Fundamentals of Canning

Module- 38

Lec- 38

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Canning

Canning aims to destroy all micro-organisms and their spores through the application of heat.

This is achieved by sterilising the food within air-tight containers to prevent re-contamination.

Industrial Food Canning

Canning Equipment
Proper equipment is essential to a safe product.

**Canning Jars**

- Check jars for nicks, cracks, and rough edges.
- Wash in soapy water, rinse well, and keep hot.
- If food is processed for less than 10 minutes, need to be sterilized.
- Do not use single-use jars, such as mayonnaise and tomato sauce jars, to process food at home.
Canning Lids

- Use two-piece lids.
- Flat lid cannot be reused but the ring band can.
- Follow the manufacturer's instructions for treating them.

Canning Tools

- Jar Funnel
- Jar Lifter
- Magnetic Lid Wand
- Bubble Freer
Canning Basics

Canning Terms

- Headspace –the unfilled space above food or liquid in jars; allows food to expand and a vacuum seal to form

- Hot-fill –heating foods to boiling, packing in hot sanitized jars, sealing, and holding at a high temperature for a given time (hot-fill-hold)
- Hot pack –placing hot food into hot jars before processing. Different from raw pack which places raw food into hot jars.

Basics of Canning

- Food is placed in a jar and heated to a temperature that destroys targeted microorganisms.
• Heat also inactivates enzymes that cause spoilage.
• Air is driven from the jar during heating. As the jar cools a vacuum seal is formed.

High Acid Foods (pH ≤4.6)

• All fruits, except for:
  – figs
  – tomatoes, and
  – melons
• Fermented pickles, such as sauerkraut
• Acidified foods, such as pickles
Low-acid Food (pH > 4.6)

- All vegetables, except rhubarb
- Meats
- Poultry
- Seafood
- Soups
- Mixed canned foods (low-acid + high-acid)

Why Two Ways to Can?

- Yeast, molds, and most bacteria are destroyed at boiling temperatures -- 212°F at sea level.
• C. botulinum forms spores that require higher temperatures for destruction in a reasonable period of time -- usually 240°F or above at sea level.

**Botulism and Growth**

To grow, the spores need:

• oxygen-free environment
• low-acid food
• temperature between 40°F to 120°F
• relatively high moisture
Conditions for C. botulinum to grow can be found in:

- Home canned foods
- Smoked fish and sausage
- Foil-wrapped baked potatoes
- Packaged mushrooms
- Pot pies

Ways to Prevent Botulism

- Test pressure canner dial gauge for accuracy each year before use.
- Correctly operate canner.
- Check canned food carefully before use.
- If toxin is suspected, detoxify food before discarding. The toxin is destroyed by boiling even though the spores are not.
Unsafe Canning Methods

- Open Kettle
- Oven Canning
- Dishwasher
- Addition of Aspirin
- Steam Canners
- Microwave Oven Canners
Two Methods of Canning

Boiling Water Canning -- used for high-acid foods

Pressure Canning -- used for low-acid foods (and some high-acid foods)
**Boiling Water Bath**

Used for high-acid foods and acidified foods

- Have water simmering or hot in canner, high enough to cover jars (about six inches).
  - Hot packed jars = simmering water
  - Raw packed jars = warm to hot water

- Wipe rim of jars and adjust lids.
- Lower jars slowly into canner.

**Pressure Canning**
Used for low-acid foods

Inspect Your Pressure Canner

- Some parts might need assembling -- see manufacturer’s directions.
- Become familiar with parts and their functions.
- Clean to remove oils.
- Lightly coat the exposed gasket and lugs on the canner bottom with cooking oil.
- Before each use be sure vent pipes are clear and open.

Using a Pressure Canner

- Have 2 to 3 inches of water simmering or hot in canner.
  - Hot packed jars = simmering water
  - Raw packed jars = warm to hot water
- Place jars on rack in canner.
- Put lid on canner with weight off or petcock open.
• Exhaust canner for 10 minutes.
• Close vent or petcock.
• Start counting processing times when correct pressure is reached.
• Turn off heat at end of processing.
• Let pressure drop to 0 psig naturally.

• Wait 2 minutes after pressure drops to 0 psig. (For some canners, check that locks in handles are released).
• Remove weight or petcock.
• Open canner. Watch steam!
• Remove jars to padded surface or rack.
• Cool jars for 24 hours, undisturbed.
• Check that jars have sealed.

Process Food Properly

Follow a credible recipe exactly
  – The following slows heat penetration:
    • Extra sugar or fat
    • Oversized food pieces
    • Added thickeners
  – Heat-up and cool-down times in pressure canners are counted toward sterilizing value of the process. Never rush them.
Importance of Processing Time

- Each food and preparation style has its own processing time.
- Processing time differs with size of jar.
- Too short
  - Underprocessing
  - Spoilage or unsafe food
- Too long
  - Overprocessing
  - Overcooked
What Affects Processing Time

- Acidity of the food
- Preparation style of the food
- Composition of the food
  - Viscosity
  - Tightness of pack
  - Convection vs. conduction transfer of heat
    - Starches, fats, bones
- Initial temperature of food as it is packed into jar
- Temperature of processing
- Size and shape of jar

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Altitude Adjustments

- As altitude increases, the temperature decreases at a given pressure.
- Dial-gauge processing changes:
  - 0-2000 feet = 11 pounds pressure
  - 2001-4000 feet = 12 pounds pressure
  - 4001-6000 feet = 13 pounds pressure
  - 6001-8000 feet = 14 pounds pressure

- Weighted gauge adjustments
  - 0-1000 feet = 10 pounds pressure
  - At altitudes above 1000 feet, process at 15 pounds pressure.
- Boiling water canner adjustments
  - Generally, the processing time will increase.
  - Use a credible resource to determine processing time.

The stages of canning

The stages of canning are:

- cleaning of raw materials;
- size reduction;
- blanching;
- filling;
• sealing;
• washing;
• sterilisation;
• cooling;
• drying;
• labelling.

Cleaning of raw materials

All foods to be canned must be washed thoroughly to remove contaminants and inedible matter. For some products this is a one-step process. For others, such as stews, all separate ingredients must go through this process.

Size reduction

Certain ingredients, such as vegetables, need to be sliced or diced in order to fit into cans. However, some varieties of carrot are grown especially so that they fit into the can whole.

Blanching
Products which contain fruits and vegetables need these ingredients blanched (i.e. immersed in boiling water) before they can be packaged. This process helps with filling the can. Blanching must take place, quickly, to prevent any enzymic reactions such as discolouration from occurring.

Filling

The cans are filled automatically with a measured weight or volume of product. A solution of brine, savoury sauce, fruit juice or sugar syrup is usually added. A space is left at the top or the can will distort when sterilised. Food is also packaged in plastic containers. These are known as plastic cans, e.g. ambient ready meals.
Sealing

The cans are sealed, under vacuum, using a double seam on the can rim. A vacuum is applied to draw out the air at the top of the can and seal the lid. At this stage some product may seep out.

Washing

Once sealed, cans are washed to remove any external particles, and are then ready to be sterilised.
Sterilisation

Batches of cans are placed in a retort, which works like a large pressure cooker. The time taken to sterilise the contents at boiling point would be relatively long. By canning under pressure less time is needed as the temperature rises to 121º C. The retort is sealed and stem is injected. This causes the temperature to rise and eventually results in air being driven out of the retort.

The type of product being canned is of importance at this stage. ‘Solid pack’ contents, e.g. canned meat, need more time as the heat needs to penetrate the product by conduction. However ‘liquid pack’ contents, e.g. soups, need far less time as the liquid present helps transfer the heat by convection. This will dictate the pressure and time needed to sterilise the product throughout.
Cooling

After the cans have been sterilised, they are cooled to prevent overcooking of the contents. This is achieved by spraying cool water over the cans and a gentle reduction in pressure.

Any sudden drop in temperature would cause the cans to distort and damage the can seams. While still warm, the cans are removed and passed through a cooling tank to reduce the temperature further.

Drying

The remaining heat from the can evaporates any water left on the surface. This is important to prevent rusting during storage and the risk of intake of dirty water if there is a seam defect.

Labelling
Finally, cans are coded then labelled with a ‘best before’ date.
References:

- A Complete Course in Canning and Related Processes: Fundamental Information on Canning [D L Downing (Author), Donald L. Downing (Editor)].
- http://learningstore.uwex.edu/assets/pdfs/B2718.pdf