

Research Note

THE PREPARATION OF PAPAYA JAM¹

Papayas occasionally are produced in excess of the market demand for fresh fruit. This study was performed in an effort to develop another use for the green fruit in addition to sliced papaya in extra heavy syrup, papaya in light, medium or heavy syrup and glazed papaya slices.

Two batches of jam were prepared in the pilot plant and a procedure, which includes two boiling operations, was developed.²

In the first boiling operation, pectin was extracted for making the jam as well as to soften the green fruit. The fruit was washed, hand peeled, seeded and cut into approximately 3/8-in cubes with an Urschell Laboratories³ machine cutter, model G. The cubes were boiled with tap water for a specified time in a stainless steel kettle provided with an agitator and separated by decanting from the boiling liquid, which was to be used later as a pectin solution. The cubes were macerated while hot to produce a pulp with a Model D., impact forward, comminuting machine provided with a No. 2 sieve.

The pulp was diluted with the pectin solution to increase the yield of jam. The solution was added with stirring until the Brix of the pulp changed from an initial reading of 3.4 or 3.5 to a final reading of 3.0.

In the second boiling operation, an amount of pectin solution was heated from 70° to 80° C to dissolve a mixture of 70% sucrose and 30% glucose (60° B).⁴ The diluted pulp was added to the solution, and the mixture was boiled and stirred almost to the set point when citric acid was added; further boiling was then continued to the set point.

The product was bottled in 6- and 12-oz glass jars after they had been submerged in water at 190° F for 30 min and oven-dried.

The jam was cooled by spraying the hot jars with water at room temperature and then immersing them in a water bath. Jars of jam were either stored in a stock room at 85° F or in a refrigerator at 45° F for periodic evaluation of pH, Brix, color, acidity, for sensory evaluation and for bacteriological counts.

¹ Manuscript submitted to Editorial Board October 31, 1974.

² Bessey, D. A., Ocean Spray Cranberries, Inc., Hanson, Mass., Food Engineering 42(2): 69-71, 1970.

³ Trade names are used solely for the purpose of providing specific information. Mention of trade names does not constitute a guarantee or warranty of the equipment by the Agricultural Station of the University of Puerto Rico or an endorsement over other equipment not mentioned.

⁴ Cruess, W. V., Commercial fruit and vegetable products, McGraw Hill Book Co., 4th ed., New York, 1958.

Six preliminary tests were conducted in the pilot laboratory with small quantities of papaya to determine the amount of ingredients and to derive a formulation which could be scaled up to pilot plant size.

For the preparation of fruit jams pectin is usually added to sugar and citric or malic acid to produce the required gel. For papaya, however, it was found that the solution from the first boiling operation had sufficient

TABLE 1.—*Formulation and condition of the jams prepared in the pilot plant*

Item	Batch	
	1	2
<i>First cooking</i>		
Weight of green fruit	11.93 kg (26.25 lb)	11.36 kg (25 lb)
Weight of cubes	8.3 kg (18.25 lb)	8.4 kg (18.50 lb)
Weight of water	14.6 kg (32.12 lb)	12.6 kg (27.75 lb)
Steam pressure	11 lb	15 lb
Time of cooking	30 min	20 min
<i>Second cooking</i>		
pH of pulp	5.8	5.7
Brix of pulp	3.0	3.0
Weight of pulp	9.43 kg (20.75 lb)	9.77 kg (21.50 lb)
Weight of sugars	6.67 kg (14.7 lb)	6.84 kg (15.05 lb)
Weight of citric acid	12.8 g (.028 lb)	11 g (.024 lb)
Weight of pectin solution to dissolve the sugars	2.07 kg (4.56 lb)	2.41 kg (5.3 lb)
Weight of pectin solution to dilute the pulp	3.06 kg (6.75 lb)	3.04 kg (6.70 lb)
Steam pressure	11 lb/in ²	15 lb/in ²
Time of cooking	87 min	91 min
Yield	7.04 kg (15.5 lb)	8.41 kg (18.5 lb)

TABLE 2.—*Specification of ingredients of the jams prepared in the pilot plant*

Formulation	Batch	
	1	2
	%	
Water, % of weight of cubes	176	150
Pectin solution, % of pulp weight	32.5	31.16
Sugars (70% sucrose, 30% glucose), % of pulp weight	70	70
Pectin solution to dissolve the sugars, % of pulp weight	21.97	24.65
Citric acid, % of pulp weight	0.13	0.11

pectin to form an adequate gel. This was shown by the fact that a mixture of 10 ml of the solution with 10 ml of 95% ethyl alcohol had appreciable jam characteristics. The type of jam formed (fragile to thick) indicated the abundance of pectin.

Jam made from the first three preliminary tests was cooled by letting the jars of jam stand at room temperature until cool. A taste panel found

them slightly acid and slightly gummy, but their color was acceptable and the jam retained the excellent aroma and flavor of the original fruit.⁵

In the other three tests variations in the proportion of water for boiling the cubes of fresh fruit and the quantity of citric acid were used. The method of cooling was changed to the system of spraying the hot jars with tap water followed by immersion in a water bath. The resulting jam had no indication of gumminess or excess acidity.

Appropriate conditions for the preparation of the jam were determined, and two batches were prepared in the pilot plant with a scaled up formulation from the preliminary tests (table 1). Batch number one was prepared with slow stirring and batch number two was prepared with moderately fast stirring.

After a storage time of 180 days in a stock room at 85° F chemical analysis of batches one and two showed respectively no change in pH, changes in Brix of 70 to 67 and 65 to 66, and in sensory evaluation of +1.20 to +1.08 and +1.10 to +1.00. The color difference (recorded with a Hunter Lab. Color Difference Meter Model D25 provided with a standard No. 3130) was negligible. Microbiological examination of the jam showed absence of bacteria, yeasts and molds; negative sanitation indexes of coliforms and enterococcus, and negative in food poisoning microorganisms.

A formulation for the cooking of the two batches in terms of percentage of ingredients is shown in table 2.

Orlando Parsi Ros
Food Technology Laboratory

⁵ Kramer, A., and Ditman, S., Simplified variable taste panel method for detecting flavor changes in vegetables treated with pesticides, Food Tech. 10: 155-9, 1956.