PRACTICAL ACTION
Technology challenging poverty

WATERMELON JELLY
SMALL-SCALE MANUFACTURE

technical brief

Introduction

Fully ripe watermelons that have a soft red flesh should be used for making jelly. The juice is extracted from the fruit and used to make a jelly, rather than a jam (jams contain pieces of fruit pulp whereas jellies are made from fruit juice). Watermelons contain little natural pectin so pectin has to be added to ensure the jelly will have a good set. Other fruits that are high in pectin, for example apple, rind of passion fruit, can be mixed with the watermelon juice if commercial pectin is not available. Watermelon juice is not very acidic (pH above 5.0) which is too high to make a good jam or jelly. Jams give a gel when there is the correct ratio of pectin to water and the pH is between 2.5 and 3.45 pH. The optimum pH to give a good gel is pH 3.0. Therefore citric acid has to be added to the recipe to reduce the pH and increase the acidity of the juice. The yield of usable fruit from the whole fruit is approximately 43%.

Figure 1: Three glass jam jars of Water melon Preserves by Issraa El-Kogali, Sudan

Recipe

Fruit juice	74%	(starting recipe
Sugar	55%	before boiling)
Green ginger	0.8%	
Pectin	0.4%	
Citric acid	0.7%	

Method

Wash whole fruit in clean water and discard any bad part of the fruit.

Remove the skin from the melon, cut the flesh into small pieces and remove the seeds. Mash the pieces into a pulp and strain through a muslin cloth.

Mix the pectin with a small portion of the sugar. This dry mixing of the pectin is important because pectin powder is very difficult to dissolve in water because it clumps together. If it is still a problem to dissolve, grind the sugar to a fine powder and then mix it with the pectin.

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Mix the fruit juice, sugar, citric acid and green ginger in a stainless steel saucepan and start boiling the mixture. Near the end of the boiling process the pectin dry mix can be added. (The pectin should not be heated for longer than necessary because it will be broken down and then the jelly will not set.) The jelly should not be boiled for more than 12-15 minutes as this can give rise to caramel flavours, over sweetness and discolouration, apart from being a waste of energy. By reducing the amount of water in the starting recipe the boiling time can be reduced.

Boiling to reach the final sugar concentration

The aim of boiling is to reduce the water content of the mixture and concentrate the fruit and sugar in as short a time as possible. The final Total Soluble Solids (TSS) content of a jelly (also known as the "Degrees Brix" or "end-point of the jelly") should be 65 to 68% (the TSS is a measure of the amount of material that is soluble in water. It is expressed as a percentage -a product with 100% soluble solids, has no water and one with 0% soluble solids is all water).

The correct sugar content is critical for proper gel formation and for preservation of the jelly. If the final TSS of jelly is lower than 65-68%, the shelf life will be reduced. The jelly will have a runny consistency and bacteria and moulds will be able to grow in the product. If the TSS is higher than 68%, the jelly will be very stiff and the sugar might form crystals during storage.

The end-point of boiling is measured in different ways. The most accurate method is to use a refractometer to measure the total sugar concentration. Remove the pan from the heat during testing as the jelly will continue to cook and may become over-cooked. It is always possible to cook the mixture a little bit more, but once it is over-cooked (and too thick) it cannot be reversed.

Cool the sample before it is measured by smearing it on a cold dry plate or saucepan lid. All implements used to take the sample must be dry otherwise the reading will be reduced. It is important to stir the jelly at all times during heating, otherwise it may burn at the bottom of the saucepan, causing off flavours and discoloration.

This method is not really suitable for home-use as a refractometer costs about US$ 150. It is only when making jelly for sale that a refractometer is necessary, to ensure consistency between different batches of the jelly. When making jam or jelly for home consumption, other methods can be used to determine the end point: these include the drop test, the skin wrinkle test, or the use of a jam thermometer to test the temperature (68% sugar corresponds to a jam temperature of 105°C).

When the jelly starts to thicken, it is important to test for the end point at frequent intervals. Remember to remove the pan from the heat source while you test or it will continue to thicken and may burn.

Filling into jars, cooling and labelling

Wash and sterilise the glass jars and lids by placing in a pan of water and boiling for 10 minutes. Remove the jars from the water with a pair of tongs and stand upside down to drain. Do not dry with a towel as this could contaminate the jars.

If glass jars are not available, use plastic jars. These cannot be sterilised with boiling water as they will melt. They should be thoroughly cleaned in warm soapy water and rinsed with a weak solution of sodium metabisulphite. Sterilising tablets (made of sodium metabisulphite) can be bought for this purpose.

Allow the jelly to cool slightly (to about 80°C for glass jars and 60°C for plastic jars) and then pour it into clean, sterilised jars. The jars should still be warm to prevent them from cracking when the hot jelly is poured in. If the jelly is cooled too much it will be difficult to pour. Place the clean lids on top and fasten. Invert the jars to form a seal. The filled jars can be placed in water to cool down the jelly so that it does not keep cooking in the jar. The water

should not be too cold or the glass may crack. Also, the water level must be kept below the lid of the jar. The gel starts to form as the temperature of the jelly reduces (about 55°C) and continues until it is cold. The jars should not be moved or shaken while they are cooling or the gel will not form and the jelly will not set.

Storage

Jam and jelly that is hygienically prepared, boiled until it reaches the correct final total soluble solids (68%) and which is packaged in sterilised glass jars can be stored for up to a year so long as it is kept in a cool place away from direct sunlight. Jam or jelly that is packaged in plastic containers has a shorter shelf life – up to 4 months.

Equipment list

Glass jars, Omnia lids and labels
Omnia capper
Cooking facilities, gas ring, electric ring, etc
Stainless steel saucepan
Thermometer in protective jacket
Stainless steel cutting knife and spoon
Wooden spoon for stirring
Refractometer
Cutting board
Scales
Liquidiser or mashing tool

Equipment suppliers

Note: This is a selective list of suppliers and does not imply endorsement by Practical Action

Cutting and slicing equipment

A range of manual and powered cutting and slicing machinery is available.

Eastend Engineering Company
173/1 Gopal Lal Thakur Road
Calcutta 700 035
India
Tel: +91 33 2553 6397

Narangs Corporation
P-25 Connaught Place
New Delhi 110001
India
Tel: +91 11 2336 3547
Fax: +91 11 2374 6705

Gardners Corporation
158 Golf Links
New Delhi 110003
India
Tel: +91 11 2334 4287/2336 3640
Fax: +91 11 2371 7179

Weighing machines

It is important to have accurate weighing machines. Quite often more than one machine is required - -a large one to weigh the fruit and a small one for weighing out the dry ingredients such as pectin and spices.

Fischer Scientific
Bishop Meadow Road
Loughborough
LE11 5RG
UK
Tel: +44 1509 231166
Fax: +44 1509 231893
Email: fisher@fisher.co.uk
Web: www.fisher.co.uk

Essae-Teraoka Ltd
377/22 6th Cross Wilson Garden
Bangalore 560027
India
Tel: =91 80 2216185/2241165

Alvan Blanch
UK (see above)

Narangs Corporation
India (see above)

Gardners Corporation
India (see above)

Juice extractors and pulpers

A variety of juice extractors and pulpers is available from a wide range of suppliers. They are available in different capacities and either manual or powered (either electric or diesel).

Kenwood Limited
New Lane
Havant
Hampshire
PO9 2NH
United Kingdom
Tel: +44 (0) 23 9247 6000
Fax: +44 (0) 23 9239 2400
Website: http://www.kenwood.co.uk

Lehman Hardware and Appliances Inc.
P.O. Box 41
Kidron
Ohio 44636
USA
Tel orders: +1 877 438 5346
Tel enquiries: +1 888 438 5346
E-mail: info@lehmans.com
Website: http://www.lehmans.com

Alvan Blanch
UK (see above)

Eastend Engineering Company
India (see above)+

Robot Coupe
12 Avenue Cal Leclerc
BP 134
71303 Montceau-les-Mines
France
Tel: +33 3 85 58 80 80

Florachem
Flat No. 1119, Hemkunt Chambers, 89,
Nehru Place
New Delhi 110019
India
Tel: +91 11 25589502

DISEG (Diseno Industrial y Servicios Generales)
Av Jose Carlos Mariategui 1256
Villa Maria del Triunfo
Lima
Peru
Tel: +51 14 283 1417

Gardners Corporation
India (see above)

Servifabri SA
JR Alberto Aberd
No. 400 Urb Miguel Grau (ex Pinote)
San Martin de Porres
Lima
Peru
Tel: +51 14 481 1967

Food Packs Indiana
Thrikkariyoor, Kothamangalam, Ernakulam
Kerala 686692
India
Tel: +91 485-2522134, 2523610

Bajaj Machine Private Limited
7/20, 7/27, Jai Lakshmi Industrial Estate,
Side-IV
Sahibabad Industrial Area
Ghaziabad-201301
U.P
India
Tel: +91 120 22775119/22775137
Fax: +91 120 22775137
Website: www.indiamart.com/bajajmachine

Geeta Food Engineering
Plot No C-7/1 TTC Area
Pawana MIDC Thane Belapur Road
BehindDavita Chemicals Ltd
Navi Mumbai 400 705
India
Tel: +91 22 2782 6626/2766 2098
Fax: +91 22 2782 6337

Buhler (India) Pvt Ltd

Narangs Corporation

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13-D, K A I D B Industrial Area, Attibele
Bangalore
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Tel: +91 80- 27820000
Fax: +91 80-7820001
Website: www.buhlergroup.com

India (see above)

Delhi Industries
4 Paharganj Lane,
New Delhi 110055
India
Tel: +91 11 2529720, 27525200, 27536888
Fax: +91 11 25791291

Praj Industries Ltd
Praj House Bavdhan
Pune, Maharashtra 411021
India
Tel: +91 20-22951511, 22952214
Fax: +91 20-22951511 / 22952214
Website: www.praj.net

Do-All-Engineering Industries
87/12, Industrial Suburb, Yeshawanthpur
Bangalore
Karnataka 560022
India
Tel: +91 80 23345754, 23372298
Fax: +91 80 23346138

Techno Equipments
Saraswati Sadan
1st Floor, 31 Parekh Street
Mumbai 400004
India
Tel: +91 22 2385 1258

Udaya Industries
Uda Aludeniya, Welligalla
Gampola
Sri Lanka
Tel: +94 8 388586
Fax: +94 8 388909

Kundasala Engineers
Digana Road
Kundasala
Kandy
Sri Lanka
Tel: +94 8 420482

Mark Industries (Pvt) Ltd
348/1 Dilu Road
Mokbazar
Dhaka 1000
Bangladesh
Tel: +880 2 9331778/835629/835578
Fax: +880 2 842048
Email: markind@citechco.net

For boiling

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, which are double walled pans are suitable for boiling large quantities of jam and are available in a range of sizes (from 5 to 500litres).

Gardners Corporation
India (See above)

Alvan Blanch
United Kingdom (See above)

HRS Process Systems Pvt Ltd
Asia Division, Praj House,
Bavdhan, Pune
Maharashtra 411021
India
Tel: +91 20- 22951511
Fax: +91 20- 22951718
Website: www.hrsasia.co.in

Raylons Metal Works
Kondivita Lane
J. B. Nagar Post Office
Post Box No. 17426
Andheri (E) Andheri - Kurla Road,
Mumbai - 400 059
India
Tel: +91 22 26323288 / 6325932

Sri Rajalakshmi Commercial Kitchen Equipment
No.57, (old No. 30/1) Silver Jubilee Park Road
Bangalore - 560 002
India
Tel: +91 (0)812 2222 1054/223 9738
Fax: +91 (0)812 2222 2047

United Engineering (Eastern) Corporation
Shantiniketan Site No.2 & 3
(10th Floor) 8 Camac Street
Kolkata, West Bengal 700017
India
Tel: +91 33-22823914, 22820157
Fax: +91 33-22823742

Israel Newton Limited
Summerley Works
All Alone Road
Bradford
West Yorkshire BD10 8TT
United Kingdom
Tel: +44 (0)1274 612059
Fax:+44 (0)1274 612059

APV Baker Limited
Manor Drive
Paston Parkway
Peterborough
Cambridgeshire
PE4 7AP
United Kingdom
Tel: +44 (0)1733 283000
Fax: +44 (0)1733 283005

Giusti and Son Limited
Rixon Road, Finedon Road Industrial Estate
Wellingborough,
Northamptonshire NN8 4BA
United Kingdom
Tel: + 44 (0)1933 229933
Fax: + 44 (0)1933 272363
Website: www.giusti.co.uk

Bottle filling and packaging equipment

H Erben Limited
Lady Lane
Hadleigh
Suffolk
IP7 6AS, UK
Tel: +44 (0)1473 823011
Fax: +44 (0)1473 828252
Website: http://www.erben.co.uk

Sussex and Berkshire Machinery Company PLC
Blacknest
Alton, Hants GU34 4PX
United Kingdom
Tel: + 44 (0)1420 22669
Fax: + 44 (0)1420 22687
E-mail: technical@sabplc.uk
Website: http://www.sabplc.co.uk/

Orbit Equipments Pvt Ltd
175 - B, Plassy Lane
Bowenpally
Secunderabad - 500011, Andhra Pradesh
India
Tel: +91 40 32504222
Fax: +91 40 27742638
Website : http://www.orbitequipments.com

Pharmaco Machines
Unit No. 4, S.No.25 A
Opp Savali Dhaba, Nr.Indo-Max
Nanded Phata, Off Sinhagad Rd.
Pune – 411041, India
Tel: +91 20 65706009
Fax: +91 20 24393377

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S. F. No. 120/2, Kalapatty Post Office
Coimbatore - 641 035
Tamil Nadu, India
Tel: +91 422 2666108/2669909
Fax: +91 422 2666255
Email : acufilmachines@yahoo.co.in, acufilmachines@hotmail.com
http://www.indiamart.com/acufilmachines/#products

Autopack Machines Pvt Ltd
101-C Poonam Cambers
A Wing, 1st Floor
Dr Annie Besant Road, Worli
Mumbai 400018
India
Tel: +91 22 2493 4406/2497 4800/2492 4806
Fax: +91 22 2496 4926
E-mail: autopack@bom3.vsml.net.in
www.autopackmachines.com

Bombay Engineering Industry
R NO 6 (Extn) Sevantibai Bhavan
Chimatpada
Marol Naka Andheri (East)
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India
Tel: +91 22 2836 9368/2821 5795
Fax: +91 22 2413 5828

MMM Buxabhoy & Co
140 Sarang Street
1st Floor, Near Crawford Market
Mumbai, India
Tel: +91 22 2344 2902
Fax: +91 22 2345 2532
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Gardners Corporation
India (see above)

Gurdeep Packaging Machines
Harichand Mill compound
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Fax: +91 22 2577 2846

Eastend Engineering Company
India (See above)

Rank and Company
A-p6/3, Wazirpur Industrial Estate
Delhi – 110 052
India
Tel: +91 11 27376101
Fax: +91 11 7234126
Rank@poboxes.com

Banyong Engineering
94 Moo 4 Sukhaphibaon No 2 Rd
Industrial Estate Bangchan
Bankapi
Thailand
Tel: +66 2 5179215-9

Alfa Technology Transfer Centre
301 Cach Mang Thang 8
Tan Binh District
Ho Chi Minh City
Vietnam
Tel: +84 8 9700868
Fax: +84 8 8640252

Technology and Equipment Development Centre (LIDUTA)
360 Bis Ben Van Don St
District 4
Ho Chi Minh City
Vietnam
Tel: +84 8 9400906
Fax: +84 8 9400906

Mark Industries (Pvt) Ltd
Bangladesh (See above)

John Kojo Arthur
University of Science and Technology
Kumasi
Ghana

Alvan Blanch
UK (see above)

Narangs Corporation
India (see above)

Refractometers

The refractometer is used to measure the sugar content.

Bellingham + Stanley Ltd.
Longfield Road, North Farm Industrial Estate
Tunbridge Wells, Kent TN2 3EY
United Kingdom
Tel: +44 1892 500400
Fax: +44 1892 543115
E-mail: sales@bs-ltd.com
Website: http://www.bs-ltd.com

International Ripening Company
1185 Pnieridge Road
Norfoplk
Virginia 23502-2095
USA
Tel: +1 757 855 3094
Fax: +1 757 855 4155
Email: info@QAsupplies.com
Web: www.qasupplies.com

Fisher Scientific UK Ltd
UK (see above)

Gardners Corporation
India (see above)

References and further reading

Practical Action technical briefs:

Jam, Jellies & Marmalade
Food labelling
Passion Fruit Jam,
Pineapple Jam

This technical brief was updated by S. Azam Ali in March 2009. Dr. S Azam-Ali is a consultant in food processing and nutrition with over 15 years experience of working with small-scale processors in developing countries

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