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A STUDY ON IDENTIFICATION OF FILTH AND QUALITY ASSESSMENT OF SOME POPULAR SUN-DRIED FRESHWATER FISH PRODUCTS IN SADAR UPAZILLA OF DINAJPUR DISTRICT OF BANGLADESH

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ABSTRACT

Presence of filth and sensory quality, overall quality of five sundried freshwater fish of Dinajpur Sadar Upazilla of Dinajpur district was studied by observation during visit, conducting survey and laboratory experiments on the collected samples. Five freshwater sun-dried fish species were selected for this study. These are Darkina (*Esomus danricus*), Mola (*Amblypharyngodon mola*), Jat puti (*Puntius sophore*), Tengra (*Mystus vittatus*), Kachki (*Corica soborna*). Detection of filth was done during visit to the place and interviewing the processors, traders, shopkeepers. Sensory quality and overall quality of the sun-dried fishes were assessed by collecting samples and experiments in the Laboratory of the Department of Fisheries Technology, Bangladesh Agricultural University, Mymensingh. Different types of filth was detected in the sun-dried fishes during this research study. Main categories of detected filth were sand, dust, wing of insect, legs of cockroach, dead- mosquito, butterfly, scales of fish, blow flies, fur of rat, cat, dog. Result of the laboratory analysis reveals that the mean percentage of protein, lipid, ash and moisture content of these dried fish ranged between 33.07 to 55.90%, 13.84 to 23.87%, 18.28 to 32.04% and 10.23 to 21.78% respectively. Sensory quality was found to be excellent and acceptable by organoleptic examination. Overall quality parameters of chemical and biochemical analysis TVB-N and TMA-N were in the range of 16.25 to 38.21 mg/100g dried fish, and 8.28 to 14.41 mg/100g dried fish respectively. The TVB-N and TMA-N values were in the acceptable limit. The findings of this research shows that the sun-dried fishes are highly nutritive and comparable with the other protein source such as mutton, beef etc. But if we consider the survey result the presence of many filth in the sun-dried fish during processing, handling, storage and display makes it aesthetically completely unacceptable.

KEYWORDS: Filth, proximate composition, quality, sensory quality, sun-dried freshwater fish.

INTRODUCTION

Sundried fish is a very favorite food item among the people of South-east Asian countries and has a good market demand besides fish and seafood products. It is low cost dietary protein source and used as a substitute of fish during the scarcity of fresh fish in Bangladesh and many other countries. Dried fish products are the most important nutritional food item and serves as a source of energy for human being. Dried fish is a rich source of protein, minerals, vitamins required for both young and senior citizen. A sizeable quantity of fishes are cured for mass peoples' consumption during the scarcity of fresh fishes in Bangladesh. Dried fish consumption is a part of custom and culture and is consumed all over the world where a good number of South-east Asian people are living because of its taste and flavor. In Bangladesh dried fish is available throughout the year because it can be kept for long time without any preservation. At present people are more aware about health safety and nutritional

issues. They are concern about the nutritional value of the food item during purchase for consumption.

Fish is used as food from time immemorial. Any fish that could be caught was eaten unless by experience it was found to be detrimental to health. The fish first used were mainly composed of freshwater fish, littoral or anadromous species, the latter with their large migration run often being used for preservation. In order to catch and preserve fish technologies were developed that must be of some of the oldest in man's history. Examples are the introduction of cords, nets, hooks, boats and the development of drying, salting, smoking and possibly in colder climates, chilling and freezing methods. Several factors encouraged the development of fish preservation methods either by salting or drying and also of a rudimentary form of fish farming (Connell and Hardy, 1982). Fish, processed fish and fishery products play an important role in the nutrition of many nations of the world. Fish, processed fish and fishery products have enjoyed an increase in status in recent years, particularly in rich industrial nations and many supplier countries have used this trend to boost foreign earnings. Competition among suppliers is fierce. Suppliers, able to provide quality, safety, variety economically will survive in such competition. Fish processing technology is well developed in the traditional areas of freezing, salting, drying, smoking, fermentation, canning. Products and process based on fish mince and surimi are also now in use world-wide. At the same time new technologies are finding use in fish processing as a response to economic and environmental demand (Hall, 1994). Traditional processing techniques particularly 'curing' (salting, drying, smoking), as a means of preserving fish, has been practiced perhaps longer than any other preservation technique. Salting, drying, smoking have all continued as preservation techniques virtually unaltered from prehistory to the present day. Modern developments have centered around understanding and controlling the process to achieve the standardized product demanded by today's market. A major exception has been exploitation of the sublimation of ice to dry food so that it resembled the starting material in volume and shape. For all the developments in cure-processing accommodating continuous production line, the time required to achieve a long shelf-life product purely by water removal is much greater than for any other commonly used preservation method (Horner, 1994).

Recently quality and safety issue of all types of food particularly processed fish and fishery products including dried fish is a major concern throughout the world. Large scale production of sundried fish sometimes cannot fulfill the desired sanitation, hygienic practice of the process, cannot prevent infestation etc. As a result the final product sometimes contain some extraneous materials which can cause health injury. Although considerable improvement has been achieved in the process of sun-drying of fish in the last two decades the process is still slightly faulty in many places of Bangladesh. Raw fishes are not washed perfectly instead kept on the clay of the bank of the river and landing centre, equipment and utensils are not washed perfectly, drying in open place without protection from infestation, drying fish on sand, land are the example of such fault. Moreover warehouse or go-down for storage of sundried fish is not always up the standard. The sun drying process for fish drying is still slightly ancient process. As a result different types of filth deposit on the surface of sun-dried fish. Such filth can cause health injury particularly gastrointestinal problem and some chronic problem in stomach. All these reasons cause loss of quality and safety of sun-dried fish as a human food. Filth in food is a major concern throughout the world particularly USA, UK, EU, Japan etc. In Bangladesh people are not aware of filth and harmful effect of filth usually present in sundried fish.

Earlier antibiotic, chemical, histamine and other biogenic amines in fish and fishery products were considered as filth. Now-a-days extraneous material whether physical, chemical or biological are also grouped as filth in fish and fishery products. Example of such extraneous material is that the sand particle, dust particle, dead insect, broken part of insect, broken legs of cockroach, scales of fish, blow flies, furs of rats, cats, dogs, scales of snake, even stools of some animals. Such extraneous filth in fishery product is completely unacceptable. These filths cause gastrointestinal problem in consumers. Some of these problems may be chronic in stomach. The presence of fur from rat, cat, dog as well as feather from some birds ndicate the danger of spreading many contagious diseases among the consumers. Fungus and mould growth due to inadequate drying is also hazardous to consumers' health. Presence of filth in dried fish and any food is completely unacceptable according to HACCP principles and HACCP regulations. In almost all countries it is prohibited by regulation, act, law etc. In European Union some directives (Council Directive, EEC, 1991) have been formulated and recommended that processed fish including dried fish should be subjected to visual inspection to detect parasite and filth before issuing permission for placing in market. All developed nations are very much careful about filth in all types of food. Presence of parasite and all types of filth in dried fish and processed fish make them unfit for human consumption. Every year Bangladesh export a sizeable quantity of dried fish to International market particularly in those countries where Bangladeshi people have been living for many years. Bangladesh has export trade with UK, Japan, EU, USA since a large number of Bangladesh citizen have been living for a long time. In those countries all imported dried fish are subjected to quality check including filth identification. So it is important to produce filth free dried fish products for export as well as for domestic consumption.

A large number of research have been conducted on fish drying process, storage and quality of dried fish. Connell (1980) stated that TVBN and TMAN can be a measure

of spoilage taken place in fish and fishery products. Maximum allowable limit varies from one product to another. Thus for chilled fish 1-5 mg TMAN/100g fish and 35 – 40 mg TVBN/100g fish usually regarded as the limit beyond which round whole chilled fish can be considered as too spoiled for most cases. For a variety of salted and dried fish the standard is 100-200 mg TVBN/100g fish. The maximum allowable limit of TVBN and TMAN varies among the products. In Bangladesh research on the composition of different species of fish, dried fish, quality and safety of different species of dried fish are conducted by many researchers (Islam, 1977, Kamal, 1977, Mansur *et. al*. 2013, 2014, 2016, 2017, 2019, 2021, Reza *et. al*., 2020, Hossain *et. al*. 2017, Jamil *et. al.* 2017). But less importance was given on the detection and identification of extraneous filth in dried fish. The reason may be the domestic consumers do not care about such filth and they are not aware of harmful effect of such filth. It is only recently that the developed nations have put importance on such extraneous filth in dried fish. There is a possibility that the importers will fix quality criteria about the presence of extraneous filth in dried fish which are exported from Bangladesh. The present research was planned to identify the presence of filth in sundried fish at drying yard, storage place., to determine the proximate composition of sundried fish as part of quality assessment, determination of TVBN and TMAN to determine the overall quality, to develop awareness of people about filth and their harmful effect on health by publication of result.

MATERIALS AND METHOD

Survey on the level of knowledge of traders on filth

The survey was conducted by visiting the dry fish market, dry fish shops and interviewing the traders and shopkeepers. This survey was conducted to know the market condition (sanitation and hygienic status) and to know the level of knowledge of traders and shopkeepers on filth and quality, safety aspect of sundried fish. The survey was been conducted on the basis of (previously prepared) the following questionnaire (Table 1):

Table 1: Questionnaire used in the survey.

Name: Address:
Place:
Product type:
Upazilla: District: Division:
Date and time:

Brief description of the product	Filth type usually present in dried fish	Example of filth	Comments
Sundried fish: Fish harvested from local waterbodies and sundried locally.	• Physical • Chemical • Biological • Others	• Sand particle • Soil particle • Insect part e.g. broken wings, broken legs etc. • Dead Fly, fly part • Fur from rat, cat, dog etc. • Feather from birds • Scales of fish • Stools and excrete from animals, birds, cockroach, insect etc. • Others Snake scales, snake skin etc.	• Intensity a) Very much b) Much c) Little d) Very little e) Nil • Probable source • Hazardous to health Yes/No

Questions:

1. Are you the owner of this shop?
2. How long have you been doing this trade?
3. How much do you know about hygiene, cleanliness, sanitation, quality, safety of these sundried fish and above all the infestation of insects in the sundried fish?
4. Do you know what is filth?
5. Do you have any idea on infestation of insects in your products?
6. Do you know how you can retain quality and safety of sundried fish?
7. Do you have any idea on how you can protect your sundried fish from filth?
8. Have you ever detected any type of filth in these sundried fish?
9. Have you ever attempted to detect such filth in dried fish?
10. Do you know the sundried fish products you are dealing/trading may contain sand particle, dust particle, fur from rat, cat, dog, feather from birds, scales of fish, skin and scales from snake?
11. Do you find any complain from customers about filth? Are they aware of it?
12. Are you feeling any discomfort that we are conducting this survey?

Filth identification in sun-dried fish

Detection and identification of filth in sundried fish was conducted by visual examination/ inspection. of drying yard, storage place, shops, containers e.g. gunny bags containing sundried fish, large plastic bags containing sundried fish etc. Such method is practiced in EU for parasite check and filth check on fish and processed fish before issuing permission to place in market (Council Directive EEC, 1991).

Collection, packaging and transportation of sun-dried fish

Dried fish samples were collected directly from the shopkeepers. Dried fish of five different specie were collected which are stated in Table 2 and shown in Fig.1. Samples were collected from the shopkeepers of the market at the end of winter and in early spring season. After completion of survey and observation about sanitation and environment (whether hazardous) samples were collected from three different shops. The samples were taken in dry zip lock plastic packets, labeling and transported to the Laboratory of Fish Processing and Quality Control, Department of Fisheries Technology, Bangladesh Agricultural University, Mymensingh. In the laboratory the sample packets were properly labeled and stored at ambient temperature (26^0 – 28^0C) for subsequent chemical and biochemical analysis.

Fig. 1: Dried fish samples in zip lock plastic packets.

Table 2: List of dried fish samples used in the research.

Sl. no.	Local name	Scientific name
1	Darkina	*Esomus danricus*
2	Mola	*Amblypharyngodon mola*
3	Jat puti	*Puntius sophore*
4	Tengra	*Mystus vittatus*
5	Kachki	*Corica soborna*

Laboratory analysis

Determination of proximate composition

Proximate composition (Protein, lipid, ash and moisture) was estimated in the laboratory of the Department of Fisheries Technology, Bangladesh Agricultural University, Mymensingh according to the methods of A.O.A.C. (1965). The mean value of triplicate determination has been taken as result of each analysis.

Quality assessment

Sensory quality was assessed by organoleptic examination according to the method of Howgate et. al. (1992). The sensory characteristics of sun-dried fishes e.g. Colour, Odour, Texture, Broken piece were assessed by organoleptic method and overall sensory quality was determined.

The chemical examinations for overall quality assessment of sun-dried fishes were conducted in the laboratory of the Department of Fisheries Technology, Bangladesh Agricultural University, Mymensingh. Two universal parameters TVB-N and TMA-N were determined in this regard according to the methods of A.M.C. (1979). The mean value of triplicate determination has been taken as result of each analysis.

RESULTS AND DISCUSSION

Filth in sun-dried fish

Filth detected and identified in sun-dried fish is stated in Table 3. Data collected during this research study at Dinajpur Sadar Upazilla under the district of Dinajpur revealed that some common sun-dried fishes contaminated with filth which may cause health hazard to the consumers. The possible reason of such filth in sun-dried fish is ancient processing (traditional drying) and lack of modern knowledge on fish drying. Improper hygiene, sanitation, packaging, storage, distribution, display in market or shop etc. are also responsible for such filth. Impure water or polluted water, utensil, equipment, mat used for sun-drying of fish are not clean at all. These findings will be helpful to develop an effective quality assurance plan or programme for producing safe and best quality sun-dried fish product for domestic consumption as well as for export to international market. During sun-drying and subsequent storage in traditional process fishes are kept indiscriminately without covering net, cover sheet, without maintaining sanitary condition. As a result the undesirable materials are deposited on the sun-dried fishes. Sometimes the products are covered with dust, sand and other undesirable materials. These undesirable materials are filth. Filth detected and identified on sun-dried fishes of Dinajpur Sadar Upazilla are listed in the Table 3. Among which sand, dust, broken wings of insects, broken legs of cockroach, larva of worms, sacles of fish, blow flies, dead fly, dead mosquito, fur of rodent, rat, cat, dog, are main. According to HACCP and legislation of many countries including EU presence of such filth make fish and processed fish unacceptable for consumption. Such filth is hazardous to health but surprisingly the buyers i.e. consumers are not aware and they do not care the matter but indeed the consumers are being affected which gradually develops different gastrointestinal diseases.

In the present research the specific reasons for such filth in the sun-dried fishes of the species *Esomus danricus, Amblypharyngodon mola, Puntius sophore, Mystus vittatus, Corica soborna* are summarized below:

1. Ancient/Traditional drying process
2. Lack of knowledge
3. Fish drying takes place in open field so there is no way of preventing sand, dust, birds, insects, dogs, rat fly, mosquito etc.
4. No proper fish landing centre, conditions relating to premises and equipment is not satisfactory.
5. Storage of dried fish is not perfect.
6. Display of dried fish in shop is not correct.
7. Consumers are not aware of filth.

During the survey of present research the traders were found very unaware about filth, they do not have any knowledge on sanitation, hygiene of drying process. They are not aware of the effect of filth on consumers' health. They agreed that some degree of infestation may take place by insect, birds, cat, rat, sand, dust etc. Sometimes they found such filth but they do not find any complain from the buyers or consumers. The word "Filth" is unknown to them.

Sensory quality

Results of sensory quality assessment by organoleptic examination of the sun-dried fishes are presented in Table 4. Colour, flavor, texture and broken piece of the dried fishes were assessed by organoleptic examination. Almost all species of fishes of this study were of brown colour except *Mystus vittatus* which was slightly black to brown coloured. Intensity of brown colour differed among the species e.g. *Puntius sophore* was deep brown coloured other species were light brown to brownish coloured. All species of fish possessed characteristic flavor of sun-dried fish. Texture was firm but slightly elastic. Broken piece of dried fish was observed in the container of *Esomus danricus* and *Mystus vittatus*. But broken piece was not found in the container (large bag) of othere three species e.g. *Amblypharyngodon mola*, *Puntius sophore* and *Corica soborna*. On the basis of organoleptic examination for sensory quality assessment *Puntius sophore* and *Corica soborna* were excellent and acceptable. The other three species *Amblypharyngodon mola, Esomus danricus* and *Mystus vittatus* were graded as good and acceptable.

Table 3: List of filth identified in sun-dried fish.

Species	Type of filth in the Sample							Source and cause of filth
	Sand	Dust	Wing of insect	Legs of Cockroach, dead- mosquito, Butterfly	Scales of fish, Blow flies,	Fur of rat, cat, dog	Snake scale	
Esomus danricus	++++	++	+++	++	++++	++	–	Inhygienic condition
Amblypharyngodon mola	++++	++++	++	–	++++	+	–	Ancient process
Puntius sophore	++++	++++	++	+	++++	+	–	Drying in open field
Mystus vittatus	++	++	–	+	++++	–	–	Drying in open place
Corica soborna	+	++	–	–	++++	–	–	Drying unconsciously

++++ indicates Very much; +++ indicates Much; ++ indicates Little; + indicates Very little;
– indicates NIL

Fig. 2: Filth identified in the dried fish during the survey.

Table 4: Sensory quality (Physical and Organoleptic Characteristics) of Dried Fish Products.

Species	Colour	Flavour	Texture	Broken piece	Overall Sensory Quality
Esomus danricus	Brownish	Characteristic flavour	Firm and elastic	Broken piece was present	Good and acceptable
Amblypharyngodon mola	Brownish	Characteristic flavour	Firm and elastic	No broken piece	Good and acceptable
Puntius sophore	Deep brown	Characteristic flavour	Firm and elastic	No broken piece	Excellent and acceptable
Mystus vittatus	Slightly black to brown	Characteristic flavour	Firm and elastic	Broken piece was present	Good and acceptable
Corica soborna	Light brown	Characteristic flavour	Firm and elastic	No broken piece	Excellent and acceptable

Proximate composition of the sun-dried fishes is presented in Table 5. Protein, lipid, ash and moisture content in percent indicates proximate composition. The protein content in the dried fishes are much higher than the normal content of raw fish. Because the moisture removal was high. So the protein percentage in the final product was so high. Similarly the ash content and lipid content was higher than those of the the raw fishes. Here in this research the moisture removal and moisture content in the final product is important for preservation of fish by rendering the medium an unsuitable environment for microbial propagation. Increasing the concentration of soluble substances in the medium by abstracting water is the means of accomplishing this by drying (Horner, 1994). In most of the dried fishes the moisture content was less than 15% except in *Esomus danricus* which possessed 21.78% moisture.

Table 5: Proximate composition of the sun-dried fishes.

Species	Protein (%)	Lipid (%)	Ash (%)	Moisture (%)
Esomus danricus	34.24±0.53	13.84±1.64	29.05±1.53	21.78±0.52
Amblypharyngodon mola	37.57±1.02	14.56±1.43	32.04±0.86	15.00±0.33
Puntius sophore	33.07±1.13	19.80±0.05	30.17±1.22	14.83±0.45
Mystus vittatus	35.74±0.53	23.87±1.35	27.02±2.56	12.49±0.57
Corica soborna	55.90±2.10	16.44±1.43	18.28±0.43	10.23±0.15

Scott (1957) put forward the idea that since micro-organisms compete with solute molecules for the water they require for growth over the entire range of water activity for which they are viable, knowledge of a food product's water activity, amongst other factors can give an indication of its preservative status. Growth of various specific micro-organisms present in appropriate foodstuff are limited by water activity of that food. On the other hand Mossel (1975) stated that deterioration was always controlled by a number of factors of which water activity is one factor. Broughall et. al. (1983) have also predicted that lag and generation times of two pathogenic bacteria are influenced at different water activity and temperature. Water activity is related to water in fish. Because water activity is a proportion of the vapour pressure exerted by a solution and the vapour pressure exerted by the pure solvent, normally water at the same temperature. It appears from the Table 5 the water (moisture) in the dried fishes is unavailable as a solvent in fish muscle. The low moisture content in the dried fishes indicate that microbial spoilage was rapidly prevented. Table 5 also indicates that the nutritional composition of the dried fishes were very good and desirable. Higher protein percentage, lipid percentage and ash (minerals) percentage of the dried fishes are comparable with any nutritious food.

Table 6: TVB-N and TMA-N of the sun-dried fishes.

Species	TVB-N		TMA-N	
	mg/100g	MAL	mg/100g	MAL
Esomus danricus	26.72	70-100	14.41	10-15
Amblypharyngodon mola	16.25		8.28	
Puntius sophore	28.64		11.45	
Mystus vittatus	18.37		9.18	
Corica soborna	38.21		12.59	

Table 6 states the result of TVB-N and TMA-N content of the dried fishes of the present research. TVB-N and TMA-N are the two universal parameters used to assess the spoilage of fish and fishery products which indicates the overall quality of fish and fishery products. Connell (1980) and Connell et. al. (1976) stated that TVB-N and

TMA-N tests are useful for measuring spoilage in fish and fishery products caused by autolytic enzymes and putrefactive bacteria. These two parameters are applicable to chilled, frozen, dried, salted, canned fish products. Connell (1980) also mentioned the normal range of TVB-N and TMA-N in the chilled fish, frozen fish, salted and dried fish products. A range of not more than 100 – 200 mg TVB-N/100g is specified for a variety of salted and dried fish. Maximum allowable limit of TVB-N and TMA-N is different among the countries and regulatory agencies. Raw fish to be used for canning, chilled fish, frozen fish, dried fish, salted fish, fermented fish, European pickled herring, canned fish all such product has maximum allowable limit of TVB-N and TMA-N. Considering the usefulness of TVB-N and TMA-N to assess the quality of fish and fishery products these two parameters have been accepted for quality of fish and fishery products under health control and monitoring of production condition in European Union. (Council Directive EEC, 1991). Result stated in Table 6 express the good quality of the sundried fishes of this research the TVB-N and TMA-N value were within the maximum acceptable level. The TVB-N and TMA-N content of the sundried fishes indicated that there was very little deterioration took place by autolytic enzymes and putrefactive bacteria. During processing. Also time elapse between fish catch and drying was minimum that means avoided undue delay in processing.

Sensory quality analysis, proximate composition, TVB-N and TMA-N test of the sundried fishes indicate that these sundried fishes are of acceptable sensory quality, possessed good nutritional composition and minimum spoilage i.e. acceptable quality. Result of these analysis have been mentioned in the Tables 3, 4, 5, 6. Flavour, colour, texture were good and acceptable.

But if the filth is taken into account it can be said that these sundried fishes are not safe for consumers' health. Extraneous filth (all foreign particles) e.g. sand, dust, broken part of insect, broken legs of cockroach, dead mosquito, fly, wings of many insects, fur from rat, mouse, cat, dog, scales, spider etc. is now-a-days makes food unfit for human consumption. In the European Union all types of processed fish are subjected to visual inspection to detect parasite and any type of such filth before issuing permission to place in market for sale. Presence of any type of parasite, filth which are visible must not be placed in the market for sale for human consumption. In USA there are some protocol for this purpose. Situation is same in many developed countries. All these inspection, visual examination for filth detection are done to protect consumers' health. In the present study a number of filth have been detected in the sundried fishes. Such filth is not acceptable when compared with EU, USA etc. Because such filth usually harmful for consumers health. Such filth cause many types of gastrointestinal problem. In the present research it was also found that people are not aware of the adverse effect of filth, processors and traders are not aware of the adverse effect of filth present in dried fish. Dried fish trade is a good trade and people are eating with satisfaction because they do not know about filth and its adverse effect on health.

Reason behind the presence of filth in dried fish may be the faulty and ancient method i.e. fish is dried in open filed, no covering, no protection from insects, birds, cat, dog, rat and mouse during drying, transportation, storage and sale. There is no fish landing centre so fishes are kept on the bank of the river on sand, clay which is the main source of such filth in final product. Processors do not have knowledge on safety, hygiene, quality etc. Cleanliness is not followed. Fishes are not washed in any step after catch. Handling, transportation, storage, sale/display are not perfect. After all neither the processors nor the traders are aware of filth. Even the consumers do not know what the filth is. Because of such unawareness of the people a valuable and nutritious human food like sundried fish is regarded as unfit for human consumption. It is a loss for the fishermen, processor, traders and so on. But such situation can be improved by proper planning a plan for fish drying process and awareness development, training of the processors and traders.

CONCLUSION

From the result of the present research it may be concluded that sundried fish possess good nutritional composition, sensory quality is quite acceptable and overall quality by chemical check was found excellent. But presence of filth cause loss of such valuable human food in the International market. Presence of filth in processed fish including dried fish makes it unfit for human consumption. Considering these facts the quality and safety of sun-dried fish needs to be improved.

Recommendation

Initial quality of raw fish should be high for this reason fresh fish should be used for sun-drying. Care should be taken that the fish do not undergo spoilage before drying. Good sanitation and hygienic conditions should be maintained during the whole process of drying. Equipment, all materials used in drying should be cleaned before and after drying. Water used in cleaning of equipment and washing of fish should be pure and up to the standard of drinking water. If possible the fishes may be dipped in light salt solution (2 – 5%) to minimize initial infestation. It is important to follow the improved drying method. Fish must not be dried in open field to save the product from sand, dust etc.. The infestation caused by insects during drying can be minimized by using improved "Tent drier" made of polyethylene and wooden frame. It also hastens the rate of drying. If possible covering net should be used to prevent contamination from fly, insects, birds, cockroach etc. The drying yard shold be kept out of reach of cat, dog, rat, rodents, snakes etc. Dried products are commonly stored in the open container which allow the product to absorb moisture from air reducing shelf life. Therefore

air tight container e.g. polyethylene bag, tin container should be used for the storage of the product. Vacuum container, nitrogen gas or other inert gases can also be used for storage of the product. If permissible by the Government antioxidants can be used during large scale storage to prevent oxidation. Relative humidity of store should be maintained correctly. Access of insect, rat, rodents, cat, dog, snake should be prevented. Store should be kept clean, dry, well ventilated. Hygienic condition should be maintained correctly. The final product should possess excellent sensory property, excellent quality and after all the final product should be filth free. During sun-drying, handling, storage, display monitoring and inspection (visual examination) for filth detection is necessary before issuing permission for selling in the market. Because filth is aesthetically completely unacceptable.

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