9th International Conference on
Agricultural Biotechnology: Ten Years After

organized by the:

International Consortium on Agricultural Biotechnology Research (ICABR)

and the:

Catholic University of Leuven
CEIS - University of Rome "Tor Vergata"
Centre of Sustainable Resource Development, University of California at Berkeley
Economic Growth Centre, Yale University

Ravello (Italy), July 6-10, 2005

"BioCassava Plus, Generation of Nutritionally Enhanced Cassava Cultivars for Sub-Saharan Africa"

Richard Sayre, Project Leader, Department of Plant Cellular and Molecular Biology, Ohio State University, Columbus, Ohio 43210, USA. Email: sayre.2@osu.edu

ABSTRACT

BioCassava Plus is a multidisciplinary team of scientists brought together to create a nutritious cassava cultivar for sub-Saharan Africa. Inadequate nutrition is the single greatest cause of excess mortality, morbidity and suffering in sub-Saharan Africa. Two hundred and fifty million Africans rely on the starchy root crop cassava (*Manihot esculenta*) as their staple food. Cassava-based diets, however, are deficient in both macro and micronutrients. Cassava roots have the lowest protein:energy ratio of all the staple crops. A typical cassava-based diet provides less than 30% of the minimum daily requirement for protein and only 10-20% of the required amounts of iron, zinc, vitamin A and vitamin E.

BioCassava Plus will employ modern biotechnologies to improve the health of Africans through development and delivery of novel cassava germplasm with increased levels of bioavailable zinc, iron, protein and vitamins A and E. Consumers of the enhanced root will receive a complete compliment of macro and micronutrients from cassava alone. Cyanogens present in cassava foodstuffs, which can compromise the health of undernourished consumers, will be decreased. Effective delivery of the enhanced cassava will be achieved by linking optimal nutritional traits with improved post-harvest durability of the storage roots and elevated resistance to viral disease; characteristics required to provide ample amounts of foodstuffs and the incentive for farmers to adopt and sustain the use of cassava cultivars developed within BioCassava Plus.

The BioCassava Plus program is distinguished by an innovative combination of approaches that draw upon transgenic plant science, effective collaboration with African partners and field and human feeding tests to demonstrate efficacy of the improved cassava. Existing technologies, for which proof of principle has been demonstrated in other crops, will be modified and applied to cassava. In

addition, novel research strategies will be targeted to deal with the unique biochemistry and physiology of cassava. Research projects within BioCassava Plus will build on recent progress in cassava biotechnology and field trial capacity, but will also utilize techniques new to the crop, including; virus-induced gene silencing, methods for identification of root-specific promoters and transgenic systems for rapid assessment of stable gene expression in cassava roots.

Specific Nutritional Objectives of BioCassava Plus:

- Increase bioavailable levels of iron and zinc levels in foods six-fold.
- Increase the protein content of cassava roots four-fold
- Increase levels of both vitamin A and vitamin E ten-fold
- Reduce cyanogen levels in cassava foodstuffs ten fold.

Specific "Delivery" Objectives of BioCassava Plus:

- Suppression of the rapid post-harvest physiological deterioration inherent to cassava roots
- Generation of robust geminivirus resistance in susceptible, farmer-preferred cultivars.