

Do You Know Konjac?

By Joshua Brooks, Contributing Editor

If you follow which diet trends are "in," you might have noticed a growing interest in Shirataki noodles, especially in weight-loss, low-carb and gluten-free regimes. The main ingredient in these traditional Japanese noodles is *konjaku*, or konjac. But, functionally speaking, this hydrocolloid ingredient has much more to offer than weight management. Not only are researchers examining konjac's health benefits, product developers are finding it a valuable tool to improve the properties of a wide range of finished products.

Konjac has been used in Asia for thousands of years, and is becoming more widely used in the west as a natural ingredient in conventional foods, as well as in functional foods and nutraceutical supplements. More and more mainstream manufacturers are formulating with konjac. The USDA recently approved konjac for use in meat products and has allowed it on the NOP list of organic-compliant ingredients. It is also on the Whole Foods Market list of allowable ingredients. All of this indicates growing consumer acceptance of this hydrocolloid.

Jac of all trades

Konjac is derived from the tuber of the *Amorphophallus konjac* plant. The plant's shape—its stem above ground and the tuber below—resembles an elephant's foot; therefore, the tuber is called the "elephant yam." It grows mainly in China and Japan on konjac farms. The tuber is harvested, then sliced, dried and ground. It is then blended to specification to yield its highly functional properties as an emulsifier, gelling agent, texturant and nutraceutical ingredient.

Konjac is often called by its molecular name, glucomannan. This long-chain, water-soluble polysaccharide of high molecular weight (200,000 to 2,000,000) consists of a chain of mannose and glucose units in a ratio of 1.6:1 connected with β (1,4) linkages. Acetyl groups are present at some of the sugar units. There is usually one acetyl group for every 60 to 20 sugar units.

Removing these groups by raising the pH to 9.5 or higher and heating will cause konjac to form an irreversible gel. This makes konjac versatile for the formulator, as a gel former (reversible or irreversible), and as a highly viscous, nongelling product, as well. Once fully hydrated, these gels and viscous solutions are salt-tolerant and will hold up in low-pH systems.

Konjac also combines synergistically with other hydrocolloids to create a wide range of mouthfeels, textures and gel strengths. Xanthan, carrageenans, tara gum and starch each create different properties when blended with konjac. Food scientists can create just the right gel set for any application that requires a structure to hold it together. The gel sets can range from true gels (a gel that retains the shape of a mold it sets in) to pseudo gels (amorphous structures) to sets, which are almost undetectable but provide a subtle structure.

Konjac and xanthan combinations provide a set that is elastic enough to replace gluten in a gluten-free pasta, allowing for the dough to pass through an extruder without breaking apart. This stabilizer blend also prevents the pasta from becoming too soft and mushy on a steam table. Konjac and xanthan blends are also used in meat and fish analogs to hold a veggie burger together as it is grilled and help create a bit of a chewiness that mimics a meat product.

Konjac, xanthan and starch provide even greater elasticity for, say, a cheese stick-type application that needs just the right amount of bounce in the bite, plus stringiness. Furthermore, the stabilizer will prevent moisture migration from the cheese to the breading.

When konjac is synergized with microcrystalline cellulose and xanthan, it creates a more-effective fat mimic than microcrystalline alone. Together, the three hydrocolloids form a rich, creamy mouthfeel that mimic fats or oils in reduced-fat applications. The combination of these three components can also form a strong three-dimensional matrix without heating. Most gels require heat, then set upon cooling. However, this system can gel simply when shear is applied, so it can be used in both cold- and hot-processed applications.

As a highly functional hydrocolloid, konjac is more effective in controlling a greater amount of water than many other gums. It can bind up to about 200 times its own weight in water. vs. guar, which can hold about 60 times its weight in water, or certain starches, which can bind about 8 times their weight. This makes konjac useful for preventing water and oil separation. Its water-binding ability also makes konjac a good choice for providing freeze/thaw stability, as it controls the water in a product from migrating from one "layer" to another through multiple freeze/thaw cycles. (With hydrocolloids, "binding water" refers to organizing, controlling and holding water, and thus preventing its migration, rather than reducing water activity levels.)

Hitting the health jac-pot

In recent years, manufacturers of health and wellness products have incorporated konjac into many functional-food formulations. This is, in part because it contains 85% to 95% soluble dietary fiber. In addition, many studies indicate konjac may have a beneficial effect in improving blood lipid profiles, reducing serum cholesterol levels and improving systolic blood pressure in high-risk diabetics.

One meta-analysis from the University of Connecticut, Storrs, CT, analyzed 14 studies involving capsules, energy bars and biscuits made with glucomannan. Results showed that the glucomannan significantly lowered low-density lipoprotein levels and kept blood glucose under control. (*American Journal of Clinical Nutrition*, 2008; 88(4):1,167-1,175). The analysis also found a slight effect on lowering body weight; satiety is a notable characteristic of konjac consumption.

Increasingly, consumers are seeing konjac listed on the labels of functional foods designed for health and wellness, and are drawing the conclusion that konjac must be good for health.. This is a good thing for manufacturers who want to take advantage of not just konjac's functional properties, but also its health halo.

Joshua Brooks, vice president of sales for Gum Technology Corporation, frequently teaches corporations how gums can be utilized to solve problems and increase cost efficiency in new and existing products. He graduated from the City University of New York and, through Gum Technology, is a member of the Institute of Food Technologists, Research Chefs Association, Baking Industry Suppliers Association, Tortilla Industry Association, AACC, Association for Dressings & Sauces and more. Contact him at josh@gumtech.com.