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DIETARY HEALTH

Tropical Fruit Butter

Introduction

Fruits have unique characteristics that make them not only delicious but also diverse in culinary applications. Fruits come in a variety of flavors, from the sweetness of berries, tartness of citrus fruits, to tropical notes of pineapples and mangoes. Fruits are packed with vitamins, minerals, antioxidants, and natural fibers.

Fruits are harvested in distinct seasons, and this periodic rotation encourages the use of local products. However, an abundance of fruit production in peak season causes losses that can be an opportunity for creativity, to turn a surplus into delicious and long-lasting creations. Canning is one of the main food preservation technologies used to take advantage of excess fruit production. Heat treatment and the addition of sugar allow for an increase in the shelf life of fruits when they are packed in a sealed jar.

Products prepared from fruits include fruit butter, jelly, or preserves. Their characteristics are described below according to definitions and standards of identity. Pectin, gums, or both can be added for a thicker consistency and to compensate for the deficiency of the natural pectin content in the fruit.

Table 1. *Products made from fruits and their characteristics.*

Product	Description	Fruit/Sweetener	Soluble solids	Reference
Fruit butter	Smooth, semisolid, concentrated with or without heat.	>5 parts of fruit with 2 parts of sweetener	>43%	21CFR150.110
Fruit jelly	Jelled fruit from filtered or strained juice	>45 parts of fruit to each 55 parts of sweetener	>65%	21CFR150.140
Fruit preserve or jam	Viscous or semi-solid food	>47 parts of fruit to each 55 parts of sweetener	>65%	21CFR150.160

Fruit butter

Fruit butter does not contain dairy butter. The name is derived from its smooth and creamy texture. A fruit butter is prepared by simmering fruit with sugar. The fruit breaks down and water evaporates, resulting in a smooth and semisolid texture. The solids in fruit butter are lower than those in jelly or jam, meaning they have a lower content of sweetener or sugar than these products (FDA, 2023d).

Fruit jelly

Making fruit jelly involves extracting, straining, and combining fruit juice with sugar and pectin. Heat is also applied to remove water, until the mixture reaches the desired percentage of solids (>65° Brix). A firm gel is formed when the product cools (FDA, 2023b).

Fruit preserve or jam

This technique involves cooking whole or large pieces of fruit along with sugar to create a thick, textured mixture. The heat physically breaks down the fruit and removes water, preserving the natural fruit flavor and aroma (FDA, 2023c).

Passion fruit and mango butter

Ingredients

(Yields 10 jars/8 oz)

8 cups (2000 g) mango pulp

1 ¼ cups (300 g) passion fruit juice

3.5 cups (700 g) sugar

0.80 oz (23 g) pectin (1% of fruit weight)

Procedure

1. Obtain the fruit pulp by removing the peel, core, or seeds. Cut pulp into slices and weigh, then simmer with 3 cups of sugar in a pan for 10-20 minutes, until the fruit is softened. Blend or smash the fruit into a puree with a small amount of water.

1.

2. Cook at a gentle boil over medium heat and stir frequently to prevent burning. Mix the pectin with ½ cup (100 g) of the sugar and add with agitation to avoid clumping. Pectin should be added near the end of the process, as overcooking will break down pectin and prevent proper gelling.

2.

3. Keep cooking the mixture until it reaches at least 42% of solids, measured with a Brix meter (see section D). If needed, add water to adjust the consistency of the final product.

4.

4. Fill the hot mixture into clean and sterilized jars (see section b), leaving ¼-inch of headspace.

5. Then, adjust the lids and continue with the heat treatment as described in section 3.

5.

A. What type of jars can be used?

Glass jars with metal lids are recommended for products that are required to have a heat treatment. A wide-mouth jar will allow for easy product filling. The lid can have 1 or 2 pieces. The two-piece lid has a flat metal disc accompanied by a metal screw band (Figure 1). The one-piece lid has both parts joined in one piece and is commonly used in industrial canning. A space of ¼-inch headspace should be left between the food and the lid, as this space is needed to form the vacuum seal and to allow food expansion when heated.

Figure 1. Types of glass jars used for canning, with two-piece (top row) and one-piece (bottom) lids.

B. How to clean jars

The empty jars can be washed with detergent and rinsed thoroughly with clean water to remove soil or extraneous matter. An effective sterilization of jars is required to remove any spoilage or pathogenic microorganisms that may be present. This is done by boiling the jars for 10 minutes in enough water to cover them. At higher elevations, boil them one more minute for each additional 1000 ft elevation. It is recommended to keep jars hot by reducing the heat until it is time to fill them. Remember, the jar sterilization method is required for products with less than 10 minutes of heat processing (USDA, 2015).

C. Why and how to sterilize preserves

There are two main reasons to sterilize preserves. First, it helps to maintain a good color and flavor by removing oxygen and destroying food enzymes. Second, and most importantly, it reduces the risk of illnesses caused by food-borne pathogens. For sterilization purposes, food has been categorized according to the pH as low-acid or acid foods, with a pH of 4.6 as the limit. Low-acid foods (pH>4.6) require a stronger treatment because they have a higher risk for growth of food-borne pathogens. Clostridium botulinum, a bacterium that produces a toxin responsible for botulism, is a specific concern for low-acid foods.

Most fruit spreads are categorized as acid foods (pH<4.6), with fruit butter having a pH range from 3.5-4.2 (USDA, 2020). Therefore, the time needed for a heat treatment will be between 5 and 20 minutes (see Table 2) for the boiling-water method. The treatment time depends on the size of the jars, composition, and type of packaging.

The boiling-water method, commonly used for acid products, is as follows:

1. Fill a pot with clean water and bring to a boil. The diameter of the pot should be at most 4 inches wider than the heating source, to ensure uniform processing.

Table 2. *Boiling times according to jar size and altitude (LaBorde & Zepp, 2015; USDA, 2015)*

			Processing time (min)		
Product	**Style of Pack**	**Jar Size**	**0-1000 ft**	**1001-6000 ft**	**Above 6000 ft**
Fruit butters, jellies and jams	Hot-filled	Half-pints	5	10	15
	Hot-filled	Pints	5	10	15
	Hot-filled	Quarts	10	15	20

2. Load the sealed jars containing the product in the pot, always keeping the jars upright. Add more water if needed, to cover the jars 1 or 2 inches above the height of the jars.
3. Turn the heat on to obtain a vigorous boil, and cover the pot.
4. Start the timer for the required processing minutes according to the altitude and jar size (Table 2).
5. When the time has ended, turn off the heat and remove the pot lid. Wait 5 minutes before removing the jars, and always keep the jars upright.
6. Let the jars sit on a towel undisturbed at room temperature for 12 to 24 hours.
7. Test the seal by pressing the middle of the lid to verify that it does not pop back, and that the lid is curved down in the center.

D. What is degrees Brix?

Degrees Brix is a measurement scale that quantifies the percentage of soluble solids in a liquid, primarily applied to fruit juices, preserves, and beverages. Soluble solids refer to the total amount of solid compounds dissolved in a liquid, mostly sugars, and in less quantity organic acids, pectin, and minerals (Sinha et al., 2012). The concentration (%) is measured with a Brix meter and used to assess quality (Figure 2), as each fruit product has an established range or minimum percentage, as seen on Table 1. The degrees Brix of fruits vary according to ripeness. For example, a mango can have 5% Brix when green and 16% Brix when ripe, mostly from sugars composition.

Glossary

Low-acid food: foods with a finished equilibrium pH greater than 4.6 and a water activity greater than 0.85 (FDA, 2023a).

Acidified food: low-acid foods to which acid(s) or acid food(s) are added.

Acid food: foods that have a natural pH of 4.6 or below.

Brix: or degrees Brix. The percent by weight concentration of the total soluble solids of the juice or citrus product when tested with a Brix hydrometer calibrated at 20 °C (68 °F) (CFR, 2023)

Water activity: ratio between the vapor pressure of the food by the vapor pressure of distilled water, under identical conditions. Water activity provides information about available moisture for microbial growth.

Standard of identity: requirements established by regulations that determine what a food product must contain to be marketed under a certain name.

Takeaway key points

- Fruits (including those in excess from overproduction) can be preserved to extend their shelf life.
- Fruit, pectin, acid, and sugar ratio can be adjusted to produce jam, jelly, or butter.
- Total solids of the final product are measured with degrees Brix to fulfill standards of identity.
- Sterilization time and temperature are key parameters required to avoid food poisoning.

Figure 2. Brix meters – portable (a), digital (b), and benchtop (c).

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