Course Name: Canning Technology and Value Addition in Seafood
Professors name: Dr. Maya Raman, Dr. Abhilash Sasidharan
Department: Food Science and Technology
Institute: Kerala University of Fisheries and Ocean Studies
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Process of seafood canning P2

Welcome again to the NPTEL course, Canning Technology and Value Addition of Sea Food. We will be dealing about canning procedure for various seafood products. In the previous class, we have discussed about the canning of different fish that is fin fish and, in this class, we will be discussing about the canning of shell fishes. So, first, let's look what is shrimp canning. In the shrimp canning we go for *Penaeus indicus*, *Penaeus monodon* and little *Penaeus vannamei*. So, these are the commercially important shrimp species and this is how it is marketed. So, this is the protocol for canning of shrimp. First, we receive the raw material. In the case of shrimps need to be fresh and it should be brought or preprocessed immediately after catch. So that is very important in the case of shrimp and then after material has been received it need to be washed. Any adhering, slime, blood, mud or anything unwanted materials it needs to be removed and then weighed and be heading. So, in this we remove the shell, head and other unwanted parts of the body and shrimp it has an exoskeleton. Skeleton is on the outside of the body so that need to be removed. After heading and peeling it is deveining. Deveining is the process where we remove the gut content so it is on the dorsal part. If you make a slight cut and you can remove the weight and then it is washed, weighed and it is subjected to blanching. Blanching it helps in inhibiting the enzymatic activity because if the enzymatic activity continues it will cause deposition of melanin and it may cause black spots. So that is removed by dipping or by treating the shrimp by blanching the material 0.1% citric acid so this helps in inhibiting or arresting the enzymatic activity which will prevent the melanosis. And after that the blanched shrimps they are dried, they are graded if they are different sized then according to the size they are sorted and graded, it can be done manually or mechanically then weighed and it is packed and usually the prawns are packed in SR lacquered cans. This is sulphur resistant cans because the amino acids, sulphur containing amino acids they may react with the can and it may cause rusting or production of gas H2S. So, to prevent that SR lacquered cans are used. Filling liquid is added it is generally 2% brine. Usually, the pure salt is used for brining and we can also add oil then it is seamed, washed, the can is washed any adhering oils on the surface or any adhering materials on the surface of the can it also need to be removed by washing then it is retorted. Retorting temperature is 115 that is 115 degrees centigrade for 20 to 25 minutes this again depends upon the type of can that is being used after retorting it is cooled immediately and then dried. For cooling, we use potable water or chlorinated water that is 1 ppm chlorine and after drying it is labeled and stored.

So, in the canning process we need to be careful because it has an exoskeleton unlike the pinfish the skeleton is located on the surface of the body. So, it needs to be removed and that process is called peeling. After peeling the veins are removed. It is called deveining and during this process the organs gastrointestinal tract, reproductive organs and hepatopancreas are also removed. Sometimes, smaller prawns, deveining is not required it's not mandatory but for larger sized prawns or shrimps deveining is required and because it contains microbes the gut may contain microbes so that need to be removed. After deveining, it is blanched and is done for many reasons. One of the reasons which we have discussed earlier was to arrest the enzymatic activity the other reason is to help in salt absorption also to develop the pink color so when we are subjecting the shrimp to the blanching or slight heating it develops the pink color which gives a good texture and appearance to the product. It also improves the flavor and again blanching reduces the moisture content. So, these are the additional advantages of doing blanching. After blanching, the shrimps are packed in desired cans; liquid media can be oil or brine and after packing, we go for exhausting, seaming and retorting which we have seen earlier. The problems associated with canned shrimp is retort burn which is usually seen in dry packs where we don't have liquid media or when the level of liquid media is below the level of the product. So, if the product is exposed, it may develop burns on the surface that during retorting. Again, sulphide blackening, it is because of the sulphur containing amino acids like methionine or cysteine reacts with the canned content that stannous and forms sulphide which gives a black color to the content. So, that is again a disadvantage or problem which is associated with the shrimp canning. Now this is a specification for canned shrimp in brine and it was laid in 1968. Accordingly, the level of heavy metals is given- arsenic - 1 ppm, lead- 5 ppm, copper- 10 ppm, zinc- 15 ppm, tin- 250 ppm and we need to maintain the headspace of 0.5 to 0.75 cm and drained weight should be 64 %, sodium chloride should be 3.5 % w/v basis. These specifications need to be taken care of while we do the canning of shrimps.

Now, coming to the canning of crabs. These are the different species that are canned Charybdis, *Portunus sanguinolentus*, *Portunus pelagicus*. So, these are the species that are used for canning. They can be canned or they can also be sold as pasteurized product. Now, this is the protocol for crab canning; raw materials are received they are washed and again in the crabs we need to get the fresh live crabs. The dead crabs or the weak crabs need to be avoided or discarded and after washing the dirt, everything need to be removed, they need to be weighed and dressed. During dressing, the back shell is removed. Viscera and gills are also removed. After that, again it is subjected to washing and blanching and followed by blanching it is cooling, meat picking. So here, you have to understand that the meat is collected after cooking the product. In the previous cases, it is after cooking there is nothing directly going to the canning process or it is filled inside the can. But in case of crab, to remove the meat it has to be done after cooking. So, after meat picking, again it is washed or treated with weak acetic acid and then it is packed

into the container and we can add liquid media or we can also add masala we can also add oil or brine and after retorting, it is subjected to cooling, drying, labeling and storage. These parts are again similar to the procedures we had seen earlier.

So, in the canning of crab we have to be careful only live crabs are used for canning and for meat separation it is subjected to heat and only after that we are separating the meat crab, it needs to be cooked or it need to be heated to separate the meat and again crabs they can be canned into two different forms that is single face pack and double face pack. In the single face pack, the body meat is packed into the can and on the top of it we find the claws and in the double face pack, the claw meat is packed on both on the top and the bottom and along with that we add brine and citric acid.

The problems that are associated with crab meat are blackening or black discoloration and this can be averted by adding a lining of parchment paper in the can and we also find retort burn this is generally seen when the amount of the media is lesser it is pasteurized or it is a dry packed and blue discoloration also is there when the bleeding of crab is not done thoroughly then it will cause blue discoloration. This can be avoided by adding a chelating agent which will chelate the metal. Usually, we go for EDTA or citric acid they are metal chelators and they will trap the metals and the metal will not be available for the further reactions.

The standards for crab meat in brine; and the vacuum should be 150-millimeter, sodium chloride in brine should be 2% and citric acid which is used for maintaining the acidity is 0.2% w/v. Bacteria requirement should satisfy the test that is Clostridium content should be nil and TPC should be according to the limits and acid insoluble ash should be 2% by mass. Now, according to the FSSAI these are the different products that can be marketed. Claw meat, blackfin, premium lump and special. Under each, you can find the description. For example, claw meat- it is crab meat from claws it is mainly only the claw meat that is taken and it's an economical grade and it is usually used for soups and dips and according to the FSSAI the minimum lethality temperature should be 85 degrees centigrade for 31 minutes. The standard has been put by FSSAI and these are other types of cans for crab and here it is according to the grades so 55-75 it indicates that there will be 55 to 75 lumps in one can and 30-40 it indicates 30 to 40 lumps so in 90-120 jump o'lum means 90 to 130 pieces or lumps in the can.

So, the CCPS will be receiving and followed by metal detection and seaming pasteurizing or canning and then chilling and chill storage. So, these are the different CCPS. To identify the CCP is very important. Problem associated with the crab is the presence of antibiotics. So, the residual content needs to be checked and it should be within the limits. If it is not within the limits, it should be informed the supplier and necessary actions need to be taken and again metal detector it's a physical hazard so any metal pieces that need to be trapped by using a metal detector. Then seaming need to be confirmed because it again

causes recontamination of the product. Then pasteurizing temperature. It is a time temperature relationship that also need to be maintained properly. Then chilling and chill storage. These CCPS we need to be checked and necessary actions need to be taken accordingly.

Next, we have to see mussel canning. Mussels are clamps or meat of bivalves are used for canning and mussels can be green mussels or brown mussels we also have a *Marcia recens* and the procedure includes raw material collection, washing, depuration. Depuration is a unique step which is included only for the mussels. During this process, the mussels they accumulate the toxins in the body when the mussels are collected from environment they have to be subjected to depuration and in this they are treated or they are kept in the running water for 24 hours which helps in removing the sand dirt and other materials from the body and after depuration, the shell is opened by boiling it in the water for 10 to 15 minutes and it is called shucking and meat is removed. If it is a large size, then the gut content needs to be removed or else the smaller ones we can be used as such and after that it is graded if there's a size variation is there then it needs to be graded it is blanched in the 5% salt solution for 5 minutes. Then the mussels can be packed with oil. It can also be packed with masala and then it is exhausted, seemed and washing, again retorting, cooling, drying, labeling and storing. So, the points we need to remember are we have to take only live shells and depuration need to be included in the canning of bivalves and when we do the cooking in case of large clams, they are cooked by laying in a single layer and when subjecting it to heating or cooking the liquor comes out and it is collected in the shell. So, that is called clam nectar and it can be added to the can itself to maintain the flavor or it can be marketed as a separate product. So, it can be marketed as a clam nectar. Actually, it adds to the flavor of the product. The process of removing the shell is called shocking. So, after removing the shells the clams are subjected to canning as we had discussed earlier. These are the standards mussels in oil and it was late in 1983 according to it arsenic content should be 1 ppm that is the maximum limit, then led it should be below 5 ppm, copper below 10 ppm, Zinc 50ppm, mercury 0.5 ppm and here we add mercury because again it's a heavy metal it comes from the industrial deposits or the waste which goes into the water so that's why mercury also need to be tested for the shelled animals.

In this session, we had seen the canning of fin fish and canning of shellfish the protocols are mostly same for both the cases that is fin fish and shellfish. In the fin fish we had seen canning of tuna sardine mackerel. These are the commercially important fishes and sardine it has scales and descaling is very important. The nobbing is an important part in the canning of fin fish where we remove the head and the gut region so that is a very important step you will not find in the crustacean canning or canning of shrimps or crabs or mussels and after canning, they are subjected to brining which helps in removing the soluble proteins and if the soluble proteins are not removed it will adhere to the surface of

the can again it will cause the foliage. That is again another step which is not found in crustaceans and again the skin is very thick in case of tuna that need to be removed and it is removed only after baking which is not there in other fish and not even it is not there in the crustaceans also. These are some of the points which make fish different from shrimp and in the case of shrimp we usually go for marine shrimp for canning and the deveining is very important because it removes the gut content and if it is a smaller crustacean, we can use it as such but for larger crustacean. It is very important to devein the product and it need to be fresh in case of fish we can go for frozen samples also frozen products that can be thawed and used for canning. But in case of shrimps, it needs to be fresh and it need to be processed immediately and crabs need to be live. If it is mussels then it needs to be depurated these are the different points that need to be noted in case of shrimps or in case of shell exoskeleton or the crustaceans. Again, the crustaceans, they are subjected to blanching because it inhibits or arrests enzymatic activity because if it is not arrested it will cause a blackening or the color will develop on the material. So, that need to be avoided. That is done only in the case of shrimp. In case of bivalves, we had seen that the operation is done which removes the contents that has been deposited in the body of the clam, it will be removed during depuration. It is a very important step again for mussels. But we don't see this step in case of other products that is in case of fin fish or other crustaceans and also the clam nectar it is a very important byproduct which is obtained only in the case of clams and this clam nectar we can use as such in the cans or we can market it separately. It adds to the flavor can get achieve the clam flavor in the nectar. So, that is again important point that need to be remembered. Now, these are the processes. The canning process is a processing step which is done after pre-processing and pre-processing is a very important criteria and a lot of steps are involved in this. Pre-processing is the preparatory step where we prepare the product for further processing and these we will be discussing in the coming sessions. Let's wind up for today.