BLEND OF DIETARY FIBER FOR NUTRITIONAL PRODUCTS

FIELD OF THE INVENTION

The present invention relates generally to a blend of dietary fibers for use as a component of a nutritional product.

BACKGROUND OF THE INVENTION

Numerous types of dietary fibers are currently available. Basically, dietary fiber passes through the small intestine undigested by enzymes and is a kind of natural and necessary laxative. Dietary fiber is understood to be all of the components of a food that are not broken down by enzymes in the human digestive tract to produce small molecular compounds which are then absorbed into the bloodstream. These components are mostly celluloses, hemicelluloses, pectin, gums, mucilages, lignin and lignin material varying in different plants according to type and age. These fibers differ significantly in their chemical composition and physical structure and subsequently their physiological function. Those skilled in the art have attempted to identify fibers (or fiber systems) which will normalize bowel function, alter glucose absorption, lower serum cholesterol and/or serve as an indirect energy source for the colon.

There are many publications relating to dietary fiber.

Japanese published patent application Kokai No. Hei 2-227046 published Sept. 10, 1990 teaches the use of dietary fiber, including gum arabic, as embulsifying agents in food products.

U.S. Pat. Nos. 4,565,702 and 4,619,831 teach dietary fiber compositions prepared by coating an insoluble fiber with a soluble fiber.

U.S. Pat. No. 4,834,990 teaches a non-dairy liquid food product made by adding dietary fiber and calcium to a fruit juice or a drink.

U.S. Pat. No. 4,959,227 teaches a food product prepared from an aqueous composition containing non-fat milk solids and dietary fiber.

The properties of fibers (or fiber systems) most often related to physiological function are solubility and fermentability. With regard to solubility, fiber can be divided into soluble and insoluble components based on the fiber's capacity to be solubilized in a buffer solution at a defined pH. Fiber sources differ in the amount of soluble and insoluble fiber they contain. As used herein and in the claims "soluble" and "insoluble" dietary fiber is determined using American Association of Cereal Chemists (AACC) Method 32-07. As used herein and in the claims "total dietary fiber" or "dietary fiber" is understood to be the sum of the soluble and insoluble dietary fiber determined by AACC Method 32-07 and wherein by weight at least 70% of the fiber source comprises dietary fiber. As used herein and in the claims a "soluble" dietary fiber source is a fiber source in which at least 60% of the dietary fiber is soluble dietary fiber as determined by AACC Method 32-07, and an "insoluble" dietary fiber source is a fiber source in which at least 60% of the total dietary fiber is insoluble dietary fiber as determined by AACC Method 32-07. Examples of soluble dietary fiber sources are gum arabic, sodium carboxymethylcellulose, guar gum, citrus pectin, low and high methoxy pectin, barley glucans and psyllium. Examples of insoluble dietary fiber sources are oat hull fiber, pea hull fiber, soy fiber, beet fiber, cellulose, and corn bran.

"Applications of Soluble Dietary Fiber", *FOOD TECHNOLOGY*, January 1987, pages 74–75, teaches that the use of gum arabic and low viscosity grades of carboxymethylcellulose will allow the introduction of soluble dietary fiber into a liquid food, but that: "Itis virtually impossible to formulate a good tasting, high fiber drink using insoluble forms of fiber." The dietary fiber system of the present invention succeeds in overcoming this hurdle by providing a unique blend of soluble and insoluble fibers.

A second property of fiber is the capacity to be fermented by the anaerobic bacteria present in the human large bowel. Certain beneficial effects of dietary fiber in the human diet may be mediated by short chain fatty acids (SCFAs) produced during anaerobic fermentation in the large bowel. Furthermore, it is clear that certain beneficial effects of increased dietary fiber consumption may result from chemical and/or physical properties of the intact fiber (e.g. water holding capacity and absorption of bile acids). Dietary fibers vary significantly in their fermentability. As used herein and in the claims the term "non-fermentable" is understood to refer to dietary fibers which have a relatively low fermentability of less than 40%, preferably less than 30%, and the term "fermentable" is understood to refer to dietary fibers which have a relatively high fermentability of greater than 60%, preferably greater than 70%. Examples of fermentable dietary fiber sources are gum arabic and guar gum. Examples of non-fermentable dietary fiber sources are carboxymethylcellulose (CMC), oat hull fiber and corn bran.

As used herein and in the claims fermentability is determined by the following method, which is also described in "Fermentability of various fiber sources by human fecal bacteria in vitro[1-3]" at *AMERICAN JOURNAL OF CLINICAL NUTRITION*, 1991; 53: 1418–1424. A healthy human donor serves as a source of fecal material from which an inoculum is prepared. For 8 days before the onset of the experiment, the fecal donor should consume more than 20 g of total dietary fiber per day. This level of consumption may be ensured by consumption of commercial products containing mixtures of soluble and insoluble fibers. An inoculum is prepared from fecal material by mixing 20 g of feces with 180 g of an anaerobic dilution solution and then by blending the mixture and filtering it through cheese cloth. The anaerobic dilution solution is prepared as presented below. The inoculumn is prepared under carbon dioxide to maintain anaerobiosis.

ANAEROBIC DILUTION SOLUTION[a]
(1 Liter)

INGREDIENT	AMOUNT
Mineral solution 1[b]	37.5 mL
Mineral solution 2[c]	37.5 mL
Resazurin solution (.1% w/v)[d]	1.0 mL
$NaHCO_3$	6.37 g
Distilled H_2O (sonicated)	924.0 mL
cysteine $HCl.H_2O$	0.5 g

[a]Mix minerals 1 and 2, resazurin and water, saturate with carbon dioxide, and add $NaHCO_3$ and autoclave. Add 0.5 g of cysteine HCl to cooled solution.

[b]K_2HPO_4, 0.6 g; Na Citrate.$2H_2O$, 0.2 g; d H_2O, 100 mL.

[c]NaCl, 1.2 g; $(NH_4)SO_4$, 1.2 g; KH_2PO_4, 0.6 g; $CaCl_2$, 0.12 g; $MgSO_4.7H_2O$, 0.25 g; Na Citrate.$2H_2O$, 2 g; d H_2O 100 mL; (dissolve salts in H_2O in above order).

[d]Resazurin, 0.05 g; d H_2O, 50 mL.