Bottling Food Products

Namaskar,,,,,Welcome to the lecture series of Food Technology. In Today's lecture I am going to present the lecture on the topic "Bottling Food Products. The topic divided into the following five sections

1. Introduction
2. New Challenges of Bottling of food products
3. Canning Basics for Preserving Food
4. Bottling or Canning Equipment and
5. Conclusion

1. Introduction

Eating is a basic activity of the human species and the type of food is strongly connected with the natural resources of each region. With the passing of time, food type has come to form part of the culture of the different nations and is one of the most influential cultural elements in the individuals of a given culture.

The so-called "Mediterranean diet" has gained great prestige in recent years. Numerous studies point out that people in the Mediterranean region have a lower tendency to suffer from certain illnesses and that the cause of this outstanding phenomenon lies in certain foodstuffs that the diet in this region is composed of or, to be more precise perhaps, in the appropriate combination of these in the diet.

The preserved foodstuffs that are considered within the scope of this survey are relatively modern types of food. Right from the beginnings of his evolution, man has always looked for ways to preserve food resources that nature offers in super abundance during certain periods and denies in others. Salting, curing, smoking and dehydration were all discovered in time but all of these processes slightly modified the characteristics of the original fresh food. To overcome these issues, bottled or Canned foods are the great contribution of the eighteenth century to the world of food. They completely modify the range of food that is available. All of a sudden, meat, fish and vegetables can be preserved for weeks and months in a state that is very similar to its original form. Canned food symbolized a revolution for those in charge of provisioning an army or a crew on board ship during long voyages. As a result of new technologies that have appeared, canned food no longer has this basic function of feeding certain populations in advanced societies and today they are just one more type of food in the wide range of foodstuffs that are available. While the basic technology for producing canned food has evolved very little during recent years, the equipment and installations designed for this function have undergone variations, together with the types and materials of the containers used.

Bottling and canning process with preservatives is very important in food manufacturing industries. The process involves cooking fruits or vegetables, sealing them in sterile cans or jars, and boiling the containers to kill any remaining bacteria as a form of pasteurization. High-acid fruits like strawberries require no preservatives to bottle and only a short boiling cycle, whereas marginal fruits like tomatoes require

longer boiling and addition of other acidic elements. Food preserved by canning or bottling is at immediate risk of spoilage once the can or bottle has been opened.

2. New Challenges of Bottling of food products

The new challenges in the future that the food industry must face and resolve quickly lie in taking old systems of bottling in food production:

- The use of renewable forms of energy that do not reduce the planet‘s limited energy reserves.
- The use of resources and raw materials that are renewable or subjected to safe recovery processes.
- No emission or disposal of any substance that modifies or deteriorates the natural environment and the life forms that develops in it.
- Do not produce any product whose consumption may cause a decrease in natural reserves, or cause the deterioration or modification of the natural environment.

The Regional Activity Centre for Cleaner Production of the Mediterranean Action Plan has made this study on *Pollution Prevention in Food Canning Processes in the Mediterranean Region*. Its object is to gather relevant data to provide information on the environmental impact of food canning or bottling activities in the Mediterranean region and mainly to present opportunities that can be applied for preventing pollution in this sector. There are substantial differences between what is conventionally known as canned food ie a foodstuff preserved in a can or glass jar and what preserved food is in technical terms.

General Dos and Don'ts for Canning/Bottling High Quality Special Products

- Market tests your processed products on a small scale by providing samples to your fresh produce customers.
- Start with only the best quality, freshest ingredients.
- Use only high quality containers and food grade caps liners for a proper seal.
- Sort and wash produce thoroughly before chopping/slicing/pre-treating.
- Follow recommended procedures for pre-treatments such as blanching ie make white or remove color, peeling, seeding or coring to ensure high quality.
- Leave enough heads pace when filling containers.
- Measure acidity to determine the proper processing method to use.
- Make sure canned/bottled products are processed at the proper temperature and pressure for the recommended length of time.
- Adjust processing times for food products uses in different altitude. Add 5 minutes to boiling water bath times for altitudes from 3001 to 6000 ft; 10 minutes for altitudes from 6001 to 8000 ft. For altitudes over 100 ft, increase the pressure for processing via pressure canners.
- Follow the safety practices to prevent food safety problems during processing.
- Work with a reputable co-packer to process produce if you are unwilling to make the investments necessary to ensure high quality and food safety.

- Store products in a cool, dark place, Check containers to make sure a vacuum seal is present. Signs that products have spoiled include broken seals, seepage, mold, yeast growth, gassiness, fermentation, spurting liquid when jar is opened, sliminess, cloudiness, and disagreeable odors.

3. Canning Basics for Preserving Food

Canning is an important, safe method for preserving food if practiced properly. The canning process involves placing foods in jars or similar containers and heating them to a temperature that destroys micro-organisms that cause food to spoil. During this heating process air is driven out of the jar and as it cools a vacuum seal is formed. This vacuum seal prevents air from getting back into the product bringing with it contaminating micro-organisms.

Safe Canning Methods are Water bathing method and pressure bottling method

Water bathing Method, Bottles filled in water bath, generally covering the bottle by 2 -3 cm and heating the contents with hot water for a prescribed time. The boiling water bath method is safe for tomatoes, fruits, jams, jellies, pickles and other preserves. In this method, jars of food are heated completely covered with boiling water (212°F at sea level) and cooked for a specified amount of time. The water bathing method is not suitable for herbs, garlic, low acidity tomatoes or any vegetables. This also means that you should not add herbs, onions or garlic to tomatoes to process via the water bathing method. Water-bath preserver can find in both electric and stove top varieties. Stove top units include the Ball Preserving Kit and all pressure canners can also be used as stove top units by removing the pressure regulator on the top of the unit. Currently pressure canners are only available in stove top versions. They are not suited to use on glass top stoves or induction cookers. They can be used on outdoor gas burners in those cases.

Pressure Bottling or Pressure canning is the only safe method of preserving vegetables, meats, poultry and seafood. Jars of food are placed in 2 to 3 inches of water in a special pressure cooker which is heated to a temperature of at least 240° F. This temperature can only be reached using the pressure method. A microorganism called Clostridium botulinum is the main reason why pressure processing is necessary. Though the bacterial cells are killed at boiling temperatures, they can form spores that can withstand these temperatures. The spores grow well in low acid foods, in the absence of air, such as in canned low acidic foods like meats and vegetables. When the spores begin to grow, they produce the deadly botulinum toxins(poisons).

The only way to destroy these spores is by pressure cooking the food at a temperature of 240°F, or above, for a specified amount of time depending on the type of food and altitude. Foods that are low acid have a pH of more than 4.6 and because of the danger of botulism, they must be prepared in a pressure canner.

The low acidic foods include:

- Meats
- Seafood
- Poultry
- dairy products
- all vegetables

High acid foods have a pH of 4.6 or less and contain enough acid so that the Clostridium botulinum spores cannot grow and produce their deadly toxin. High acidic foods can be safely canned using the boiling water bath method.

The high acidic foods include:

- fruits
- properly pickled vegetables

Certain foods like, tomatoes and figs, that have a pH value close to 4.6 need to have acid added to them in order to use the water bath method. This is accomplished by adding lemon juice of citric acid.

4. Botteling or Canning Equipment

Water Bath Canners

A water bath canner is a large cooking pot, with a tight fitting lid and a wire or wooden rack that keeps jars from touching each other. The rack allows the boiling water to flow around and underneath jars for a more even processing of the contents. The rack also keeps jars from bumping each other and cracking or breaking. If a rack is not available, clean cotton dish towels or similar can be used to pack around jars. If a standard canner is not available any large metal container may be used as long as it is deep enough for l to 2 inches of briskly boiling water to cover the jars. The diameter of the canner should be no more than 4 inches wider than the diameter of your stove's burner to ensure proper heating of all jars. Using a wash kettle that fits over two burners is not recommended because the middle jars do not get enough heat. For an electric range, the canner must have a flat bottom. Outdoor fire pits with a solid grate will also work however close attention is required to insure proper boiling temperature.

Pressure Canners

A pressure canner is a specially-made heavy pot with a lid that can be closed steam-tight. The lid is fitted with a vent or pet-cock, a weighted pressure gauge and a safety fuse. Newer models have an extra cover-lock as an added precaution. It may or may not have a gasket. The pressure pot also has a rack. Because each type is different, be sure to read the directions for operating.

Jars

Mason jars and Ball jars specifically designed for home canning are best. Commercial mayonnaise jars, baby food and pickle jars should not be used. The mouths of the jars may not be appropriate for the sealing lids and the jars are not made with heavy glass and they are not heat treated.

Jars come in a variety of sizes from half-pint jars to half-gallon jars. Pint and quart Ball jars are the most commonly used sizes and are available in regular and wide-mouth tops. If properly used, jars may be reused indefinitely as long as they are kept in good condition. Atlas jars should not be used for home preserving and canning.

Jar Lids

Most canning jars sold today use a two piece self-sealing lid which consists of a flat metal disc with a rubber-type sealing compound around one side near the outer edge, and a separate screw-type metal band. The flat lid may only be used once but the screw band can be used over as long as it is cleaned well and does not begin to rust.

Canning Utensils

Helpful items for home canning and preserving:

- **Jar lifter:** essential for easy removal of hot jars.
- **Jar funnel:** helps in pouring and packing of liquid and small food items into canning jars.
- **Lid wand:** magnetized wand for removing treated jar lids from hot water.
- **Clean cloths:** handy to have for wiping jar rims, spills and general cleanup.
- **Knives:** for preparing food.
- **Narrow, flat rubber spatula:** for removing trapped air bubbles before sealing jars.
- **Timer or clock:** for accurate food processing time.
- **Hot pads**
- **Cutting board**

There are also many special utensils available like apple slicers, cutting spoons for coring and pit removal, corn cutters and fruit skinners.

Home Recipes

When looking for advice and information on preserving food, try to avoid old pamphlets, outdated cookbooks, untrained celebrities and undocumented food shows on TV. Your best source for current information on research and processing instructions are publications made by the U.S. Food and Agriculture Department, College Cooperative Extension Services and major food processing equipment manufactures.

Preparation of the covering liquid

Most canned products are filled with hot sweet syrup solutions, brines (salt with a small amount of sugar) or sauces, that must be at the highest possible temperature at the time that the container is being filled. This helps to optimise the sterilisation process because the container starts at an initially high temperature, and at the same time it helps to eliminate air from the headroom in the container.

In the case of vegetables, a 2% brine solution with a small quantity of sugar to enhance the flavour is used. Most fruit is preserved in syrup. This sweetens the fruit and at the same time helps to keep the texture firms and prevents the loss of colour that could occur due to the degradation of anthocyanic pigments.

This process only generates wastewater from cleaning.

Filling of the containers and elimination of any trapped air

Once the containers have been washed, they are uniformly filled with the appropriate quantity of the product in order to expel any unwanted gases, especially oxygen. Here a covering liquid is added that can be brine, a sauce, juice or syrup, according to the type of preserved food. Different types of canning equipment exist on the market, ranging from semi-automatic to automatic ones, although for products like asparagus, filling has to be done by hand. Solid/liquid fillers are normally used for products that come in pieces, such as runner beans and broad beans that are covered with a juice. The containers are put into the machine on a small conveyor belt and transferred directly to the solids' filler head by a synchronised feeder. The container is filled with the pre-set amount of product while it moves and then goes to the liquids' filler head, with the containers positioned on lifting platforms in the filling position. Here they are gravity filled and space left for a predetermined headroom gap. Piston or plunger fillers consist of a cylindrical tank with external measuring rollers where the product is drained as the tank revolves.

Once the containers are filled and before they are sealed, they are preheated to eliminate any air trapped inside of the containers so that there is a partial vacuum that prevents alterations occurring during storage and to reduce the sterilisation time, at the same time that the pressure inside the container is reduced during the period of sterilisation.

In the case of some acid foodstuffs, such as tinned fruit, hydrogen gets produced in the can as a result of acid attacking the steel base of the tin plate. Once enough hydrogen is produced, the container can burst unless sufficient space has been left.

Another possibility is for the filling of the product or control juice to be hot packed, which is the case especially with small sized containers. The application of jets of steam is necessary here during sealing.

Sealing the containers

Sealing the containers is an essential part of the canning process because incorrect sealing would lead to recontamination of the foodstuff once it has been sterilised. There are various sealing alternatives according to the type of container. Glass jars are normally vacuum sealed while tins are closed with a double seam on the seal side and they can also be vacuum sealed. Sealing can be done with either manual equipment or very modern, efficient machinery than can seal over a thousand cans a minute.

Sterilisation

Heat treatment is the most important operation in the process of manufacturing canned products. It is an operation in which the foodstuff is heated to a sufficiently high temperature and during a sufficiently long period of time to destroy all microbial and enzymatic activity in the food and it also lengthens the life of the product.

Nicolás Appert was the first person to try out the sterilisation process in 1809 by preparing stable preserved foodstuffs in sealed glass jars. The system has evolved since then with equipment that is more efficient and that enables the application of much more homogeneous and suitable treatments. Nowadays, the different sterilisation techniques are classified into two systems, in batches and continuously. The difference between these is that the first system works with discontinuous system autoclaves (steam-driven sterilizers) that make automation of the production line difficult, whereas the second system uses continuous sterilizers where the product is sent through different areas at different temperatures that are maintained constant the whole time that the sterilizer is being undergone. This second system represents: 1. A saving of energy, 2. The uniform treatment of the product.

The disadvantage of the first system (batches) can be avoided by setting up various parallel autoclaves and a mechanised feeding system that puts the containers in racks, transports them to the autoclave that is ready to begin the operation, puts them into it and, once the processing time has finished, takes them out of the autoclave and removes them from the racks.

Description of the different types of canned food processing

Juices

Fruits are simmered in water or their own juice in a stainless steel, glass pot. When tender the product is cut into pieces and pressed through a food mill. Sugar or lemon juice can be added, to taste. The juices must then be either frozen or canned for storage. Juices can be frozen in jars or freezer containers. Most fruit juices can be

canned in a boiling water bath for 20 minutes, but apple and grape juices can be processed in hot water (82°C or 180° F) for 30 minutes. Recent problems with apple juice have lead to requirements for labeling on pasteurization.

Apple juice: 24 Ibs apples, Wash apples, drain, remove stem and blossom ends, chop and place in a large pot. Add water and cook until tender, stirring frequently. Strain through several layers of cheesecloth into a second pot. Heat juice just to a boil, then fill hot jars. Add caps and process in a balling water canner for 10 minutes. Yield about 12half pints.

Mango Squash: Use ripe fruits, washed with clean water and dried. Squeeze each fruit, rolling it between your palms to break the pulp, then remove the stem end and squeeze out the thick pulp and juice. To make a 25% pulp squash combine 1.75 kg sugar. 40 g citric acid and 1.25 kg water and bring to a boil. Cool and filter through a muslin cloth. Add I kg mango pulp, filter again through a muslin cloth. Add 2.9 g potassium metabisulfite as a preservative and mix thoroughly. Fill clean, dry glass bottles, leaving about I inch headspace.

Vegetables: Vegetables should be chopped or shredded, then simmered for 45 to 50 minutes. The juice can then be pressed or strained from the vegetable pulp, and frozen or canned. Canning vegetable juices require processing at 10 pounds of pressure in a pressure canner. Pints should be processed for 55 minutes, and quarts for 85 minutes.

Processed Products: Pickles and Vinegars The high acid content of pickled vegetables allows use a boiling water bath rather than a pressure calmer, and reduces the time required for processing. The salt used for pickling is free of additives food in table salt, which will cause clouding. Flavored vinegars are so highly acid that no further processing is necessary if vinegar is decanted into sterilized bottles. To sterilize containers: fill with hot water place in a pot; cover with water and boil for 10 minutes.

Canned fish

Canned tuna is a product that is obtained from the corresponding species, with practically no scales, blood, skin or bones. For products to be considered as canned, they are packed in hermetic metal tins and appropriately sterilised and stabilised by heat. Canned tuna is presented in vinegar, oil or different types of sauce.

5. Conclusion

Bottled or Canned foods are the great contribution of the eighteenth century to the world of food. Bottling techniques is highly helpful to transport and utilize hygienic food products in all seasons. Meat, fish and vegetables can be preserved for weeks and months in a state that is very similar to its original form. Canned food symbolized a revolution for those in charge of provisioning an army or a crew on board ship during long voyages.

Thanking you