

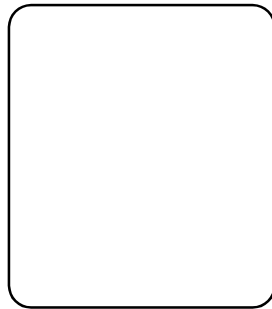
Invited Article

Whole grain nutrition – Rediscovering the hidden wealth

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Indian diets are known as cereal based diets, rightly so, as one third of an average Indian meal comprises of cereals, the rest is made up of legumes, vegetables, flesh foods (infrequently), and milk products. This is true for raw ingredients. In cooked form, percentage rises to nearly fifty as cereals increase twice or thrice in volume after cooking. Therefore, cereals are important part of daily diet and their nutritional contribution is worth examining. Contemporary nutrition science evolved with discovery of nutrients and their physiological functions as significant developments, wherein the essential role, requirements and recommendations of every nutrient was defined based on how much of a particular component is available or absorbed from the food. Newer discoveries point to the role of whole foods such as whole grains and other components of foods, digestible or non-digestible which have significant physiological functions. While whole gains would include cereals, millets and pulses, the focus of this article is on the former.

Cereals are known to have entered human diets around 10,000 years ago with the advent of agriculture. Historically, food grains have been instrumental for paving way for the settled civilizations of today through planned agriculture. Food grains are a fine example of diversity of nature with many varieties and varied features. They are storable food commodities and lend themselves to numerous processing manipulations. Nutritionally, food grains are rich source of almost all known nutrients and several phytochemicals. The increasing incidence of metabolic diseases are attributed to unbalanced energy rich diets lacking in fiber and protective bioactive compounds such as micronutrients and phytochemicals. Whole grain cereal products protect against development of chronic diseases such as obesity, metabolic

syndrome, type-2 diabetes, cardiovascular disorders and cancers. However, to derive maximum benefit, the form in which grains are consumed is very important.

All along cereals were used in the original form as given by nature, the only processing they were subjected to was cooking after dehusking to remove the inedible hull portion. Some grains were converted to flour too. Hence, all the wholesome components of the grain were retained and consumed. The pre-processing operations were manual and used low technology units. With advances in science and technology, processing operations like polishing, differential milling, sieving, removal of outer bran came into existence and the wholesome grains of yesteryears turned into refined grains and flours leaving behind the richest nutritional part of the grain for alternate uses.

Wholegrain cereals are rich sources of many nutrients. They are a source of energy contributed from macronutrients; proteins, fats and carbohydrates, which again perform many other functions. Cereals also provide numerous vitamins, minerals, dietary fiber and bioactive components. Generally, the nutrients and bioactive components are unevenly distributed in grain – higher proportion being present in germ and bran. Pre-processing technique can increase or decrease the amount of these constituents in the final product thus influencing the nutritional quality of grain. During the process of refining, whole grain losses a considerable quantity of fiber, minerals, vitamins, phytic acid and bioactive components. For example, whole finger millet flour, when sieved resulted in a fine flour with a decrease in nutrients such as fat, protein, thiamin, riboflavin, zinc, iron, calcium by 11-50%. A decrease in other constituents such as tannins, polyphenols, flavonoids and phytic acid was also observed. Similar results were obtained for other cereals.

Dietary fiber and antioxidant components are recognized as the two most important dietary

factors in prevention of chronic diseases. Dietary fiber is a complex component having different biological functions. It has an essential role in intestinal health and is significantly associated with lower risk of developing non-communicable diseases. While high fiber diets are considered healthy, low fiber consumption is associated with numerous health problems such as constipation, diverticular diseases, colorectal cancer, hiatus hernia, appendicitis, obesity, heart diseases, duodenal ulcers, breast cancers and gall stones. Dietary fiber improves gastrointestinal health by increasing the fecal bulk, which dilutes the effect of any genotoxic agents in large intestine, thereby reducing the extent of DNA damage to cells lining the colon. It improves glucose tolerance and the insulin response in diabetics. Traditional soluble fibers form gel like substance lowering the gastric emptying, hasten small intestinal transit and help control absorption of nutrient. This can control the blood sugar levels. Some cereals like barley and rye taken in first meal can lower the glucose response of a subsequent meal. Soluble fiber decreases cholesterol and improves lipid profiles. Fermentation of fiber and resistant starch within the colon produces short chain fatty acids, particularly butyrate, which are associated with lower risk of colon cancer. Cereals are rich in dietary fiber, particularly insoluble fiber increases satiety and helps in weight management.

Whole grains are rich source of antioxidants and protect body against oxidative stress that is involved and/or associated with all major chronic diseases. Dietary antioxidants protect against oxidative damage to DNA, proteins and lipids and have a significant impact on regulation of gene expression. A higher intake or plasma concentration of dietary antioxidants has been associated with low risk of chronic disease in healthy adults. These could be indirect antioxidants such as iron, zinc, copper and selenium, which act as cofactors of antioxidant enzymes and direct radical scavengers such as ferulic acid, polyphenols, carotenoids, vitamin E, oryzanol and phytic acid.

Recent research indicates that a significant amount of dietary antioxidants traverse the small intestine, mainly polyphenols and some carotenoids intact with dietary fiber. These antioxidants reach the colon where they are released from the fiber matrix by enzymic action and produce metabolites

and antioxidant environment by action of bacterial microbiota. Apart from dietary fiber, other indigestible constituents such as resistant starch, oligosaccharides and polyphenolics provide fermentable substrate for bacterial microbes and enhance immune system. Needless to say, these constituents are present in whole grains and can affect human health significantly.

In conclusion, to get the benefit of wholegrain nutrition, it is important to use the grain as provided by nature. While fiber enriched products may carry some health benefits, a product prepared out of whole grain is not equal to a product wherein the constituents have been removed and then added back while processing. Consumers need to read the label thoroughly for a better selection of processed foods. Industry in turn needs to provide customer with healthful products prepared out of whole grain wherever possible instead of fortifying products with extracted fiber.

Further Readings

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