(2)

SUMMARY

Rukiya Haji

December 20, 2010

APPROVAL DECISION FOR THE APPLICATION TO INTRODUCE TRANSGENIC CASSAVA CONTAINING PROVITAMIN A GENES FOR A CONFINED FIELD TRIAL

Background

Cassava is another primary food staple in sub-saharan Africa accounting for half of all calories consumed. It (Manihot esculenta, Crantz) is a key food security crop, that is draught-tolerant and fares well across various agricultural zones including semi-arid regions.

In Kenya, cassava is grown on more than 90000 hectares of land, with an annual production of about 540000 tones. Cultivation is mainly in, western provinces- 60%, eastern provinces-10%, coastal provinces-30%.

Just over a decade ago, a virulent form of cassava mosaic disease crossed the Ugandan border into western Kenya and wiped out just about every cassava field around Lake Victoria. Fortunately, with the use of modern biotechnology agricultural researchers have developed improved cassava varieties that are resistant to cassava mosaic disease. Now cassava is proving to be an inexpensive crop to grow as compared to corn and it is therefore, one of the crops used to improve food security in Kenya and Africa at large, so as to eradicate poverty and malnutrition.

Introduction

Vitamin A is a generic term for a large number of related compounds. Retinol (an alcohol) and retinal (an aldehyde) are often referred to as pre-formed vitamin A. Retinal can be converted by the body to retinoic acid, the form of vitamin A known to affect gene transcription. Retinol, retinal, retinoic acid, and related compounds are known as retinoids. Beta-carotene and other carotenoids that can be converted by the body into retinol are referred to as provitamin A carotenoids. Plants synthesize hundreds of different carotenoids, but only about 10% of them are provitamin A carotenoid.

Vitamin A is commonly known as the anti-infective vitamin, because it is required for normal functioning of the immune system. The skin and mucosal cells (cells that line the airways, digestive tract, and urinary tract) function as a barrier and form the body's first line of defense against infection. Retinol and its metabolites are required to maintain the integrity and function of these cells.

Vitamin A and retinoic acid (RA) play a central role in the development and differentiation of white blood cells, such as lymphocytes, which play critical roles in the immune response.
The research or application is to conduct a CFT of transgenic cassava that contains a single trait that confers for an increased level of pro-vitamin A, as compared to non-transgenic types.

Objectives

a) To assess expression of the target trait, which is pro-vitamin A content, in the transgenic cassava in the field

b) To assess phenotypic performance of the transgenic cassava relative to the non-transgenic cassava.

Procedure

The transgenic cassava referred to as the BioCassava Plus pro-vitamin A cassava, was produced through Agrobacterium mediated gene transformation of embryogenic cells of cassava with genotype 60444, inserted within two gene sequences for phytoene synthase **(PSY**), and 1-deoxy-d-xyllulose-5-phosphate synthase **(DXS**).

The genes conferring the desirable traits encoding for the following enzymes;

a. **PSY** is the enzyme that catalyses the first step in carotenoid synthesis and its involved in the regulation of flux through the plastid isoprenoid pathway toward the synthesis of B-carotene.
b. Co-expression of **PSY** and **DXS** intended to not only enhance the flux in synthesis of beta-carotene, but also increase synthesis of isoprenoids, for the enzyme catalyses the rate limiting step of the synthesis pathway.

c. **NptII** was used as the selectable marker.

After culturing in Agrobacterium tumefaciens, the tissues were cultured in medium containing kanamycin for selection of transgenic tissues from those that are non-transgenic. Callus was then used to induce production of embryogenic callus, and this was further sub-cultured to produce the target tissue, which will primarily give rise to transgenic plants. Through micropropagation, the shoots that rooted will be transferred to green houses for acclimatization, and characterization.

These will then be transferred to the field to test for their ability to show the interested trait and show how they differ from non-transgenic varieties.

Decision; APPROVED

The transgenic genes are almost equivalent to the non-transgenic except in levels of pro-vitamin A. There will be no loses in characteristics of the species. Cross-pollination rarely occurs. The only species this might occur with is non-indigenous, and is rarely found in the vicinity of the test field. Cassava is not considered to be a weed and is not invasive