
Canning

CANNING

- The process of sealing foodstuffs hermetically in containers and sterilizing them by heat for long storage is known as canning.

- In 1804, Appert in France invented a process of sealing foods hermetically in containers and sterilizing them by heat.

- Appert is known as the 'Father of Canning'.

Canning is also known as appertizing.

INTRODUCTION

- Canning is defined as the preservation of foods in the sealed containers and usually implies heat treatment as the principal factor in prevention of spoilage.
- Mostly the canning is done in tin cans but other containers like glass, plastics, etc are also used.
- The fruits and vegetables used for canning should be as fresh as possible so that their quality could be retained.
- Fruits should be mature, firm ripe and free from all defects, while vegetables should be usually tender.

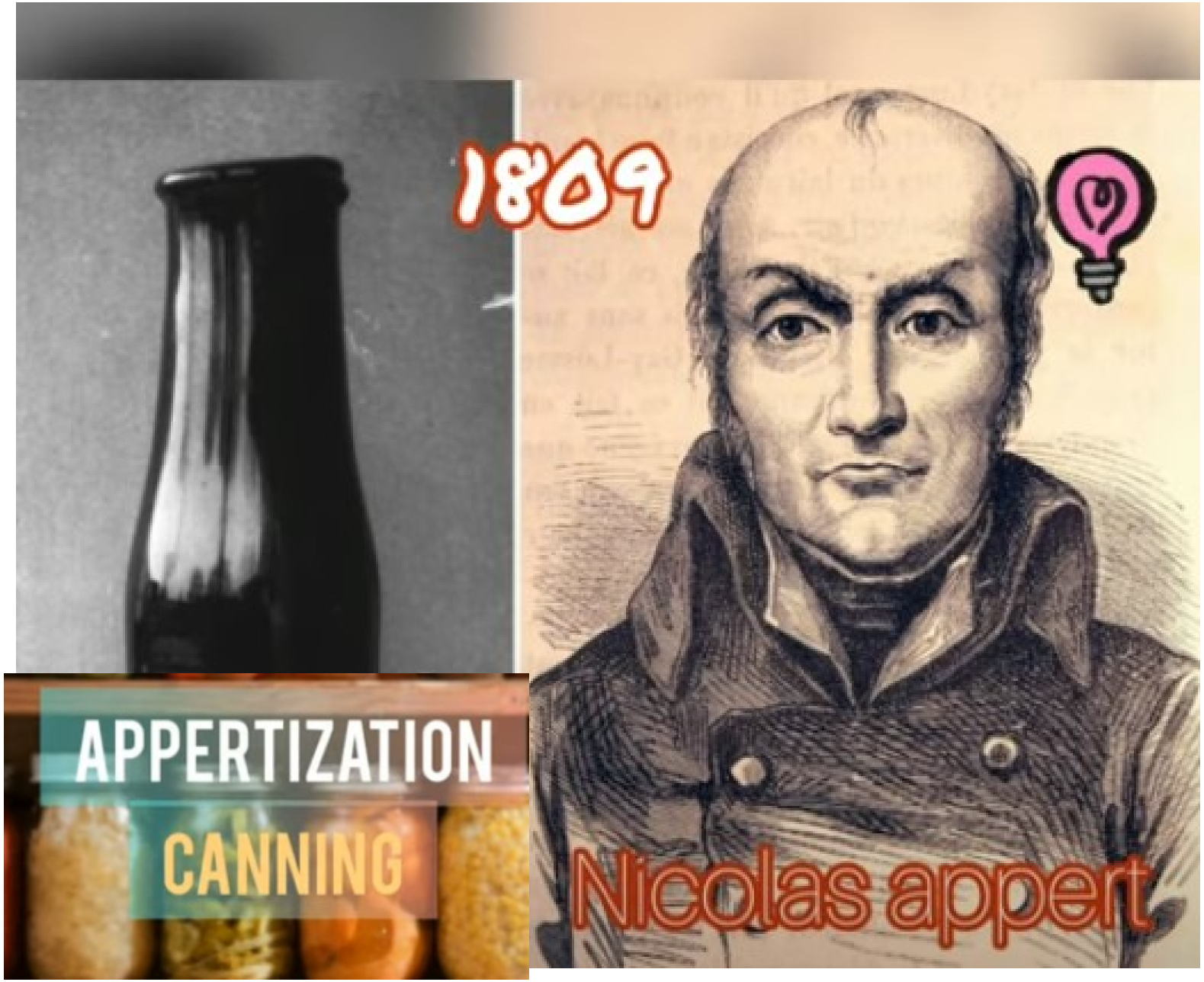
Principles of Canning

1. Destruction of spoilage organisms within the sealed containers by application of heat,
2. To improve the texture, flavour and appearance by cooking, and
3. To stop recontamination of food during storage. You should be careful during heat application that palatability of food is least disturbed while all the microbial load is destroyed.

History of canning

Important historical developments in canning are as under:

- The credit for invention of canning goes to Nicholas Appert, a French confectioner who was awarded a prize in 1809 by the French government for developing new method of heat preservation of food in sealed container and after whose name the process of canning is known as Appertization.
- In 1807, Saddington was first to describe a method of canning of foods.
- In year 1810, Appert published the first book on canning entitled “the Art of Preserving Animal and Vegetables substances for many years” which is the first known work on canning.
- In 1810, Peter Durand got first British Patent on canning of foods in tin or metal containers.
- William Underwood introduced canning of fruits on a commercial scale in U.S.A.

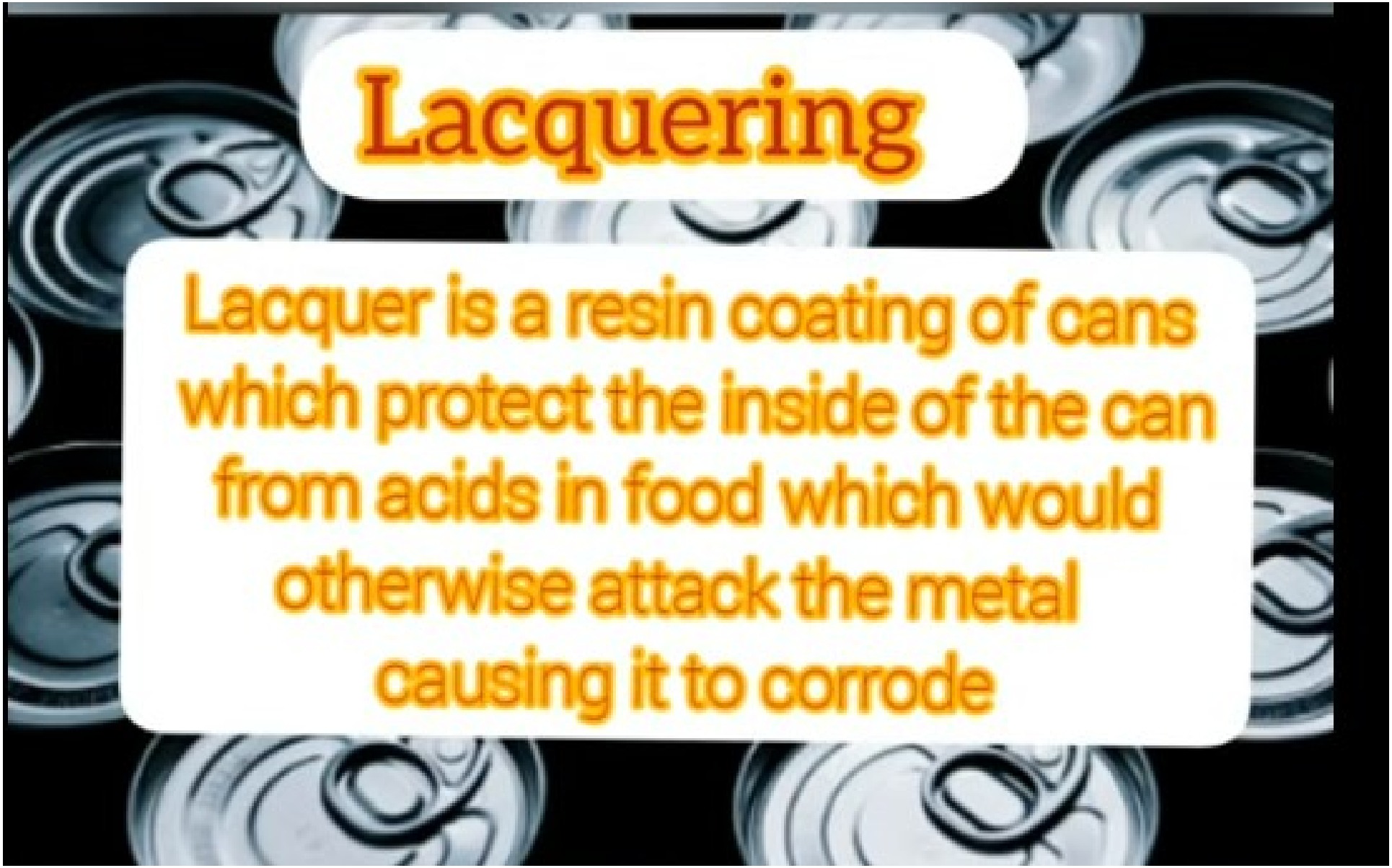

1809
APPERTIZATION
CANNING
Nicolas appert


LOW ACID FOODS
ACID FOODS
HIGH ACID FOODS


LOW ACID FOODS
pH 5.0-6.8


ACIDFOODS
tomatoes,
Oranges ,peas etc
pH 4.5-3.7


ACIDFOODS
Pickle, fermented products
And jam jellies
pH3.7-2.3


Lacquering
Lacquer is a resin coating of cans which protect the inside of the can from acids in food which would otherwise attack the metal causing it to corrode

Cans


Acid resistant
Acid resistant
FOR FRUITS
Sulphur resistant
FOR VEGETABLES

Two types of lacquers are used:

(i) Acid-resistant: Acid-resistant lacquer is a golden coloured enamel and cans coated with it are called R-enamel or A.R cans. These cans are used for packing acid fruits which are of two kinds : (a) those whose colouring matter is insoluble in water, e.g., peach, pineapple, apricot, grapefruit, and (b) those in which it is water-soluble, e.g., raspberry, strawberry, red plum and coloured grape. Fruits of group (a) are packed in plaincans and those of group (b) in lacquered cans.

(ii) Sulphur-resistant: This lacquer is also of a golden colour and cans coated with it are called C-enamel or S.R. cans. They are meant for non-acid foods only and should not be used for any highly acid product as acid eats into the lacquer. These cans are used for pea, corn, lima bean, red kidney bean, etc.

Tin containers are preferred to glass containers because of certain advantages:

(i) Ease of fabrication,
(ii) Strength to withstand processing,
(iii) light weight,
(iv) Ease in handling,
(v) Cheapness, and
(vi) Can be handled by high speed machines.

Manufacturing of cans

- Metal cans are mainly used in the national and international trade for canning of fruits and vegetables.
- Open top sanitary (OTS) cans are made from tin plates which are very thin sheets of steel lightly coated with tin (0.00025 cm thick) on both sides.
- Tin can is cut into proper sizes with a trimming and slitting machine..
- After notching and slitting, the flat can body is passed through an edging machine where hooks are formed.
- The can body is then bent into a cylindrical shape and side seam is soldered.
- These operations are carried in the can manufacturing factory.
- Now the cans are supplied in the flattened form to the users to lower the packing and transportation costs.
- The can ends are supplied separately along with the cans.

Table7.1: Trade name and sizes of cans used in canning of fruits and vegetables.

Trade name	Trade size	Size mm
A1	211×400	68×102
1 lb jam	301×309	78×90
A1 tall	301×411	78×119
A2	307×408	87×114
1 lb butter	401×212	103×70
2 lb jam	401×400	103×102
A 2 1/2	401×411	103×119
7 lb jam	603×513	157×148
A10	603×700	157×178

PROCESS OF CANNING

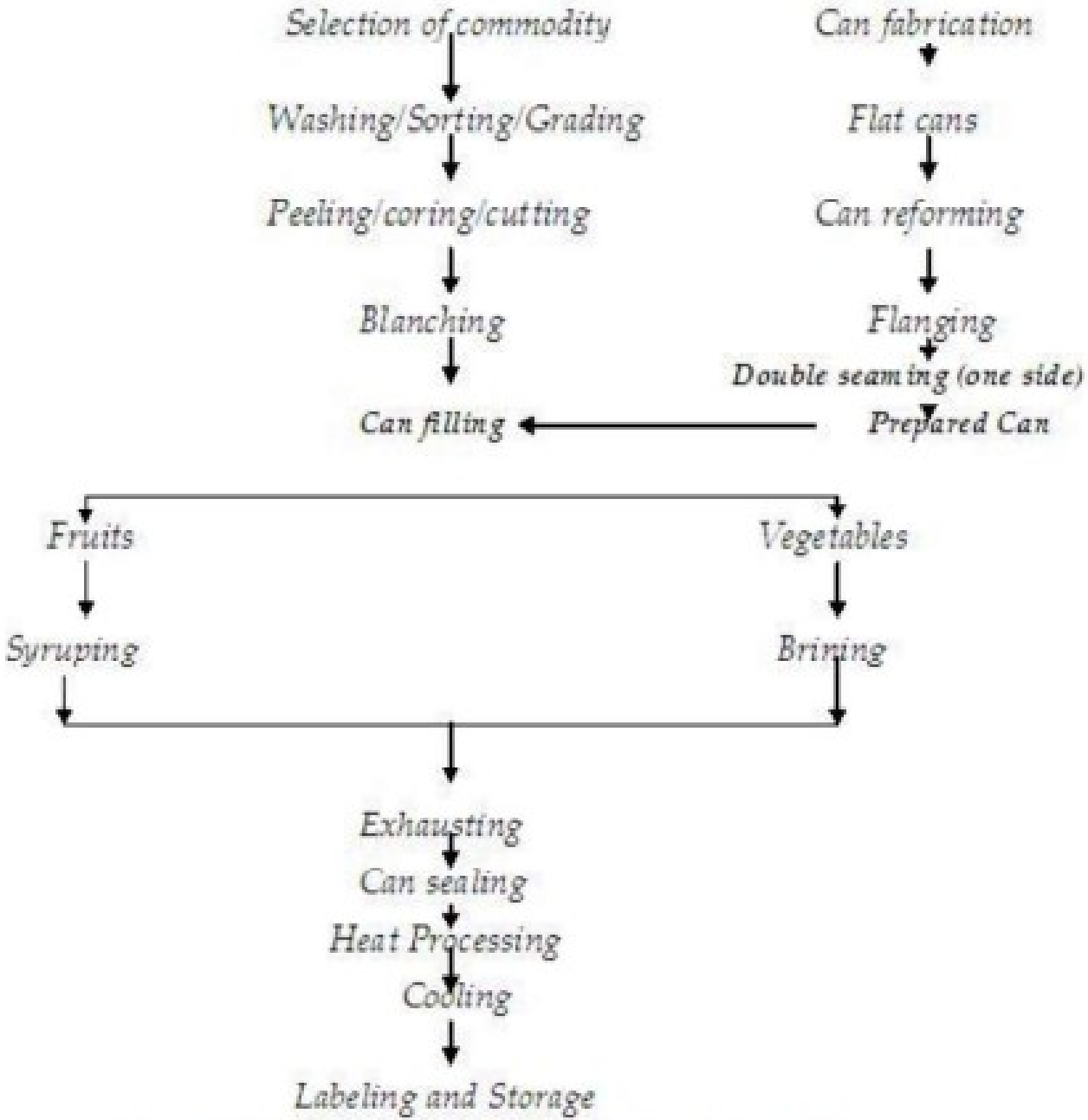


Figure 7.1: Flow sheet for canning of fruits and vegetables


Canning of pineapple
Selection
And washing of fruit


Peeling and cutting

PEELING

(i) Hand peeling: It is done mostly in case of fruits of irregular shape, e.g., mango and papaya, where mechanical peeling is not possible.

(ii) Steam peeling : Free-stone and clingstone peaches are steam peeled in different ways. The former are cut and steam washed. Potatoes and tomatoes are peeled by steam or boiling water.

(iii) Mechanical peeling : This is done in case of apples, peaches, pineapples and cherries and also for root vegetables like carrots, turnips and potatoes.

(iv) Lye peeling : Fruits like peaches, apricots, sweet oranges, mandarin oranges and vegetables like carrots and sweet potatoes are peeled by dipping them in 1 to 2 per cent boiling caustic soda solution (lye) for 30 seconds to 2 minutes depending on their nature and maturity. Hot lye loosens the skin from the flesh by dissolving the pectin. The peel is then removed easily by hand. Any trace of alkali is removed by washing the fruit or vegetable thoroughly in running cold water or dipping it for a few seconds in 0.5 per cent citric acid solution. This is a quick method where by cost and wastage in peeling is reduced.

(v) Flame peeling: It is used only for garlic and onion which have a papery outer covering. This is just burnt off. Vegetables like peas are shelled, carrots are scraped, and beans are snipped or trimmed.


Discard seeds, stones


Sterilization of cans


Blanching
80-82°C for 2-3 min.

Blanching

Also known as: Parboiling, scalding or precooking

(i) Inactivates most of the plant enzymes which cause toughness, discolouration (polyphenol oxidase). mustiness, off-flavour (peroxidase), softening and loss of nutritive value.
(ii) Reduces the area of leafy vegetables such as spinach by shrinkage or wilting, making their packing easier.
(iii) Removes tissue gases which reduce sulphides.
(iv) Reduces the number of microorganisms by as much as 99%.

(v) Enhances the green colour of vegetables such as peas, broccoli and spinach.
(vi) Removes saponin in peas.
(vii) Removes undesirable acids and astringent taste of the peel, and thus improves flavour.
(viii) Removes the skin of vegetables such as beetroot and tomatoes which helps in their peeling.

Disadvantages

(i) Water-soluble materials like sugar and anthocyanin pigments are leached by boiling water.
(ii) Fruits lose their colour, flavour and sugar.


Filling
In pre sterilized can


Syruping


TSS of sugar
20-55°B


Brining (for vegetables)


Syrup is at 79-82°C
Pour syrup on fruit
Head space 0.3-0.5cm


Exhausting
Removal of air from cans
In hot water
At 82-87°C
6-10min

(9) Exhausting

The process of removal of air from cans is known as exhausting. After filling and lidding or clinching, exhausting is essential. The major advantages of exhausting are as under:

(i) Corrosion of the tinplate and pin holing during storage is avoided.
(ii) Minimizes discolouration by preventing oxidation.
(iii) Helps in better retention of vitamins particularly vitamin C.
(iv) Prevents building of cans when stored in hot climate or at high altitude.
(v) Reduces chemical reaction between the container and the contents.
(vi) Prevents development of excessive pressure and strain during sterilization.

Containers are exhausted either by heating or mechanically. The heat treatment method is generally used. The cans are passed through a tank of hot water at 82 to 87°C or move on a belt through a covered steam box. In the water exhaust box, the cans are placed in such a manner that the level of water is 4-5 cm below their tops. The exhaust box is heated till the temperature of water reaches 82 to 100^0c and the centre of the can shows a temperature of about 79°C. The time of exhausting varies from 6 to 1 a minutes, depending on the nature of the product. In the case of glass jars or bottles, vacuum closing machines are generally used. The bottles or jars are placed in a closed chamber in which a high vacuum is maintained.


Can sealer
Sealing
Temp. should not fall below 74°C


Ball
Ball
Processing
At 100°C for 30min

(11) Processing

Heating of foods for preserving is known as processing, however, in canning technology processing means heating or cooling of canned foods to inactivate bacteria. Many bacterial spores can be killed by either high or very low tempera- ture. Such drastic treatment, however, affects the quality of food. Processing time and temperature should be adequate to eliminate all bacterial growth. Moreover, over-cooking should be avoided as it spoils the flavour as well as the appearance of the product. Almost all fruits and add vegetables can be processed satisfactorily at a temperature of 100°C, i.e., in boiling water.


Cooling
Cool at 39°C

(12) Cooling

After processing. the cans are cooled rapidly to about *39°C* to stop the cooking process and to prevent stack-burning. Cooling is done by the following methods:

(i) dipping or immersing the hot cans in tanks containing cold water;

(ii) letting cold water into the pressure cooker specially in case of vegetables;

(iii) Spraying cans with jets of cold water; and

(iv) exposing the cans to air.

Generally the first method, i.e., dipping the cans in cold water, is used. If canned products are not cooled immediately after processing, peaches and pears become dark in colour, tomatoes tum brownish and bitter in taste, peas become pulpy with cooked taste and many vegetables develop flat sour (become sour).


Labeling
Packaging
Storage

Causes of spoilage of canned foods

Spoilage of canned products may be due to two reasons:

(A) Physical and chemical changes, and

(B) Microorganisms.

(A) Spoilage due to physical and chemical changes