HAWAII FOOD PROCESSORS HANDBOOK

CIRCULAR 55
HAWAII AGRICULTURAL EXPERIMENT STATION
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<table>
<thead>
<tr>
<th>FRUITS AND FRUIT PRODUCTS</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fruits</strong></td>
<td>7</td>
</tr>
<tr>
<td>Avocado Spread, Frozen</td>
<td>7</td>
</tr>
<tr>
<td>Banana, Canned</td>
<td>7</td>
</tr>
<tr>
<td>Australian Tropical Fruit Cocktail, Canned</td>
<td>8</td>
</tr>
<tr>
<td>Australian Tropical Fruit Salad, Canned</td>
<td>8</td>
</tr>
<tr>
<td>Hawaiian Tropical Fruit Salad, Canned</td>
<td>9</td>
</tr>
<tr>
<td>Guava Spread, Frozen</td>
<td>10</td>
</tr>
<tr>
<td>Lychee in Syrup, Frozen</td>
<td>10</td>
</tr>
<tr>
<td>Lychee, Canned</td>
<td>10</td>
</tr>
<tr>
<td>Mango, Canned</td>
<td>11</td>
</tr>
<tr>
<td>Papaya, Canned</td>
<td>11</td>
</tr>
<tr>
<td>Papaya in Syrup, Frozen</td>
<td>12</td>
</tr>
<tr>
<td>Passion Fruit Pulp, Canned</td>
<td>12</td>
</tr>
<tr>
<td><strong>Fruit Juices, Nectars, Nectar Bases, and Purees</strong></td>
<td>12</td>
</tr>
<tr>
<td>Guava Nectar Base, Frozen</td>
<td>12</td>
</tr>
<tr>
<td>Guava Nectar, Canned</td>
<td>13</td>
</tr>
<tr>
<td>Guava Puree, Frozen</td>
<td>13</td>
</tr>
<tr>
<td>Papaya Nectar, Canned</td>
<td>13</td>
</tr>
<tr>
<td>Papaya Nectar Base, Frozen</td>
<td>14</td>
</tr>
<tr>
<td>Papaya-Banana Nectar, Canned</td>
<td>14</td>
</tr>
<tr>
<td>Papaya Puree, Frozen</td>
<td>14</td>
</tr>
<tr>
<td>Papaya-Passion Fruit Nectar, Canned</td>
<td>15</td>
</tr>
<tr>
<td>Papaya-Pineapple Nectar, Canned</td>
<td>15</td>
</tr>
<tr>
<td>PASSION FRUIT-Acerola Cherry Nectar, Canned</td>
<td>16</td>
</tr>
<tr>
<td>PASSION FRUIT-Pineapple Nectar, Canned</td>
<td>16</td>
</tr>
<tr>
<td>Passion Fruit Juice, Frozen</td>
<td>17</td>
</tr>
<tr>
<td>Passion Fruit Nectar, Canned</td>
<td>17</td>
</tr>
<tr>
<td>Passion Fruit Nectar Base, Canned</td>
<td>17</td>
</tr>
<tr>
<td>Passion Fruit Nectar Base, Frozen</td>
<td>18</td>
</tr>
<tr>
<td><strong>Jams, Jellies, and Syrups</strong></td>
<td>18</td>
</tr>
<tr>
<td>Coconut Syrup</td>
<td>18</td>
</tr>
<tr>
<td>Guava Jam</td>
<td>18</td>
</tr>
<tr>
<td>Guava Jelly</td>
<td>19</td>
</tr>
<tr>
<td>Passion Fruit Jelly</td>
<td>19</td>
</tr>
<tr>
<td>Papaya-Pineapple Jam</td>
<td>20</td>
</tr>
<tr>
<td>Passion Fruit-Papaya Jam</td>
<td>20</td>
</tr>
<tr>
<td>Passion Fruit-Pineapple Jam</td>
<td>21</td>
</tr>
</tbody>
</table>
# TABLE OF CONTENTS (Continued)

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>VEGETABLES AND VEGETABLE PRODUCTS</td>
<td></td>
</tr>
<tr>
<td>Poi, Acidified, Canned</td>
<td>22</td>
</tr>
<tr>
<td>Poi, Fresh, Canned</td>
<td>22</td>
</tr>
<tr>
<td>Poi, Sour, Canned</td>
<td>22</td>
</tr>
<tr>
<td>Taro Leaf, Canned</td>
<td>23</td>
</tr>
<tr>
<td>Strained Taro Leaf, Canned</td>
<td>23</td>
</tr>
<tr>
<td>MEATS, MEAT PRODUCTS, AND FISH</td>
<td></td>
</tr>
<tr>
<td>Frankfurters, Canned</td>
<td>24</td>
</tr>
<tr>
<td>Kau Yuk (Chinese Pot Roast Pork), Canned</td>
<td>25</td>
</tr>
<tr>
<td>Sweet-Sour Spareribs, Canned</td>
<td>25</td>
</tr>
<tr>
<td>Tuna Chicken, Processed</td>
<td>26</td>
</tr>
<tr>
<td>Tuna Ham, Processed</td>
<td>26</td>
</tr>
<tr>
<td>Lauralau, Canned</td>
<td>26</td>
</tr>
<tr>
<td>MISCELLANEOUS</td>
<td></td>
</tr>
<tr>
<td>Birds’ Nest Soup, Canned</td>
<td>27</td>
</tr>
<tr>
<td>Chocolate Taro Beverage, Canned</td>
<td>28</td>
</tr>
<tr>
<td>Shredded Coconut, Canned</td>
<td>28</td>
</tr>
<tr>
<td>Haupia, Canned</td>
<td>29</td>
</tr>
<tr>
<td>Fried Rice, Canned</td>
<td>29</td>
</tr>
<tr>
<td>REFERENCES</td>
<td></td>
</tr>
<tr>
<td></td>
<td>30</td>
</tr>
</tbody>
</table>
FOREWORD

This publication constitutes a revision and extension of the Food Processors’ Handbook for Hawaiian Fruits and Vegetables issued in the form of Progress Notes by the Agricultural Experiment Station of the University of Hawaii in May, 1952. The original edition provided valuable guidance to the food industry of the Territory of Hawaii. Recent advances in the science of food technology together with the patent need for increased diversification in production are the basic reasons for alterations and additions. These changes were forecast in the prefatory remarks to the first edition in which the authors state, “As our work progresses changes and alterations may be necessary in the formulations, methods, and equipment requirements. Supplements will be issued from time to time to show any new recommendations and to keep the procedures up to date.” This revised edition may therefore be taken to denote substantial progress in the research work of the Food Processing Laboratory since 1952.

The retention of the section dealing with general processing was not considered necessary in view of availability of excellent textbooks in which unit processes and food equipment are described in detail. For the same reason explanatory information relating to specific processing procedures has been deleted. Canned and frozen products have been grouped under fruits, vegetables, and meats and fish, rather than according to the method of preservation but this arrangement is purely one of personal preference. An endeavor has been made to insure conformity of presentation of all products insofar as this treatment was possible. A brief list of references of the more prominent publications in the field of food technology has been included.

Quantities of materials used in formulation have been expressed as parts but, since they total one hundred in most cases, they may also be regarded as percentages. Processors are reminded that Territorial and Federal food regulations prevail irrespective of statements made in this Handbook.

It is strongly recommended that heat sensitive, high acid products be sterilized in a spin cooker. Details of its construction and performance are available from this laboratory.

Process times recommended for retorted products commence when the retort attains temperature. After the expiration of the stipulated time the cans are cooled immediately.

There are certain aspects of the processing of foodstuffs which are not amenable to unqualified statement; e.g., times and temperatures are rarely stated for the commercial sterilization of products which vary in viscosity in accordance with standards established by different manufacturers. For information on such matters and on the various technological problems that arise from time to time, it is suggested that application for advice be made to the Food Processing Laboratory.
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FRUITS AND FRUIT PRODUCTS

Fruits

FROZEN AVOCADO SPREAD

Formulation:
- Avocado puree 93.0 parts
- Lime or lemon juice 4.6 parts
- Salt 1.9 parts
- Onion powder 0.3 part
- Ascorbic acid 0.2 part

Preparation:
Select avocados of high fat content, low fiber, and good color. Pass flesh through a pulping machine equipped with a 0.027-in. (or finer) screen. Sufficient lemon or lime juice should be added to reduce the spread to less than pH 4.5.

Fill: Fill into jars, paper pails, or other suitable containers.

Process: Freeze immediately and store at 0°F.

CANNED BANANA

Formulation:
- Cavendish or Chinese banana
- Syrup 30° Brix containing 0.5 percent citric acid and 0.2 percent calcium chloride

Preparation:
Select fruit of early eating stage just beginning to fleck, hand peel, and cut into ~4-in. to 1-in. pieces.

Fill:
- Fill 12 oz. into a No. 2 enamel can. Add syrup close to the boiling point to give a final headspace when cold of 6/16 in. and exhaust to a center temperature of 160°F., close without vacuum or add syrup to 5/16-in. headspace and close at 15-in. vacuum.

Thermal process:
Heat in an agitating cooker to 195°F. and cool immediately or heat in boiling water to 195°F. and cool immediately.
CANNED AUSTRALIAN TROPICAL FRUIT COCKTAIL

Formulation:  
- Pineapple  
- Papaya  
- Banana  
- Passion fruit  
- Syrup 40° Brix

Preparation:  
Select firm fully ripe pineapples, papayas, and passion fruit. Select bananas just beginning to fleck at the early eating stage. Wash fruit. Peel and core the pineapples. Peel the bananas and papayas, and deseed the papayas. Remove the pulp from the passion fruit. Dice the pineapples and papayas into 7/16-in. cubes and cut the bananas into 3/16-in. slices.

Fill:  
Fill into a No. 2 plain can:
- Pineapple 7.0 oz.  
- Papaya 5.0 oz.  
- Banana 1.0 oz.  
- Passion fruit pulp 0.7 oz.

Add syrup close to the boiling point to give a headspace when cool of 6/16 in. Exhaust to a center temperature of 160°F. and close without vacuum. Or add syrup to 5/16-in. headspace and close at 15-in. vacuum.

Thermal process:  
Process in an agitating cooker to 195°F. and cool immediately or heat in boiling water about 10 min. to a center temperature of 195°F. and cool immediately.

CANNED AUSTRALIAN TROPICAL FRUIT SALAD

Formulation:  
- Pineapple  
- Papaya  
- Banana  
- Passion fruit  
- Syrup 40° Brix containing 0.2 percent citric acid

Preparation:  
Select firm fully ripe pineapples, papayas, and passion fruit. Select bananas just beginning to fleck at the early eating stage. Wash fruit. Peel and core the pineapples. Peel the bananas and papayas, and deseed the papayas. Remove the pulp from the passion fruit. Dice the pineapples, papayas, and bananas into ⅜-in. to ⅝-in. cubes.
Fill: Fill into a No. 2 plain can:

- Pineapple 5.6 oz.
- Papaya 5.6 oz.
- Banana 2.1 oz.
- Passion fruit pulp 0.7 oz.

Add syrup close to the boiling point to give a head-space when cool of 6/16 in. Exhaust to a center temperature of 160°F. and close without vacuum. Or add syrup to 5/16-in. headspace and close at 15-in. vacuum.

Thermal process: Process in an agitating cooker to 195°F. and cool immediately or heat in boiling water about 10 min. to a center temperature of 195°F. and cool immediately.

CANNED HAWAIIAN TROPICAL FRUIT SALAD

Formulation: Pineapple Smooth leaf Cayenne
- Papaya Solo
- Banana Cavendish
- Lychee Brewster, Kwai Mi
- Passion fruit Yellow
- Syrup 40° Brix containing 0.2 percent citric acid

Preparation: Select firm fully ripe pineapples, papayas, lychees, and passion fruit. Select bananas just beginning to fleck at the early eating stage. Wash fruit. Peel and core the pineapples. Peel and deseed the papayas and lychees, cutting the lychees into half. Peel the bananas. Remove the pulp from the passion fruit and strain out the seeds. Dice pineapples, papayas, and bananas into ½-in. to ¾-in. cubes.

Fill: Fill into a No. 2 plain can:

- Pineapple 5.5 oz.
- Papaya 5.5 oz.
- Banana 1.0 oz.
- Lychee 1.3 oz.
- Passion fruit juice 0.7 oz.

Add syrup close to the boiling point to give a head-space when cool of 6/16 in. Exhaust to a center temperature of 160°F. and close without vacuum. Or add syrup to 5/16-in. headspace and close at 15-in. vacuum.

Thermal process: Process in an agitating cooker to 195°F. and cool immediately or heat in boiling water about 10 min. to a center temperature of 195°F. and cool immediately.
FROZEN GUAVA SPREAD

Formulation: Guava puree 46.54 parts
Sugar 52.96 parts
Pectin, 150 grade 0.50 part

Preparation: Select only ripe whole fruit. Wash thoroughly and pass fruit successively through pulpers fitted with 0.033-in. and 0.014-in. screens. The pH of puree should be adjusted to 3.00 ± 0.05 with citric acid. Thoroughly stir the pectin mixed with 8 times its weight of sugar into 10 percent of the puree without incorporation of air. Add to this with continuous stirring 50 percent of the original weight of puree. Mix the balance of the puree with remaining sugar. Combine the two lots and stir until sugar is completely dissolved.

Fill: Fill into suitable containers and let stand until the product has set, usually overnight.

Process: Seal container, quick freeze, and store at 0°F.

FROZEN LYCHEE IN SYRUP

Formulation: Lychee
Syrup 40° Brix

Preparation: Select whole fully ripe firm fruit. Wash fruit, peel, and deseed.

Fill: Fill into enamel cans or other suitable containers and cover with syrup to ½-in. headspace.

Process: Close cans at 15-in. vacuum, quick freeze, and store at 0°F.

CANNED LYCHEE

Formulation: Lychee
Syrup 40° Brix containing 0.2 percent citric acid for varieties other than Brewster, or
Syrup 40° Brix containing 0.1 percent citric acid for Brewster 25 parts
Preparation: Select only firm whole ripe fruit. Remove peels and seeds.

Fill: Fill 16.5 oz. fruit into a No. 2 enamel can with 5.5 oz syrup. Close at 15-in. vacuum or exhaust in steam to a center temperature of 160°F. and close without vacuum.

Thermal process: Heat in an agitating cooker to 195°F. (about 2 min.) and cool immediately or cook in boiling water about 12 min. to a center temperature of 195°F.

CANNED MANGO

Formulation: Mapulehu (Joe Welch) or Haden mango
Syrup 40° Brix containing 0.25 percent citric acid

Preparation: Select firm fully ripe fruit. Wash, peel, and slice off the cheeks, dice into ¾-in. or 1-in. cubes.

Fill: Fill 13.5 oz. into a No. 2 can. Add syrup close to the boiling point to give a headspace when cool of 6/16 in. Exhaust to a center temperature of 160°F. and close without vacuum. Or add syrup to 5/16-in. headspace and close at 15-in. vacuum.

Thermal process: Process in an agitating cooker to 195°F. and cool immediately or heat in boiling water about 10 min. to a center temperature of 195°F. and cool immediately.

CANNED PAPAYA

Formulation: Papaya
Syrup 40° Brix containing 0.75 percent citric acid

Preparation: Select firm fully ripe papayas. Wash, peel, halve, and deseed the fruit. Dice into ¾-in. or 1-in. cubes.

Fill: Fill 13.5 oz. fruit into a No. 2 enamel can. Add syrup close to the boiling point to give a headspace when cool of 6/16 in. Exhaust to a center temperature of 160°F. and close without vacuum. Or add syrup to 5/16-in. headspace and close at 15-in. vacuum.

Thermal process: Process in an agitating cooker to 195°F. and cool immediately or heat in boiling water about 10 min. to a center temperature of 195°F. and cool immediately.
FROZEN PAPAYA IN SYRUP

Formulation:
- Diced papaya 60.00 parts
- Syrup 40° Brix 39.82 parts
- Citric acid 0.18 part

Preparation: Select whole mature firm fruit. Peel, halve, deseed, and cut into 1-in. dice.

Fill: Pack into enamel cans or other suitable containers and add syrup to ½-in. headspace.

Process: Close cans at 15-in. vacuum, quick freeze, and store at 0°F.

CANNED PASSION FRUIT PULP

Formulation:
- Passion fruit pulp 87.5 parts
- Sugar 12.5 parts

Preparation: Select only ripe whole fruit. Wash thoroughly, halve, and remove pulp mechanically. Dissolve sugar in pulp with minimum incorporation of air into the product.

Fill: Fill pulp into enamel cans to 5/16-in. headspace. Close at 20-in. vacuum or exhaust in steam to a center temperature of 160°F. and close without vacuum.

Thermal process: Heat in an agitating cooker to 195°F. and cool or cook in boiling water about 12 min. to a center temperature of 195°F. and cool in water.

Fruit Juices, Nectars, Nectar Bases, and Purees

FROZEN GUAVA NECTAR BASE

Formulation:
- Guava puree 67.5 parts
- Sugar 32.5 parts

Preparation: Select only ripe whole fruit. Wash thoroughly and pass fruit successively through pulper equipped with 0.033-in. and 0.020-in. screens. Dissolve sugar thoroughly in puree with minimum incorporation of air into the product.

Fill: Fill into enamel cans or other suitable containers to ½-in. headspace.

Process: Close cans at 15-in. vacuum, quick freeze, and store at 0°F. Dilute 2½ times for use as a beverage.
CANNED GUAVA NECTAR

Formulation: Guava puree 20.0 parts
Sugar 9.6 parts
Water 70.4 parts

Preparation: Select only ripe whole fruit. Wash thoroughly and pass successively through pulpers fitted with 0.033-in. and 0.020-in. screens. Dissolve sugar in water thoroughly and mix with puree.

Fill: Fill into enamel cans to 5/16-in. headspace and close at 15-in. vacuum or heat in steam jacketed kettle to 160°F., fill hot, and close without vacuum.

Thermal process: Heat in an agitating cooker to 195°F. and cool immediately or heat in boiling water to 195°F. and cool in water.

FROZEN GUAVA PUREE

Preparation: Select only ripe whole fruit. Wash thoroughly and pass fruit successively through pulpers fitted with 0.033-in. and 0.020-in. screens.

Fill: Fill into enamel cans or other suitable containers to 3/4-in. headspace.

Process: Close cans at 15-in. vacuum, quick freeze, and store at 0°F.

CANNED PAPAYA NECTAR

Formulation: Papaya pulp 35.2 parts
Sugar 8.5 parts
Citric acid 0.5 part
Water 55.8 parts

Preparation: Select only ripe whole fruit. Wash, peel, halve, deseed, and pass through a pulper fitted with a 0.020-in. screen. Dissolve sugar and acid in water and mix with pulp.

Fill: Fill into enamel cans to 5/16-in. headspace and close at 15-in. vacuum or heat in a steam jacketed kettle to 160°F., fill hot, and close without vacuum.

Thermal process: Heat in an agitating cooker to 195°F. and cool immediately or heat in boiling water to 195°F. and cool in water.
**FROZEN PAPAYA NECTAR BASE**

**Formulation:**
- Puree: 83.33 parts
- Sugar: 16.25 parts
- Citric acid: 0.42 part

**Preparation:**
Select only ripe whole fruit. Wash, peel, halve, deseed, and pass through a pulper fitted with a 0.020-in. screen. Heat the papaya puree to 180°F. in a steam jacketed pan. Dissolve sugar and acid in puree.

**Fill:**
Fill hot into enamel cans or other suitable containers to 4/16-in. headspace and close or allow to cool, fill to ½-in. headspace, and close.

**Process:**
Cool in water, quick freeze, and store at 0°F.

**CANNED PAPAYA-BANANA NECTAR**

**Formulation:**
- Papaya puree: 33.22 parts
- Banana puree: 1.75 parts
- Sugar: 6.47 parts
- Citric acid: 0.17 part
- Water: 58.39 parts

**Preparation:**
Select only ripe whole fruit. Wash, peel, halve, and deseed papayas, and pass through a pulper fitted with a 0.020-in. screen. Wash and peel bananas, blanch in boiling water for 5 min., and pass through a pulper fitted with a 0.020-in. screen. Dissolve citric acid in water. Mix all ingredients thoroughly.

**Fill:**
Fill into enamel cans to 5/16-in. headspace and close at 15-in. vacuum or heat in a steam jacketed kettle to 160°F., fill hot, and close without vacuum.

**Thermal process:**
Heat in an agitating cooker to 195°F. and cool immediately or heat in boiling water to 195°F. and cool in water.

**FROZEN PAPAYA PUREE**

**Preparation:**
Select only ripe whole fruit. Wash fruit, peel, halve, remove seeds, and pass through a pulper equipped with a 0.020-in. screen. Heat puree to 195°F. in a flash pasteurizer or to 185°F. in a steam jacketed kettle.

**Fill:**
Fill hot into enameled cans with ¾-in. headspace.

**Process:**
Cool cans in water, quick freeze, and store at 0°F.
### CANNED PAPAYA-PASSION FRUIT NECTAR

**Formulation:**
- Papaya puree: 26.6 parts
- Passion fruit juice: 11.7 parts
- Sugar: 11.7 parts
- Water: 50.0 parts

**Preparation:**
Select only ripe whole fruit. Wash passion fruit thoroughly and remove pulp mechanically. Run fruit through a pulper fitted with a 0.033-in. screen. Wash, peel, halve, and deseed papayas. Pass through a pulper fitted with a 0.020-in. screen. Dissolve sugar in water and mix with papaya puree and passion fruit juice.

**Fill:**
Fill into enamel cans to 5/16-in. headspace and close at 15-in. vacuum or heat in a steam jacketed kettle to 160°F., fill hot, and close without vacuum.

**Thermal process:**
Heat in an agitating cooker to 195°F. and cool immediately or heat in boiling water to 195°F. and cool in water.

### CANNED PAPAYA-PINEAPPLE NECTAR

**Formulation:**
- Papaya puree: 32.55 parts
- Pineapple juice: 9.30 parts
- Sugar: 7.75 parts
- Citric acid: 0.40 part
- Water: 50.00 parts

**Preparation:**
Select only ripe whole fruit. Wash, peel, halve, and deseed papayas and pass through a pulper fitted with a 0.020-in. screen. Pineapple juice is obtained by passing by-product material from fruit cannery lines through a screw press, heating to coagulate protein, and centrifuging to standardize content of insoluble solids. Thoroughly dissolve sugar and citric acid in water and stir in the papaya puree and the pineapple juice.

**Fill:**
Fill into plain cans to 5/16-in. headspace and close at 15-in. vacuum or heat in a steam jacketed kettle to 160°F., fill hot, and close without vacuum.

**Thermal process:**
Heat in an agitating cooker to 195°F. and cool immediately or heat in boiling water to a center temperature of 195°F. and cool in water.
### CANNED PASSION FRUIT-ACEROLA CHERRY NECTAR

**Formulation:**
- Passion fruit juice: 13.60 parts
- Acerola cherry pulp: 2.50 parts
- Sugar: 8.90 parts
- Water: 75.00 parts

**Preparation:**
Select ripe whole passion fruit. Wash fruit thoroughly and remove pulp mechanically. Pass pulp through a pulper fitted with a 0.033-in. screen and then finish through a 60-mesh screen. Select firm ripe whole acerola cherries, wash, and pass through pulper fitted with a 0.020-in. screen. Dissolve sugar in water and mix in passion fruit and acerola cherry pulp.

**Fill:**
Fill into enamel cans to 5/16-in. headspace and close at 15-in. vacuum or heat in steam jacketed kettle to 160°F., fill hot, and close without vacuum.

**Thermal process:**
Heat in an agitating cooker to 195°F. and cool immediately or heat in boiling water to 195°F. and cool in water.

### CANNED PASSION FRUIT-PINEAPPLE NECTAR

**Formulation:**
- Passion fruit juice: 11.3 parts
- Pineapple juice: 11.3 parts
- Sugar: 9.9 parts
- Water: 67.5 parts

**Preparation:**
Select only ripe whole fruit. Wash passion fruit thoroughly and remove pulp mechanically. Run fruit through a pulper fitted with a 0.033-in. screen and then finish through a 60-mesh screen. Pineapple juice is obtained by passing by-product material from fruit cannery lines through a screw press, heating to coagulate protein, and centrifuging to standardize content of insoluble solids. Thoroughly dissolve sugar in water and stir in the passion fruit juice and pineapple juice.

**Fill:**
Fill into plain cans to 5/16-in. headspace and close at 15-in. vacuum or heat in a steam jacketed kettle to 160°F., fill hot, and close without vacuum.

**Thermal process:**
Heat in an agitating cooker to 195°F. and cool immediately or heat in boiling water to a center temperature of 195°F. and cool in water.
FROZEN PASSION FRUIT JUICE

Preparation: Select only ripe whole fruit. Wash fruit thoroughly and remove pulp mechanically. Pass pulp through a pulper fitted with a 0.033-in. screen.

Fill: Fill to ½-in. headspace into enamel cans or into other suitable containers.

Process: Close cans at 15-in. vacuum, quick freeze, and store at 0°F.

CANNED PASSION FRUIT NECTAR

Formulation: Passion fruit juice 15 parts
Sugar 10 parts
Water 75 parts

Preparation: Select only ripe whole fruit. Wash fruit thoroughly and remove pulp mechanically. Pass pulp through a pulper fitted with a 0.033-in. screen. Dissolve sugar in water thoroughly and mix with passion fruit juice.

Fill: Fill into enamel cans to 5/16-in. headspace and close at 15-in. vacuum or heat in steam jacketed kettle to 160°F., fill hot, and close without vacuum.

Thermal process: Heat in an agitating cooker to 195°F. and cool immediately or heat in boiling water to 195°F. and cool in water.

CANNED PASSION FRUIT NECTAR BASE

Formulation: Passion fruit juice 60 parts
Sugar 40 parts

Preparation: Select only ripe whole fruit. Wash fruit thoroughly and remove pulp mechanically. Pass pulp through a pulper fitted with a 0.033-in. screen and then finish through a 60-mesh screen. Thoroughly dissolve sugar in passion fruit juice.

Fill: Fill into enamel cans to 5/16-in. headspace and close at 15-in. vacuum.

Process: Heat in a spin cooker for 2 min. to 195°F. and spin cool immediately.
FROZEN PASSION FRUIT NECTAR BASE

Formulation:

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<th>Ingredient</th>
<th>Parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passion fruit juice</td>
<td>60</td>
</tr>
<tr>
<td>Sugar</td>
<td>40</td>
</tr>
</tbody>
</table>

Preparation:
Select ripe whole fruit. Wash thoroughly and remove pulp mechanically. Pass pulp through a pulper fitted with a 0.033-in. screen and then finish through a 60-mesh screen. Dissolve sugar thoroughly in juice with a minimum incorporation of air.

Fill: Fill into enamel cans or other suitable containers to ½-in. headspace.

Process: Close cans at 15-in. vacuum, quick freeze, and store at 0°F. Dilute 4 times for use as a beverage.

Jams, Jellies, and Syrups

COCONUT SYRUP

Formulation:

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coconut milk</td>
<td>50</td>
</tr>
<tr>
<td>Corn syrup 43° Baume</td>
<td>50</td>
</tr>
</tbody>
</table>

Preparation:
Select fully mature coconuts. Remove meat from shell and peel brown skin from meat. Grate or grind meat and express milk in a hydraulic press or a screw press. Mix milk and corn syrup thoroughly and boil moderately in a steam jacketed kettle to 222°F. (75 percent soluble solids). Pass syrup through a homogenizer at 3,000 psi and deaerate.

Fill: Fill into appropriate containers to exclude headspace and close without vacuum.

GUAVA JAM

Formulation:

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guava puree</td>
<td>45 to 50</td>
</tr>
<tr>
<td>Sugar</td>
<td>55 to 50</td>
</tr>
<tr>
<td>Pectin, rapid set 150 grade</td>
<td>0.45</td>
</tr>
</tbody>
</table>

Preparation:
Select only ripe whole guavas, wash thoroughly, and pass through a pulper fitted with a 0.030-in. screen. Heat puree in a steam jacketed kettle to 160°F. Stir
in pectin mixed with 5 times its weight of dry sugar and bring to a brisk boil. Add balance of sugar, bring to boil, and boil moderately to 222°F.

**Fill:**
Fill hot into suitable containers without headspace.

**Process:**
Close at a minimum temperature of 180°F., invert for 2 min. to sterilize cover, and cool in water.

### GUAVA JELLY

<table>
<thead>
<tr>
<th>Formulation:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Guava jelly stock</td>
<td>45 to 50 parts</td>
</tr>
<tr>
<td>Sugar</td>
<td>55 to 50 parts</td>
</tr>
<tr>
<td>Pectin, rapid set 150 grade</td>
<td>0.42 part</td>
</tr>
</tbody>
</table>

**Preparation:**
Select only whole ripe fruit. Wash thoroughly and pass successively through pulpers fitted with 0.030-in. and 0.014-in. screens. Heat juice in a steam jacketed kettle to 160°F. Stir in pectin mixed with 5 times its weight of sugar and bring to a brisk boil. Add balance of sugar, bring to boil, and boil moderately to 222°F.

**Fill:**
Fill hot into suitable containers without headspace.

**Process:**
Close at a minimum temperature of 180°F., invert for 2 min. to sterilize cover, and cool in water.

### PASSION FRUIT JELLY

<table>
<thead>
<tr>
<th>Formulation:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Passion fruit juice</td>
<td>40 parts</td>
</tr>
<tr>
<td>Sugar</td>
<td>60 parts</td>
</tr>
<tr>
<td>Pectin, rapid set 150 grade</td>
<td>0.57 part</td>
</tr>
</tbody>
</table>

**Preparation:**
Select only ripe whole fruit. Wash fruit thoroughly and remove pulp mechanically. Pass pulp through a pulper fitted with a 0.033-in. screen and then finish through a 60-mesh screen. Heat juice in a steam jacketed kettle to 160°F. Stir in pectin mixed with 5 times its weight of dry sugar and bring to a brisk boil. Add balance of sugar, bring to boil, and boil moderately to 222°–223°F.

**Fill:**
Fill hot into suitable containers without headspace.

**Process:**
Close at a minimum temperature of 180°F., invert for 2 min. to sterilize cover, and cool in water.
PAPAYA-PINEAPPLE JAM

Formulation:
- Papaya puree 22.5 to 33.3 parts
- Pineapple 11.1 to 22.5 parts
- Sugar 55.6 parts
- Pectin, slow set 208 grade 0.35 part
- Citric acid to 3.5 pH 0.2 part approximately

Preparation:
Select only ripe whole fruit. Wash, peel, halve, and deseed papayas and pass through a pulper fitted with a 0.020-in. screen. Wash pineapples, peel, core, and cut to ¼-in. dice. Mix the papaya and pineapple in a steam jacketed kettle and bring to a brisk boil. Stir in pectin mixed with 5 times its weight of dry sugar and when thoroughly dispersed add the sugar in three portions allowing 2-min. interval between additions. This procedure will insure sugar penetration into the pineapple portions. Boil to 222°F.

Fill:
Fill hot into suitable containers without headspace.

Process:
Close at a minimum temperature of 180°F., invert cans for 2 min. to sterilize cover, and cool in water.

Note:
The proportion of pineapple ingredient may be increased up to 50 percent of the total fruit weight to suit individual taste requirements.

PASSION FRUIT-PAPAYA JAM

Formulation:
- Passion fruit juice 33.3 parts
- Papaya puree 11.1 parts
- Sugar 55.6 parts
- Pectin, slow set 208 grade 0.35 part

Preparation:
Select only ripe whole fruit. Wash passion fruit thoroughly and remove pulp mechanically. Pass pulp through a pulper fitted with a 0.033-in. screen and then finish through a 60-mesh screen. Wash, peel, halve, and deseed papayas, and pass through a pulper fitted with a 0.020-in. screen. Heat passion fruit juice in a steam jacketed kettle to 160°F. Stir in pectin mixed with 5 times its weight of dry sugar and bring to brisk boil. Add balance of sugar and papaya puree. Bring to boil and boil moderately to 222°F.

Fill:
Fill hot into suitable containers without headspace.
PASSION FRUIT-PINEAPPLE JAM

Formulation:

- Passion fruit juice 33.3 parts
- Pineapple 11.1 parts
- Sugar 55.6 parts
- Pectin, slow set 208 grade 0.35 part

Preparation:

Select only ripe whole fruit. Wash passion fruit thoroughly and remove pulp mechanically. Pass pulp through a pulper fitted with a 0.033-in. screen and then finish through a 60-mesh screen. Wash pineapples, peel, core, and cut to ⅛-in. dice. Mix the passion fruit and pineapple in a steam jacketed kettle and bring to a brisk boil. Stir in pectin mixed with 5 times its weight of dry sugar and when thoroughly dispersed add the sugar in three portions allowing 2-min. interval between additions. This procedure will insure sugar penetration into the pineapple portions. Boil to 222°F.

Fill:

Fill hot into suitable containers without headspace.

Process:

Close at a minimum temperature of 180°F., invert cans for 2 min. to sterilize cover, and cool in water.
VEGETABLES AND VEGETABLE PRODUCTS

CANNED ACIDIFIED POI (READY-MIXED)

Definition: Acidified poi is the unfermented product prepared from standard grade poi not more than 4 hours old to which has been added 1 percent commercial lactic acid (50 percent lactic acid). Standard grade poi contains not less than 30 percent total solids and ready-mixed poi contains not less than 18 percent total solids.

Formulation:
- Poi (30 percent total solids) 60 parts
- Water 40 parts
- Lactic acid (commercial, 50 percent) 1 part

Preparation: The standard grade poi and the water are thoroughly mixed and heated in a steam jacketed kettle to 205°F. Close at a minimum temperature of 200°F., invert for 2 min. to sterilize cover, and cool in water.

CANNED FRESH POI (READY-MIXED)

Definition: Fresh poi is the unfermented product prepared from standard grade poi not more than 4 hours old. Standard grade poi contains not less than 30 percent total solids.

Formulation:
- Poi (30 percent total solids) 60 parts
- Water 40 parts

Preparation: The standard grade poi and the water are thoroughly mixed and heated in a steam jacketed kettle to 160°F. Fill hot 20 oz. into a No. 2 enamel can and close without vacuum.

Thermal process: Cook 100 min. at 240°F. and cool immediately.

CANNED SOUR POI (READY-MIXED)

Definition: Canned sour poi is the product prepared from standard grade poi by natural fermentation at atmospheric temperature. The final active acidity should be in the range pH 3.8 to pH 4.0.
Formulation:  
Fermented poi  
Water

Preparation:  
Commercially prepared standard grade poi is allowed to ferment for several days, thoroughly mixed with the water, and heated in a steam jacketed kettle to 205°F.

Fill:  
Fill hot 20 oz. into a No. 2 enamel can.

Process:  
Close at a minimum temperature of 200°F., invert for 2 min. to sterilize cover, and cool in water.

---

**CANNED TARO LEAF**

Formulation:  
Taro leaf  72.20 parts  
Brine (2 percent)  27.77 parts  
Monosodium glutamate  0.03 part

Preparation:  
Wash leaves and blanch in water for 5 min. at 180°F.

Fill:  
Fill into No. 2 enamel cans 13 oz. taro leaves, 5 oz. brine containing 0.005 oz. monosodium glutamate. Close at 15-in. vacuum or exhaust in steam to a center temperature of 160°F. and close without vacuum.

Thermal process:  
Cook 75 min. at 240°F. and cool in water.

---

**CANNED STRAINED TARO LEAF**

Formulation:  
Taro leaf  99.47 parts  
Salt  0.50 part  
Monosodium glutamate  0.03 part

Preparation:  
Trim ends from taro leaf stalks, wash, and blanch in water 5 min. at 180°F. Pass through horizontal high speed mill fitted with %-in. diameter screen. Add 0.5 percent salt and 0.03 percent monosodium glutamate.

Fill:  
Fill 19 oz. (4/16-in. headspace) into No. 2 enamel cans and close at 20-in. vacuum or exhaust in steam to a center temperature of 160°F. and close without vacuum.

Thermal process:  
Cook 105 min. at 240°F. and cool in water.
MEATS, MEAT PRODUCTS, AND FISH

CANNED FRANKFURTERS

Definition: Frankfurters are linked sausages, each ¾ to 1 in. in diameter and 4 in. or more in length. Generally they are made of about 60 percent beef and 40 percent pork, cured, spiced, cased, smoked, and cooked. The curing mixture usually consists of nitrate, nitrite, sugar, and salt, its quantitative addition being governed by regulation.

Raw materials: Beef and pork trimmings.
Beef — Steer, heifer, stag, or bull meat of canner grade containing low fat content.
Pork — Trimmings should not contain more than 50 percent fat, and head and seedy parts of the belly should not be used.
Cereal or milk powder may be added to the extent of 3.5 percent.
Casings should be commercial grade—16 to 24 millimeters, sheep or artificial.

Preparation: Trimmings are ground through a ½-in. plate and minced in a silent cutter or through a fine plate in the following order: beef, salt, spices, cure, and ice or cold water. The pork is added last to lessen the breakdown of fatty tissue. Continue mixture at a temperature below 55°F. in silent cutter until a finely cut product is obtained. Pack product tightly in a sausage stuffer to exclude air.
Linking may be done by hand or by a linking machine. The sausages are cured for several hours and hung over a smoke stick and smoked, usually at 130°F. for 2 hrs. They are then transferred to a hot water bath until the center temperature reaches 160°F. After a cold water spray the sausages are allowed to dry and held in a cooler. Shrinkage during smoking and cooking amounts to about 15 percent.

Fill: The frankfurter links are separated, but for vienna canning the links are cut to approximately 6/16 in. less than the height of the can. The sausages are next
Thermal process:

<table>
<thead>
<tr>
<th>Initial</th>
<th>Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can Size</td>
<td>Temperature</td>
</tr>
<tr>
<td>211 × 400</td>
<td>140°F.</td>
</tr>
</tbody>
</table>

CANNED KAU YUK (CHINESE POT ROAST PORK)

Formulation:
- Belly pork
- Chinese red bean curd
- Chinese spice
- Chinese parsley
- Sugar
- Water

Preparation:
Parboil pork and drain well. Brown in oil, cut into ½-in. pieces and simmer in sauce made from other ingredients for 10 min.

Fill:
Fill hot into a No. 2 enamel can 14 oz. pork and 5 oz. sauce. Close preferably under vacuum and cook for 100 min. at 240°F. Cool in water.

CANNED SWEET-SOUR SPARERIBS

Formulation:
- Spareribs 53 parts
- Pineapple 21 parts
- Brown sugar 5 parts
- Vinegar 7 parts
- Soyu sauce 4 parts
- Flour 1.4 parts
- Ginger 0.8 part
- Garlic 0.2 part
- Salt 0.6 part
- Water 7.0 parts

Preparation:
Cut pineapple into 1-in. cubes. Make a sauce of crushed ginger, garlic, brown sugar, vinegar, soyu sauce, salt, flour, and water. Trim fat from ribs, cut into 1½-in. pieces, and marinate in sauce 1 hr. Remove ribs from sauce and brown. Return browned ribs to sauce and simmer for 20 min.

Fill:
Fill hot into No. 2 enamel cans 12 oz. spareribs, 4 oz. pineapple, 5 oz. sauce.

Thermal process:
Close at 15-in. vacuum. Cook at 240°F. for 100 min. (initial temperature 160°F.) and cool in water.
**PROCESSED TUNA CHICKEN**

**Formulation:**
- Tuna fillets
- Brine (55° salometer 10 percent)
- Monosodium glutamate (if desired)

**Preparation:**
Fillet fresh tuna and immerse for 1 hr. in 55° salometer 10 percent brine with or without the addition of monosodium glutamate. Steam cook fillets for 15 min. at 250°F. in a retort and cool in air. Remove skins and bones by hand.

**Fill:**
Pack into suitable containers in sections or mold under pressure into blocks and pack.

**Process:**
Quick freeze and store at 0°F.

**PROCESSED TUNA HAM**

**Formulation:**
- Tuna fillets
- Brine: Salt 14.5 parts
- Sugar 3.0 parts
- Sodium nitrite 0.094 part
- Sodium nitrate 0.031 part
- Water 82.5 parts

**Preparation:**
Fillet fresh tuna and immerse for 24 hrs. in 55° salometer brine of the above formulation maintained at 120°F. for the period. Drain fillets well, and smoke them in heated wood smoke at 170°F. for 4 hrs.

**Fill:**
Pack into suitable containers in sections or mold under pressure into blocks and pack.

**Process:**
Quick freeze and store at 0°F.

**CANNED LAULAU**

**Formulation:**
- Per Laulau
  - Pork 48 parts
  - Taro leaf 28 parts
  - Butterfish 24 parts
  - Ti leaves for wrapping (2) 2 oz. approx.
Preparation: Trim excess fat and bone from pork. Cut meat into 4-oz. pieces and parboil. Remove scales, fins, tail, and large bones from fish, cut into 2-oz. cubes and soak in water 1½ hrs. to remove excess salt using several water changes. Blanch ti leaves 5 min. at 180°F. Wrap taro leaves about fish and pork and envelop whole in 2 ti leaves placed crosswise, draw ends of ti leaves together and cut off excess ti leaf. Preheat laulaus in steam for 15 min.

Fill: Pack 2 laulaus per No. 2 enamel can (heads and tails) to give a filled weight of 19 oz. Close at 20-in. vacuum or exhaust cans in steam for 15 min. and close without vacuum.

Thermal process: Cook 100 min. at 240°F. and cool in water.

MISCELLANEOUS

CANNED BIRDS’ NEST SOUP

Definition: Birds’ nest is the gelatinous substance of the salivary glands of a swallow native to China. This substance serves to bind together the materials of the birds’ nest.

Formulation: Chicken 3 pounds
Dried Birds’ Nest 1 pound
Water 8 pounds
Salt to taste
Monosodium glutamate to taste

Preparation: Soak birds’ nest in water 12 hrs., cook 2 hrs. at just below boil, drain to remove hot water, soak in cold water, and remove impurities. Cook the chicken in the water until the meat will strip from the bones. then return the bones to the stock, and cook 2 hrs. longer. Add the birds’ nest to the stock and cook for 30 min. Add salt and monosodium glutamate to taste. Dice chicken to ½ in. and add to soup.

Fill: Fill about 20 oz. into a No. 2 enamel can and close at 10-in. vacuum and minimum temperature of 160°F.

Thermal process: Cook 85 min. at 240°F. and cool in water.
CANNED CHOCOLATE TARO BEVERAGE

Formulation:  
<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poi</td>
<td>15.50</td>
</tr>
<tr>
<td>Sugar</td>
<td>5.50</td>
</tr>
<tr>
<td>Milk solids</td>
<td>3.40</td>
</tr>
<tr>
<td>Cocoa</td>
<td>0.50</td>
</tr>
<tr>
<td>Diamalt</td>
<td>0.50</td>
</tr>
<tr>
<td>Vanilla extract</td>
<td>0.50</td>
</tr>
<tr>
<td>Salt</td>
<td>0.05</td>
</tr>
<tr>
<td>*SeaKem 2</td>
<td>0.05</td>
</tr>
<tr>
<td>Water</td>
<td>74.00</td>
</tr>
</tbody>
</table>

Preparation:  
Mix *SeaKem 2* with 10 times its weight of sugar, dissolve in cold water using a blender or comparable mixer, and heat to 140°F. to insure solution. Keep hot. Dissolve milk solids and cocoa in hot water. Mix remaining ingredients thoroughly, add milk-cocoa mixture, and heat to 160°F. Add stabilizer-sugar solution and homogenize immediately.

Fill:  
Fill hot to 3/16-in. headspace into No. 2 enamel cans. Close without vacuum.

Thermal process:  
Cook 60 min. at 240°F. and cool immediately. After removal from retort cool to 45°F. Store at room temperature.

*A refined Irish moss extractive manufactured by Seaplant Corporation, New Bedford, Mass.*

CANNED SHREDDED COCONUT

Formulation:  
<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shredded coconut</td>
<td>82.00</td>
</tr>
<tr>
<td>Sugar</td>
<td>2.50</td>
</tr>
<tr>
<td>Water</td>
<td>15.50</td>
</tr>
<tr>
<td>Potassium meta-bisulfite ($\text{K}_2\text{S}_2\text{O}_3$)</td>
<td>400 parts per million</td>
</tr>
</tbody>
</table>

Preparation:  
Select only whole mature nuts. Husk nuts and remove meat from shell. Peel brown skin from meat and pass through shredder. Dissolve $\text{K}_2\text{S}_2\text{O}_3$ and sugar in water. Mix $\text{K}_2\text{S}_2\text{O}_3$-sugar solution thoroughly with the shredded coconut.

Fill:  
Fill 19.5 oz. into a No. 2 enamel can. Close at 20-in. vacuum or exhaust to a center temperature of 160°F. and close without vacuum.

Thermal process:  
Cook 90 min. at 240°F. and cool in water.
**CANNED HAUPIA**

**Formulation:**
- Coconut milk: 42.2 parts
- Water: 42.2 parts
- Starch: 7.3 parts
- Sugar: 8.0 parts
- Potassium meta-bisulfite ($\text{K}_2\text{S}_2\text{O}_5$): 0.025 part

**Preparation:**
Select only mature whole coconuts. Husk and shell coconuts and peel off brown coating from coconut meat. Shred or grind meat as fine as possible. Extract milk by pressing meat in a screw press or in a hydraulic press. Mix the ingredients thoroughly and heat in a steam jacketed kettle to 170°F. with constant stirring.

**Fill:**
Fill hot without headspace into No. 2 enamel cans. Allow to cool to 120°F. or less and close at 20-in. vacuum.

**Thermal process:**
Cook 105 min. at 240°F. and cool immediately.

**CANNED FRIED RICE**

**Formulation:**
- Rice, 60 percent moisture content: 75 parts
- Pork (diced): 19 parts
- Egg (fresh): 6 parts
- Green onions, shrimp sauce, soyu sauce, herbs, spices, and salt as required

**Preparation:**
The rice should be edible grade, clean, sound, free from insect infestation and other objectionable foreign matter. Wash rice thoroughly with agitation in cold water to remove adherent surface starch and dust. Soak rice in water at 90°-100°F. for 40 min. Blanch the well-drained soaked rice in boiling water, the pH of which has been adjusted to 7 or slightly less, for 5 to 6 min. Moisture content of rice after blanching is approximately 60 percent. Brown the diced pork in small amount of oil, mix in the rice, egg, and seasoning.

**Fill:**
Fill hot into a No. 2 enamel can 15 oz. of fried rice.

**Thermal process:**
Close, preferably under 20-in. vacuum, and cook at 240°F. for 100 min. Cool in water.
REFERENCES


