

# Comparison of Sugar and Preservatives in Different Brands of Jam from Different Origins

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**Abstract.** Food health is a global issue that people have been paying attention to. The ingredients and contaminants contained in food may endanger human health also jam is a food necessity in most people's lives. This article will conduct experiments and compare data on sugar and mold in apricot jam to explore sugar and bacterial colonies. Additionally, the author discovered that compared to purchased jams, self-made jams contain less sugar, are made from healthier ingredients, have fewer preservatives, can be stored for a long time if stored properly, and are not easily spoiled. In comparison, foreign brands of apricot jam have higher sugar content and the highest total number of molds and domestic one keeps stable and there are not many maximum values in the data of domestic one. Each chain of colonies that appears on the plate and lacks distinct borders is counted as a separate colony for determining the overall number of molds present.

**Keywords:** Jam; sugar content; molds (total number of).

## 1. Introduction

Consumers around the world are adding sugary traditional foods such as jams, honey and/or some nut butters to their daily diets. In addition, these foods can be stored for a long time and are also suitable for long-term storage. Jam is a food substrate made from heating pulp with other substances such as sugar, pectin, acidic food preservatives, food coloring, and flavorings [1]. A mixture created by heating the pulp while adding sugar, pectin, acid, and additional ingredients such as flavorings, colors, and preservatives. In order to retain the fruit tissue in place, the final product should have a thick, hard consistency. This article compares and analyzes the sugar and preservatives in different brands and different origins of apricot jam. Test the sugar content by diluting the jam and using a refractometer, also compare the impact of the storage of the jam at different temperatures and the amount of mold produced.

## 2. Methods

### 2.1. Materials

All the materials below illustrate essential items for both two experiments.

- A spoon for taking samples, one spoon for each sample, and several samples need to be prepared.
- Electronic scale (as accurate as possible to 0.01g).
- Glass beakers, one for each sample (250ml).
- Distilled water (more than 2 liters).
- Round-head glass rod, stirring rod.
- Boiling pot for water bath.
- A Buchner funnel.
- Sample cups (one for each sample).
- Wash bottle (one).
- Refractometer.
- Alcohol.
- Absorbent cotton.
- Sample cup.

## 2.2. Process I

During the experiment, it mainly divided in to two parts, refractometer and total number of bacterial colonies. In order to ensure the varieties of the jam, author chose three different brands of apricot jam, one from China, one from foreign country and one is self-made. Process of self-made jam are following: the invention discloses a method for making apricot jam, which includes the following steps: stage 1: Screen yellow apricots, screen out soft and rotten yellow apricots and immature yellow apricots, and then process the screened fresh yellow apricots. Cleaning, the surface of the yellow apricot is cleaned, the pedicle bar recess of the yellow apricot is cleaned, and then the yellow apricot is drained, and the surface of the yellow apricot is removed or wiped dry. Boil over a low heat that does not exceed the bottom of the pot, and stir continuously with a spoon during the cooking process. During the stirring process, press the apricot with the tip of the spoon to crush the lumps of apricot. Soft and rotten, the yellow apricot can be boiled until it becomes gelatinous. The result is that the apricot flesh in the jam is soft and rotten into pulp fibers, and the jam is sticky, thereby increasing the viscosity of the apricot jam, increasing the degree of exudation of pectin in the apricot, and improving the quality of the fruit. The food ingredients are added, the convenience of eating is enriched, and it is also more convenient when frying bread [2].

## 2.3. Process II

During this process, the refractometer was calibrated according to the instructions before the measurement. Remove the lid and carefully apply the prism with a soft cloth. Separate the two floor mirrors of the refractometer, and wipe them with absorbent cotton dipped in ether or alcohol. A few drops of the test solution should be taken, placed on the detection prism, carefully covered to prevent air bubbles, and then the solution should be evenly distributed throughout the prism surface. To clearly see the blue and white field-of-view borders, point the instrument's light entrance plate at a light source or other bright area, look through the eyepiece, and use the eyepiece adjustment handwheel. The solution concentration is represented by the scale value of the dividing line. Before taking a measurement, the instrument needs to be zero-calibrated. Turn the zero-adjustment screw to the 0% position of the scale, add a few drops of distilled water, and place it on the detecting prism. Then wipe the detection prism to start detection. Use a glass rod with a rounded end to dip 2 to 3 drops of the prepared sample solution, and carefully drop it on the center of the plane of the refractometer's floor mirror (be careful not to let the glass rod touch the prism). Quickly close the mirrors on the upper and lower floors, and let it stand for 1 min. It is required that the liquid is uniform and free of bubbles and fills the field of vision. Aim at the light source, observe with the sun mirror, and adjust the indicator gauge so that the field of view is divided into two parts, light and dark. Then turn the fine-tuning screw to make the boundary between the two parts clear, and the dividing line is just at the cross point of the objective lens, and read the reading.

## 2.4. Process III

To ascertain the similarities and differences between the quince jam samples, categorical main components analysis was carried out using the number of molds as a variable [3]. The first step is sample dilution. Weigh 25g of the sample and place it in a sterile homogenizing cup containing 225 ml of phosphate buffer or physiological saline, and beat for 1-2 minutes to make a 1:10 sample homogeneous solution. Liquid sample: Take 25 ml of the sample with a sterile pipette and place it in a sterile Erlenmeyer flask filled with 225 ml of phosphate-grade flushing solution or normal saline, and mix well to prepare a ratio of one to ten homogeneous sample solution. One milliliter of the 1:10 homogenous sample solution should be drawn using a sterile pipette or micropipette, slowly injected along the tube wall into a sterile test tube containing nine milliliters of diluent, and then mixed evenly to create a 1:100 solution. Choose a minimum of three homogenous sample solutions with the proper dilutions based on your estimation of the sample contamination status (liquid samples may contain original solutions) [4]. Pipette 1 ml of the homogenous sample solution into an uncontaminated plate to execute a 10-fold dilution. Fill two sterile plates with 1 cc of blank diluent to serve as blank controls

at the same time. Agar medium for counting plates that is 15 ml to 20 ml in size and cooled to 46 °C (it can be stored in a water bath at 46 °C plus or minus 1 °C) should be added as soon as possible. The plate should then be rotated to ensure even mixing. A nutritious step follows. Turn the plate over and incubate it for 48 hours plus two hours at 36 degrees Celsius plus or minus one degree after the agar has solidified [5]. In case the sample appears to have colonies that are spreading out on the surface of the agar medium, the culture can be continued as usual by covering the surface of the agar with a thin layer of agar medium (approximately 4 ml) after it has solidified. The pour plate method is used to look for bacterial species that do not thrive in the presence of air. The sample is diluted in steps and then mixed with liquid nutrient agar before being placed into vials for the initial examination. The bottles are then sealed and turned so the agar surface slopes downward. After incubation, it is possible to visually count the colonies that form within the medium's main body. The phrase used to describe the total number of colonies is total viable count (TVC). CFU/ml stands for number of colony forming units per milliliter. are used to measure quantities in relation to the original sample. This is calculated as a multiple of the counted number of colonies times the dilution used [6].

### 3. Results

#### 3.1. Experiment's Result

In the first experiment, three samples (domestic, foreign, and self-made) were tested twice with a weight of 20.3g. The experimental results are shown in Table 1.

**Table 1.** Results of the first experiment

|         | Domestic | Foreign | Self-made |
|---------|----------|---------|-----------|
| Trial 1 | 8.7%     | 10.4%   | 4.8%      |
| Trial 2 | 8.8%     | 10.5%   | 4.8%      |

In the second experiment, the proper counting range only includes the number of colonies on a single dilution plate. To determine the total number of colonies per g(mL) of sample, multiply the average number of colonies across the two plates by the corresponding dilution factor. When there are two serial dilutions of plate ruffle numbers within the appropriate counting range, it needs to be calculated according to the formula:  $N = \text{number of colonies} = \frac{\text{The sum of the number of colonies on the plate (the plate containing the number of colonies in the appropriate range)}}{(\text{the first dilution-the number of plates with a low dilution factor} + 0.1 \text{ multiplied by the second dilution-the number of plates with a high dilution factor})}$  multiplied by the dilution factor (first dilution spend) which also equal to  $(\text{Number of colonies} * \text{dilution factor}) / \text{volume of culture plate}$  [7].

After calculation, the experimental results are shown in Table 2.

**Table 2.** Results of the second experiment

|        | Domestic     | Foreign      | Self-made    |
|--------|--------------|--------------|--------------|
| Result | $6.8 * 10^3$ | $2.3 * 10^4$ | $9.6 * 10^3$ |

#### 3.2. Discussion

Early attempts to preserve fruit for consumption outside of the growing season gave rise to jam. The pulp is cooked with additional ingredients (preservatives, coloring, and flavoring agents) until a fairly thick consistency is formed. It is a food with intermediate moisture [8]. A marker for assessing the level of food contamination and a measure of food hygiene is the total number of bacterial colonies. The detection can forecast the food's shelf life [7]. Compared with the experiments in this article, there are actually more and more detailed methods. For example, bio electrochemical methods, electrical impedance detection methods, and ATP bioluminescence methods and so on [7]. On the other hand, spread-plating has various benefits over pour-plating, including greater handling flexibility and fewer negative effects on organisms with high temperature sensitivities [9]. As a result, rapid detection technology came into being, and moved from the culture level to the molecular level.

The total number of colonies is widely adopted by countries and organizations all over the world as the microbiological standard of food. Due to the differences in the composition of food in various countries around the world and the different populations of microorganisms that contaminate food, there are differences in the name of the total number of bacterial colonies, medium selection, culture conditions, etc., but their function of reflecting the degree of bacterial contamination of food is the same [10].

#### 4. Conclusion

As a supplementary food, jam has high calories. The ingredients in jam have a greater impact on the human body and also comprehensively affect people's food health. In today's society, individuals are increasingly striving for a greater quality of life, and food is being made with healthier components. Finding natural foods such as formulas and meal preparations that are more suitable for modern people, such as vitamins, healthier ingredients and foods can also ensure more nutritious ingredients. However, high nutrient intake may also cause people to have slower metabolism or cause some diseases, such as high blood pressure. Classify according to different groups of people, and let the jams also be classified. This can not only ensure specialization in the industry, but also better absorb different nutrients according to different groups of people. Compared with jam bought outside, self-made jam is more suitable for people who are looking for less sugar and have poor metabolism, because it contains the least sugar and the least preservatives.

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