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Culinary Nutrition News:

Functional Ingredients: Gums and Starches

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In the world of food product development, the term “functional ingredients” is not new. Food product developers rely heavily on these ingredients to enhance, thicken, stabilize and give products a certain desired texture, appearance or nutrition profile. While food product developers have many other factors to consider outside of normal, everyday kitchen use of ingredients, there are a number of functional ingredients that are becoming more available and viable for the restaurant chef to use. Gums and starches, also referred to as “hydrocolloids,” are just some of these types of ingredients. They are produced from natural sources and possess thickening, gelling and stabilizing properties. They can be used to enhance the texture and nutritional impact of ordinary dishes or to inspire and create more unique dishes.

All natural?

In food manufacturing, gums and starches isolated from plant sources are widely used as stabilizers. Natural gums and starches are not chemically modified, they are isolated and purified from the original plant sources—typically from plants and seaweeds. Starches are generally considered natural ingredients, except when the plant is genetically modified or the starch itself is chemically altered. Natural gum stabilizers include those that come from natural sources and are processed by natural means, such as

mechanical, heat or water extraction, not by chemically reactive processes.

What are gums?

Gums are polysaccharides that originate from natural raw materials such as plants, algae and microorganisms. Virtually free of fat, gums consist primarily of complex carbohydrates derived from plants or from the biosynthesis of end products by microorganisms (e.g., xanthan gum). Natural gums include agar, sodium alginate, carrageenan, guar, tragacanth, locust bean gum and xanthan gum. The addition of gums can impart a creamy mouthfeel and smooth texture to finished products such as sauces, gravies, soups and dressings.

Meet the gums

Agar is an additive extracted from several generations of red algae. In China, agar is made into an unflavored gel that is sliced and served in a complex sauce. It is also used to gel flavorful mixtures of fruit juice and sugar, and stews of meats, fish or vegetables. In Japan, agar is made into jellied sweets. This tasteless, dried seaweed acts as a setting agent and can be substituted for gelatin, but has stronger setting properties (five times greater), so less of it is required.

kitchen tips

Unlike gelatin, agar will set at room temperature. Agar forms gels at even lower

concentrations than gelatin does. An agar jelly is somewhat opaque and has a more crumbly texture than gelatin. Furthermore, agar gel won't melt in one's mouth; it must be chewed. Agar will remain solid on hot days and can be served hot. This property allows for the dispersion of small agar-gelled morsels of contrasting flavor into a hot dish.

Guar gum is a powdered additive from the seeds of the guar gum bush, which is cultivated in India, Pakistan and Texas. It is often used as a thickener and stabilizer in food products. It can also be used in gluten-free baking to improve elasticity.

kitchen tips

In many recipes, guar gum can be used interchangeably with xanthan gum, and it is often used alongside xanthan gum in gluten-free recipes. However, excessive amounts of guar gum may cause a bitter aftertaste in baked goods. Guar has a high water binding capacity. It has eight times the thickening power of cornstarch and about 16 times the thickening power of flour.

Gum arabic is a natural additive from the bark of certain varieties of the acacia tree. Gum arabic is colorless, tasteless and odorless, and is used to thicken, emulsify and stabilize foods such as candy, ice cream and sweet syrups.

kitchen tips

Gum arabic can also be used to make uniquely flavored marshmallows.

Locust bean gum is a food additive derived from the endosperm of seeds from the carob tree, which is grown in Mediterranean countries. It is used as a thickening agent in food products, such as in cream cheese, dairy desserts, ice cream, fruit preparations, baked goods, dressings and sauces.

kitchen tips

In frozen products, locust bean gum slows down the growth of ice crystals, which improves mouthfeel, making it a viable addition to sorbets. Also, adding 0.2% locust bean gum to fillings in baked goods such as pumpkin pie and fruit tarts creates a more stable filling that is less likely to boil over.

Sodium alginate is a thick, jelly-like substance obtained from a number of brown seaweeds. It is used to stabilize, thicken, or in gels. It can only form gels in the presence of calcium (in milk or cream, for example).

kitchen tips

Sodium alginate can be used in spherification, encapsulating a liquid in a solid, using a calcium bath. This can be done with fruit and vegetable juices to make caviar-like spheres. To do this, prepare a calcium-free alginate solution of the desired flavor and color, and drip it into a calcium solution, where it immediately gels. Calcium-rich foods, such as dairy products, are well suited for reverse spherification.



Xanthan gum, a powdered additive made from fermented corn starch, is used as a food additive, and provides structure and acts as a thickening agent in sauces and batters. It is also used as a thickener, emulsifier and stabilizer in foods such as dairy products and salad dressings.

kitchen tips

Xanthan gum can be used to add pliability and structure. When used alongside guar gum (for best results, use a 2:1 ratio), it prevents crumbling in gluten-free baked goods. A touch of xanthan gum can prevent water leakage from preparations such as vegetable purées. Possessing the properties that make liquids more viscous at rest, xanthan gum provides excellent cling properties that can be helpful in tempura batters. It can also help stabilize whipped cream and mousses.

Carrageenan is derived from purplish/red seaweed known as Irish moss. It's named after the Irish town of Carrageen, which was once famous for a dessert produced by boiling milk and seaweed. Dating back 200 years, it has long been used in China to gel stews and flavored liquids. Used as a thickener, emulsifier and stabilizer, carrageenan forms a gel when in the presence of calcium or potassium, depending on the type.

kitchen tips

Carrageenan provides a rich mouthfeel to milk-based drinks such as frappuccinos. It can also be used to make dairy foams and milk-based gels, as well as fruit-flavored gels (if potassium is used). In meat products, carrageenan's gelling properties bind moisture, reducing cooking loss and improving slicing properties. Pâtés, sausages and similar emulsified products benefit from improved firmness and texture.

Sodium alginate can be used to make caviar-like spheres of your desired flavor and color.



Xanthan gum is often used as a thickener, emulsifier and stabilizer in salad dressings.

What is starch?

Starch is a polymer of glucose (dextrose) and is found only in the vegetable kingdom. It is produced by all green plants and stored, in varying proportions, as microscopic grains throughout the plant structure. When you cook rice, tapioca or breakfast cereals, you can observe the presence of starch with the thickening of the liquid. Food-grade starches are used in food processing as thickeners, as well as fat replacers, and come from corn, tapioca, potato, rice, sorghum, wheat and other cereals, and from roots such as potato and tapioca.

Meet the starches

Arrowroot is a flavorless starch used as a thickening agent in puddings, sauces and other cooked foods. It comes from a tropical tuber with the same name. The rootstalks are dried and ground into a very fine powder. Arrowroot's thickening power is about twice that of wheat flour, and arrowroot is easier to digest than wheat flour.

kitchen tips

Arrowroot becomes clear when cooked and, unlike cornstarch, it does not impart a chalky taste when undercooked. It should be mixed with a cold liquid before being heated or added to hot mixtures.

Cornstarch is a dense, powdery “flour” obtained from the endosperm portion of the corn kernel. It is commonly used as a thickening agent for puddings, sauces and soups. It also lends chewiness when combined with other flours in doughs and batters.

kitchen tips

Cornstarch has about twice the thickening power of flour. Sauces thickened with cornstarch will be clear, rather than opaque, as with flour-based sauces. In many European cake and cookie recipes, cornstarch is used with flour to produce a finer texture that is more compact than flour alone.

Tapioca is a starch substance extracted from the root of the yuca (cassava). It is used as a thickening agent for soups, fruit fillings, glazes, etc.

kitchen tips

Tapioca makes a great gluten-free thickener and adds translucency and resilience to dough.

Sago is a starch extracted from the sago palm (and other tropical palms) that is processed into flour, meal and pearl sago, which is similar to tapioca. South Pacific cooks frequently use sago for baking and to thicken soups, puddings and other desserts. In the Orient and in India, it is used as flour. In the U.S., it is occasionally used as a thickener.

Health benefits

Gums and starches are often used as fat replacers, fiber-bearing ingredients and low carb alternatives in food products. Most fat-reduced food products rely on starches and gums and their ability to regulate moisture

Cook rice, tapioca or breakfast cereals to observe the presence of starch, which thickens liquids.

to help simulate the bulk and mouthfeel of the removed fat. Digestible carbohydrates such as modified starches provide 4 kcal/g, while nondigestible complex carbohydrates provide few calories. Gums, starches and other carbohydrate ingredients provide some of the functions of fat in foods by binding water and providing texture and mouthfeel. For example, xanthan gum and carrageenan can be used as stabilizers to reduce fat in salad dressings, and a blend of bland-tasting guar gum and locust bean gum can be used in a base roux instead of flour in a soup.

As a fiber, gums naturally resist digestion. Starches, on the other hand, are primarily energy sources. However, modified forms called “resistant starches” have starch fractions that resist hydrolysis in the small intestine, though they may ferment in the colon. The solubility of gums has made them useful ingredients for adding fiber to beverages and other foods, with minimal effect on formulation. Adding ingredients such as gums and resistant starches can be a good way to sneak fiber into certain foods and beverages without compromising texture or taste.

The use of gums is one way to reduce net



When used in pâtés and sausages, carrageenan improves firmness and texture.

carbs while simultaneously boosting soluble dietary fiber levels. Gums can be used to replace high-carb ingredients such as flour and corn syrup. Gums work well with low-carb formulations, thereby reducing overall calorie content. In addition, they offer other health benefits. Research has shown that gums can be utilized to support a healthy intestinal and digestive system, and they have been clinically proven to lower blood serum cholesterol.

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improving culinary nutrition skills.

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Consider adding 0.2% locust bean gum to fillings in baked goods such as pumpkin pie to create a more stable filling that is less likely to boil over.

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Xanthan gum can help stabilize whipped cream and mousses.

