

Soy milk: *Terrible or Terrific*



"Soy milk may be good for you, but it tastes terrible, right?"
"Last time I tasted soy milk, it had a strong beany taste and rancid-oil like flavor."
"The taste is OK, but it is chalky in mouthfeel."
"It tastes like medicine."

These remarks are now out-of-date. The quality of some soy milk and soy milk products has improved to the extent that they are liked even by the mainstream consumers in the West. Soy beverage sales in mainstream supermarkets reached \$126 million for the year ended in February 2000, a 60 percent increase, according to data compiled by tracking firms SPINS and A.C. Nielsen. If we include the sales at health and ethnic food stores, the number jumps to \$300 million.

That's still a fraction of the \$22 billion worth of soda and milk that Americans buy annually, but analysts expect the soy market to continue growing, in part because the Food and Drug Administration in the US is allowing soy products to bear a claim that soy protein reduces risk of heart disease.

Nutritional and Medical benefits of soy proteins are well known. Soy foods and beverages are a rich source of proteins and minerals, and are free from cholesterol and lactose. Their consumption reduces the risk of heart disease, cancer, and osteoporosis. Dr. Barry Sears, Dr. Robert Atkins and other authors of the best selling diet books like The Zone and Dr. Atkins' New Diet Revolution

advocate extensive use of soy foods for weight control and healthy long life.

Soy milk is no longer a niche product produced and marketed by and for ethnic people. Big corporations like Best Foods, Dean Foods, Dairyworld, McCains, Parmalat, and Suiza Foods see the category growing so fast that they have decided to set-up joint ventures or other arrangements to get into soy milk/soy-beverage business. Heinz, Kraft and Kelloggs are also entering soy foods.



Cold Grinding

For time immemorial, soy milk has been extracted from soybeans and used as a hot drink in most of the orient. As the rest of the world learned about the nutritional benefits of soybean products and economic advantage of growing soybeans, scientists wrestled with the bad taste and off-flavor traditionally associated with soy products.

The age-old oriental method uses cold grinding of well-soaked and rinsed soybean in a stone mill with water. The resulting puree is mixed with additional water and cooked in an open caldron or in a pressure cooker for an adequate time to make it digestible. The cooked slurry is filtered through a filter bag to extract soy milk. The okara (residue in the bag) is pressed to squeeze out more soy milk. The squeezed okara is mixed with water and filtered and pressed again to obtain thin soy milk. This thin soy milk is either mixed with the soy milk already extracted or used in place of water in the stone mill when grinding soybean in order to improve soy milk yield. This method gives soy milk with excellent mouth-feel and good



yield. However, the soymilk has very high level of the rancid-oil-like smell, which is rather repulsive, especially when soymilk is consumed as a cold beverage rather than as a hot drink.

Hot Grinding

The other most commonly used method is the hot-grind method in its variety of proprietary and sometimes patented forms. Essentially, it involves grinding soybeans (with hulls or without, soaked or dry) with hot, almost boiling water, sometimes accompanied with steam injection, to make ground soybean slurry. Most hot-grind methods use sodium bicarbonate or caustic soda to increase the pH of the water to make it significantly alkaline. High temperature and pH substantially inactivate the lipoxygenase enzyme and reduce the rancid-oil-like taste in soymilk. Once the soymilk is extracted, its alkalinity is neutralized by adding hydrochloric or some other acid. Soymilk extracted with this method has significantly less rancid-oil-like off-flavor but suffers from a chalky mouth-feel resulting from the adverse affect of heat on the protein solubility.

Some researchers decided to take the hot-grind method a step further by thoroughly blanching the soybean by boiling it in water or alkaline solution for a duration that is long enough to completely inactivate the lipoxygenase enzyme. This hot-blanch method eliminates the rancid-oil-like flavor completely at the cost of adding roasted nut flavor to the product and making the protein almost completely insoluble in water. The blanched soybeans are ground very fine in water, usually in a colloid mill, and the resulting fine slurry is passed through a high pressure homogenizer. The soymilk thus obtained is a suspension of fine soybean particles in water and in spite of its pleasant taste has very chalky mouth-feel. When alkaline solution is used, the soymilk is neutralized with an acid to achieve a pH of 6.7 to 7.0

Airless Cold Grinding

The airless cold-grind method has been developed to keep the virtue of the traditional cold grind method (the smooth mouth-feel) while eliminating its curse (the rancid-oil-like off-flavor) in the making of

soymilk from soybeans. In this method, the culprit enzyme lipoxygenase is unable to catalyze the reaction among the reactants (oxygen, water, and oil) to produce off-flavor volatiles like aldehyde, keytones, furans, etc., for one of the reactant (oxygen) is kept out of the reaction volume. No heat treatment is required to partially or fully inactivate the enzyme for controlling or eliminating the off-flavor. Any heat treatment to improve the protein efficiency ratio (PER) and to inactivate the trypsin inhibitor enzyme is deferred until soy protein and other solubles are already in the water. Such heat treatment in the later stage of processing is desirable to make the product digestible and to denature any anti-nutritional factors. The chalky taste is thus eliminated without compromising the mouth-feel. No chemicals at all are required in this method. It produces terrific tasting products.

Recent technology development and nutritional awareness have made soy foods and beverages from being terrible to terrific in less than five years. Sales of soy products are growing at a fairy-tale pace. However, like in any burgeoning field one needs to be careful in selecting the right technology partner and proper business planning to be successful. Unfortunately there are few who have expertise and dedication to help the uninitiated.



VS2000 SOYMILK PLANT AT SURREY, B.C.

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