Technological Approaches for Enhancing Utilization of Sorghums and Millets in Kenya

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ABSTRACT

Sorghums and millets are arid and semi arid lands (ASAL) crops. They not only grow well in regions with rich soil and plentiful rain but they also grow well in regions with minimal rain and with little or no farm inputs. In spite of this, most ASAL regions in the country experience food shortages, hunger, malnutrition and related deaths because such crops are ignored. Local millers and the cereal industry have likewise not exploited their potential. On the other hand a ready market outlet for such cereals is lacking and manufacture of convenience food products, from them may lead to renewed vigor in their production. This underutilization may be attributed to preference of other conventional cereals, poor palatability of certain varieties containing high tannins, low nutritional value due to the presence of high amounts of anti-nutrients which bind proteins and minerals, as well as the negative perception of these cereals as the poor man's food.

Research was undertaken to evaluate methods that could be used to increase consumption and utilization of these cereals. The study area was in one of the ASAL regions of the country, Nguni sub-location, Mwingi district, of the Eastern province of Kenya. The research focused on detoxification and nutrient enhancement treatments namely; alkali treatment, malting, and fermentation. Optimized flours from these treatments together with pigeon pea were used to develop breakfast cereals with a view to encourage commercialization.

The alkali treatment was aimed at reducing tannins and phytates. Four alkalis were used namely ash from pigeon pea pods, *magadi soda*-sodium sesquicarbonate ($Na_2CO_3NaHCO_3.H_2O$), ammonia and sodium bicarbonate. Solutions of varying concentrations of these alkalis were made and the cereals steeped in them for specified time periods and the reduction in tannins and phytates checked through analysis. The most effective alkali was *magadi soda* applied at 1% for 2 days of steeping, which reduced tannins and phytates by 68-75% and 14-29%, respectively.

Malting and fermentation significantly reduced tannins and phytates, enhanced protein digestibility and availability of B-vitamins ($p \leq 0.05$). Optimal malting was done for 3 days and fermentation for 2 days both at room temperature of 25°C. Tannin was reduced by up to 50% by both malting and fermentation, while phytate reduction was about 20.4% by fermentation and 21.7% by malting. These differences were however not significant from each other ($p \leq 0.05$). Protein digestibility was significantly different with both malting and fermentation in comparison to those of unmalted and unfermented cereals ($p \leq 0.05$). Malted cereal flours had a protein content of 34.5-68.1% while fermented flours had 97.4-98.3%. Quantities of the selected B-vitamins were significantly enhanced by fermentation with a range of 71.2-94.2% while only riboflavin was enhanced by malting with 44.2% increase, the rest were less than 10.5% ($p \leq 0.05$).

The optimally treated cereal flours were used with pigeon pea and other ingredients to develop breakfast cereals. The white sorghum produced the most preferred breakfast cereal whose degree of acceptability was 7.5 out of 9. The keeping quality and nutrient contents of the developed breakfast cereal products were better than the controls and some commercial ready-to-eat breakfast cereals. The products' microbial load stability on storage exceeded 18 weeks.