The Use of Carrageenan and Cellulose Gel in Gummi Candy

Gummi candies are part of the large category of confectionery products such as jellies, pastilles, and wine gums. These candies, originally popularized in Europe, were introduced to the U.S. in the early 1980s (Dziezak, 1989). This category of products currently manufactured in the United States includes a diverse array of different sizes, flavors, shapes, and textures.

Gummi candies are traditionally produced by using various water-holding hydrocolloids, such as gelatin, starch, pectin, gum arabic or a combination of these gelling agents. Since these high solids candies are extremely adhesive and tacky on the teeth, they are often avoided because of this negative attribute. Formulating gummi candies with carrageenan can eliminate sticking to the teeth and also offer a range of desirable textures—from soft, easy-to-chew to firmer, short textured candies. Gummies made with carrageenan provide clean flavor release, decreased set-up time, and heat stability upon storage.

CARRAGEENAN

Carrageenan is a naturally occurring family of carbohydrates obtained by extraction from red seaweeds found in various regions in the world. The main seaweed types are Eucheuma, Chondrus and Gigartina, which are primarily sulfated polysaccharides of varying ester sulfate content. These seaweed extracts yield the three main types of carrageenan: kappa, iota and lambda which have interesting and unique properties.

Structure of Carrageenan

Carrageenan is a high molecular weight polysaccharide made up of repeating galactose units and 3, 6 anhydrogalactose (3,6 AG) both sulfated and non-sulfated. Carrageenan extracts have common structural features composed of repeating galactose-based sugar units glycosidically linked through alternating alpha 1,3 and beta 1,4 sites. Carrageenan extracts have varying ester sulfate contents that influence their properties (see Figure 1).

Carrageenans can be customized or blended for specific gelling, thickening and stabilizing properties desired by food formulators. By selecting pre-established parameters for these factors, a carrageenan supplier can produce products with the desired properties.

Three Basic Types of Carrageenan

Desired textures—brittle or flexible—will determine the type of carrageenan chosen for a specific application. The three basic types of carrageenan differ by the amount and position of the ester sulfate groups. Generally, the higher the level of ester sulfate, the lower the solubility temperature and the lower the gel strength will be in a given application.

Kappa and iota carrageenan are used to form gels. Lambda carrageenan is basically used for cold soluble thickening and suspending applications. The structure of kappa and iota carrageenans are nearly identical. The only difference is that iota contains an additional sulfate group on the 2-carbon position opposite the 4-sulfate galactose unit of the repeating disaccharide. Lambda carrageenan differs from kappa and iota in the position of the sulfate groups on the molecule. This structural difference prevents lambda carrageenan molecules from associating into a gel structure while in solution. This is why