PRACTICAL ACTION
Technology challenging poverty

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.

Chillies 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.

Figure 1: Chillies drying in Sri Lanka. Photo: Zul Mukhida.

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 from sea level to altitudes of1800 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.

technical brief

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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 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.

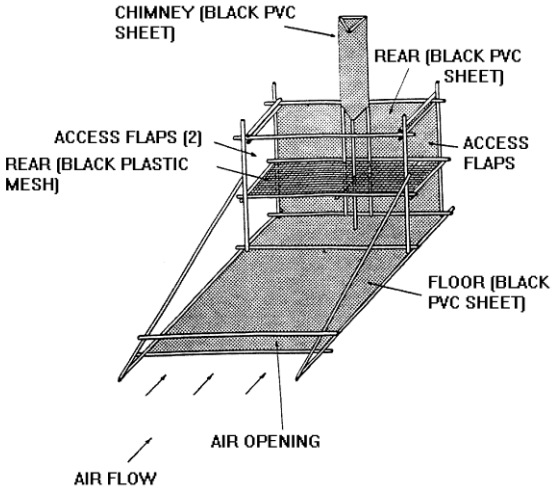

Figure 2: A chimney dryer.

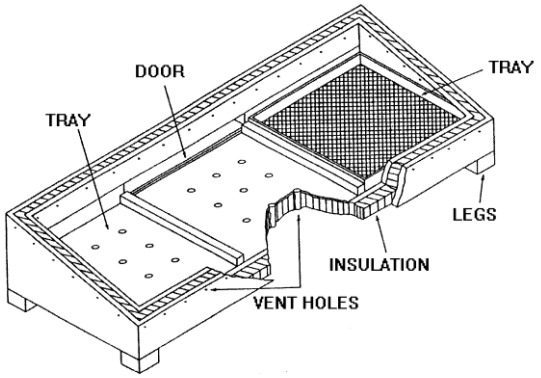

Figure 3: A cabinet solar dryer.

Dying 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 goof 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

Dryers

Acufil Machines
S. F. No. 120/2, Kalapatty Post Office
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Packaging and labelling machines

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Further Reading

Drying selection of Practical Action Technical Briefs:
Drying, Food Cycle Source Book 6 UNIFEM and Practical Action Publishing 1995
Preservation of Fruit and Vegetables: Agrodok 3, Agromisa 1997
Try Drying It! Case Studies in the Dissemination of Tray Drying Technology, B Axtell,Practical Action Publishing 1991
Producing Solar Dried Fruit and Vegetables for Micro and Small scale Rural Enterprise Development, A Series of Practical Guides' written by the Natural Resources Institute.
Setting up a food drying business P Thuillier, Practical Action Publishing, 2002
Drying Food for Profit B Axtell, Practical Action Publishing, 2002

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