

### Cereal extrusion technology for small food processing enterprises

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Food extrusion has become a very popular and important processing operation in the food industry. It provides a great opportunity to create new and exciting products. The main purpose of extrusion is to increase the variety of foods in the diet by producing a range of products with different shapes, textures, colours and flavours from basic ingredients. Today, food extruders are used to produce pasta, ready-to eat cereals, snacks, pet food, confectionery products, modified starches for soup, baby food and instant foods, rice and dal analogues, beverage bases and texturized vegetable proteins. Extrusion cooking is a high temperature short-time (HTST) process, which reduces microbial contamination, and inactivates enzymes. A typical extruder consists of a power supply to operate the main screw, a feeder to meter in the raw ingredients, and a barrel, which surrounds the screw. The screw conveys the raw material through towards a shaped hole, the die that shapes the product. Extrusion can take place under high temperatures and pressures or can be simply a non-cooking, forming process. Pre-ground and conditioned ingredients enter the screw where they are conveyed, mixed, and heated by a variety of processes. The product exits the extruder through a die where it usually puffs and changes texture from the release of steam and normal forces. Cereal processing using an extruder offers good opportunities for small-scale businesses in India because raw materials are readily available, extruders are reasonably affordable and if the products are chosen correctly, they have a good demand and can be profitable. The majority of the cereals available in India can be processed with extruder for snacks, pasta, rice analogue or breakfast cereals and combined with potentially hundreds of other ingredients to produce a vast range of processed cereal products.

## NUTRITION

### Grains for health – combating metabolic syndrome: results obtained in healthgrain

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Lifestyle factors are recognized as a major determinant for the risk of non-communicable diseases, many of which are associated with obesity and disturbances in glucose and lipid metabolism. Intake of cereal dietary fibre and whole grain type foods have in epidemiological studies been shown to be protective against type-2 diabetes and cardiovascular disease. As with food generally, the risk reduction is due to multiple food factors and physiological mechanisms. The EU HEALTHGRAIN project was in 2005–2010 a large attempt to address different research targets relevant for increasing the intake of protective factors of cereal grains (Poutanen *et al.*, 2008).

The topics studied ranged from dietary interventions and consumer attitudes to natural and induced variation in the raw materials, and development of technologies to bring more of the fibre and grain phytochemicals in the products. In the HEALTHGRAIN project, the content and effects of processing of dietary fibre and various bioactive compounds mainly in wheat grain was studied, including lignans, phenolic acids, alkylresorcinols, phytosterols, folates, tocopherols and tocotrienols, other vitamins and minerals (Ward *et al.*, 2008). New milling, fractionation and bioprocessing methods were developed to deliver more of these compounds in foods, and processing was also shown to be important for their bioavailability (Mateo Anson *et al.*, 2011). Whole grain and fibre-rich cereal foods were shown to be important for appetite regulation, and the role of gastrointestinal fermentation in mediating beneficial effects in glucose metabolism was further demonstrated (Nilsson *et al.*, 2010). The beneficial features of rye products in insulin responses were confirmed, and the potential of high-amylose wheat with respect to glycaemic control was shown. The role of betaine as one of the mediators of the protective effects of whole grain was also suggested (Price *et al.*, 2010). In order to work on the whole grain production chain, the HEALTHGRAIN project linked different disciplines from plant breeding through food processing to human nutrition. In its dissemination and technology transfer element, it also linked academic and industrial actors together with other stakeholders in a dialogue about the importance of the nutritional quality of cereal foods. The work to use this major energy source worldwide for its full potential to assist in health maintenance continues in the Healthgrain Forum.

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### Keywords

grains; dietary fibre; phytochemicals; health; metabolic syndrome; Healthgrain.

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