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Storage Quality and Chemical and Structural Changes of Fresh and Frozen-Thawed Fish

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Abstract: Samples from frozen fish showed structural changes in their meat. In muscle cells initial processes of breakdown prevailed in the central part, whereas peripheral changes were not observed. Sensory evaluation showed that thawed fillets never had as high scores at the beginning of iced storage as unfrozen fillets. It is concluded that the freezing of carp meat produced various structural changes in dorsal skeletal musculature that could be used in the differentiation of fresh from frozen thawed fish.

Key words: Fresh fish · Thawed fish · Freezing · Shelf life

INTRODUCTION

Freezing is the best way of preserving the quality of fish. With proper care at each step of the procedure for freezing fish, fish will retain its fresh flavor for many months. The quality of frozen fish is controlled by many factors. Consideration must be given to the type of protective packaging used, maintenance of proper storage temperature and freezing properties of different species [1].

Frozen Storage Spoilage: There are two means of spoilage during frozen storage that can change a good-tasting fish into a poor-tasting one-oxidation and dehydration. Dehydration is the drying out of frozen foods after freezing. The advanced stage of dehydration is known as "freezer burn." It causes a chalky-white appearance on the skin of fish and a browning of the flesh. It also causes fish to become tough, dry and to lose flavor. Dehydration can be prevented by using a packaging material which provides a good vapor barrier. Oxidation, A large percentage of the fats and oils found in fish are polyunsaturated which make fish very healthful to eat. But, at the same time, these polyunsaturated oils are susceptible to oxidation. When oxygen comes in contact with fish during frozen storage, the fats and oils turn rancid, resulting in unpleasant flavors. You can retard the onset of rancidity by choosing a packaging material that forms a barrier to oxygen and by forcing out all air from the package before freezing [2].

Retarding Rancidity: When freezing such fatty fish as whitefish, trout and salmon, additional protection against rancidity may be needed if the fish is to be stored beyond recommended storage length of four to six months. Ascorbic acid (Vitamin C) will extend the storage life of fillets by three to six months. Ascorbic acid is used as a preservative in frozen fruits and is available through drug stores. To treat fish, place in an ascorbic acid dip for 20 seconds (two tablespoons ascorbic acid to 1 quart water). Wrap and freeze fish immediately. Ascorbic acid will become inactive in unfrozen fish flesh and will no longer protect against rancidity [3].

Frozen Storage Life: Recommended storage life is at 0 degrees F or lower. When freezing fish,, check the temperature of freezer, especially if storing fish in the freezer compartment of a refrigerator. Many refrigerator freezer compartments range from 5 degrees to 30 degrees F. Fish stored at 15 degrees for as little as 2 weeks show a significant loss of quality. Fish of high fat content generally develop a rancid odor and flavor quicker during frozen storage than leaner fish. There are, however, exceptions to this rule. Lake herring, smelt and northern pike do not withstand frozen storage as well as other fish of similar fat content. Conversely, chinook and coho salmon with relatively high fat content store better than some fish with less fat. Never thaw fish at room temperature or in warm water since surface spoilage can take place quickly under these conditions. Small pieces of fish may be cooked while frozen (allow twice the cooking

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time) or may be thawed like large fish. Thawing in the refrigerator takes about 24 hours for a one-pound package. If a quicker method is preferred, hold the fish in cold water until thawed (1-2 hours). It should remain in the moisture, vapor-proof wrapping while thawing. If fish is completely thawed, cook it as fresh fish. If only partially thawed, cook fish slightly longer than recommended. When fish has thawed, it should be cooked immediately. Never refreeze fish. Although refrozen fish will be safe to eat when properly cooked, refreezing may cause a substantial loss in taste and texture [4].

DISCUSSION

Fish species are known to provide high contents of important constituents for the human diet such as nutritional and readily-digestive proteins, lipid-soluble vitamins, microelements and polyunsaturated fatty acids. However, marine and fresh water products are known to easily deteriorate during post-mortem storage and processing as a result of different damage mechanisms such as autolytic degradation, microbiological spoilage and lipid oxidation. Freezing and frozen storage are important methods for the preservation of fish species. Although many damage pathways are inhibited by such processes, undesirable reactions associated with lipids and proteins have shown to occur, leading to detrimental changes in nutritional and sensory properties. In this sense, cryoprotectants and antioxidants have been widely employed during frozen storage because of improving functional properties, avoiding lipid oxidation development, inhibiting dripping loss when defrosting and prolonging shelf life time. In recent years, fish technologists and the fish trade have increasingly prompted more attention to aquaculture techniques as a source of fish and other seafood products. Related to this fish species, previous research accounts for composition studies and its employment as a source of protein hydrolysates and commercial products. Among the different applications, silver carp has attracted great attention for use in the elaboration of surimi. Previous research concerning the gel forming capacity of this species has examined the effect of the catching season and the presence of different binding agents on gel-forming capacity as well as making comparisons to other fish species. The present work is focused on the chemical changes related to the quality loss of silver carp minced muscle during frozen storage. The effects of both a previous washing process and frozen storage time on different chemical (composition and quality indexes) parameters are studied [5-7].

The freezing of fish and fish products is the best method to prolong their shelf life. Freezing is characterized with easy application and storage conditions, neither adding nor removing any ingredients from meat. The effect of low temperatures is due to the fact that the velocity of molecular movement decreases with lowering the temperature slows down all processes in the cell. Second, the formation of ice crystals in the product’s tissue reduces the risk of microbial development. Freezing alters a number of physical and biological parameters of tissues. Studies on meat from hot blood animals have demonstrated the effect of freezing on tissue microstructure. The information about the histological alterations occurring in fish meat after freezing is however scarce. There are single reports on changes in trout meat frozen for different periods of time. No data are available for other freshwater representatives [7-14].

Generally, fish has been widely accepted as a good source of protein and other elements necessary for the maintenance of healthy body. Inadequate storage techniques would implies a substantial shortfall in fish availability thereby affecting the animal protein intake of the people in the tropics whose protein intake from fish ranges between 17.5-50%. Freezing is a common practice in the meat, fish and other animal protein based industry, because it preserved the quality for an extended time and offers several advantages such as insignificant alterations in the product dimensions and minimum deterioration in products color, flavor and texture. However, there are some disadvantages associated with frozen storage including freezer burn, product dehydration, rancidity, drip loss and product bleaching which can have an overall effect on the quality of the frozen foods. It can be concluded that the fish is a good source of protein, fat and minerals and that quality of fish is best before frozen storage and that quality of frozen fish is better achieved in first day's storage. Deterioration increases as the duration of storage increases.

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