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Characterisation of Staygreen Trait Associated with Drought Tolerance in Cassava (*Manihot esculenta* Crantz)

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Abstract

Over 70 % of Kenya's population depends on agriculture and agriculture-related activities for their economic livelihood. More than 1/3 of these people live in the arid and semi-arid lands defined by low soil fertility and frequent droughts. However, these areas have agricultural potential if irrigation systems are established and drought tolerant crops bred. Cassava ranks as 5th most important staple food crop for over 800 million people in the tropics and sub-tropics. The crop is particularly resilient under sub-optimal conditions, with several cultivars reportedly performing well under prolonged drought conditions.

Recent advances in genomics have contributed to a better understanding of biological mechanisms and allowed the development of new or improved screening methods for more efficient breeding strategies. Understanding the molecular mechanisms of drought tolerance in selected cassava cultivars and subsequent development of molecular markers could facilitate the rapid introgression of the drought tolerance trait in farmer-preferred and locally adapted cultivars. Breeding cassava for drought tolerance is likely to enhance its sustainable production and contribute to food and income security.

This study intends to evaluate cassava's phenotypic and physiological response to drought as well as molecular characterisation of the crop response to drought stress. Analysis of the so-called stay-green cassava cultivars is being emphasised. The selected cultivars are being characterised under controlled (greenhouse) and field conditions (at two drought-prone locations in Kenya). Molecular analysis involves identification of differentially expressed drought responsive genes by using OMICS tools. The recent release of the cassava genome (www.phytozome.net/cassava.php) allows the selection of drought-responsive genes by analogy to other studied plant species. Selected genes will be analysed by qRT-PCR after designing gene-specific primers. The drought-responsive genes will be functionally characterised using cassava transgenic systems.

Broadly, this research will generate and implement advanced molecular tools that uncover genetic pathways modulated upon drought to characterise cassava drought tolerance physiology. The transfer of technology (methods developed during the project), will enhance capacity building at IITA-Kenya and the evaluation of traditionally bred stay-green cultivars combined with development of molecular markers for rapid introgression of the stay-green trait will ensure a valuable output for plant breeders and partners in the South.

Keywords: Cassava, drought, molecular markers, stay-green trait

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