



# DRYING OF CHILLIES

## Introduction

The chilli (*Capsicum annum*) is native to Mexico but is now grown and used extensively in most parts of the world. It is the most popular spice and is used throughout the world to flavour and add interest to bland foods. The seeds of chilli have a long shelf life of 2-3 years which helped in their global spread.

Chilliies belong to the same plant family (Solanaceae) as potato, tomato and aubergine. There are at least 150 different types of chilli, varying in the degree of hotness. They are rich in vitamin C, stimulate the appetite and cool the body, especially in hot climates, by making the person sweat.

## Production

The chilli plant is a small bush that grows up to about 0.6m tall. It has white flowers that produce fruits in a variety of sizes and shapes. Some chillies (the cayenne pepper) are like stumpy fingers, while others such as the birds eye chilli are tiny. The hottest chilli is the habanero which looks like a mini sweet pepper. Chilli plants grow at altitudes from sea level to 1800 meters in the tropics. Their pungency is influenced by several factors such as high night temperatures and drought or over-watering. Green chillies are immature fruits and red chillies have been allowed to ripen for a further four weeks. Ripened chillies can also be orange-yellow, purple, dark brown or black.

## Harvesting

By definition processing does not involve harvesting. However, one cannot produce a good quality product from badly harvested materials. Correct harvesting techniques are one of the most important factors in the production of a high quality final product.

For processing, chillies should not be picked until they are mature and start to turn red.

## Cleaning

The crop should be cleaned before processing. The first stage is to remove dust and dirt using a winnowing basket. This can be made locally from bamboo, palm or other leaves. Someone used to this work can remove the dust, dirt and stones quickly and efficiently (eg they could clean 100kg of chillies in an eight hour day). Small machines are available for cleaning but they are rarely cost effective.

After winnowing the crop needs to be washed in clean water. All that is needed are two or three 15 litre buckets. For larger quantities a small sink needs to be constructed. This can be made out of concrete. However, the water must be changed regularly to prevent recontamination by dirty water. Only potable water should be used. Take care not to over-wet the chillies or they will take longer to dry.

## Drying

This is by far the most important stage of the process. If the chillies are not fully dried or if they take a long time to dry, they will be prone to mould growth and spoilage. The sale value of mouldy chilli can be less than 50% the normal value. In extreme cases the whole crop can be lost.

The choice of dryer will depend on the climate at the time of harvest and the intended end use of the chillies. For home use of the dried chillies, it is preferable to use the cheapest method

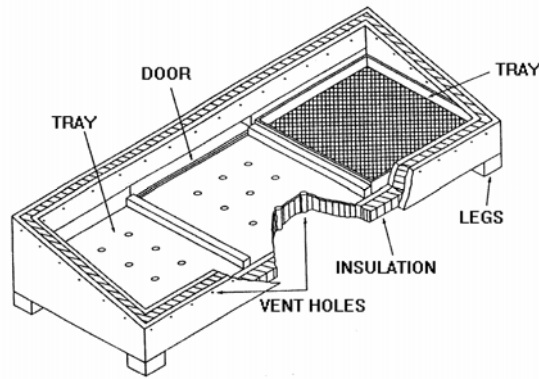


Figure 1: A cabinet solar dryer

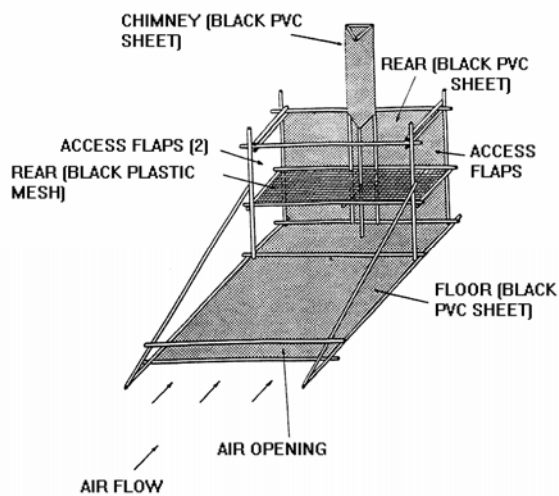


Figure 2: The 'Exell Solar Dryer'

available, which is sun drying.

However, sun drying is really only practical in dry climates with plenty of sunshine. In humid climates drying will take too long, during which time the chillies have the potential to spoil. If a solar dryer is available, it is advantageous to use it as the drying process will be speeded up and the end result will be a higher quality dried chilli. Artificial dryers are only an option if there is a guaranteed market for the dried chillies. The Practical Action technical briefs on drying give a good overview of the principles and practicalities of drying and good advice on the choice of dryer.

## Drying during the dry season

During the dry season, sun drying is usually adequate to dry the produce. The simplest and cheapest method is to lay the produce on mats in the sun. However, there are problems associated with this method. Dust and dirt are blown onto the crop and unexpected rain storms can re-wet the crop. To improve the cleanliness of the process, the drying chillies should be covered with a light gauze or muslin sheet which keeps away the insects and dust. To help maintain a good red colour, the chillies should be dried in the shade, not in direct bright sunlight.

Alternatively a solar dryer can be used. The simplest type of solar dryer is the cabinet solar dryer, see Figure 1, which can be constructed out of locally available materials (eg bamboo, coir fibre or nylon weave).

For larger units (over 30kg/day) an 'Exell Solar Dryer' could be used, see Figure 2. However, the construction costs are greater and a full financial evaluation should be made to ensure that a higher income from better quality spices can justify the additional expense.

## Drying during the wet season

During the wet season or times of high humidity, which often coincides with the harvest of the spices, a solar dryer or sun drying cannot be used effectively. An artificial dryer which uses a cheap energy source is necessary. This may be a wood or husk burning dryer or a combined wood burning and solar dryer. The technical brief on drying of foods contains more information on artificial dryers.

## **Over drying**

Care needs to be taken to prevent over drying of the chillies. A dryer operator will soon learn how to assess the moisture content of the chillies by hand. The final moisture content should be 10% wet basis.

## **Grading**

In some cases the dried chillies need to be graded, eg to gain a premium price for high quality packaged products. Chillies are graded by colour and size – the brighter the colour red the better. Grading is carried out by hand.

## **Grinding**

Dried chillies can either be sold whole or ground into a powder. Grinding is one way of adding value to the product, but it must be done carefully to avoid problems and losses of material. A whole, intact product can be easily assessed for quality whereas a ground product is more difficult. Some consumers do not like to buy ground spices for fear that they have been adulterated. This fear can be overcome by producing a consistently high quality product and gaining the confidence of customers. Ground spices also lose their flavour and pungency much more quickly than whole spices. Therefore, grinding the chillies reduces their shelf life and potentially means that you may suffer from higher losses as you will have to discard any ground spice that does not sell. It is essential that the ground powder is well packaged in moisture proof bags to prevent it taking up moisture. You really should only grind spices if you have an assured market with a rapid turnover for the product. Basically there are two types of grinder - manual and mechanical. Whichever type you opt for, it must be placed in a separate and well-ventilated room because of the dust that it creates.

## **Manual grinding mills**

There are many manual grinders that could be used to grind chilli (see equipment suppliers below).

An experienced operator can grind about 20kg in an eight hour day. However, this is hard and boring work. A treadle or bicycle could easily be attached to the grinder which will make the work easier. With this system one person could grind about 30kg in one day.

Consumer research should be carried out to find out the fineness of grinding that the consumer wants. The grinding mills then need to be set so that they produce the desired ground product.

For small-scale production, (up to 100kg/day) a series of these grinders is all that is needed. For larger scale production units, a mechanical grinder would be required.

## **Mechanical grinding mills**

There are a range of mills - horizontal plate, vertical plate or hammer mills - that are suitable for grinding chillies. The choice of mill depends on what is available in your particular area and the price of the mill.

## **Packaging**

### **Packaging material**

Packaging of these products, especially if they are ground requires polypropylene. Polythene cannot be used as the flavour components diffuse through it.

### **Simple sealing**

The bags can be sealed simply by folding the polypropylene over a hacksaw blade and drawing it slowly over the flame of a candle. However, this is extremely uncomfortable as the hacksaw blade heats up and burns the hands of the operator. It is however a very common technique and one that works adequately to seal the bags.

### **Sealing machines**

A sealing machine will considerably speed up this operation and produce a much tidier finish (which is very important). The cheapest sealing machines have no timing mechanism to show when the bag is sealed and they have a tendency to overheat.

It is desirable to have a sealing machine with a timer. These machines come in many sizes. For most work an 8 inch (20cm) sealer is sufficient. Eye catching labels should be sealed above the product in a separate compartment and holed so the package can be hung-up in the shop.

## Storage

A well designed and secure store is essential.

The optimal conditions for a store are: low temperature, low humidity and free from pests. The store should be located in a shaded, dry place. To keep humidity as low as possible only fully dried products should be stored in it. The produce should be checked regularly and if it has absorbed too much moisture it should be dried again.

To prevent pests entering, the roof should be completely sealed. Mosquito netting should be placed over the windows and doors should be close fitting.

## References and further reading

*Small-scale spice processing*, Practical Action Technical Brief

*Drying technologies*, Practical Action Technical Brief

*Drying of foods* Practical Action Technical Brief

*Solar drying* Practical Action Technical Brief

## Equipment suppliers

Note: This is a selective list of suppliers 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](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

E-mail: [acufilmachines@yahoo.co.in](mailto:acufilmachines@yahoo.co.in)

[acufilmachines@hotmail.com](mailto: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](mailto:bomeng@vsnl.com)

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

### Bry-Air (Asia) Pvt Ltd

21C Sector 18

Gurgaon – 122015

India

Tel: +91 124 4091111

Fax: +91 124 4091100

[enquire@pahwa.com](mailto:enquire@pahwa.com)

<http://www.bryair.com/index.htm>

### 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 27376101

Fax: +91 11 7234126

[Rank@poboxes.com](mailto:Rank@poboxes.com)

### Tata Energy Research Institute (TERI)

Darbari Seth Block

IHC Complex, Lodhi Road

New Delhi, India

Tel: +91 11 2468 2100/ 4150 4900

Fax: +91 11 2468 2144/ 2468 2145

[mailbox@teri.res.in](mailto:mailbox@teri.res.in)

[www.teriin.org/tech\\_cardamom.php](http://www.teriin.org/tech_cardamom.php)

### Bry-Air China

No 951-F Jian Chuan Road

Minhang District

### Bry-Air (Korea)

202 2F DH Building, 174-2 Songpa-dong

Songpa-gu

Shanghai 200240  
China  
Tel: +86 21 51591555  
Fax: +86 21 51591559  
[bryairc@online.sh.cn](mailto:bryairc@online.sh.cn); [bryair@vip.sina.com](mailto:bryair@vip.sina.com)  
[www.bryair.com.cn](http://www.bryair.com.cn)

**Bry-Air (Malaysia)**  
Sdn Bhd (197712-W)  
Lot 11, Jalan P/7, Bangi Industrial Estate  
43650 Bandar Baru Bangi  
Selangor, Malaysia  
Tel: 603 89256622  
Fax: 603 89259957  
[bryair@bryair.com.my](mailto:bryair@bryair.com.my)  
[www.bryair.com.my](http://www.bryair.com.my)

**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  
Tel: +94 71 764725

**Alvan Blanch**  
Chelworth, Malmesbury  
Wiltshire  
SN16 9SG  
UK  
Tel: +44 1666 577333  
Fax: +44 1666 577339  
[enquiries@alvanblanch.co.uk](mailto:enquiries@alvanblanch.co.uk)  
[www.alvanblanch.co.uk](http://www.alvanblanch.co.uk)

## Grinders and mills

**Kaps Engineers 831, G.I.D.C.**  
Makarpura  
Vadodara - 390 010  
India  
Tel: +91 265 644692/ 640785/ 644407  
Fax: +91 265 643178/ 642185

**Alvan Blanch**  
UK (See above)

**CS Bell Co**  
170 West Davis Street  
PO Box 291  
Tiffin  
Ohio

Seoul, Korea  
Tel: +82 2 414 0629  
Fax: +82 2 417 2622  
[drikorea@hanmail.net](mailto:drikorea@hanmail.net)  
[www.drikorea.co.kr](http://www.drikorea.co.kr)

**Bry-Air (Thailand)**  
448 Richie Tower, 2<sup>nd</sup> Floor  
Ratchadaphisek Road  
Samsennai Huayekhwang  
Bangkok 10320  
Thailand  
Tel: +66 2 5415479, 9389304  
Fax: +66 2 9389314  
[info@bryair.co.th](mailto:info@bryair.co.th)  
[www.bryair.co.th](http://www.bryair.co.th)

**Bry-Air (Africa)**  
Lower Ground Floor  
Lakeside Place  
1 Ernest Oppenheimer Drive  
Bruma-2198, Bedfordview  
Johannesburg, South Africa  
Tel: +27 11 6150458  
Fax: +27 11 6166485  
[bryairafrika@telkomsa.net](mailto:bryairafrika@telkomsa.net);  
[bryairafrika@pahwa.com](mailto:bryairafrika@pahwa.com)

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

**Mitchell Dryers Ltd**  
Denton Holme, Carlisle  
Cumbria  
CA2 5DU  
UK  
Tel: +44 1228 534433  
Fax: +44 1228 633555  
[webinfo@mitchell-dryers.co.uk](mailto:webinfo@mitchell-dryers.co.uk)  
<http://www.mitchell-dryers.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  
[info@lehmans.com](mailto:info@lehmans.com)  
<http://www.lehmans.com>

**Premium Engineers PVT Ltd**  
India (see above)

**Miracle Mills Ltd**  
Knightsdale Road  
Ipswich  
IP1 4LE  
United Kingdom

USA  
Tel: +1 419 448 0791  
Fax: +1 419 448 1203  
E-mail: [sales@csbell.co.com](mailto:sales@csbell.co.com)  
<http://www.csbellco.com/>

Tel: (01473) 742325  
Fax: (01473) 462773  
[sales@miracle-mills.co.uk](mailto:sales@miracle-mills.co.uk)  
<http://www.miracle-mills.co.uk/>

## Packaging and labelling machines

### Acufil Machines

India (See above)

### Gardners Corporation

158 Golf Links  
New Delhi 110003  
India  
Tel: +91 11 23344287/3363640  
Fax: +91 11 23717179

### 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  
1<sup>st</sup> Floor, Near Crawford Market  
Mumbai, India  
Tel: +91 22 2344 2902  
Fax: +91 22 2345 2532  
[yusufs@vsnl.com](mailto:yusufs@vsnl.com); [mmmb@vsnl.com](mailto:mmmb@vsnl.com);  
[yusuf@mmmb.in](mailto:yusuf@mmmb.in)

### Narang's Corporation

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  
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

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

UK (see above)

## Contacts

The following contacts should be able to provide further information:

Tata Energy Research Institute (TERI)  
Darbari Seth Block  
IHC Complex, Lodhi Road  
New Delhi  
India  
Tel: +91 11 2468 2100/ 4150 4900  
Fax: +91 11 2468 2144/ 2468 2145  
[mailbox@teri.res.in](mailto:mailbox@teri.res.in)  
[www.teriin.org/tech\\_cardamom.php](http://www.teriin.org/tech_cardamom.php)

Indian Institute of Spices Research (IISR)  
Marikunnu PO, Calicut  
Kerala  
India 673012  
Tel: +91 495 2731346  
+91 495 2730294  
[parthasarathy@iisr.org](mailto:parthasarathy@iisr.org); [rdinesh@iisr.org](mailto:rdinesh@iisr.org)  
<http://www.iisr.org/package/index.php?spice=Cardamom&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/>