

Course Name: Canning Technology and Value Addition in Seafood
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Additives P1

Welcome back to NPTEL course Canning Technology and Value Addition of Seafood. We had been discussing about canning procedure for various food products and under which we have completed step by step process variations in item wise seafood canning. We had also seen what are the different pre-processing steps that need to be adopted to clean the fish at the initial stages to pre-process and what are the different methods of pre-processing. And in today's class we are going to discuss about additives that are used in seafood industry during canning process. Now let's see what are food additives.

Food additives they are defined as substances that are added to food to maintain or to improve the safety, freshness, taste, texture or appearance of the food. These are some additional components or additional ingredients that are added to a product. It can be done during processing or it can be done during preservation. It can also be done during storage. These are done with the intention of improving the freshness, flavour, texture and the other desirable qualities that can be expected from the food.

The food additives they have been in use for a very long time and they have been used as preservatives. We have class 1 preservatives like salt and sugar and they were in use for a very long time. Salt is being used to preserve bacon and dried fish and sugar. It is used in marmalades, jams and juices to extend the shelf life and preserve the food product. And synthetic preservatives like sulphur dioxide is also being used as a preservative in food products. Many different food additives are being developed, and every day we get new ones to meet the needs of food production. Additives ensure that processed foods remain safe from farm to fork. Over 3000 additives are reported in the market, available for use. Adding food additives is not random; it needs justification. A solid reason, like improving freshness, flavor, texture, or acting as an emulsifier or thickener, is necessary. There should be a justifiable technological reason, significant and not misleading to consumers. For example, when adding flavor, it shouldn't mask the original product flavor, creating a false impression. Intentional addition is crucial, and all added substances must be clearly mentioned on the label by name or number.

It's vital that substances with little or no nutritive value, added as additives, are acknowledged. All additives have nutritional significance, added for their functional

properties. Now, additives are used for technological functions. The most important reason is to preserve the nutritional quality of food. Preservatives are a major part of commonly used food additives. It enhances the quality, stability, and organoleptic properties (sensory properties), involving the five senses: sight, odor, flavor, touch, and overall acceptability. It should be pleasing to look at, with aesthetic appearance, good taste, maintaining the natural taste. Smell and odor are crucial; these senses help identify whether the food is fresh or acceptable. Additives should satisfy our senses.

Additives also aid in manufacturing, processing, preparation, treatment, and packing. They can be added at any of these stages but should not change the nature or quality of the food, deceiving or misleading the consumer. Disguise should never happen when adding food additives. Faulty material should not be added to the product, misleading consumers as part of the food. It should not be in disguise.

Additives put into the market are based on suggestions from the Joint FAO/WHO Expert Committee on Food Additives (JECFA). JECFA evaluates and collects scientific reviews, providing insights into biochemical, toxicological, and other relevant aspects of additives. They conduct animal tests, research studies, and observations to understand the effects on human beings, considering short-term or long-term studies, including acute effects. The focus is mainly on the ADME behavior of food additives. So, how it is absorbed in the body, digested, metabolized, and excreted are crucial parameters. All literature and studies related to these will be collected. FAO and WHO, or collectively JECFA, will develop theories and policies regarding additives based on these studies.

The first step is establishing an Acceptable Daily Intake level, an estimate of the safe amount of an additive in food, drink, or drinking water that can be consumed daily over a lifetime without adverse health effects. For example, if we consider salt, the prescribed acceptable daily intake level will be adopted by companies using that particular food additive. The Codex Alimentarius Commission establishes the maximum use of additives, setting levels for foods and beverages. They adopt regulations and limits set by JECFA, aiding in setting national standards. Codex acts as a reference standard, protecting consumers and facilitating international trade, building consumer confidence in food safety. The Codex Alimentarius organization includes an executive committee, Codex Secretariat, and committees on general and commodity subjects. The Codex Committee on Food Additives (CCFA) focuses on setting levels for additives in food. JECFA, when approached with an inquiry about introducing a product as an additive, collects relevant information, conducts trials with WHO and FAO, and sets a limit based on reliable independent scientific opinions. CCFA then conveys this information to other nations for setting national standards.

Acceptable Daily Intake (ADI), related to No Observed Effect Level (NOEL), is crucial. NOEL is the highest tested dose with no adverse health effects on humans or animals in

chronic studies. ADI is the daily amount that can be consumed without adverse effects, always below NOEL. For instance, salt tolerance in humans is the NOEL level, the highest tolerated dose, and ADI is calculated as 100 times the NOEL (NOEL divided by 100). That is the safe level. In India, bodies like FSSAI set limits or decide approval for food additives. To introduce an additive, procedures are the same, taking several years for recommendations from JECFA and a minimum of two to three years to get a final notification from FSSAI and altogether it may take six to seven years for a product to be marketed as an additive.

Food additives are classified as direct or indirect. Direct additives are intentionally added to food for a specific purpose, labeled as ingredients, like xanthan gum improving texture in chocolate milk. Indirect additives enter food unknowingly in trace amounts during processing, packaging, or storage. Additives can also be classified based on their origin. Natural additives come from plants, animals, minerals, or microbes. Synthetic or artificial additives are lab-synthesized. Nature identical additives resemble natural ones but are lab-synthesized. Lycopene from tomatoes can be natural or nature identical. BHA and MSG are examples of artificial additives.

All additives are numbered and classified into categories like colors, preservatives, antioxidants, acidity regulators, thickeners, stabilizers, emulsifiers, anti-caking agents, flavor enhancers, glazing agents, sweeteners, and gases. Anti-caking agents prevent salt from forming lumps. Numbers are known as E numbers (E100 to E599), part of the international numbering system (INS), initiated due to commercial interests and consumer pressure. Regulations were set for labeling additives, and E stands for European nations. Additives sold or marketed in Europe are given an E number with E as a prefix, such as E100 or E199. In nations like Australia and New Zealand, E may not be used, but they follow the same numbering system. The number is universal worldwide, so E260 can be sold as 260, indicating the addition of acetic acid to the food.

Nutritional additives enhance nutrition in food, including vitamins, minerals, amino acids, and fatty acids. These additives restore losses that may occur during processing, storage, or handling. For example, if vitamin C is lost during processing of vitamin C-rich gooseberry, it can be added back as a nutritional additive. Nutritional additives can come in various forms, such as powders encapsulated in gelatin or emulsified, depending on the application. The selection of the additive form depends on stability, ease of dissolution, and integration with the food matrix, including macro and micro components. The next major group is preservatives, which extend shelf life, maintain food quality, psychochemical properties, and functional properties without affecting nutritive components. Natural and artificial preservatives exist, and conventional methods like canning are also used for shelf-life extension. Preservation techniques and preservatives involve adding chemicals to extend shelf life. This concludes today's discussion on the

classification and properties of preservatives. Other aspects of food additives will be discussed in future classes.