## TH27 LOCAL VARIETY AS A SOURCE OF BIOFORTIFIED RICE IN BRAZIL

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Rice is one of the major sources of calories and is cultivated all over Brazil. In the Northeastern region, rice is planted mostly in small areas, essentially carried out by small farmers, using mostly family labor and characterized by low levels of technology input, in a subsistance fashion. They yield around 26% of the national upland rice production in around 591 thousand ha. Moreover, around 50% of the area is cultivated with traditional varieties, where the farmers select and multiply their own seeds. The main purpose of this work was to identify and spread out the use of brown and polished rice from selected varieties with higher contents of Fe and Zn among Northeast farmers, as part of AgroSalud biofortification program. 192 local varieties, among 3600 collected by the Brazilian Agricultural Research Corporation (Embrapa) in the last 30 years, were selected based on local origin and screened for mineral content. The zinc and iron contents were analyzed by nitric-percloric acid digestion (2:1) of milled samples of brown and polished rice using an atomic absorption spectrophotometer (Varian), according to AOAC method (1995) with some modifications. Analyses were carried out in the Grain Quality Lab at Embrapa Rice and Beans. The variety "Zebu Ligeiro", collected in 2001 in the vicinity of the city of Caxias, located in the Northeast region, presented, on whole grain, Zn and Fe contents of 48.8 mg/kg and 19.3 mg/kg, respectively. These values are, in terms of Zn, 36% and 77% superior to values found in BRS Primavera and CIRAD 141, the most planted upland varieties in the country. In the case of Fe, it suplants these varieties in 19% and 10%, respectively. As for polished grain, the values for Zn and Fe were respectively of 42.2 mg/Kg and 11.9 mg/kg, representing 51% and 150% of increment for Zn and 73% and 87% for Fe, respectively, when compared to BRS Primavera and CIRAD 141. Analysis were carried out in the Grain Quality Lab at Embrapa Rice and Beans. The Zebu Ligeiro seeds are being produced in close collabotration with partners in charge of local seed production and distribution, such as the AGERP, the research and extension agency of Maranhao State.

**Keywords:** Oriza sativa, biofortification, iron, zinc.

## TH28 CAROTENOID RETENTION IN ORANGE FLESH SWEET POTATO FLOUR DURING STORAGE

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In Brazil, the activities of the AgroSalud Program on Biofortification is coordinated by the Brazilian Agricultural Research Corporation (Embrapa), which includes a number of research centers that are part of the biofortification network. The main food staples under research in this program are: cassava, sweet potato, rice, common beans and products made from these crops. The aim of this work, conducted at Embrapa Vegetables, was to study the carotenoid retention in orange flesh sweet potato flour during storage for sixty days. Quantifying this degradation is an important step in defining which flour production technology is more adequate since it defines the shelf life based on nutritional factors. Sweet potato is marketed as fresh roots and consumed boiled, roasted, fried, mashed or as an ingredient in recipes (cakes, cookies, pastries). Processing sweet potato into flour will make it possible for it to be inserted into social programs as supplements in school meals. As part of the AgroSalud project, Embrapa Vegetables is selecting varieties of sweet potato with high content of beta-carotene, aiming to increase the availability of pro- vitamin "A" to the population with less access to high quality food. In order to quantify the retention of carotenoids in flour during storage, samples were packed in plastic bags and covered with aluminum sheets. Every 14 days the total carotenoids content was evaluated following the Rodriguez-Amaya (1999) methodology. Storing the flour in aluminum coated plastic bags preserved the total carotenoid content for two weeks. After this period, even protected from humidity and light, there was a rapid degradation of carotenoids. The initial concentration of total carotenoids was 219.2mg•kg-1 and after 60 days the concentration was 34.8mg•kg-1 reducing, therefore, to 15% of the initial value. Visually, it was possible to notice the reduction of color intensity from deep orange to yellowish. Thus, these results suggest the necessity of a more resistant package against humidity, oxygen, and luminosity in order to extend shelf life.

**Keywords:** Ipomoea batatas, carotenoids, sweet potato flour

## TH29 QUALITY EVALUATION OF ORANGE FLESH SWEET POTATO FLOUR IN STORAGE FOR TWO YEARS

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Sweet potato is the 5th most consumed vegetable in Brazil, with a production of 480,000 tons per year. Part of the AgroSalud program, Embrapa Vegetables has been selecting clones with high beta-carotene (pro-vitamin A) content, aiming towards more availability of naturally enriched food, and targeting the poor masses, especially school-age children. Orange flesh sweet potato present high levels of beta-carotene. Its commercialization in the raw form make difficult to include it in basic-food baskets and in food complementation programs, such as school lunch. Transforming the roots into flour allows it to be stored for long periods without refrigeration. The objective of this work, conducted at Embrapa Vegetables, was to quantify the microbial occurrence in the flour after a long period of storage and also to evaluate its hygroscopicity, to verify if after this period the flour can still be considered good for consumption, even if the degradation of carotene occurs during storage. The steps for flour production are: peeling, shredding, drying at about 65ºC (reaching 10-12% of humidity), and milling. There is the possibility of contamination due to manipulation operations on the production steps. Eighteen samples of two sweet-potato varieties were packed in plastic bags and stored for two years, then six samples (3 lots, 2 varieties) were analyzed for microbiological content (Bacillus cereus, Samonela, and Coliforms). Twelve samples of 1g were dried at 105ºC, exposed to air and weighed at intervals of one hour, during six hours. According to the results, none of the samples presented contamination by Salmonela or B. cereus. Only one sample presented coliform contamination, indicating inadequate handling during production. As for hygroscopicity, the flour entered equilibrium after the fifth hour of exposure to air, presenting a final humidity of 12.2%. This value is considered adequate, based on the norms established for other flours.

**Keywords:** Ipomoea batatas, sweet-potato flour, storage, microbiological quality.

## TH30 DEVELOPMENT OF MAIZE CULTIVARS FOR HIGHER ZINC AND IRON CONTENT AND BIOAVAILABILITY IN BRAZIL

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This work aimed to develop maize cultivars with higher zinc and iron content and bioavailability, inside the HarvestPlus program scenario. Initially, 2009 QPM and normal endosperm inbred lines were screened for Fe and Zn content. A large degree of variation in maize grain content was observed with these minerals. The screening of these samples ranged from 4 to 63 mg kg-1 and 3 to 71 mg kg-1 for Zn and Fe, respectively. Iron, zinc and phytic acid (PA) were determined in 22 inbred lines, previously selected for presenting the highest iron or zinc concentrations. The PA content percentage was determined according to the methodology described by Haug and Lantzsch (1983) and PA/Fe and PA/Zn molar ratios were estimated. Genetic variability was observed for PA levels, which ranged from 0,500 to 1,040%. Iron and zinc concentrations were also determined applying atomic absorption spectrophotometry and ranging from 13 mg kg-1 to 36 mg kg-1 and 19 mg kg-1 to 40 mg kg -1, respectively. PA/Fe molar ratios in the samples ranged from 16.3 and 45.5, and PA/Zn molar ratios between 18 and 43.5. A partial QPM diallel trial (4 dent x 8 flint lines) was established in Northeastern Brazilian environments (Mata Roma and Teresina) for on site evaluation. The hybrids presented zinc content in the grains varying within 21.4 and 32.9 mg kg-1 with 27.7 µg g-1 in average, while PA/Zn molar ratios in the samples ranged from 20.4 and 31.8 and averaged 24.0. The general combining ability (GCC) effects for zinc content ranged from -3.4 to 1.2 mg kg-1 and from -1.3 to 2.5 mg kg-1 for the dent and flint groups, respectively. The GCC effects for PA/Zn molar ratios ranged from -2.1 to 2.4 and from -1.1 to 2.2 for the dent and flint groups, respectively. Thirty-one (31) normal endosperm hybrids were evaluated in 2 Northeastern Brazilian environments. Hybrids were shown to have zinc content in the grains from 20.7 to 28.7 mg kg-1 with 24.5 µg g-1 in average, while PA/Zn molar ratios in the samples ranged from 24.4 and 34.1 and averaged 28.6. These preliminary results indicated that the development of synthetic varieties and hybrids may be based on parental lines with high combining ability for Ag, PA/Zn and PA/Fe molar ratios rather than Zn and Fe content.

**Keywords:** Zea mays, iron, zinc, biofortification