

Dietary Fiber in Oat Hulls, Flakes and Bran

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During the past two decades there has been a growing interest in high fiber foods and their role in human nutrition and health. The initial evidence of the importance of dietary fiber was drawn from population studies which linked the lack of fiber in the diet to chronic bowel-related diseases prevalent in Western and industrialized countries, especially constipation, diverticulosis and cancer of the large bowel. More recently, other diet-related disorders, including obesity, cardiovascular disease and diabetes, have been associated with low-fiber diets. Due to the importance of these disease problems and the wealth of information available to the public on food fiber, there is considerable self-medication and experimentation being conducted by consumers. Since oat fiber has become the latest food fad, it is appropriate to review the characteristics of oat fiber in relation to those of other fiber sources.

Most plant fibers are structural polysaccharides associated with cell walls and the vascular system of plants. Cellulose is the main structural component in plants which is largely insoluble in the digestive tract and resistant to enzymatic hydrolysis. The lignified cell walls of the bran and hulls in cereals and legume seeds would be largely insoluble dietary fiber. Interior tissues of seeds have soluble dietary fiber associated with the cellulosic cell walls (hemicellulose and pectin) or cell secretions (gums and mucilages).

Soluble and insoluble fibers are both beneficial to health, but they act in different ways. Water-insoluble fiber passes through the digestive system in a highly hydrated form. It provides the bulk which pushes the food rapidly through the small and large intestine, thus relieving constipation. Alpha-cellulose (usually extracted from wood by-products), corn bran and wheat bran are typical bulking agents which decrease the degree of food digestion and absorption of nutrients in general. High levels of insoluble fiber are often found in plant materials that have been traditionally used as animal feeds or agricultural wastes. The outer coverings of seeds, fruits and vegetables may be contaminated with bacteria, yeasts or molds as well as pesticides and other foreign materials. It is important that the primary plant material is sanitary and that food-grade processes are employed in the separation or extraction of the fiber source.

The physical form of the insoluble food fiber is also important. Some fiber-rich materials disintegrate into sharp, needle-like particles upon grinding. Oat hulls, unlike cereal brans and legume hulls, contain spiculation that are relatively hard and might cause irritation or physical damage to the alimentary tract. Hulls are normally removed in making human oat foods, and only the clean groat with its component bran, endosperm and germ are consumed.

Water-soluble fiber is found in oat products, beans and other legumes, raw vegetables and fruits in relatively high concentration. These noncellulosic polysaccharides reduce plasma-cholesterol levels and may increase the high density:low density lipid ratio which is desired in

hypercholesterolemic individuals. Researchers suggest that the soluble fiber absorbs moisture like the insoluble fiber but, in the process, forms a gel which traps the bile acids and prevents their reabsorption in the small intestine. Soluble fiber is digested by bacteria in the large intestine but the cholesterol is not absorbed at this stage.

Methods for analysis of dietary fiber components have undergone a rapid evolution in attempts to obtain quantitative values that will predict the physiological response to the diet. Also it is very desirable that meaningful labels and compositions can be provided on high-fiber food packages. The problem is amply illustrated in the collaborative study conducted by Prosky et al. (1984). Analyses by over 30 laboratories demonstrated that corn bran was exceptionally high in total dietary fiber, 89.0%, as compared to the most common fiber supplement, wheat bran, which had only 42.3% fiber. Whole wheat flour and quick-cooking oats contained only 12.5-13.0% of dietary fiber in this survey. However, studies conducted by Anderson and Chen (1983) showed that cellulose and wheat bran did not have a significant effect on plasma cholesterol levels whereas whole oats and oat bran decreased cholesterol-rich lipoproteins by 11% and 17%, respectively. Recent medical investigations at the Northwest School of Medicine showed that the consumption of 2 ounces of oats or oat bran daily resulted in decreases in blood cholesterol levels by nearly 5% within a few weeks (Van Horn et al., 1986). It is apparent that total dietary fiber analysis does not adequately characterize the differential effects of fiber sources in the human digestive system.

One of the advantages of consuming whole grain cereals like oat flakes is that the fiber concentration is insufficient to cause any digestive problems. The intake of large quantities of wheat bran or dry hydrocolloids like guar gum or psyllium at a single sitting may result in excessive hydration and swelling at one region in the gastrointestinal tract. This can be painful, and there is risk of blockage in extreme cases. For a healthy diet, one should consume a wide variety of high fiber, low fat foods that include oatmeal or flakes, whole grain breads and cereals, legumes, fruits and vegetables, and avoid the concentrated fiber-rich laxatives which are offered as a panacea for an overly-refined diet.

References Cited

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