esculenta* Crantz), is grown for its starchy tuberous roots which provide food for over 800 million people - mostly small-scale and subsistence farmers in developing countries. High yield of starch, drought and heat tolerance, together with low requirements on soil makes cassava a valuable plant. Beside its role as food crop, cassava starch finds application in different industries such as coating agent thickener and emulsifier. In recent years, cassava has increasingly been grown for bioethanol production in Asian countries such as China, Viet Nam and Thailand. Cassava is an interesting choice because of its yield (superior to most energy crops including corn and sugarcane) and the high conversion rate of biomass to ethanol.

The project aims at understanding storage root formation and starch accumulation and at developing improved root for bioethanol production. To this end, systems to visualise and characterise the different stages of root formation are being developed (*i.e.* hydroponics, time course harvesting, *in vitro* system). Several gene candidates involved in storage root formation in other plant species have been selected and their cassava orthologs have been identified. Their transcript modulation over storage root formation is being analysed through qPCR. In parallel, carbon flux and translocation to storage roots are also being analyzed. Cassava root has high carbohydrate content, with 80 % dry weight of the stored carbohydrates being starch.

The ability to modify starch composition and structure offers important opportunities for creating new products and increasing the value of cassava as a crop. Several key enzymes shown to be involved in starch metabolism in other plants will be modulated in transgenic cassava. Starch quantity and quality in the transgenic lines will be evaluated. The successful generation of cassava cultivars with higher starch yields or higher value starches would secure cassava production and increase farmers' income.

Keywords: Cassava, starch, storage root