



DRY SALTED PICKLED CUCUMBERS

Pickled cucumbers are made throughout the world – in Africa, Asia and Latin America. They are made by mixing cucumber with salt or a brine solution from where they undergo a lactic acid fermentation. The products vary according to the type of cucumber used, the length and type of fermentation and the presence of any additional herbs or spices. Typical products include *Khalpi* which is a cucumber pickle produced in Nepal, *oi sobagi* and *oiji* from Korea and *torshi khiar* from Egypt.

This technical brief should be read together with ‘Pickled fruits’ which gives an overview of the process of lactic acid fermentation of fruit and vegetables.

Preservation principles

Selected cucumbers are prepared and placed in either dry salt or a brine solution (15-20% salt). With wet fruits such as cucumbers, dry salt is usually used (brine is more often used for less juicy fruit and vegetables). The salt draws moisture out of the cucumbers to form a brine. Lactic acid producing bacteria thrive in the salty environment and begin to grow and multiply. As they do so they produce lactic acid as a by-product, which increase the acidity of the pickle and gives it its distinctive sour taste. The increased acidity preserves the cucumber and prevents the growth of other food poisoning bacteria. The fermentation continues until all the nutrients are used up and the acidity is so high it destroys the lactic acid bacteria.

The dry salting method is used for pickling many vegetables and fruits including limes, lemons and cucumbers. For dry salt pickling, any variety of common salt is suitable as long as it is pure. Impurities or additives can cause the following problems:

- Chemicals to reduce caking should not be used as they make the brine cloudy.
- Lime impurities can reduce the acidity of the final product and reduce the shelf life of the product.
- Iron impurities can result in the blackening of the vegetables.
- Magnesium impurities impart a bitter taste.
- Carbonates can result in pickles with a soft texture

Raw material preparation

Select the raw material. Only use fully ripe cucumbers without bruising or damage. Wash the cucumbers in potable cold water and drain. It is important that the water used for washing is clean – boiled water is ideal – to avoid contamination of the brine by water-borne bacteria. Chlorinated water should not be used for washing the fruit as this could prevent the natural fermentation taking place. The cucumbers can be pickled whole or sliced - this depends on their size. The very small cucumbers (less than 10 cm long) are often left whole while the larger ones are sliced. For *khalpi* the cucumbers are washed, sliced and cut into 5-8cm pieces.

Processing

Place the cucumbers and salt in alternating layers in a suitable fermentation bucket. A large food-grade plastic bucket with a lid is ideal. The proportions of salt to cucumbers are 1 kg of salt to every 20kg of small cucumbers or 15kg of large cucumbers. Close the bucket. Add a heavy weight such as a clean plate to the top of the cucumbers to weight them down and aid the formation of the brine. Place the bucket in a warm place (20°C) to allow the brine to form by osmosis (water is drawn out of the cucumber and mixes with the salt to make a brine). This takes about 24 hours depending on the temperature. If the brine formed by osmosis does not cover the cucumbers, add additional brine (made to a strength of 40° Salometer) up to the required level. One or two days after the brine has formed, stir the mixture to equalise the concentration of salt throughout the mass.

As soon as the brine is formed, fermentation starts and bubbles of carbon dioxide appear. Fermentation takes between one and four weeks depending on the ambient temperature. Fermentation is complete when no more bubbles appear.

During fermentation the brine becomes cloudy for the first few days due to the growth of bacteria. Later if the brine is not covered, a filmy yeast growth will often occur on the surface.

Flow diagram

Process	Quality assurance
Selection ↓	Only ripe cucumbers should be selected
Wash ↓	In clean water
Mix with salt ↓	1kg salt for 15-20kg of cucumbers
Ferment ↓	For between one and four weeks at 21°C
Package	

Packaging and storage

Pack the pickle into clean glass or plastic jars that are sterilised prior to filling. Cucumber pickle keeps well if stored in a cool place. Due to the high acid level of the final product, the risk of food poisoning is low. With *khalpi* in Nepal, oil is added to the surface of the pickle to prevent spoilage and further fermentation.

Equipment required

- Fermentation bucket – plastic bucket with lid
- Thermometer
- Weighing scales
- Salometer (optional)

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.

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Gardners Corporation

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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

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Alvan Blanch

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Bottle filling and packaging equipment**H Erben Limited**

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University of Science and Technology
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Thermometers

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Web: www.qasupplies.com

Fisher Scientific UK Ltd

UK (see above)

Gardners Corporation

India (see above)

References and further reading

Practical Action Technical Briefs
Pickled fruit and vegetables
Pickled cabbage (kimchi)
Pickled dry salted limes
Pickled fruits
Labelling

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.

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