

## **Application in food industries**

The food industries are one of the largest consumers of starch and starch products. In addition, large quantities of starch are sold in the form of products sold in small packages for household cooking. Production of cassava starch has increased considerably in recent years.

Unmodified starch, modified starch and glucose are used in the food industry for one or more of the following purposes:

- (a) Directly as cooked starch food, custard and other forms;
- (b) Thickener, using the paste properties of starch (soups, baby foods, sauces and gravies, etc.);
- (c) Filler, contributing to the solid content of soups, pills and tablets and other pharmaceutical products, fee cream, etc.;
- (d) Binder, to consolidate the mass and prevent it from drying out during cooking (sausages and processed meats);
- (e) Stabilizer, owing to the high water-holding capacity of starch (e.g., in fee cream).

## ***Bakery products***

Although starch is the major constituent of flours, the art of bread baking depends to a large extent on the selection of flour with the proper gluten characteristics. Starch is used in biscuit making, to increase volume and crispness. In Malaysia, cassava starch is used in sweetened and unsweetened biscuits and in cream sandwiches at the rate of 5-10 percent in order to soften zye texture, add taste and render the biscuit nonsticky. The use of dextrose in some kinds of yeast-raised bread and bakery products has certain advantages as it is readily available to the yeast and the resulting fermentation is quick and complete. It also imparts a golden brown color to the crust and permits longer conservation.

## ***Confectioneries***

In addition to the widespread use of dextrose and glucose syrup as sweetening agents in confectioneries, starch and modified starches are also used in the manufacture of many types of candies such as jellybeans, toffee, hard and soft gums, boiled sweets (hard candy), fondants and Turkish delight. In confectioneries, starch is used principally in the manufacture of gums, pastes and other types of sweets as an ingredient, in the making of moulds or for dusting sweets to prevent them from sticking together. Dextrose prevents crystallization in boiled sweets and reduces hygroscopicity in the finished product.

## ***Canned fruits, jams and preserves***

Recent advances in these industries include the partial replacement of sucrose by dextrose or sulfur-dioxide-free glucose syrup. This helps to maintain the desired percentage of solids in the products without giving excessive sweetness, thereby emphasizing the natural flavor of the fruit. The tendency toward crystallization of sugars is also decreased.

## ***Monosodium glutamate (MSG)***

This product is used extensively in many parts of the world in powder or crystal form as a flavoring agent in foods such as meats, vegetables, sauces and gravies. Cassava starch and molasses are the major raw materials used in the manufacture of MSG in the Far East and Latin American countries. The starch is usually hydrolyzed into glucose by boiling with hydrochloric or sulfuric acid solutions in closed converters under pressure. The glucose is filtered and converted into glutamic acid by bacterial fermentation. The resulting glutamic acid is refined, filtered and treated with caustic soda to produce monosodium glutamate, which is then centrifuged and dried in drum driers. The finished product is usually at least 99 percent pure.

### ***The production of commercial caramel***

Caramel as a coloring agent for food, confectionery and liquor is extensively made of glucose rather than sucrose because of its lower cost. If invert sugar, dextrose or glucose is heated alone, a material is formed that is used for flavoring purposes; but if heated in the presence of certain catalysts, the coloration is greatly heightened, and the darker brown products formed can be used to color many foodstuffs and beverages.

Uniform and controlled heating with uniform agitation is necessary to carry the caramellization to the point where all the sugar has been destroyed without liberating the carbon.