



CLOVE PROCESSING

Introduction

Cloves are the unopened flower buds of the evergreen tree *Eugenia caryophyllus*. The tree is native to the Moluccas (Spice Islands), which are part of the Indonesian islands. It was taken to Mauritius and then on to the islands of Zanzibar and Pemba on the East African coast during the 18th Century. Zanzibar and Pemba are now the world's largest producers of cloves.

Cloves must be dried before they are stored and sold for market. This brief outlines the important steps that should be taken pre-harvest and post-harvest to ensure that the dried cloves are of top quality for the market.



Figure 1: Dry cloves. Photo: Neil Noble / Practical Action

Clove production

The clove tree is a small evergreen tree that grows to a height of 12-20 metres. It thrives in coastal regions with temperatures between 15 and 30°C, average rainfall and a distinctive dry season (the optimum level of rainfall is 1750 to 2500mm a year). It is a low altitude plant that grows best at altitudes lower than 300m above sea level although it will also grow at altitudes above 900m.

The young leaves of the clove tree are bright pink and change to a greenish yellow as they mature. The flowers develop in clusters of three to ten groups, each with three flowers per group.

Harvesting

Clove trees are first harvested when the tree is 6-8 years old. The timing of harvest of the clove buds is critical. The buds should be harvested before the purple or crimson flowers start to develop. The correct time of harvest is when the outer green leaves (the calyx) of the flower bud change from olive green to yellow pink and before the petals fall to expose the stamens. Clusters of flower buds are hand-picked from the branches. It is important that the branches are not removed or damaged as this will reduce the yield of future crops.

Pre-treatment

After harvest the buds are detached from the stalks by holding a cluster in one hand, pressing it against the palm of the other hand and slowly twisting so that the buds fall off. The hands of the processor and the room in which the buds are separated must be very clean to prevent contamination of the cloves. The stems and buds are separated and dried separately. The stems can be used for oil distillation.

Drying

The buds have to be dried quickly or they will start to ferment. They are usually dried in the sun, spread on clean mats. The cloves should be raked and turned frequently to ensure they develop an even brown colour. The colour of buds changes from pale russet to a darker brown as the clove dries. The drying process takes about four to five days. It cannot be speeded up or the cloves will become dry, brittle and withered rather than plump.

The final moisture content of the dried cloves should be 8-10%. Experienced clove driers will know when the cloves are fully dry as the buds will snap easily. During the rainy season, cloves should be dried using a mechanical drier such as a tray drier.

Badly dried cloves are pale brown and classified as khuker.

Winnowing

The dried buds are winnowed using a traditional winnowing basket to remove dust and other foreign matter. Small cleaning machines are available that use a blower to remove the dirt and dust.

Standards

The US Government and American Spice Trade Association standards for cloves are as follows:

Moisture (% wet basis)	<8%
Extraneous matter	<1%
Mouldy buds	<1%

Grinding

Grinding can be a method of adding value to a product. However, it is not advisable to grind spices. After grinding, spices are more vulnerable to spoilage. The flavour and aroma compounds are not stable and will quickly disappear from ground products. The storage life of ground spices is much less than for the whole spices. It is very difficult for the consumer to judge the quality of a ground spice. It is also very easy for unscrupulous processors to contaminate the ground spice by adding other material. Therefore most consumers, from wholesalers to individual customers, prefer to buy whole spices.

Dried cloves are usually sold whole.

Packaging

Cloves can be packaged in polythene bags of various sizes according to the market demand. The bags should be sealed to prevent moisture entering. Sealing machines can be used to seal the bags. Attractive labels should be applied to the products. The label needs to contain all relevant product and legal information – the name of the product, brand name (if appropriate), details of the manufacturer (name and address), date of manufacture, expiry date, weight of the contents, added ingredients (if relevant) plus any other information that the country of origin and of import may require (a barcode, producer code and packer code are all extra information that is required in some countries to help trace the product back to its origin). See the Practical Action Technical Brief on labelling for further information on labelling requirements.

Storage

Dried cloves must be stored in moisture-proof containers away from direct sunlight. It is essential that the cloves are fully dry before they are stored. Any moisture within the bags will cause the cloves to rot. The stored cloves should be inspected regularly for signs of spoilage or moisture. If they have absorbed moisture, they should be re-dried to a moisture content of 10%.

The storage room should be clean, dry, cool and free from pests. Mosquito netting should be fitted on the windows to prevent pests and insects from entering the room. Strong smelling foods, detergents and paints should not be stored in the same room as they will spoil the aroma and flavour of the cloves.

Equipment suppliers

This is a selective list of suppliers of equipment and does not imply endorsement by Practical Action.

This website includes lists of companies in India who supply food processing equipment.

http://www.niir.org/directory/tag/z,,1b_0_32/fruit+processing/index.html

Dryers

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>

Bombay Engineering Works

1 Navyug Industrial Estate

185 Tokersey Jivraj Road

Opposite Swan Mill, Sewree (W)

Mumbai 400015

India

Tel: +91 22 24137094/24135959

Fax: +91 22 24135828

bomeng@vsnl.com

<http://www.bombayengg.com/contact.html>

Premium Engineers Pvt Ltd

Plot No 2009, Phase IV, GIDC

Vatva, Ahmedabad 382445

India

Tel: +91 79 25830836

Fax: +91 79 25830965

Rank and Company

A-p6/3, Wazirpur Industrial Estate

Delhi – 110 052

India

Tel: +91 11 7456101/ 27456102

Fax: +91 11 7234126/7433905

Rank@poboxes.com

Industrias Technologicas Dinamicas SA

Av. Los Platinos 228

URB industrial Infantas

Los Olivios

Lima

Peru

Tel: +51 14 528 9731

Fax: +51 14 528 1579

Ashoka Industries

Kirama

Walgammulla

Sri Lanka

+94 71 764725

Kundasala Engineers

Digana Road

Kundasala

Kandy

Sri Lanka

Tel: +94 8 420482

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Chelworth, Malmesbury

Wiltshire

SN16 9SG

UK

Tel: +44 1666 577333

Fax: +44 1666 577339

enquiries@alvanblanch.co.uk

www.alvanblanch.co.uk

Mitchell Dryers Ltd

Denton Holme, Carlisle

Cumbria

CA2 5DU

UK

Tel: +44 1228 534433

Fax: +44 1228 633555

webinfo@mitchell-dryers.co.uk

<http://www.mitchell-dryers.co.uk/>

technical brief

Packaging and labelling machines

Acufil Machines

India (See above)

Gardners Corporation

158 Golf Links
New Delhi 110003
India
Tel: +91 11 3344287/3363640
Fax: +91 11 3717179

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

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@mmb.in

Narangs Corporation

India
P-25 Connaught Place
New Delhi 110 001
India
Tel: +91 11 2336 3547
Fax: +91 11 2374 6705

Orbit Equipments Pvt Ltd

175 - B, Plassy Lane
Bowenpally
Secunderabad - 500011, Andhra Pradesh
India
Tel: +91 40 32504222
Fax: +91 40 27742638
<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

India (see above)

Banyong Engineering

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

Technology and Equipment Development Centre (LIDUTA)

360 Bis Ben Van Don St
District 4
Ho Chi Minh City
Vietnam
Tel: +84 8 940 0906
Fax: +84 8 940 0906

John Kojo Arthur

University of Science and Technology
Kumasi
Ghana

Alvan Blanch

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Contacts

The following contacts should be able to provide further information:

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Kerala
India 673012
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+91 495 2730294
parthasarathy@iisr.org; rdinesh@iisr.org
<http://www.iisr.org/package/index.php?spice=Clove&body=Overview>

Indian Institute of Technology (IIT) Bombay

Powai

Mumbai 400076

India

Tel: +91 22 2572 2545

Fax: +91 22 2572 3480

<http://www.ircc.iitb.ac.in/webnew/>**Further reading***Drying* Practical Action Technical Brief*Spice Processing* Practical Action Technical Brief*Labeling Food Products* Practical Action Technical Brief<http://www.clovescloves.com/process.htm> A clove producer that outlines the stages of their processing.

This document was produced by Dr. S Azam Ali for Practical Action in May 2007. 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

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Practical Action is a development charity with a difference. We know the simplest ideas can have the most profound, life-changing effect on poor people across the world. For over 40 years, we have been working closely with some of the world's poorest people - using simple technology to fight poverty and transform their lives for the better. We currently work in 15 countries in Africa, South Asia and Latin America.

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