Food product development using sorghum and millets: opportunities and challenges

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Sorghum and millets are uniquely well-adapted to cultivation in the harsh environmental conditions of the semi-arid tropics. For Africa and India, they represent attractive materials for developing food and beverage manufacturing enterprises; in contrast to wheat and barley that often cannot be locally cultivated economically. For example, notable technological and commercial success has been achieved in Africa with the replacement of barley malt with sorghum in the production of lager and stout beers and non-alcoholic malt beverages. Sorghum and millets also have a several valuable attributes that are increasing being exploited in food and beverage products. Their most important attribute is that they are the basis of many local traditional African and Indian foods such as porridges, flatbreads, snacks and fermented non-alcoholic and alcoholic beverages. By application of cereal science and technology, safe and economic manufacturing processes are being developed for many of these traditional products or derivatives of them. Such products are generally aimed at the rapidly growing urban market. Three levels of grain value-addition can be identified, which demand increasingly sophisticated skills, but are suitable for SME-type manufacture: 1. Clean grain and simple flours, 2. Composite and fortified flours, and 3. Ready-to-Eat foods and beverages.

In Western countries, the attribute of sorghum and millets that is generating much interest and product development, is their health-promoting properties. They are especially rich in phytochemicals, particularly antioxidant phenolics, at levels similar to that of other rich sources such as berries. In fact, in the USA, particular sorghum varieties and products from them such as breakfast cereals are being promoted under the name 'grain berry'. The other attribute of very wide interest in Western countries is that sorghum and millets do not contain wheat-like gluten proteins, and hence are suitable for consumption by coeliacs. Very rapid developments are taking place in the technology of gluten-free baked products.

These technologies for health-promoting food products and gluten-free baked goods need to be adapted for general production of sorghum and millet-based breads and other food products in Africa and India. A major challenge is to substantially reduce the cost of the gluten-free technologies, in order to provide an affordable good quality non-wheat based bread-type product to meet the rapidly growing demand for bread. However, the biggest challenge for Africa and India is simply the economic cultivation of sorghum and millets. Their agricultural productivity must be substantially improved in order to reduce the costs of these grains to make them more economically attractive alternatives to imported cereals such as maize, wheat and barley. More fundamentally, improvement in the productivity of sorghum and millets will contribute substantially to food security and economic development in Africa and India.

Keywords
sorghum; millets; ready-to-eat; beer; phenolics; gluten-free.

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A new standard for the industrial production of high quality Atta flour

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Atta flour is a wheat flour with an extraction of ≥95 % and belongs to the main staple foods in India where it is consumed as flat bread (Chapatti or Roti). Conventional industrial Atta flour production is realized by the parallel operation of several stone mills – so called Chakki mills. This technology has major drawbacks such as intensive maintenance, strong flour quality fluctuations, poor sanitation and limited throughputs. We have been able to overcome all these constraints but to maintain the unique Atta traits coming from the traditional process, setting a new standard for the industrial production of high quality Atta flour. As basis for this development, relevant structure-process property relationships of Atta flours were elucidated. Physicochemical, rheological, organoleptic (baking tests) as well as flour shelf-life characteristics of several Atta flours were assessed by internal as well as external analyses by the CFTRI in Mysore. A high total farinonograph water absorption ≥76 % (500 BU, 14% moisture) and a high starch damage of ≥18 % (AACC 76-30.02, dry matter base) were identified as key quality parameters for baking behaviour and flatbread softness. Furthermore, it could be shown that a certain flour heat treatment during milling is necessary in order to assure the shelf-life stability of the produced Atta flour.

Keywords
Atta flour; chapati; starch damage; wheat; bran.

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