

## 1.3: Types of Thickening Agents

### Cornstarch

Cornstarch is the most common thickening agent used in the industry. It is mixed with water or juice and boiled to make fillings and to give a glossy semi-clear finish to products. Commercial cornstarch is made by soaking maize in water containing sulphur dioxide. The soaking softens the corn and the sulphur dioxide prevents possible fermentation. It is then crushed and passed to water tanks where the germ floats off. The mass is then ground fine and, still in a semi-fluid state, passed through silk screens to remove the skin particles. After filtration, the product, which is almost 100% starch, is dried.

Cornstarch in cold water is insoluble, granular, and will settle out if left standing. However, when cornstarch is cooked in water, the starch granules absorb water, swell, and rupture, forming a translucent thickened mixture. This phenomenon is called *gelatinization*. Gelatinization usually begins at about 60°C (140°F), reaching completion at the boiling point.

The commonly used ingredients in a starch recipe affect the rate of gelatinization of the starch. Sugar, added in a high ratio to the starch, will inhibit the granular swelling. The starch gelatinization will not be completed even after prolonged cooking at normal temperature. The result is a filling of thin consistency, dull color, and a cereal taste. Withhold some of the sugar from the cooking step in such cases, and add it after gelatinization of the starch has been completed.

Other ingredients such as egg, fat, and dry milk solids have a similar effect. Fruits with high acidity such as rhubarb will also inhibit starch setting. Cook the starch paste first and add the fruit afterward.

In cooking a filling, about 1.5 kg (3 1/3 lb.) of sugar should be cooked with the water or juice for every 500 g (18 oz.) of starch used as a thickener. Approximately 100 g (4 oz.) of starch is used to thicken 1 L of water or fruit juice. The higher the acidity of the fruit juice, the more thickener required to hold the gel. Regular cornstarch thickens well but makes a cloudy solution. Another kind of cornstarch, waxy maize starch, makes a more fluid mix of great clarity.

### Pre-gelatinized Starches

Pre-gelatinized starches are mixed with sugar and then added to the water or juice. They thicken the filling in the presence of sugar and water without heating. This is due to the starch being precooked and not requiring heat to enable it to absorb and gelatinize. There are several brands of these starches on the market (e.g., Clear Jel), and they all vary in absorption properties. For best results, follow the manufacturer's guidelines. Do not put pre-gelatinized starch directly into water, as it will form lumps immediately.

#### Note

If fruit fillings are made with these pre-cooked starches, there is a potential for breakdown if the fillings are kept. Enzymes in the uncooked fruit may “attack” the starch and destroy some of the gelatinized structure. For example, if you are making a week's supply of pie filling from fresh rhubarb, use a regular cooked formula.

### Arrowroot

Arrowroot is a highly nutritious farinaceous starch obtained from the roots and tubers of various West Indian plants. It is used in the preparation of delicate soups, sauces, puddings, and custards.

### Agar-Agar

Agar-agar is a jelly-like substance extracted from red seaweed found off the coasts of Japan, California, and Sri Lanka. It is available in strips or slabs and in powder form. Agar-agar only dissolves in hot water and is colorless. Use it at 1% to make a firm gel. It has a melting point much higher than gelatin and its jellying power is eight times greater. It is used in pie fillings and to some extent in the stiffening of jams. It is a permitted ingredient in some dairy products, including ice cream at 0.5%. One of its largest uses is in the production of materials such as piping jelly and marshmallow.

### Alginate (Sodium Alginate)

Extracted from kelp, this gum dissolves in cold water and a 1% concentration to give a firm gel. It has the disadvantage of not working well in the presence of acidic fruits. It is popular in uncooked icings because it works well in the cold state and holds a lot of moisture. It reduces stickiness and prevents recrystallization.

## Carrageenan or Irish Moss

Carrageenan is another marine gum extracted from red seaweed. It is used as a thickening agent in various products, from icing stabilizers to whipping cream, at an allowable rate of 0.1% to 0.5%.

## Gelatin

Gelatin is a glutinous substance made from the bones, connective tissues, and skins of animals. The calcium is removed and the remaining substance is soaked in cold water. Then it is heated to 40°C to 60°C (105°F 140°F). The partially evaporated liquid is defatted and coagulated on glass plates and then poured into moulds. When solid, the blocks of gelatin are cut into thin layers and dried on wire netting.

Gelatin is available in sheets of leaf gelatin, powders, granules, or flakes. Use it at a 1% ratio. Like some of the other gelling agents, acidity adversely affects its gelling capacity.

The quality of gelatin often varies because of different methods of processing and manufacturing. For this reason, many bakers prefer leaf gelatin because of its reliable strength.

## Gum Arabic or Acacin

This gum is obtained from various kinds of trees and is soluble in hot or cold water. Solutions of gum arabic are used in the bakery for glazing various kinds of goods, particularly marzipan fruits.

## Gum Tragacanth

This gum is obtained from several species of Astragalus, low-growing shrubs found in Western Asia. It can be purchased in flakes or powdered form. Gum tragacanth was once used to make gum paste and gum paste wedding ornaments, but due to high labour costs and a prohibitive price for the product, its use nowadays is uncommon.

## Pectin

Pectin is a mucilaginous substance (gummy substance extracted from plants), occurring naturally in pears, apples, quince, oranges, and other citrus fruits. It is used as the gelling agent in traditional jams and jellies.

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