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Fish Canning

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SUMMARY

Canning is the method of preserving food from spoilage by storing it in containers that are hermetically sealed and then sterilized by heat. The process was invented after prolonged research by Nicolas Appert in France in the year 1809, in response to a government for a means of preserving food for army and navy purpose. The high heat destroys microorganisms and inactivates enzymes to preserve the safety and quality of the food. Canning is an important, and also a safe method of food preservation if practiced properly. Air is driven from the jar during heating, and as it cools, a vacuum seal is formed. The vascuum seal prevents air from getting back into the product bringing with it microorganisms to decontaminate the food. These spores can be destroyed by canning the food at a temperature of 240 °F, or above, for the correct length of time. This temperature is above the boiling point of water at 212 °F so it can only be reached in a pressure canner. Since the canned foods are sufficiently cooked products and free from micro-organisms they offer consumer safety besides being ready to consume. Canning has the unique distinction of being an invention in the field of food processing whereas all other methods can be considered as adaptation of natural processes or their modifications. Due to their very long shelf life and ready to consume feature canned products have become very popular and a variety of food stuffs, both plant and animal origin and their combinations are produced and distributed.

INTRODUCTION

Originally, cans consist of a sheet of tin-plated iron that was rolled into a cylinder onto which the top and bottom were manually soldered. This form was replaced in the early 20th century by the modern sanitary, or open-top, can, whose constituent parts are joined by interlocking folds that are crimped, or pressed together. Polymer sealing compounds are applied to the end, or lid, seams, and the body seams can be sealed on the outside by soldering. The modern tin can is made of 98.5% sheet steel with a thin coating of tin. It is manufactured on wholly automatic lines of machinery at rates of hundreds of cans per minute. Most vegetables, fruits, meat and dairy products, and processed foods are stored in tin cans, but soft drinks and many other beverages are now commonly stored in aluminum cans, which are lighter and do not rust. Canning preserves most of the nutrients in foods like the Proteins, carbohydrates, and fats are unaffected, and the same vitamins like vitamins A, C, D, and B_2. The retention of vitamin B_1 depends on the amount of heat used during canning. Some vitamins and minerals in the products may dissolve into the brine or syrup in a can during processing, but they retain their nutritive value if those liquids are consumed.

Procedure:

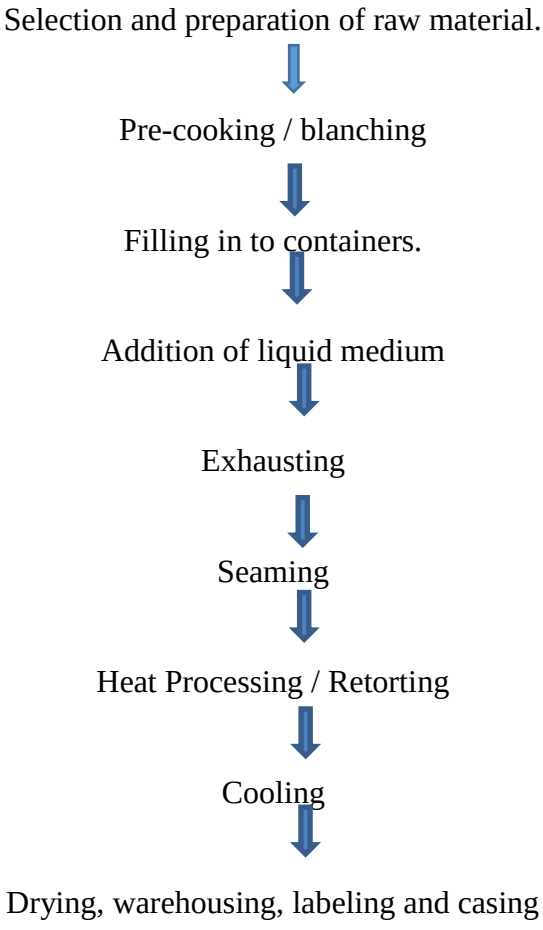

Fig. No1 Flow diagram of canning

Selection

Different types of fish and shellfish suitable for canning are available in our nation. Sardine, mackerel, tuna, seer fish and shellfish like shrimp, clam, oyster, mussel, crab etc. are suitable for canning. Good raw material is very important for canning. Only freshly harvested fish should be taken for canning. Since the heat processing is standardized with respect to a known number of microbial spore populations, the excess no of microbial load will result in the failure of destruction of micro-organisms. Therefore it is essential that, the bacterial load in the fish prior to canning should be kept as low as possible. This can be achieved by using very fresh fish, proper dressing and thorough washing in potable water and keeping properly iced.

Preparation of raw material

De-scaling, beheading, gutting, removal of fins, tail and cutting in to small pieces etc. In the case of shrimps, peeling and de-veining is done Bivalves like clams, mussels, oysters etc. require a purification process called 'depuration` for improving the bacterial quality of the meat. The meat is picked out or sieved and collected and thoroughly washed in potable water. In the case of crab, the legs, outer shell, body flap, gills etc. are removed and the body is split in to two or four pieces. The pieces are then thoroughly washed in potable water.

Blanching/Pre-cooking

There are two types of blanching

- Cold blanching
- Hot blanching

Cold blanching

The dressed fish is subjected to this process before filling in to cans. The process is to keep the fish pieces immersed in a salt solution, the concentration of salt solution and dipping time of fish varies depending

on the species and size of fish. This process removes blood, slime, dirt and gives firmness to the texture and imparts a salty taste to the product. It also reduces the bacterial population.

Hot blanching

Shell fish including shrimps and crabs, blanching process is done in boiling brine solution. During this process the shrimp meat gets their characteristic red color, curls and shrinks in size permitting adequate filling in to cans. Pre-cooking of fish is carried out in steam before or after packing in to cans. The fish is cooked for such a length of time that no further water is exuded while the cans are subjected to heat processing. For sardine or fatty fish the cooking time is found to depend on the fat content, lean fish taking larger cooking time. This process will expel the cellular gases and improve vacuum in the can, inactivate the enzymes and reduce the bacterial population.

Containers filling

Mostly used container is the tin plate can commonly known as the open top sanitary can. The tin plate can is 98% steel and 2% tin coating on either side. For preventing black discoloration in canned fish. The sulphur from the sulphur containing amino acids in the fish muscle reacts with iron in the tin can and forms black iron sulphide, which results in what is known as sulphide blackening. The most commonly used lacquer in fish cans is the oleo-resinous C-enamel lacquer. C- Enamels contain Zinc oxide, which reacts with sulphur compounds producing zinc sulphide, which is white in color. The color of the product thus remains unaffected. The OTS cans meet most of these requirements and hence it is widely used in the food industry. One practical difficulty met with OTS can is in opening the can. Tin cans with easy opening lids, Aluminum cans with EOE facility etc. are the innovations in this direction for easy opening.

Addition of liquid medium

The liquid besides serving as a constituent of the product and improving taste, texture, flavor, it also facilitates rapid heat penetration enhancing the sterilization process. Brine is the most satisfactory liquid for most fatty-fishes where as non- fatty fishes require special additives to improve their flavor and texture. Double refined and de-odorized vegetable oil, is the principal additive for many canned fish products. The oil used should be such that it should not undergo any change during heat processing. It also should not impart any color or flavor to the product. Tomato sauce is an important additive in mackerel, oyster and the like. The tomato sauce for use as packing medium should be prepared out of good quality tomato and the color of the sauce

should not deteriorate during heat processing. The consistency of the sauce should be adjusted to a solid content of 28 to 30%. There are a number of other additives such as carboxy methyl cellulose, monosodium glutamate, sugar, vegetables, spices etc. added in specific cases to yield canned products of specific qualities. While filling with liquid medium a head space of 6 to 9 mm from top of the can should be provided for adequate vacuum formation in the can.

Exhausting

Exhausting is the process of removal of air from the contents and headspace of the can before it is seamed. This is a very important operation and has the following functions to perform. Exhausting is achieved by one of the following three methods.

Sealing

The objective of sealing is to provide an air tight seal between the can body and the can end so that microbes cannot gain entry in to the cans. Perfect sealing is a critical operation stage in a canning process. For providing perfect sealing to the can adjustments to the seaming machine are done before starting the seaming operations and the double seam formed is examined with standard measurements. The sealed cans are subjected to pressure testing for checking the seam perfection. The can seaming machine should be checked daily for its perfect performance before the cans are taken for sealing. For providing a hermetic sealing a rubber sealing compound is applied to the curl of the can end. The successive operations of the first and second rollers of the seaming machine gives the double seam, the perfectness of which should be checked as per the guidelines given by the manufacturer. The exhausted cans are sealed immediately without any delay. The delay may cause cooling of the contents and air may occupy the headspace thereby leaving no room for vacuum formation. The sealed cans are properly washed using a detergent. The adhering meat particles, grease and oil from the sealing machine are washed before taken for the next operation.

Heat Processing

Heat processing is the most important operation in canning process. In heat processing the product is subjected to heat at a high temperature more than 110°C or above to sufficient length of time to cause destruction of all harmful microorganisms and inactivate/destroy the micro-organisms causing. Among the pathogenic bacteria, *Clostridium botulinum* is the most important, since it is able to grow in sealed cans under vacuum if it present and lead to the development of a potentially lethal toxin. In general, proper thermal processing prevents spoilage, helps to retain most of the sensory qualities and assures consumer safety. The temperature and duration of heat processing depend on the type and nature of microbes and heat penetration characteristic of the food. When microbes are subjected to heating in steam, it is observed that 90% of the population is destroyed at equal intervals of time at a particular temperature.

According to the FAO/WHO Codex Alimentarius Commission, defines commercial sterility as the condition achieved by the application of heat, sufficient alone, or in combination with other treatments, to render the food free from microbes capable of growing in the food at normal, non- refrigerated conditions at which the food is likely to be held during distribution and storage. The cans are arranged in crates and placed in retorts for heat processing. Before closing the lid of the retort, air from the retort is completely fleshed out by flushing with steam. The air vent is then closed and steam is admitted in to the retort in such a way that the temperature and pressure is raised slowly till the required temperature and pressure is attained. Heat processing is carried out at the designated temperature, pressure and duration till the heat processing value designated as F0 is attained. F0 is the heat processing time at 121°C. When the heat processing is over steam is released slowly till the pressure is brought down to 0. Aluminum cans and flexible pouches require super imposed pressure cooling for preventing bursting while steam pressure is released. The cans are taken out and transferred to cooling tanks immediately after heat processing.

Cooling

The heat from the can as well as the pressure developed inside the can has to be reduced very rapidly for preventing straining on the seam and excessive cooking. The seam in a heated can is in an expanded condition. There can be microscopic openings in a seam through which cooling water may be sucked in. If this water is contaminated, it will spoil of the cans. This is for maintaining proper water quality .The cooling water must be of drinking quality chlorinated to available chlorine of 5 ppm. Continuous use of the same water for

cooling helps in building up bacterial load, particularly in later stages when there will be ample nutrients in cooling water in the form of fish particles washed off from can exterior side. The cans must be cooled to 37°C retaining sufficient heat for drying the can surface which also protects against rusting.

Drying, warehousing, labeling and casing

The processed cans must not be hot because the loss of heat by radiation from the cases will become slow which will provide favorable condition for the development of hemophilic bacteria which might have survived heat processing. Cans should not be stored adjacent to steam pipes or humid environments. Warehouses should be away from chemical and fertilizer factories where the fumes of chemicals/fertilizers are harmful to food cans. Warehouses should be clean, cool and dry. Water condensing on surface, high humidity or temperature, corrosive fumes etc. leads to rusting of the cans.

CONCLUSION

Fish canning offers a delicious and convenient way to incorporate seafood into your diet. With a long shelf life and no refrigeration required, canned fish provides a versatile protein option for any pantry. From classic tuna salad to gourmet sardines on toast, canned fish offers endless possibilities for creating tasty and nutritious meals. So next time you're looking for a quick and easy protein source, reach for a can of fish and discover the culinary potential this shelf-stable staple has to offer. Fish canning also offers a multitude of benefits, ensuring food preservation, promoting dietary diversity, and creating a readily available source of nutrients. However, considerations regarding potential environmental impacts and maximizing nutrient retention during processing are crucial for a sustainable future. As the industry evolves, striking a balance between efficiency and responsible practices will be key to maintaining the value of canned fish for consumers and the environment.

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