Direct RESEARCH JOURNALS

Effect of super chilling on microbial load and chemical composition of Nile tilapia and Nile perch

Direct Research Journal of Agriculture and Food Science (DRJAFS) Vol.2 (5), pp. 40-43, May 2014
Available online at directresearchpublisher.org/drjafs
ISSN 2354-4147 ©2014 Direct Research Journals Publisher

Research Paper

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ABSTRACT

Eighteen samples, 9 Tilapia (*Oreochromis niloticus*), 120 – 180 g and 9 Nile perch (*Lates niloticus*), 150 – 200 g bought from Elmourada fish market were iced in thermostatic container and transported to the Sudan University of Science and Technology, College of Veterinary Medicine and Animal Production. The fish were divided into two groups; one was filleted and packed in plastic bags, then placed in refrigerator, were stored for 7 days. The Second group was treated as fresh (control); finally, the whole samples were analyzed. From the statistical analysis there is no significant difference ($P > 0.05$) between fresh and frozen samples, and no significant difference ($P > 0.05$) between two species (Tilapia and Nile perch) in microbiology examinations while there is significant difference ($P < 0.05$) between freezing period in chemical composition, and no significant different ($P > 0.05$) between fish species in chemical composition.

Key words: Tilapia, Nile perch, bacterial load, chemical composition

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Accepted 10 May 2014

INTRODUCTION

Fish is a major source of protein and its harvesting, handling, processing and distribution provide live hood for millions of people (Jufaili, 2006). Fish can form a very nutritious part of man's diet; it is rich in most of the vitamins he requires, it contains a good selection of minerals, and the proteins contain all the essential amino acids in the right proportions. As with many animal products, fish and fishery products contain water, proteins and other nitrogenous compounds, lipids, carbohydrates, minerals and vitamins. However, the chemical composition of fish varies greatly from one species and one individual fish to another depending on age, sex, environment and season (FAO, 2001).

The microbial flora associated with freshly harvested fish principally a function of the environment in which the fish are caught and not of the fish species; hence, the indigenous microbial population of fish can vary significantly (Shewan, 1977).

Microbial action has been known to play a large part in the spoilage of fish. Bacterial spoilage is characterized by softening of the muscle tissue and the production of slime and offensive odors (Eyo, 2001).

Tilapia (*Oreochromis nilotius*)**:** Recently, the demand of tilapia (*Oreochromis niloticus*) consumption has increased continuously because *O.niloticus* is of low price with high nutrition food. The whole fish and fillet are admirable for consumers. As a result, it affects the trent of both domestic and export consumption. Moreover, the *O.niloticus* has many outstanding advantages such as easy to culture, high growth rate, easy breeding, high fibrils protein, good taste, white cotton meat like sea bass fish, high nutrition and having more Omega-3 than other wild freshwater fishes and wild estuarine fish (Aquatic Animal Research Centre Charoen Pokphand, 1999).

Nile perch *Lates niloticus***:** which is native to Ethiopia country was introduced in the Lake Victoria. During late 1950 and other lakes in Africa. It is described as strongest and first freshwater fish, which may reach large sizes counted over two meters. The Nile perch is of great commercial importance in East Africa (especially the Lake Victoria Basin), where the fishery has brought modernization (e.g., electricity) and profitability to fishing villages that were traditionally based on subsistence fishing (Abila 1998).

The rate of deterioration in fish is highly temperature dependant and can be inhibited by use of low temperature (Sivertsvik et al., 2002). Generally, chilling slow down the deterioration of seafood. The prevent

Table1. Bacteriological examinations.

Species	Period/ day	Microbial load/cfu
Tilapia	Zero day	$3.50x10^4$
	Seven day	. $17x10^5$5
Nile perch	Zero day	.$10x10^4$6
	Seven day	$5.40x10^5$

Table 2. Chemical composition of fresh and chilled fish Tilapia and Nile perch.

Species	Period	Moisture %	Dry matter %	Ash %	Protein %	Fat %
Tilapia	Zero day	**7**5.53 ±1.0	**24.460**±1.0	5. 1**0**±0.2	33.**0**.1±0.9	7. 40±0.14
	Seven day	**75.53**±1.0	**24.46**±1.0	5.1**0**±0.2	33.**0**.1±0.9	7. 40±0.23
Nile perch	Zero day	**76.36**±0.6	**2**3.**63.**±67	6.**0.**1±01	31..**10**±0.29	7. 21±0.0
	Seven day	**76.36**±0.6	**2**3.**63** ±67	6.**0** 1±0.2	31..**10**±0.29	7. 21±0.23

method of retarding spoilage in India as well as in other tropical countries is storage in ice (Surrendran et al., 1989). When the atmospheric surrounding of the product is modified to reduce oxygen concentration, the shelf life is increased considerably due to the reduction in the rate of the chemical oxidation by oxygen as well as in the growth of aerobic microorganisms (Stile, 1991).This study tend to investigate the effect of freezing on microbial load and chemical composition of *Oreochromis niloticus* and *Lates niloticus.*

MATERIALS AND METHODS

Fish treatment

Eighteen samples, 9 Tilapia (*Oreochromis niloticus*), 120-180 g and 9 Nile perch (*Lates niloticus*), 150-200 g bought from Elmourada fish market were iced in thermostatic container and transported to the Sudan University of Science and Technology, College of Veterinary Medicine and Animal Production. The fish were divided into two groups; one was filleted and packed in plastic bags, then placed in refrigerator, were stored for 7 days. The Second group was treated as fresh (control), finally the whole samples were analyzed.

Plate count agar

Five grams of casein enzyme hydrolysis, 2.59 of yeast extract, 1g of dextrose and 9g agar were dissolved in 1000 ml distilled water. After that, the medium was boiled to blend the media and the reconstituted medium was adjusted to pH 7. Then it was sterilized by autoclaving at 15 pound per square inch pressure (121ºc) for 15 minutes.

BACTERIOLOGICAL METHOD

Total viable count (TVC)

Separate sterile pipettes were used, decimal dilution of 10^{-2}, 10^{-3}, 10^{-4}, 10^{-5} and others were prepared, and sample was homogenized by transferring 1ml of previous dilutions to 9ml of diluents. One ml. of each dilution was pipette into separate duplicate, appropriately marked Petri dishes. Two plates were inoculated per dilution 15-20 ml plate count agars were added (after cooled to 45ºc ±1) to each plate within 15 min. of original dilution (AOAC, 1980).

Chemical measurements

Analysis for the determination of the proximate composition (crude protein, total lipid, ash and moisture) for fillet fish, for the two groups was performed by the methods described bellow include methods recommended by the Analytical Methods Committee (AMC) of the Royal Society of Chemistry in 1979(AMC, 1979).

Statistical analysis

The obtained results were analyzed statistically using factorial two ways ANOVA. The test was used to evaluate the mean differences among different treatments at the 0.05 significance level (Dowdy and Wearden, 1991; SAS, 1988).

RESULTS

Bacteriological and chemical composition examinations results of apparently fresh and chilled fish. The results of bacteriological and chemical composition examination of 18 samples of fish showed in (Tables 1 and 2). From the statistical analysis there is no significant difference ($P > 0.05$) between fresh and frozen samples , and no significant difference ($P > 0.05$) between two species (Tilapia and Nile perch) in microbiology examination while there is significant difference ($P < 0.05$) between freezing period in chemical composition, and no significant difference ($P > 0.05$) between fish species in chemical

composition.

DISCUSSION

Bacterial growth is main cause of fish spoilage, therefore, it is logical to use bacterial number as an index of fish quality. In this study the total number of bacterial for fresh tilapia (*Oreochromis niloticus*) meat was $3.50x10^4$ cfu/g and that of Nile perch (*lates niloticus*) $6.10x10^4$ this result is differ from the finding of (Musa and Ahmed, 2012) who found that the bacterial load of fresh *Oreochromis niloticus* range between 1.8 $x10^5$ –$3.7x10^5$ cfu/g. This number was in the accepted limit mentioned by SSMO (Sudanese Standard and Metrology Organization, SDs357) which was $5x10^5$- 10^6cfu/g for fresh products. In addition, this number was in the normal range stated by Liston (1980) which was 10^7 cfu/g for fish meat. Shwan (1977) reported that the bacterial flora on freshly caught fish depend on environment rather than fish species, and this reflect the wide range of bacterial count.

The present study revealed that the total bacterial count for chilled for 7 days tilapia and Nile perch is $5.17x10^5$cfu/g and $5.40x10^5$cfu/g respectively. From the statistical analysis, there is no significant difference ($P > 0.05$) between fresh and frozen samples ($P > 0.05$). This result agree with Latip et al., (2013) who stated that there was no significant differences in aerobic count plate of fresh and chilled big head carp stored for seven day. In addition, these results agree with (Musa and Ahmed, 2012) who reported that the bacterial count of chilled tilapia for seven days ranged between $1x10^5$ – $2.3 x10^5$ cfu/g. In addition, this result is similar to that of (Jeyasekaran et al., 2006) who reported that the initial total bacteria count was found to be 10^5 when the fish were chilled with ice. It is consider accepted limit compared to Anon (1991) who said that the total mesophilic aerobic bacterial counts over 10^6 cfu/g is regard as accepted limit for seafood.

In case of approximate analysis the result obtain from fresh Tilapia and Nile perch showed the main value of protein, fat, water and ash which is 33.10%, 7.4%, 76%, 5.1% and 31.10%, 7.2%, 76% and 6.01% respectively. In case of chilled Tilapia and Nile perch the value of protein, fat, moisture, and ash is 33.10%, 7.40%, 76%, 5.10% and 31.1%, 7.21%, 76.70% and 6.10% respectively and no significant difference ($P > 0.05$) between fresh and chilled fish species in chemical composition . This result disagree with Latip et al (2013) who reported that there was increase in moisture content and decrease of protein and ash content and no significant difference in fat content of big head carp stored for seven days in ice and agree with Simpson and Haard (1987) and Gandota et al., (2012) however, found only very little difference in biochemical and chemical deterioration of cod *(Gadus morhua)* stored at 0°C and at - 3°C and Labeo rohita stored for 7 days. In Japanese studies with sea bass, carp, rainbow trout and mackerel, it has been shown that the drip loss as well as several biochemical and chemical deteriorative reactions were reduced in super chilled fish, compared to ice storage (Kato *et al.,* 1974; Uchiyama *et al.,* 1978; Aleman *et al.,* 1982). As opposed to cod and several other fish species, the prime quality of super chilled shrimp from Pakistan increased from 8 days in ice to 16 days in NaCl-ice at -3°C (Fatima *et al.,* 1988).

REFERENCES

Abila RO (1998). The patterns and trends of marketing and consumption of the fish of Lake Victoria (Kenyan waters). African Journal of Tropical Hydrobiology and Fisheries 8: 35-40.

Jufaili MS, Ofara IU (2006). Status of Fisheries post harvest in the Sultanate of Oman .Part1.handling and marketing system of fresh fish .Journal of Fisheries International (2-4):144-149.

Aleman MP, Kaluda K, Uchiyama H (1982). Partial freezing as a means of keeping freshness of fish. Bull. Tokai Reg. Fish. Res. Lab. 106: 11-26.

AMC, 1979.Analytical methods committee (AMC) of the royal society of chemistryin1979.

Anon Y (1991). Su Urunlerinde Mikrobiyolojik Ve Agir Metal Kabul Edilebilir Degerler. Resmi Gazete, 28 mayis 20884, p5.

AOAC (1980). Association of Official Analytical Chemist Official method of Analysis.(ed.Harwitzw,W.) 3ed Washington.

Pokphand :Aquatic Animal Research Center Charoen**.** (1999).Taptim Fish Culture,Technical Paper(Leaflet) p.6.

Dowdy S, Wearden S (1991). Statistics for Research .2nd ed. New York: Johan Wiley and Sons.p. 629.

Eyo AA (2001). Fish processing in the tropics. Published by the University of.Il or in press. pp.403.

FAO (2001). The composition of fish, produced by Torry Research Station. FAO in partnership with support unit for international fisheries and aquatic research, SIFAR.

Fatima R, Khan MA Qadri RB (1988). Shelf life of shrimp *(Penaeus merguiensis)* stored in ice (0 and deg;C) and partially frozen (-3 and deg;C). J. Sci. Food Agric. 42: 235-247.

Gandota R, Koul M Gupta S, Sharma S (2012). Change in approximate composition and microbial count by low temperature preservation in fish muscle of Labeo rohita (Ham- Buch). Journal of Pharmacy and Biological Science (IOSR. JPBS). 2(5):5-9.

Jeyasekaran G, Ganesan P, Anandaraj R, Jeya Shakila R, Sukumar D (2006). Quantitative and qualitative studies on the bacteriological quality of Indian white shrimp (Penaeus indicus) stored in dry ice. Food Microbiology 23(6): 526-533.

Kato N, Umemoto S, Uchiyama H (1974). Partial freezing as a means of preserving the freshness of fish - 11. Changes in the properties of protein during the storage of partially frozen sea bass muscle. Bull. Jap. Soc. Sci. Fish. 40:1263-1267.

Latip LD, Zzaman W, Yang TA (2013). Effect of chilled frozen storage on physic-chemical, microbial and sensory of farmed bighead carp (*Hypothalmichthys nobilis*). Journal of Fishery and Aquatic Science.(10):1-11.

Liston J (1980). Microbiology in fishery science. In: Connell, J.J. (ed.) *Advances in fishery science and technology,* Fishing News Books Ltd., Farnham, England, 138-157.

Musa IA, Ahmed SH (2012). Effect of chilling on microbial load of two species of fish (*Oreochromis niloticus* and *Clarias lazera).*Am.J.Food.Nut., (3):109-113.

SAS (1988). SAS User's Guide: Statistics.Cary, N.C: SAS Institute Inc. p .956

Shewan J (1977). The bacteriology of fish and spoilage of fish and biochemical changes induced by bacterial action. In: proceeding of conference on handling, processing, and marketing of tropical fish, Ondon, Tropical Production Institute.pp.51-66.

Simpson MV, Haard NF (1987). Temperature acclimatization of

Atlantic cod (Gadus *morhua)* and its influence on freezing point and biochemical damage of postmortem muscle during storage at and deg;C and -3and deg;C *J. Food Biochem. 11*:69.

Sivertsvik M, Jeksrud WK, Rosnes JT (2002). Areview of modified atmosphere packaging of fish and fishery products – significance of microbial growthactivities safety. Int. J. food Sci. Techol., 37:107-127.

SSMO. (SDS357). Aerobic Plate Count (APC) . For fresh or frozen fish and its products. Fishing Products and seafoods. Sudanese Standard and Metrology Organization.

Stile ME (1991). Scientific principles of controlled / modified atmosphere packaging. In: Modified atmosphere packaging of food. Oorikul B. and Stile. M (eds), Ellis harwood, London, pp: 18-25.

Surrendran PK, Joseph AV, Shenoy PA, Perigreen KM, Gopakumar K (1989) . Studies on spoilage of commercially imported tropical fishes under iced stored .Fish Res., 7:1-9.

Uchiyama, H., Ehira, S. Uchiyama, T. and Masuzawa, H. (1978). Partial freezing as a means of keeping freshenss of cultured rainbow trout. *Bull.* Tokai. Reg. Fish. Res. Lab. 95: 1-14.