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Stier Most people take water for granted. In the United States, Japan and in Western Europe, all that an individual needs to do is turn on the tap at any time in the day or night to get clean, potable water. Water is used for drinking, cooking, washing and myriad other tasks. The reality is, however, that those who have abundant supplies of good, clean water should consider themselves blessed. There are still places in the world where water must be drawn from public wells and carried home, and others where the people are not even that fortunate. Of course, even in places where water quality is considered good, problems crop up. In March and April , an outbreak of cryptosporidiosis in Milwaukee resulted in diarrheal illness in an estimated , persons. Following that outbreak, testing for Cryptosporidium in persons with diarrhea increased substantially in some areas of Wisconsin; by Aug. For example, during the later years of the Clinton Administration, they proposed lowering the standards for certain elements. The Bush Administration held up implementation to allow for additional study. Food processors need large quantities of good quality water for a range of operations, including blending or mixing, cleaning, ice making, steam production and product transport. It is absolutely essential that food processors take steps to assure that the water and water systems in their plants are safe, wholesome and under their control. The following has been drawn from the U. Each processor shall have and implement a sanitation standard operating procedure SSOP that addresses sanitation conditions and practices before, during, and after processing. The SSOP shall address: Any water that contacts food or food-contact surfaces shall be safe and of adequate sanitary quality. Running water at a suitable temperature, and under pressure as needed, shall be provided in all areas where required for the processing of food, for the cleaning of equipment, utensils, and food packaging materials or for employee sanitary facilities. The assumption is that these are safe sources but this needs to be verified. There are many operations around the world that draw from rivers or other sources and must treat water on site to assure its sanitary quality. Treatment plants must, therefore, be an integral part of these facilities. In the early s, two outbreaks of botulism that were traced to canned salmon processors underscored the need for both good sanitation and good water quality in these operations. Several operations installed reservoirs for chlorinating can cooling water. Using information developed by the National Food Processors Association, the waters were treated to achieve a 5-log reduction of spores of Clostridium botulinum in an effort to reduce the potential hazard from water. They may be passing water through a reverse osmosis RO system to ensure that the water is cleaner or of better chemical quality when used as an ingredient. Other might chlorinate or ozonate their process waters, and there are those who pass water through ultraviolet UV light systems. The water must also be delivered to different areas within the plant at with sufficient pressure to do the job that needs to be done. For example, if a line contains a washer or washing step, the water pressure must be high enough to properly wash the product or unit operation. Operations that have problems with poor water pressure may be forced to install hold tanks with pumps to assure both adequate supply and pressure. Most food processors use hot water for cleaning and other operations. Processors need to assure that they establish systems that allow them to heat sufficient quantities of water for all their needs. Ideally, these systems should allow them to control temperature to within the necessary parameters. For example, cleaners work best within set temperature ranges. If an operation is involved with the production of meat or meat products, U. Department of Agriculture USDA regulations mandate that there be sanitizing stations where the water is held at 82F or above to assure that utensils may be properly sanitized. The first step for a processor is to be sure that there are complete and updated plumbing diagrams. Processors need to understand how fresh water comes into the factory, its source and, perhaps, most important, that there are no cross-connections with sewage or waste water lines. This is something that most new plants would have, but is not as common in older facilities. Understanding water and wastewater flow is absolutely essential. Experience shows that as plants expand or are modified, these operations tend not to make the necessary changes to their plumbing blueprints. Processors should also examine all water lines and water handling systems to be sure that there is no potential for contamination within the operation. Do you have back-flow prevention devices on water lines? Are there air gaps between spigots or hoses and water sources? Are hoses handled properly so that their use in the process will not contaminate product, equipment or ingredients? Operators need to teach plant staff how to handle and store hoses. Line workers often drag hoses across the floor, over equipment and use them to fill blending or mix tanks. Wastewater and soil end up in the mix. Perhaps the greatest potential concern for contamination is cross-connections. Processors need to verify that plumbing diagrams are both accurate and current. The diagrams should show no cross- connections. As noted, processors should conduct an audit of their water and plumbing systems. Water lines remain clean because they are constantly flushed. Unused lines off a main or a large reservoir below the floor will not be flushed properly. Water remaining in these dead areas can create potential health and quality problems. For example, a processor who relies on clean water for blending might experience off-flavor problems if there is a dead spot upstream of the blend tanks. Back-flow devices are designed to prevent dirty or contaminated water from flowing towards a clean source. They allow water to flow in one direction only. Water sources and tanks must be separated. Indeed, back-flow prevention has become a hot button in third-party audits. The plumbing diagrams alluded to earlier should include all water systems and the locations of the back-flow devices in the system. There should also be an easily accessible back-flow device on all water mains coming into the plant. There are plants where the lines are under ground and, therefore, inaccessible. These companies conduct pressure tests on the devices and make any adjustments that are needed. Their report will also serve as an auditable record to ensure that the work is being done. There is a sense that plant workers and their managers believe that frozen water cannot be a source of contamination. In many operations, especially in the seafood industry, water for chilling foods or blending is produced in large icemakers that deposit the ice in bins. This is not a good practice since that ice may be used to chill foods. The icemakers themselves also need to be cleaned and sanitized on a regular schedule. Microbiologist Cliff Coles of California Microbiological Consulting has found a number of operators to have filthy icemakers. In fact, most still have the original cartridge filter in place that was there 20 years ago. They should also establish a regular maintenance program for the water filters. A sticker or tag should be placed on the filter that can be easily seen that indicates when the filter was serviced and when it is due to be serviced again. Records of filter maintenance and icemaker cleaning and sanitizing should be maintained in the plant to document that the work has been done. To further assure the quality of ice used in production, processors are now treating water used for ice making with ozone. This helps assure that the ice is of good microbiological quality and can even help control the microbial load on certain products. Water Quality Analysis All food processors should test water in the plant from different outlets at least once each yearâ€"and preferably more often. Operators should collect water samples from the farthest faucet from the line in the facility and preferably from the cold side. This should be done even if water is obtained from a city water system. The water quality as it leaves a treatment plant and its condition when it gets to your plant may vary. This is especially true in cities where pipelines are old. If the water pipes are iron, it is quite easy to pick up that metal from the lines. High iron water, whether from old pipes or a natural source, is quite easy to detect. All one needs do is look for iron stains wherever there are leaks or drips. Along these lines, processors should always request that the city provide them with water test results. These results are those obtained at the water treatment facilities. Having city water records does not preclude the processor from testing water from their own operations, however. If water from multiple sources is being used wells, city or wherever , be sure that samples from each source are tested. Both microbiological and chemical parameters should be tested. Knowing the chemistry of the water coming into the plant will help in other areas. Microbial analyses should include total counts and coliforms. If there are concerns that the water may have been contaminated with runoff from fields or elsewhere, you may want to look for pathogens or parasites. Chemical tests should include pH, water hardness, heavy metals, pesticides, iron and nitrates. Water samples for complete chemical analyses should collected at least once a year and submitted to a recognized water testing laboratory. Testing the microbiological quality of the water should be done more frequently. Be sure to establish documented programs for water sampling. These should include how to sample, how often to sample and where to sample. These procedures should also include what tests should be done and the methods for doing the work. Maintain all your records and testing procedures in a separate file or binder so that test results may be quickly and easily accessed. Installing sample ports on water lines is a good idea, provided they are installed properly. If water samples are being collected for microbiological testing and the water is chlorinated, be sure that the sampling program includes a step to neutralize any residual chlorine.

Chapter 2 : Authenticity of Canned Seafood | Javier Quinteiro - www.nxgvision.com

This book covers the basic principles in canned seafood: principles of thermal processing, resistance of microorganisms, canned seafood microbiology and laboratory practice, as well as spoilage and defects in canned foods.

Visit for more related articles at Journal of FisheriesSciences. In Centre 1, canning experiments were carried out by using blue whiting that had quality which was principal to be used as a raw material for canned products. However the quality was inferior when compared with commercial canned herring product in tomato sauce that is well accepted in German market. Centre 2 involved evaluation of the shelf life and sensory panel of blue whiting fillets. The blue whiting was sourced as block frozen fillets and individually quick frozen IQF fillets. They were tempered and evaluated as chilled fillets packed in modified atmosphere MAP , or in air to assess their potential suitability for sale from chilled retail markets. Frozen breaded blue whiting goujons and nuggets were also well accepted. Further research was undertaken to observe some trace elements and cholesterol content in the muscle of blue whiting. Keywords Blue whiting, fillets, shelf life, canning, freezing, cholesterol, trace elements Introduction Blue whiting Micromesistius poutassou is an abundant fish species in the North Atlantic, and elsewhere, and its potential as a human food has been investigated by a number of authors. Studies on blue whiting include tests on mince and gel formation Perez et al. Other aspects investigated including the occurrence of parasites in blue whiting flesh Levsen, , the influence of catching season Whittle et al. The studies were carried at two different research institutes which are in Germany Centre 1 and Ireland Centre 2. The research and development arose from continuing requests from seafood processors for information on the use of non conventional fish species as an alternative to conventional ones. This is due the shortage of conventional fish species mackerel, herring, cod etc due to over fishing and the imposition of quotas. A number of studies have been reported on the utilisation of less well known fish species including large studies of Brennan and Gormley , and Fagan et al. The research on blue whiting in Centre 1 dated back to the early s when intensive research about so-called new food fishes including blue whiting as raw material for fish product development was funded by government Christians, Later, from to intensive studies on blue whiting fillets as possible raw material for typical German canned fish products were undertaken at the former Institute for Biochemistry and Technology in the Federal Research Centre for Fisheries in Hamburg. The aim was to test blue whiting as a possible substitute for herring or other fatty fish species. The influence of different canning steps on the quality of the final product was studied, including thawing methods of frozen fish, steaming and cooking as pre-treatment prior to canning to reduce the water content, as well as the influence of pH and different sauces on taste and texture of the final canned products. Until now these results have only been published in the German language for the national fish canning industry Karl, and Further investigations in Centre 1 were undertaken on the cholesterol content of blue whiting and on the content of the two toxic heavy metals that are cadmium and lead in edible part of fish as well as essential elements like copper and zinc. This work was carried out during a long term programme on the status of inorganic elements content in marine fish species. The research in Centre 2 involved evaluation of the shelf life and sensory panel of blue whiting fillets and products. The blue whiting were sourced as block frozen fillets and individually quick frozen IQF fillets. They were tempered and evaluated as chilled fillets packed in modified atmosphere MAP or in air to assess their potential suitability for sale from chilled retail markets. Freeze-chilled MAP raw fish fillets are increasingly popular in retail outlets in European countries Fagan et al. The trial on products involved the evaluation of blue whiting as breaded goujons and nuggets both with and without spices. Trials at Centre 1 embraced research on blue whiting as a raw material for canned products. Centre 1 Federal Research Centre for Nutrition and Food Canning trials Mechanically filleted, de-skinned and interleaf packed quick frozen fillet 7. The fish were caught by commercial freezing trawlers from South-East of Greenland in Dohrn-bank. Data used in this study was obtained in and The industrial canning process includes several steps. The maximum peak height was used as characteristic for firmness Karl and Schreiber, Chemical analysis: Water, ash and raw protein contents were determined according to Antonacopoulus Compositional data Blue whiting were collected by fishery research vessels between and Specimens were collected from the hauls, taken to on-board laboratory and dissected into edible part for later analysis on land. Analysis of trace elements: Centre 2 Ashtown Food Research Centre, IE The research development arose from continuing requests from seafood processors for information on the use of non conventional fish species. There is shortage of conventional fish species mackerel, herring, cod etc. A number of studies have reported on the utilisation of less well known fish species including the studies of Brennan and Gormley , and Fagan et al. Blue whiting samples were sourced as block frozen fillets, individually quick frozen IQF fillets, and as fillets from previously frozen round fish i. The samples came from the same commercial catch and were landed at Killybegs, Ireland as part of an Irish Sea Fisheries Board BIM initiative to promote this species to both trawler men and to seafood processing companies. The round fish were thawed in-factory, filleted, and sent chilled to Centre 2 for inclusion in air or MAP packs. In this case the thaw water was not included in the GD value. In addition, the thawed round fish fillets were 1 day in chill temperature during transit to AFRC which means that test days were 0, 3, 5 and 9 in reality for the round fish fillets days were 1, 4, 6 and This should be borne in mind when interpreting the data in Tables 3 to 6. The samples for sensory tests were evaluated by 8 trained taste panel that are experienced in tasting fish. The fish fillets were pan fried with a trace of oil and were assessed for acceptability on a 6- cm line with end-points of unacceptable 0 and very acceptable 6 commonly used in our laboratory. Trials in the goujon and nugget on blue whiting were prepared from IQF fillets. The following day the skin was removed and the fillets were cut into goujons circa 30 g. Samples were removed and tested after 1, 2 and 3 months. Results and Discussion Centre 1 Federal Research Centre for Nutrition and Food, DE Canning trials The German fish canning industry favourably uses skin-on herring fillets as raw material for the production of a variety of canned products due to the high fat content of this species. The most common canned product in Germany is herring fillets in tomato sauce, sometimes with the addition of spices and vegetables. Annually approximately millions of fish cans are produced in Germany. To obtain an acceptable canned product despite the low fat content compared to herring, every single canning step was checked in respect of mass loss, texture chances, chances in chemical composition and pH-value. The canned products were assessed by sensorial test with specially focus on texture. Pre-treatment prior to canning: The first part of the investigation dealt with the influence of thawing and heat pre-treatment on blue whiting fillets. Different thawing methods had little influence on the texture of the fillets results not shown. Texture measurements also revealed significant differences between both treatments. The texture of cooked blue whiting fillets was less firm than the steamed fillets. Changes in composition, pH and texture shear force of blue whiting fillets during different processes of heat treatment mean of 5 fillets and standard deviation Canning Blue whiting fillets Pre-cooked fillets were used in the canning experiments. To get a close mix between sauce and fillets, the cans were first bottom filled with half of the sauce 45 g , the fillets g were manually placed on top of the sauce and then covered by the other half of the sauce. The canning experiments showed that the texture of canned Blue whiting fillets was mainly affected by the pH value of the sauce and by the type of sauce. The pH value of a canned fish product can be adjusted by the pH of the sauce. Commercial canned herring fillets in tomato sauce show pH values of 5. Lower pH values can result in firm textures. The effect of pH values between 4. Five sets were produced with increasing sauce pH values. All sets were stored for three months at ambient temperature before analysis to allow an equalization of the pH between sauce and fillet. A direct correlation was found between the pH value of the fillets and their firmness. The sensory panel scored fillets with low and high pH values as both unacceptably hard and dry, or too soft and mushy results not shown in detail. Only fillets with pH values around 6. Comparing canned blue whiting fillets in tomato sauce with fillets in mustard sauce or other commercially available creamy white sauces, the fillets in sauces without addition of tomato concentrate exhibited a significantly softer texture and a lower TMA-N and DMA-N contents Table 1. To overcome the influence of the pH value on the texture of the fillets, all sauces were adjusted to a pH around 6 before preparation of the canned products. The addition of tomato concentrate to sauces obviously catalysed a partial decomposition of the remaining TMAO of the Blue whiting fillets to form DMA, TMA and consequently also formaldehyde which hardens the flesh. A similar increase of TMA was reported by Taguchi et al. Canned blue whiting fillets without tomato sauce did not show this decomposition during storage. Compositional data Cholesterol The cholesterol content of 31 specimens of

Blue whiting from different fishing grounds was No large variations were detected in fish from different catching grounds. Trace elements The concentrations of trace elements investigated in fillet of blue whiting are presented and summarised in Table 2. Contents of the toxic heavy metals cadmium and lead were low and far below legal limits in European Union 0. Statistics are calculated without values for lead content in six blue whiting specimens caught in on North Cape Bank in Northern Norway. These specimens exhibited a lead content significantly higher than that in all other specimens investigated Reasons for this elevated level are unknown but most probably the fish fed on lead-containing zoo- or phytoplankton. Trace element concentrations in edible part fillet of blue whiting from different catching grounds. However, the latter were a day older than the others see Materials and Methods and Table 3. In general MAP fillets were whiter than those in air and samples were whiter on days 3 and 5 than on days 0 and 9. This led to a statistically significant interaction. While these data suggest that freezing round fish may be the best option for minimising drip, this may not be the case. The round fish were thawed in-factory prior to sending to Centre 2 and this thaw water was not included in the GD value. The mean GD values were relatively similar from day to day but were higher than those reported for freeze-chilled whiting fillets Merlangius merlangus Fagan et al. These data suggest that in-pack drip pads may be necessary for most of the treatments to soak up the exudates. This was expected as these samples were a day older than the fillets originating from block or IQF frozen fish; i. MAP out-performed lower TVB-N values air over time especially for fillets from round fish and this was manifested by a statistically significant interaction Table 4. However, this contrasts with the findings of Fagan et al. However, the latter were a day older at the time of comparison see above, and in Materials and Methods. MAP out-performed air over time in that the former kept TVCs lower for a longer time period than the latter Table 5 and this led to a statistically significant interaction; mean TVC values increased over the 9-day test period. This is similar to the findings for freeze-chilled whiting, salmon and mackerel in MAP Fagan et al.

Chapter 3 : Formats and Editions of Quality parameters in canned seafoods [www.nxgvision.com]

Book Description: This new book covers the basic principles in canned seafood: principles of thermal processing, resistance of microorganisms, canned seafood microbiology and laboratory practice, as well as spoilage and defects in canned foods.

Codes of Practice are available for some processes in the fish industry, and these can serve as useful foundations on which to base process specifications. It is impossible in the space of this note to deal with all processing details, but the following are a number of illustrative points. Time Because fish is so perishable, it is important that it be processed quickly; systematic checks must be made on the time fish takes to pass through the process, and it is useful to prepare a schedule of permitted times. The rate of spoilage of wet fish at different temperatures is known accurately; thus it is possible to specify maximum allowable times in order to keep spoilage to a permitted level. For example, it might be specified that fish off the market should not be iced back for more than 24 hours, or that the interval between packing fillets at normal factory temperature and freezing them should not be longer than 1 hour. Freezing times can be important to quality maintenance, and often need to be specified; in the same way maximum cold storage times for raw material or finished product may be stated, since fish deteriorates slowly even at low temperature. Measurement and control of operation time is straightforward; equipment like freezers or retorts can be controlled by alarm clocks, time switches or more complex programmed systems. Good practice when handling wet fish is dealt with in detail in several notes in this series; temperature measurement is discussed in Advisory Note When it is impractical to hold fish at a specified temperature, then a maximum permissible temperature should be given. Temperatures of freezing, cold storage, drying, smoking, cooking and heat processing may have to be stated in a process specification. Contamination The product can be contaminated in a number of ways during processing, for example by dirt, scales, bones, blood, water, lubricating oil, unpleasant odours and flavours, and hair. The process specification should detail the main methods of avoiding contamination, for example the wearing of protective clothing. Much of what needs to be specified under this heading is a matter of common sense and experience. Damage or deterioration A wide range of protective measures against damage or deterioration come under this head, for example measures designed to prevent the fish being trodden on, knocked, bruised, pierced with hooks, bent while stiff in rigor, or squashed. Protection against drying or freezer burn by humidity control, glazing or suitable packaging may be specified; instructions about heat sealing of packs may be detailed here, and the use of vacuum packing may be specified to reduce oxidative rancidity. Permitted additives and their manner of use might be specified, for example antioxidants to prevent deterioration and combustion of fish meal, or polyphosphates to prevent drip loss in prepacked wet fish. Conditions of storage of raw material or product may also be controlled under this head. Hygiene and sanitation Fish is a food, and must be handled hygienically; if hygiene is not dealt with as a separate management function, then appropriate measures should be written into the process specification. Cleaning and sanitation procedures should be specified here; Advisory Note 45 deals with this subject. Equipment and methods Rather than specify how the job should be done, it is sometimes simpler to specify the equipment that will do it; for example a deboning machine that produces material of the required quality, or a labelling machine that affixes labels of the right type, may be easier to specify than the job to be done. A certain type of freezer may be specified to ensure that freezing is done in the required manner but, where the equipment can be used in several ways, it may be necessary to specify exactly how it should be used; for example, it is usually necessary to specify the manner of loading and the freezing time for each product in an air blast freezer, or the brine strength and product residence time in a continuous briner. Packing for product appeal The eye appeal and finish of the product is important, and the process specification should cover these aspects; for example instructions to cut and trim neatly, and to arrange the fish attractively in the pack, will help to ensure the product is displayed to the best advantage; filling the pack with the right number, size and weight of fish, and the manner of labelling and stapling can be specified under this heading. Yield and efficiency The yield of edible product from raw fish, and the efficiency of the process, are important factors affecting profitability, and responsibility for these in the larger firms usually falls on production and method study staff, but in small firms the job may conveniently be combined with QC. Maximum yield and high efficiency depend on close supervision of such things as skill of filleters and other hand workers, incentive schemes, machine settings, and weight changes during processing due to drying, drip loss, water absorption, uptake of salt, polyphosphate and cooking oil. Methods of measuring and controlling output of staff and machines is outside the scope of this note. Operation checks The process specification or the part of the product specification that deals with processing will show the critical points at which operations should be checked. In this context there are two kinds of operations, the work of operatives and the settings on equipment. Instructions about how to make the operation checks should be written down, so that the checks can be made by operatives, checkers, supervisors or QC staff, although final responsibility will lie with QC staff. Operation checks can sometimes be combined with product checks; for example where both the way in which a fish is to be trimmed and the form of the trimmed fish are specified, the two can be checked together. On the other hand, checking a temperature recorder on a cold store is solely an operation check. Inspection of raw material and product Methods of inspecting and testing quality are of two main types, sensory or organoleptic tests, and instrumental and chemical tests. The first type employs only the human senses of sight, smell, taste and touch, whereas the second employs instruments like thermometers and chemical apparatus which are largely independent of human responses. Generally it is obvious which type should be used, and in the fish industry sensory methods are used most widely. One of the most important factors in choosing a method is the time available for testing. Thus the assessment of freshness in wet fish must often be made within an hour or two, whereas several days may be available for testing frozen fish. Sensory methods have disadvantages; for example the results can be variable, and the operator may be subject to outside influences and fatigue. There is therefore some incentive to replace sensory methods with instrumental ones; for example chemical methods of measuring freshness are available that can largely replace sensory methods, although they are generally too elaborate and expensive to be used as routine. Their main advantage is that when there is doubt or dispute about sensory measurements they can serve as reference methods. Sensory methods are of two types, subjective and objective. With a subjective method, the inspector makes a personal assessment; for example he may say whether he likes the sample of fish or not, how much he likes or dislikes it, and whether he would buy it. This type of assessment is sometimes called hedonic, that is relating to pleasure. With an objective sensory method, the inspector attempts to assess the fish dispassionately and without prejudice by concentrating his attention on specific quality factors, for example degree of saltiness. Training and experience are necessary to enable him to do this accurately and reproducibly; he must become an expert. To reduce personal bias further, it is often advisable to have a group of experts examining the fish; the independent assessments of the members are then averaged statistically. Such a group is loosely called a taste panel. Since taste panels can be expensive to set up and run, their use is justified in only a few instances. The number of objective tests, whether sensory or instrumental, available for the assessment of those qualities of a complex product that the ordinary consumer likes is still small; thus subjective methods, despite their disadvantages, have a place in QC. Freshness Freshness is a most important quality factor to the consumer; thus assessment of freshness is vital in QC. Freshness means here how much the fish or fish product has spoiled when held in the wet state; when applied to frozen or canned fish, it means freshness of the fish before canning or freezing. Fish kept frozen for a long time may taste unpleasant because it develops off flavours in store, but these are not the same as those associated with stale wet fish. In general the sensory method of assessing freshness is the best at present for QC purposes. As fish spoils, its smell, taste, appearance and feel go through characteristic and well defined stages that trained experts or experienced staff can consistently recognize. It is convenient to attach a number or score to each stage so that the assessor can award the appropriate score to each fish or batch of fish. Alternatively the mere recognition of each stage, and acceptance or rejection of fish on this basis, may be all that is necessary. Different species and products spoil in different ways, but freshness scoring systems are available from Torry Research Station for most UK commercial species and for many of the products listed in the table. The spoilage changes can be observed in either the raw fish or the cooked fish, and systems are available for both forms. Freshness expressed in numbers is finding its way increasingly into product specifications and standards; examples of elaborate systems can be found in the Model Purchase Specifications referred to earlier, but quite simple number codes can be of considerable help in QC. There are several chemical methods that assess freshness sufficiently well for QC purposes. They all depend on measuring the concentration of certain chemical substances in the flesh and, since the sample is destroyed in the process, they cannot be used to test every fish in a batch. The concentration of the chemicals changes in a regular manner as the fish spoils, so that the level of concentration indicates the freshness. All the methods require the use of a laboratory or fairly elaborate facilities. The main methods used are the measurement of trimethylamine, TMA, hypoxanthine, volatile reducing substances, and total volatile bases, TVB. The methods do not apply to all species and products alike, but the method used widely is TMA. The ideal method would be one that avoids the subjectivity of sensory methods, and would be cheap, nondestructive, easy to use, not subject to variation or fatigue, have rapid response and wide application. These requirements can be satisfied only by an instrument. Although promising ideas for such an instrument are being pursued, a suitable one is not yet available. Species The distinguishing features of whole fish of different species make identifications and control of supply fairly straightforward, but identification of skinless fillets, canned fish and fish in products like fish cakes is more of a problem. Furthermore, the Labelling of Food Regulations require that only certain approved names be used for the principal UK species; the species in a product must be exactly what is stated on the label. Suppliers will then need to have recourse to a suitable identity test. A chemical method, known as the electrophoretic method, is now available which can be used to identify with certainty the species in an unknown sample; the method is applicable to frozen, cooked and canned products as well as wet fish in Advisory Note Condition and texture This category includes factors like plumpness, thinness, toughness, softness, oiliness, greasiness, wateriness, presence of roe or milt. Most of these can only be assessed subjectively, and this is all that is necessary. The fat content of the flesh or of the whole fish for species like herring and sprat can be measured, and there are sensory scoring schemes for measuring degree of toughness of flesh, particularly for frozen fish. Instrumental and chemical tests for toughness have been used experimentally, but not yet in industrial QC. Blemishes Blemishes here mean mainly instrinsic defects, ones found in the raw material, but a few arise from defects in handling; all are assessed by eye. The presence of dirt or gross filth is not allowed, and normal production inspection will ensure this. Some tolerance is usually allowed for other blemishes like bruises and blood marks, chalky or gaping flesh, parasites, and struvite crystals. Tables describing different levels of occurrence of blemishes can be prepared to aid the inspector in his judgment; for example the maximum number or size of blood clots can be specified for a specific area of fillet. The inspector then measures the blemishes on a representative sample and compares the value with the specification. Advice on detecting parasites, particularly nematode worms in cod, by candling is given in Advisory Note Skin, bones and belly membrane This category covers defects in workmanship as opposed to intrinsic blemishes described above. Workmanship can never be perfect, and tolerances must be allowed; the tolerance should be related to what is practicable in industry. Inspection is made in the same manner as for blemishes. The presence of bones after filleting or trimming is detected by sight and touch. Off odours and flavours Fish with strong objectionable odours are normally detected and discarded during processing, but some less noticeable off odours and flavours can be detected only by experienced personnel. Badly stored frozen fish in particular is susceptible to two kinds of unpleasant odour and flavour; these are the so-called cold storage odour or flavour of white fish, and rancidity in fatty fish. Sensory scoring systems are available and may be specified for the assessment of these and similar defects. In addition it is always good practice to taste the product from time to time to reduce the chance of off flavours escaping detection. Cold storage odour and flavour can be assessed indirectly by chemical tests, for example by measuring the concentration of formaldehyde in frozen cod, or by measuring the peroxide value in frozen herring, but little commercial use has hitherto been made of these tests. Bacterial count Bacterial counts are necessary in QC for two reasons. First, the presence of harmful microorganisms such as Staphylococcus aureus, Coliforms and Salmonella in fish products may cause illness through infection or poisoning, and secondly the presence of large numbers of organisms indicates either gross contamination or spoilage. Thus a low or moderate incidence of microorganisms is one indicator of good quality. Some public health authorities and some buyers, particularly overseas, now insist that fish products contain no more than a certain number of bacteria in a unit weight; thus suppliers of some products now have to include a suitable test in their QC. Bacterial testing can be time consuming and expensive; only large firms are normally able to provide their own facility, and smaller firms have to employ consultants or outside testing laboratories. Where a firm does provide its own facility, this can often be combined with an advisory service on hygiene, sanitation and fish spoilage. Representative samples have to be taken for bacterial examination, because the fish or product is destroyed during the test. Interpreting the results of bacterial testing is a task for experts who should be consulted when necessary. Salt content The acceptable amount of salt in fish products in the UK is usually per cent, but for some products it may be necessary to control salt content more closely; for example the range for kippers might be 1. Process control may involve either sensory or chemical tests.

Chapter 4 : Quality Parameters in Canned Seafoods - Ana G. Cabado, Juan M. Vieites - Google Books

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Advanced multivariate analysis is used for statistics and makes it possible to correlate single attributes to oxidative deterioration in the fish oil. The panel uses an intensity scale normally ranging from 0 to 9. Profiling can be used for all kinds of fishery products, even for fresh fish when special attention is placed on a single attribute. Statistics In any experiment including sensory analysis the experimental design e. Failure to do so may often lead to insufficient data and non-conclusive experiments. A guide to the most used statistical methods can be seen in Meilgaard et al. A panel used for descriptive testing shall preferably consist of no less than persons, and it should be remembered that the test becomes statistically much stronger if it is done in duplicate. This can often be difficult using sensory analysis on small fish. Thus the experiment must include a sufficient number ofsamples to remove the sources of variability, and the testing must be properly randomized. The degree of training depends on the difficulty and complexity of the assessment. For example, for profiling a thorough training with presentation of a large range of samples is necessary in order to obtain proper definitions of the descriptors an equal use of the scoring system. The triangle test normally requires a minor degree of training. Sensory quality control is often done by a few persons either at the fish market when buying fish or at quality inspection. The experience of these persons allows them to grade the fish. Starting as a fish inspector it is not necessary to know all the different methods of sensory assessment described in textbooks Meilgaard et al. The assessor must be trained in basic tastes, the most common fish taste and must learn the difference between off- flavour and taints. This knowledge can be provided in a 2- day basic training course. In bigger companies and for experimental work a further training of a sensory panel is necessary in order to have an objective panel. A laboratory panel must have members, and the training and testing of panel members must be repeated regularly. Facilities The facilities required for sensory evaluation is described in textbooks on sensory evaluation. The minimum requirement for evaluation is a preparation room and a room where the samples are served. The rooms should be well ventilated and provided with a good light Howgate, There must be enough space on the tables for inspection of raw samples of fish. Cooking and serving The samples of fishery products should not be less than g per person. The samples should be kept warm when served, i. The fish can be heat treated by steaming in a water bath, packed as boiled-in-the-bag in a plastic pouche or in alufoil. An oven microwave or steam-oven can also be used for heat treatment. The fish can be packed in plastic or put on a small porcelain plate covered with alufoil. The samples should be coded before serving. The establishment of tolerance levels of chemical spoilage indicators would eliminate the need to base decisions regarding product quality on personal opinions. Of course, in most cases sensory methods are useful for identifying products of very good or poor quality. Such objective methods should however correlate with sensory quality evaluations and the chemical compound to be measured should increase or decrease with the level of microbial spoilage or autolysis. It is also important that the compounds to be measured must not be affected by processing e. The following is an overview of some of the most useful procedures for the objective measurement of seafood quality. It is a general term which includes the measurement of trimethylamine produced by spoilage bacteria , dimethylamine produced by autolytic enzymes during frozen storage , ammonia produced by the deamination of amino-acids and nucleotide catabolites and other volatile basic nitrogenous compounds associated with seafood spoilage. Although TVB analyses are relatively simple to perform, they generally reflect only later stages of advanced spoilage and are generally considered unreliable for the measurement of spoilage during the first ten days of chilled storage of cod as well as several other species Rehbein and Oehlenschlager, They are particularly useful for the measurement of quality in cephalopods such as squid LeBlanc and Gill, , industrial fish for meal and silage Haaland and Njaa, , and crustaceans Vyncke, However, it should be kept in mind that TVB values do not reflect the mode of spoilage bacterial or autolytic , and results depend to a great extent on the method of analysis. Most depend upon either steam distillation of volatile amines or microdiffusion of an extract Conway, ; the latter method is the most popular in Japan. For a comparative examination of the most common procedures for TVB analysis, see Botta et al. It is also produced in the autolytic breakdown of adenosine monophosphate AMP, Figure 5. Although ammonia has been identified as a volatile component in a variety of spoiling fish, few studies have actually reported the quantification of this compound since it was impossible to determine its relative contribution to the overall increase in total volatile bases. Recently, two convenient methods specifically for identifying ammonia have been made available. The first involves the use of the enzyme glutamate dehydrogenase, NADH and alpha-ketoglutarate. The molar reduction of NH3 in a fish extract yields one mole of glutamic acid and NAD which can be monitored conveniently by absorbance measurements at nm. Test kits for ammonia based on glutamate dehydrogenase are now available from Sigma St. A third type of ammonia test kit is available in the form of a test strip Merck, Darmstadt, Germany which changes colour when placed in contact with aqueous extracts containing ammonia ammonium ion. LeBlanc and Gill used a modification of the glutamate dehydrogenase procedure to determine the ammonia levels semi-quantitatively without the use of a spectrophotometer, but with a formazan dye, which changed colour according to the following reaction: However, ammonia would appear to be a much better predictor of the latter changes in quality insofar as finfish are concerned. LeBlanc found that for iced cod, the ammonia levels did not increase substantially until the sixteenth day of storage. It would appear that at least for herring, the ammonia levels increase far more quickly than trimethylamine TMA levels which have traditionally been used to reflect the growth of spoilage bacteria on lean demersal fish species. Thus ammonia has potential as an objective quality indicator for fish which degrades autolytically rather than primarily through bacterial spoilage. Its presence in spoiling fish is due to the bacterial reduction of trimethylamine oxide TMAO which is naturally present in the living tissue of many marine fish species. Although TMA is believed to be generated by the action of spoilage bacteria, the correlation with bacterial numbers is often not very good. This phenomenon is now thought to be due to the presence of small numbers of "specific spoilage" bacteria which do not always represent a large proportion of the total bacterial flora, but which are capable of producing large amounts of spoilage -related compounds such as TMA. One of these specific spoilage organisms, Photobactetium phosphoreum, generates approximately 10 - fold the amount of TMA than that produced from the more commonly-known specific spoiler, Shewanella putrefaciens Dalgaard, in press. As mentioned above, TMA is not a particularly good indicator of edibility of herring quality but is useful as a rapid means of objectively measuring the eating quality of many marine demersal fish. For example, even high quality fillets cut with a contaminated filleting knife may have high bacterial counts. However, in such a case the bacteria have not had the opportunity to cause spoilage, thus TMA levels are bound to be low. The chief disadvantages of TMA analyses are that they do not reflect the earlier stages of spoilage and are only reliable for certain fish species. A word of caution should be given concerning the preparation of fish samples for amine analysis. TMA and many other amines become volatile at elevated pH. Most analytical methods proposed to date begin with a deproteinization step involving homogenization in perchloric or trichloroacetic acids. Volatilization of amines from stored samples may result in serious analytical errors. Therefore, samples should be neutralized to pH 7 immediately before analysis and should be left in their acidified form in sealed containers if being stored for extended time periods prior to analysis. In addition, perchloric acid is a fire hazard when brought into contact with organic matter. Spills should be washed with copious quantities of water. Some of the methods of analysis reported to date include colorimetric Dyer, ; Tozawa, , chromatographic Lundstrom and Racicot, ; Gill and Thompson, and enzymatic analysis Wong and Gill, ; Wong et al. For a more comprehensive review of the analytical techniques for TMA see the recent review articles: Dimethylarnine DMA As outlined in section 5. Thus for fish in the cod gadoid family, DMA is produced along with FA in frozen storage with the accompanying FA-induced toughening of the proteins. Much of the FA becomes bound to the tissue and is thus not extractable and cannot be measured quantitatively. The Dyer and Mounsey procedure is still in use today although perhaps more useful is the colorimetric assay proposed by Castell et al. Unfortunately, many of the colorimetric methods proposed to date lack the specificity where mixtures of different amines are present in samples. The chromatographic methods including gas-liquid chromatography Lundstrom and Racicot, and high performance liquid chromatography Gill and Thompson, are somewhat more specific, and are not as prone to interferences as the spectrophotometric methods. Also, most of the methods proposed to date for the analysis of amines are destructive and not well suited for analyzing large numbers of samples. Gas chromatographic analysis of headspace volatiles has been proposed as a non- destructive alternative for amine determinations; however, none of the methods proposed to date are without serious practical limitations. Dimethylamine is produced autolytically during frozen storage. For gadoid fish such as hake, it has been found to be a reliable indicator of FA-induced toughening Gill et al. Because it is associated with membranes in the muscle, its production is enhanced with rough handling and with temperature fluctuations in the cold storage facility. BiogenicAmines Fish muscle has the ability to support the bacterial formation of a wide variety of amine compounds which result from the direct decarboxylation of amino-acids. Most spoilage bacteria possessing decarboxylase activity do so in response to acidic pH, presumably so that the organisms may raise the pH of the growth medium through the production of amines. Histamine, putrescine, cadaverine and tyramine are produced from the decarboxylation of histidine, ornithine, lysine and tyrosine, respectively. Histamine has received most of the attention since it has been associated with incidents of scombroid poisoning in conjunction with the ingestion of tuna, mackerel, mahi-mahi dolphinfish from Hawaii. However, the absence of histamine in scombroid fish tuna, mackerel, etc. Mietz and Karmas proposed a chemical quality index based on biogenic amines which reflected the quality loss in canned tuna where: However, putrescine increased slowly after an initial lag period of 48 hours. It is interesting to note that most of the biogenic amines are stable to thermal processing, so their presence in finished canned products is a good indication that the raw material was spoiled prior to heating. Some of the methods for biogenic amine analysis include high pressure liquid chromatography Mietz and Karmas, , gas chromatography Staruszkiewicz andBond, , spectrofluorometric Vidal-Carou et al. Nucleotide Catabolites A discussion of the analysis of nucleotide catabolites has been presented in section 5. Most of the enzymes involved in the breakdown of adenosine triphosphate ATP to inosine monophosphate IMP are believed in most cases to be autolytic whereas the conversion of IMP to inosine Ino and then hypoxanthine Rx are believed mainly to be due to spoilage bacteria although Hx has been shown to accumulate slowly in sterile fish tissue. Since the levels of each of the catabolic intermediates rise and fall within the tissue as spoilage progresses, quality assessment must never be based upon levels of a single catabolite since the analyst has no way of knowing whether a single compound is increasing or decreasing. Thus, the analysis of the complete nucleotide catabolite profile is nearly always recommended. A complete analysis of nucleotide catabolites may be completed on a fish extract in minutes using a high pressure liquid chromatographic HPLC system equipped with a single pump and spectrophotometric detector wavelength nm. Several other approaches have been proposed for the analysis of individual or combination of nucleotide catabolites but none are more reliable than the HPLC approach. A word of caution is perhaps in order with regard to the quantitative analysis of nucleotide catabolites. Most methods proposed to date involve deproteinization of the fish samples by extraction with perchloric or trichloracetic acids. It is important that the acid extracts are neutralized with alkali most often potassium hydroxide as soon as possible after extraction to prevent nucleotide degradation in the extracts. Neutralized extracts appear to be quite stable even if held frozen for several weeks.

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