

FRUIT JUICE PROCESSING

All the processes for fruit juice products require that the juice or pulp is first extracted from the fruit. The following are the manufacturing stages:

Juice extraction

In the case of citrus, this is easily done with a hand presser or a revolving citrus 'rose', Figure 1. Other fruits such as mango, guava, soursop, etc require pulping - that is, after peeling and stone removal, the flesh of the fruit is pushed through a perforated metal plate. For this process, there is a range of equipment available from the small 'Mouli Legume' and several versions of hand-powered pulper/sieves, all of which force the fruit pulp down through interchangeable metal strainers, Figures 2 and 3.

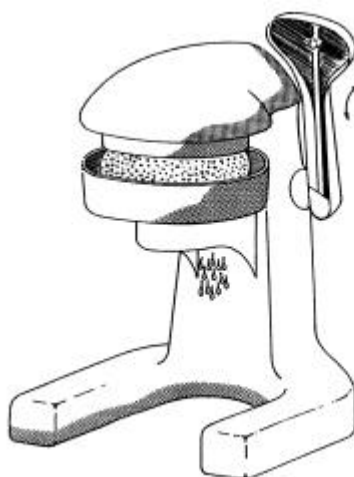


Figure 1: Hand Presser

At slightly higher production levels, it is necessary to use a power source, and the multi-purpose Kenwood Chef food mixer, is strongly recommended. This has a pulping attachment rather similar to the Mouli Legume and in addition can be used for liquidising etc.

For large-scale production, an industrial pulper-sieving machine is necessary. This also acts by forcing the fruit pulp through a fine cylindrical mesh. These cost, however, upwards of £2,500.

Preparation

When the juice or pulp has been collected, it is necessary to prepare the batch according to the chosen recipe. This is very much a matter of choice and judgement, and must be done carefully to suit local tastes. Juices are sold either pure or sweetened. Fruit squashes would normally contain about 25% fruit material mixed with a sugar syrup to give a final sugar concentration of about 40%. These are diluted with water prior to use and as the bottle is opened, partly used and then stored, the addition of a preservative is necessary (for example 800ppm sodium benzoate). Cordials are simply crystal clear squashes.

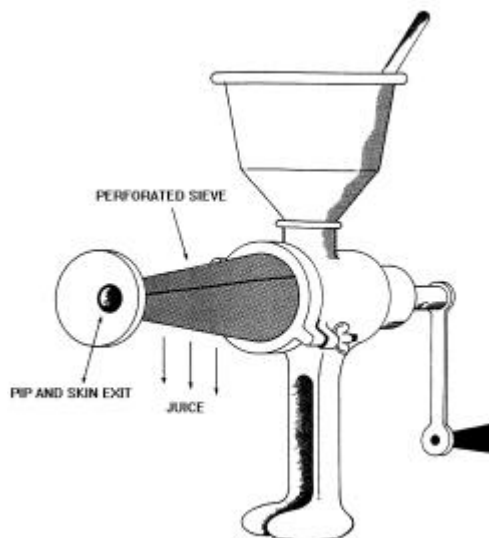


Figure 2: Hand powered pulper

Another range of products that has proved popular is fruit nectars which are consumed on a 'one shot' basis. Essentially, these consist of a 30% mix of fruit pulp and sugar syrup so as to give a final sugar level of about 12-14%. All fruits contain sugar, usually around 8-10%, with variations not only from fruit to fruit but also in the same fruit grown in different parts of the world. The addition of sugar to give the recommended levels must take into account the sugar already in the juice. However, the amount of sugar added in practice is finally decided by what the purchasers actually want.

In all cases, sugar syrups should be filtered through muslin cloth prior to mixing to remove particles of dirt which are always present.

Pasteurisation

All the products mentioned above need to be pasteurised at 80-95°C for 1-10 minutes prior to filling hot*. At the simplest level, this may be carried out in a stainless steel, enamelled or aluminium saucepan over a gas flame, but this can result in localised overheating at the base of the pan, with consequent flavour changes.

To avoid the use of large expensive, stainless steel pans, a large aluminium pan can be used to boil sugar syrup. A given amount of the syrup is then mixed with fruit juice in a small stainless steel pan and this increases the temperature to 60-70°C. The juice/syrup mixture is then quickly heated to pasteurising temperature.

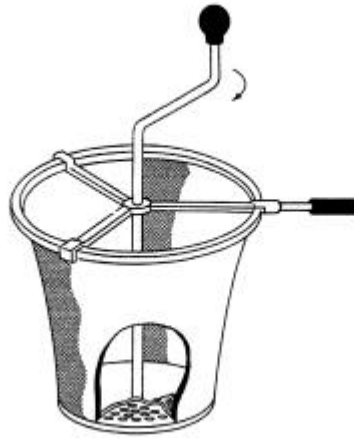


Figure 3: Hand power pulper

The next industrial jump in pasteurisation is, unfortunately, expensive in that it involves the purchase of a double-jacketed steam kettle in stainless steel and a small boiler. The total cost is likely to be in the region of £5-10,000.

ITDG has had some success with the development of a low-cost continuous pasteuriser that would, at about £300, fall in between the saucepan and the steam kettle. Further information is given in *Appropriate Technology Journal* 12,7. 1985.

Filling & bottling

In all cases, the products should be hot-filled. A stainless steel bucket, drilled to accept a small outlet tap, has proved to be a very successful filler. Output can be doubled quite simply by fitting a second tap on the other side of the bucket. This system has been used to produce 500-600 bottles of fruit juice per day in the West Indies.

After filling hot, the bottles are capped and laid on their sides to cool prior to labelling.

*Care is needed when producing pineapple juice due to a heat resistant enzyme in the juice. The enzyme damages skin after prolonged contact and workers should therefore wear gloves to protect their hands. The juice must be heated to a higher temperature for a longer time to destroy the enzyme (eg boiling for 20 minutes).

Quality control

As in all food processing enterprises it is necessary to ensure that the fruit products are correctly formulated and priced to meet the customer's requirements, and that production costs are minimised to ensure that a profit is made. The quality of each day's production should be monitored and controlled to ensure that every bottle of juice has the correct keeping and drinking qualities. In particular the following points should be observed:

- Only fresh, fully ripe fruit should be used; mouldy or insect damaged fruit should be thrown away. All unwanted parts (dirt, skins, stones etc) should be removed.
- All equipment, surfaces and floors should be thoroughly cleaned after each day's production.

- Water quality is critical, if in doubt use boiled water or add one tablespoon of bleach to each gallon of water to sterilise it. If water is cloudy, a water filter should be used.
- Pay particular attention to the quality of re-usable bottles, check for cracks, chips etc and wash thoroughly before using. Always use new caps or lids.
- The concentration of preservative should be carefully controlled for correct preservation of squashes and cordials, and may be subject to local laws. Check first and use accurate scales to measure the preservative.
- The temperature and time of heating are critical for achieving both the correct shelf life of the drink and retaining a good colour and flavour. A thermometer and clock are therefore needed.
- The correct weight should be filled into the bottles each time.

These factors are important because a customer will stop buying the products if the quality varies with each purchase.

Equipment suppliers

Note: This is a selective list of suppliers and does not imply ITDG endorsement.

Juice extractors

Kenwood chef major and continuous juice separator

Kenwood Limited
New Lane
Havant
Hants
PO9 2NH

Victorio strainer
Lehman Inc
Box 41, 4779 Kidron Road
Kidron
Ohio 44636
USA

Boiling pans

Boiling pans should be made of aluminium, enamelled metal or stainless steel. For larger quantities it is necessary to buy equipment which does not cause burning or sticking of the product to the bottom of the pan.

Stainless steel steam jacketed kettles, that is, a double walled pan are suitable and can be obtained with capacities from 5-500 litres from:

Raylons Metal Works
Kondivitta Lane
Andheri-Kurla Road
Bombay 400 059

Similar ones can be obtained in the UK but are more expensive.

APV Baker Limited
Gatwick Road
Crawley
RH10 2QB

Alfa-Laval Engineering Limited
Great West Road
Brentford
TW8 9BT

Bron & Lueffe (GB) Limited
Scaldwell Road
Brixworth

Lady Lane
Hadleigh IP7 6AS
T Giusti & Son Limited

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Fruit Juice Processing

Northampton
NN6 9EN
H Erben Limited

NS Company UK (Blackburn) Limited
Fountain Mill
Cavluke Street
Blackburn
BB1 3JR

Brierley, Collier & Hartley Equipment
Bridgefield Street
Rochdale
Lancashire
OL11 4BX

Refractometer

Gallenkamp Limited
Bishops Meadow Road
Loughborough
Leicestershire
LE11 0RG

Checklist for equipment required

Peeler
Knives (stainless steel)
Cutting boards
Juice extractor
Thermometer
Analytical balance
Stainless steel saucepan
10kg scales
Measuring cylinder
Capping machine
Wooden spoons
Plastic funnels
Plastic buckets
Strainers
Cleaning equipment (brushes, scourers, cloths, hosepipes etc) 2 gas cylinders, 2- or 3- ring burners.

Building with large preparation table, smaller table for gas burners, shelves for products, sink, draining board, taps, cupboard for labels and dry ingredients.

Total capital for equipment and furnishings is likely to be £500-800 (\$US900-1440), working capital for fruit purchase, packaging and other materials is likely to be around £600 (\$US1080).

The cost of a building is not included, but it should have the following features:

- Sloping concrete floor and proper drainage for washing down each day.
- A potable water supply.
- Preferably electricity.
- Screened windows and doors to reduce insects.
- No horizontal ledges, window sills, or rafters where dust, bird droppings etc can collect.

Intermediate Technology Development Group

Rixon Road
Finedon Industrial Estate
Wellingborough
NN8 4B4

Sussex & Berkshire Machinery Company
Limited
Blacknest
Alton
GU34 4PX

Israel Newton Limited
Summerley Work
Bradford
Yorks

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