# 15th Triennial ISTRC Symposium

# SUMMARY OF SESSION VIII : Biofortification and adding value for food and health in root and tuber crops.

# Thursday Nov. 5 2009

**Moderated by K. Tomlins and H. Ceballos**

Presentations made during this session described the progress in improving the diets of millions of people regarding the availability of micronutrients in general and pro-vitamin A carotenoids in particular. Most presentations were about sweet potato and cassava. As described in the lead presentation by **Wolfgang Pfeiffer**, the core of biofortification revolves around a product development pathway that integrates crop breeding, human nutrition and socio-economic disciplines, and subsequent presentations covered this wide range of disciplines. Presenters included plant and nutrition scientists from CIAT (**H. Ceballos** and **B.Ospina**), IITA (**B.M.Dixon**), and the University of Wisconsin Department of Nutrition (**S. Tunumihardjo**).

Orange fleshed sweet potatoes (OFSP) contain levels of pro-vitamin A caroteoids above those required by the established nutritional goals of the HarvestPlus initiative. Efficacy studies in African and Asia have demonstrated the beneficial impact of OFSP on vitamin A status in controlled environments. Having achieved the nutritional goal, the sweet potato research community has focused on developing varieties with adequate agronomic performance, particularly in relation to virus resistance and acceptable dry matter contents. Significant progress has been made releasing new varieties for Eastern and Southern Africa, East and South Asia and Latin America, in understanding the significance of genotype-by-environment interactions, and developing new breeding approaches that shorten the time required for identifying and officially releasing new cultivars.

In the case of cassava, significant progress has been made toward reaching nutritional goals through rapid cycling recurrent selection, resulting in important genetic gains. The fortunate association between high-carotenoid content with tolerance to post-harvest physiological deterioration was reported and should encourage the adoption of cassava varieties with yellow roots. Different studies on the bioavailability of pro-vitamin A carotenoids in cassava suggest high conversion rates, which is welcome news. Retention studies after different processing methods relevant for Africa and South Asia show that, as expected, retention of carotenoids depends on the processing method and the genotypes used. (**Bai Vimala**)

Work to develop processed products in Latin America based on different crops (rice, beans, maize, cassava and sweet potato) with enhanced nutritional quality was reported.

This work represents an interesting approach based on the nutritional complementation of different crops for developing sweet or salt preparations. The potential and acceptance of bread made with biofortified OFSP was evaluated in West Africa (**K.Tomlins**), with very promising results. Consumers liked the taste and appearance. Deliveries strategies can benefit from a better understanding of food consumption such as the study reporting on street foods in Nairobi (Mary **Oyunga-Ogubi**), which highlighted the large variation in their nutritional quality.

The potential of near-infrared reflectance spectroscopy (NIRS), as reported by **T. zum Felde**, cannot be overemphasized. It allows simultaneous screening for several quality traits (total carotenoids, beta-carotene, iron, zinc, starch, individual sugars, and proteins) once the calibrations curves have been developed. The few presentations that addressed issues not directly linked with bio-fortified crops reported interesting results ranging from the usefulness of molecular markers for assessing diversity, to the use of rapid viscoanalyzers in assessing functional properties of sweet potato starches. The importance of root crops for the Maori of New Zealand was highlighted in one presentation by **Nick Roskruge**.

Recommendations

Agriculture, nutrition and market interventions are all important components for the success of biofortification of different crops, and improvement in social conditions. As breeding work achieves nutritional goals, the emphasis should shift to delivery systems and promotion strategies. It is recognized that different strategies will be required to promote the integration of biofortified products in the diet of people. Considerable efforts will be required to understand the best approach(es) for maximizing the positive impact of biofortified crops.

A better understanding of the variation of micronutrients content from root to root within the same plant, as well as seasonal variation, was highlighted in at least two presentations. This issue should be taken into account in breeding and deploying strategies.

The use of NIRS should be encouraged and efforts should be made to assess the need for developing calibration curves individually for each laboratory.