PRACTICAL ACTION
Technology challenging poverty

PICKLED PAPAYA

Introduction

This pickle is more like a chutney since it is prepared by adding sugar, vinegar and salt to the fruits, followed by boiling which reduces the water content and increases the total soluble solids. The final product is a thick, slightly acidic spicy fruit preserve. Green papaya is required to make the pickle. The time of harvest of green papaya is crucial to the success of the pickle. It should be green and very firm and harvested before the fruit begins to ripen. Once the papaya starts to ripen the acidity decreases and the flesh becomes too soft. However, if it is harvested too early the pickle will have a bitter milky flavour. The yield of usable fruit from whole green papaya is approximately 70%.

Preservation principles

The acetic acid (vinegar) stops the pickle deteriorating once the jar has been opened. The amount of acetic acid required in the recipe can be calculated using the following formula, known as the preservation index. Acetic acid is used instead of vinegar because it is much cheaper.

$$\frac{\text{Total acidity} \times 100}{(100 - \text{total solids})} = \text{preservation index (should be no less than 3.6\%)}$$

Reference: Pearson (1976). The Chemical Analysis of Foods 7th edition Churchill Livingstone.

When making vinegar-based chutneys and pickles, it is essential that the preservation index is above *3.6*. This helps to ensure that there is the correct balance of acidity and total solids (sugars) to preserve the pickle and give it a reasonable shelf life. However, the formula does not work for pickles with a sugar content above *55%* total solids. For this recipe the total solids are approximately 60% so the formula cannot be applied. Pickles with a higher sugar content produce a sweeter product than those that have a higher vinegar content. The sugar has a preserving effect as in a jam.

The product can he packed in glass jars or polythene bags (at least 100 micron, preferably a thicker gauge) for smaller quantities. Polythene bags are a cheap form of packaging that can be made into various sizes, which is useful for marketing to different consumer groups. However, polythene is not a very good barrier for containing aromas, which can attract insects which will eat through the polythene and spoil the product.

This technical brief should be read together with the brief 'Pickles and chutneys' which gives an overview of the process and the quality assurance points. As with all products, it is important to carry out a market and technical feasibility study before starting production.

technical brief

Practical Action, The Schumacher Centre, Bourton on Dunsmore, Rugby, Warwickshire, CV23 9QZ, UK
T +44 (0)1926 634400 | **F** +44 (0)1926 634401 | **E** infoserv@practicalaction.org.uk | **W** www.practicalaction.org

Recipe

Prepared papaya	54%	27kg
Sugar	36%	18kg
Ground garlic	3%	1.5kg
Ground ginger	0.5%	250g
Ground mustard seed	0.3%	150g
Ground fennel seed	0.3%	150g
Ground cumin seed	0.4%	200g
Chilli powder	0.8%	400g
Saffron powder or turmeric powder	0.1 %	50g
Salt	2%	1kg
Acetic acid (80%)	0.3%	150g
Lime juice	2%	1kg

If limes are not available when the papaya is in season, the juice can be extracted and stored in bulk until it is required. Sulphur dioxide or benzoic acid (1000-1500ppm) is added to preserve it. Garlic can be ground in bulk and kept for long periods by mixing it with the salt which is required in the recipe.

To make 100 x 1lb (450g) jars of papaya pickle requires approximately 18kg of sugar and 27kg of green papaya.

Method

Wash the whole papaya in clean water and discard any which is bad.

Remove the skin with a stainless steel knife. Cut the fruit into longitudinal segments and remove the seeds, then cut the segments into very small pieces (5mm cubes). This can be done by hand or more quickly using a fruit dicing machine such as the Kenwood dicer.

Stainless steel equipment is preferred for fruit as it does not stain the flesh and does not react with the acidity of the juice. If stainless steel is not available, make sure the knives and spoons are not rusted.

Mix the papaya pieces with the sugar in a stainless steel saucepan. Leave the mixture for 10 minutes so the sugar draws out the water from the fruit pieces. Boil the mixture for 10 minutes to evaporate off some of the water from the papaya, and soften the fruit pieces. Add all the dry spices to the saucepan and continue cooking. Add the lime juice and acetic acid at the end of the cooking process. This prevents the loss of volatiles, which is very important in the case of the acetic acid.

The whole batch should be boiled down to 90% of the initial total weight of the ingredients in the saucepan. To do this, weigh the saucepan before starting to boil and at intervals until it is 90% of the original weight. With practice, an experienced processor will know how long to boil for and the desired consistency of the pickle. This will ensure that the pickle will have the correct consistency. Boiling down to the same finishing weight means that the same number of jars will be filled each time and produce a standard product.

Hot fill the pickle into jars which have been cleaned and steam sterilised. Make sure the jars are still hot so they do not crack when they are filled. The lip of the jar should be clean and dry (wipe with clean tissue paper or steam) before placing the lid on it. Polythene bags do not need to be steamed inside as they are usually clean. Do not use recycled polythene bags. The pickle should not be hotter than 90°C as this will soften the polythene. When filling the bags make sure that the pickle does not come into contact with the top of the bag otherwise it will not heat seal. The simplest way to do this is to use a wide neck funnel (which the pickle can be pushed down through) which slips inside a tube placed in the opening of the bag. The hot filling of the pickle into hermetically sealed jars will preserve the product until the jar is opened.

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Equipment list

Jars or polythene bags (at least 100 micron), and labels
Omnia lids or heat sealer
Cooking facilities, gas ring, electric ring, etc
Stainless steel saucepan
Thermometer in protective jacket
Stainless steel cutting knife
Wooden spoon for stirring
Steam generator (if jars are used)
Cutting board
Scales
Dicing machine
Funnel
Measuring cylinder

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

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

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 spices.

Fisher 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

Narangs Corporation
India (see above)

Gardners Corporation
India (see above)

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 and are available in a range of sizes (from 5 to 500 litres).

Gardners Corporation
India (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

T 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
United Kingdom
Tel: +44 (0)1473 823011

Orbit Equipments Pvt Ltd
175 - B, Plassy Lane
Bowenpally
Secunderabad - 500011, Andhra Pradesh
India
Tel: +91 40 32504222

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/

Acufil Machines
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)
Mumbai 400059
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
yusufs@vsnl.com; mmmb@vsnl.com;
yusuf@mmmb.in

Gardners Corporation
India (see above)

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

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

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Gurdeep Packaging Machines
Harichand Mill compound
LBS Marg, Vikhroli
Mumbai 400 079
India
Tel: +91 22 2578 3521/577 5846/579 5982
Fax: +91 22 2577 2846

Eastend Engineering Company
India (See above)

Narangs Corporation
India (see above)

John Kojo Arthur
University of Science and Technology
Kumasi
Ghana

Refractometers and pH meters

The refractometer is used to measure the sugar content. A pH meter is used to measure the acidity.

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

Fisher Scientific UK Ltd
UK (see above)

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

Gardners Corporation
India (see above)

References and further reading

Traditional Foods: Processing for Profit by P. Fellows, Practical Action Publishing, 1997
Fermented Fruit and Vegetables: A Global Perspective by M. Battcock & S. Azam Ali FAO, 1998
Pickles and vinegars a selection of Practical Action Technical Briefs
Preservation of Fruit and Vegetables: Agrodok 3, Agromisa 1997
Pickles of Bangladesh S Azami & M Battcock, Practical Action Publishing, 1996

Useful organisations and contacts

Agromisa
Postbus 41
6700 AA Wageningen
Netherlands
Tel: +31 (0)317 412217
Fax: +31 (0)317 419178
E-mail: agromisa@wxs.nl
Web: http://www.agromisa
Agromisa is a Dutch non-profit organisation affiliated with the Agricultural University of Wageningen in the Netherlands. Agromisa provides information and advice on small-scale sustainable agriculture and related topics in order to support and strengthen self-reliance of the rural populations in the South.

Food and Agriculture Organization of the United Nations
Viale Terme di Caracalla
00100 Rome
Italy
http://www.fao.org/

Information network on post harvest operations (INPhO). Website on post harvest information includes a virtual library, post harvest compendium and decision support tools to assist entrepreneurs in establishing agro enterprises

This document was produced by Dr. S Azam Ali for Practical Action 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.

Practical Action
The Schumacher Centre
Bourton-on-Dunsmore
Rugby, Warwickshire, CV23 9QZ
United Kingdom
Tel: +44 (0)1926 634400
Fax: +44 (0)1926 634401
E-mail: inforserv@practicalaction.org.uk
Website: http://practicalaction.org/practicalanswers/

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