Research Journal of Animal, Veterinary and Fishery Sciences _____ ISSN 2320 – 6535
Vol. **2(9),** 18-23, September **(2014)** *Res. J. Animal, Veterinary and Fishery Sci.*

Comparison of the changes in Phisico-chemical Characteristics of Dry Salted Snake-head Shoal (*Channa striatus* Bloch, 1801) and Taki (*Channa punctatus* Bloch, 1793) at Room temperature (27^0-31^0C)

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Available online at: www.isca.in, www.isca.me
Received 21st August 2014, revised 29th August 2014, accepted 22nd September 2014

Abstract

Proximate composition (moisture, protein, fat and ash) and chemical analysis (pH) of fresh and dry-salted (DS) fish samples-Shoal (C. striatus) and Taki (C. punctatus) were determined using standard methods of analysis at room temperature (27^0-31^0C) for shelf life study. In processed condition, moisture(%), protein (%), fat (%), ash (%) and pH were 48.84%, 28.49%, 5.63%, 18.97% and 6.3 respectively in case of DS Shoal and 46.21%, 23.58%, 4.03%, 27.27% and 6.5 respectively in case of DS Taki fish-product. During different days of storage, moisture and pH was significantly increased ($p<0.05$) whereas total protein, lipid and ash contents were decreased significantly ($p<0.05$). Moisture (%) and pH was increased 53.69% and 8.1 in case of DS Shoal (165 days) and 53.02% and 7.9 in case of DS Taki (150 days) respectively. Protein (%), fat (%) and ash (%) content were decreased 26.52%, 3.00% and 17.28% in case of DS Shoal (165 days) and 20.41%, 3.24% and 23.45% in case of DS Taki (150 days) fish-product. Experimentally it has been proved that the dry-salted shoal fish-product has longer shelf life (165 days) and has found better way for preservation at laboratory condition.

Keywords: Dry-salting, shoal, taki, proximate-composition, pH, Room-temperature.

Introduction

Being one of the richest sources of proteins, vitamins and minerals fishes are widely used in Bangladesh as essential source of nutrients required for people. Moreover, as supplementary source fishes alone contribute about 80% to the nation's animal protein. But the availability of this valuable nutrients source largely depends on the extent of salting, drying, smoking and freezing and many other types of preservation methods[1,2].

Fishes are very much susceptible to spoilage factors and stat to spoil just after being caught. The spoilage is mainly due to microbial flora, sun, poor handling methods and so on[3]. So immediate care should be taken just after caught in order to prevent possible damaged. There is increased pressure from countries engaged in fish processing to establish effective quality assurance systems in their plants and companies must devote both management and technical resources to meet this objective.

The purpose of the present study is to develop an efficient and effective model for curing of various fish species using cheapest ingredients (like salt) for the production of high quality end products, such as Dry-salted products and transfer the technology to the rural small-scale fisher folks allover Bangladesh. Among the freshwater fish species, Shoal (*C. striatus*) and Taki (*C. punctatus*) are delicious, nutritious and popular to the consumers as well as bear high market price. So it is necessary to take some steps for their proper preservation and marketing and during this period maintain proper quality.

Material and Methods

The fresh fish (Shoal and Taki) were collected from the river Meghna in early morning and the fishes were brought to the Fish Technology Section, IFST, BCSIR, Dhaka, using sterile polythene where fishes were carefully washed with cooled tap water. Head, scales, fins, gills and viscera were removed and washed to remove blood, slime and unnecessary flesh. The experiment was conducted for a period of 6 months between March, 2013 and August 2013.

A fresh flesh sample of shoal and Taki fish specimens (6 to 7 slices) were taken randomly which represented the parts from whole body of the fish. Then the slices were chopped with skin and bone and finally ground with an electric blender to make a homogenous sample before being sampled for analysis.

Dry-salting (DS) method: Sodium chloride (NaCl), also called common salt, and table salt, is generally recognized as a safe, antimicrobial and incidental food additive[4]. Salt has been used as a seasoning and flavor enhancer as well as a preservative or curing agent, had been purchased from the local market. Salt is a powerful depressor of water activity (a^w) of the food[5]. It has also been indicated that chloride ions are toxic for some

microorganisms[6]. The fresh fishes were enrolled by dry commercial salt (NaCl) of about 30% by weight of the dressed fish (fish weight: salt weight 3:1), stacked in containers and stored for a salting or curing period, at room temperature. In this method, the extracted water of the fish due to salt action had been removed from the container. Thus the fishes were always allowed to remain in dry condition for the production of dry salt-cured fish.

Storage of the product: At the end of salting process, Dry-salted product of two fishes was packaging with plastic bag maintaining aseptic condition as far as possible and was stored at room temperature (27^0-31^0C). The preservation period of product is linked to the amount of salt added; therefore a straight proportion is present between the amount of salt used and the preservation period[7].

Sampling procedures: Evaluation of phisico-chemical characteristics in Dry salted Shoal and Taki fishes were carried out 15 days interval for room temperature, until the fish become spoil or inedible condition. Two duplicate experiments were conducted at regular time intervals during salting period. Salt crystal was removed from the dry-salted products by tissue paper before being sampled for analysis.

Proximate Analysis: Using conventional method of AOAC, the proximate composition of fish was determined[8].

Estimation of moisture content: About 5 gram of previously prepared fairly minced samples were taken into each known weight basin and weighed in a digital balance (Toledo, Switzerland). The samples were allowed to dry into the oven (Memmet 854 Schwabach) at 105^0C for 24 hours in order to remove the moisture until constant weight. After that, the basins are taken out of the oven, cooled in a desiccators and were weighed in a digital balance. Calculation

$$\text{Moisture (\%)} = \frac{\text{Weight Loss}}{\text{Original Weight of Taken Sample}} \times 100$$

Estimation of protein content: The protein content was estimated using conventional micro-kjeldahl method[9]. Calculation

$$\frac{\%\ N_2(\text{titration reading - blank reading}) \times \text{strength of acid} \times 0.002 \times \frac{100}{5} \times 100}{\text{weight of taken sample}}$$

% of protein = % of total N_2 × 6.25 (For most routine purposes the percent of protein in the sample is then calculated by multiplying the % of N_2 with an empirical factor of 6.25 for fish).

Estimation of fat content: About 5 g sample was taken into conical flasks and 10 ml of folch reagent (Chloroform: Methanol = 2: 1) was added into the sample and homogenized properly and kept in air-tight condition for 24 hours. Fat contents of the fish muscle react with that solvent and remains in the solution. After 24 hours the solution of the flask was filtered in another weighed conical flask through a filter paper. Then these flasks were given in a hot water bath to dry up and removed the solvent. After that the flasks were kept into an oven for an hour to get the actual fat content. Then the flasks were weighed in an electronic balance to get the amount of fat content. Calculation

$$\text{Fat (\%)} = \frac{\text{Weight of the residue}}{\text{Weight of taken sample}} \times 100$$

Estimation of ash content: About 4-5 g fish sample was weighed into a pre-weighed crucible and heated over a long flame till all the material was completely churned and transferred in a Muffle Furnace (600^0C) for 5 hours. Then the crucible was cooled in desiccators. Finally ash (%) was estimated. Calculation

$$\text{ash (\%)} = \frac{\text{Weight of fish}}{\text{Weight of taken sample}} \times 100$$

Estimation of pH value: pH value of the sample was determined with the help of a pH meter (Mettler Toledo 320-s, Shanghi, China) follwing standard method[10].

Statistical analysis: To calculate significance at $p< 0.05$ level all data was analyzed with the help of SPSS for windows, version 20 statistical software.

Results and Discussion

Determination of the proximate composition and pH of Shoal and Taki fish in fresh condition and dry-salted condition (storage at room temperature) were done. It has been established that the proximate composition of fish may vary in different species and even within the same species from one individual to another is mainly due to age, sex, season, size, species, starvation of the day, energy spending procedure and so on[11-14].

Moisture, protein, fat, ash and pH value was 77.03%, 17.32%, 2.62%, 1.44% and 6.9 in case of fresh shoal fish and 78.65%, 15.89%, 3.02%, 1.16% and 7 in case of fresh taki fish respectively (figure 1). Fresh fish samples presented a high moisture and low protein content, similar to previous report[15]. Fish species with low levels of fat are suitable to be processed[16].

Changes in proximate composition in dry-salted shoal and taki fish products during different days of observation period through shelf life study were shown in figure 2 and 3.

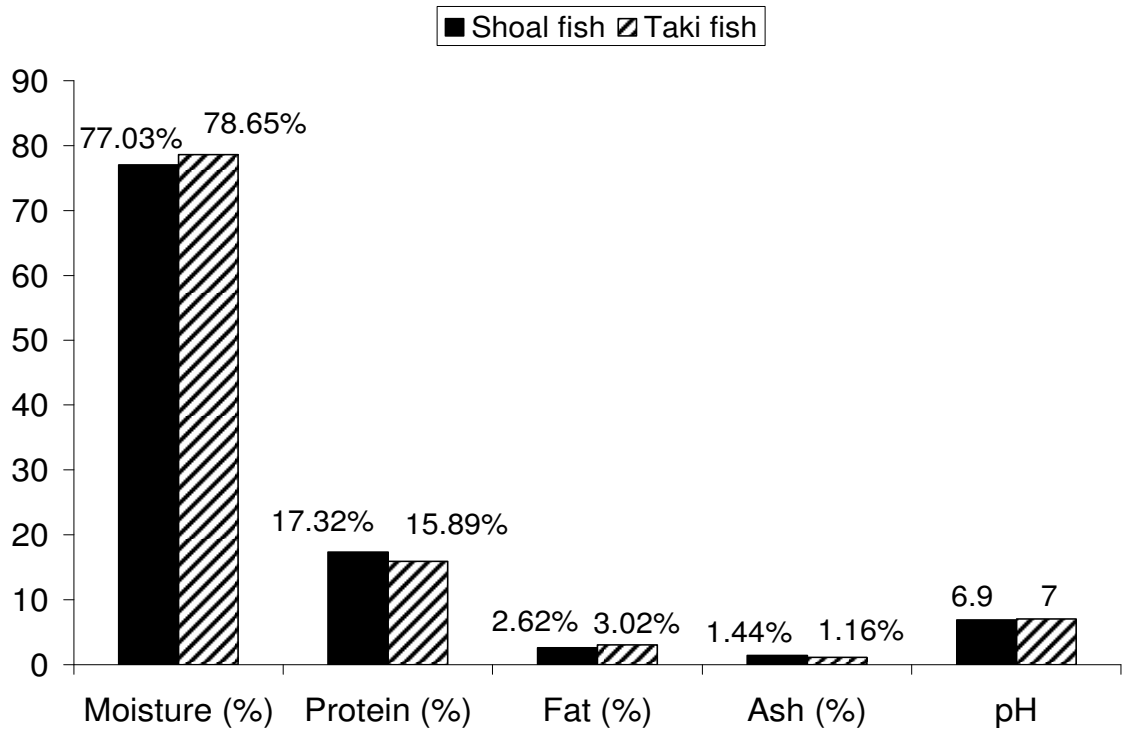

Figure-1
Comparison of the proximate composition and pH value of fresh Shoal (*C.striatus*) and Taki (*C. punctatus*) fish

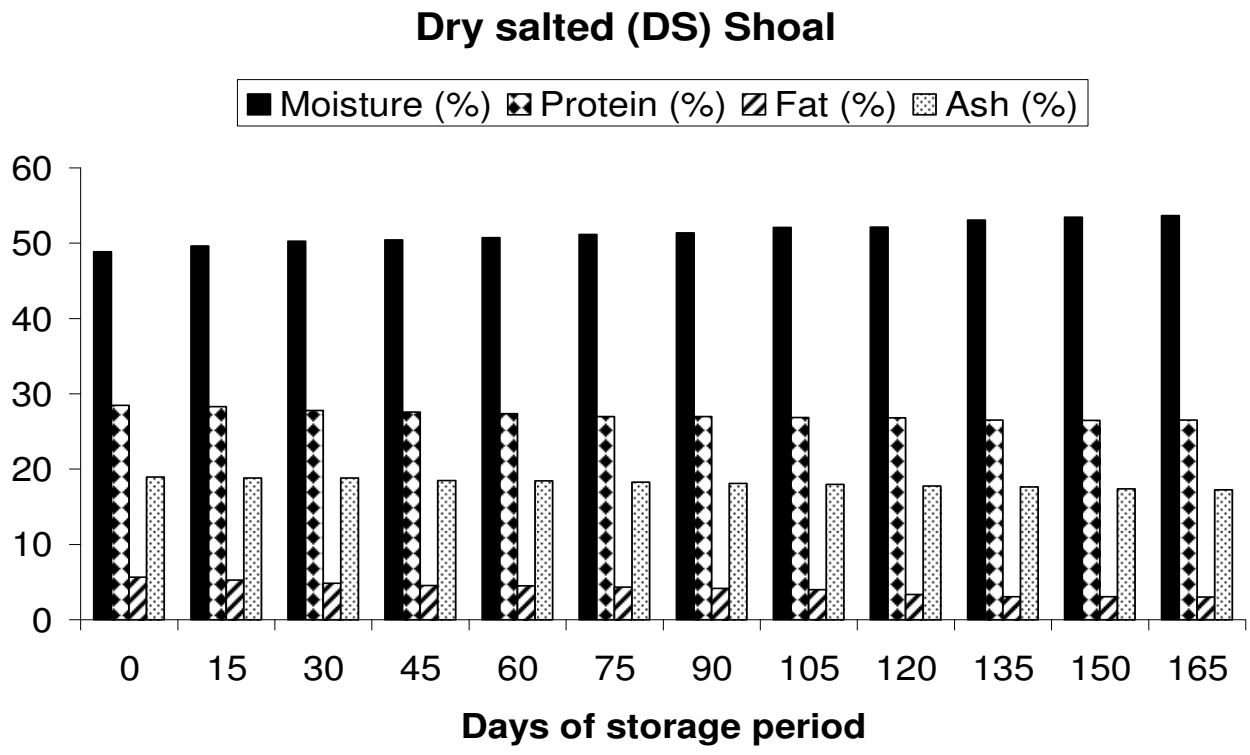

Figure-2
Changes in Proximate Composition of Dry-Salted Shoal fish during Storage at Room Temperature

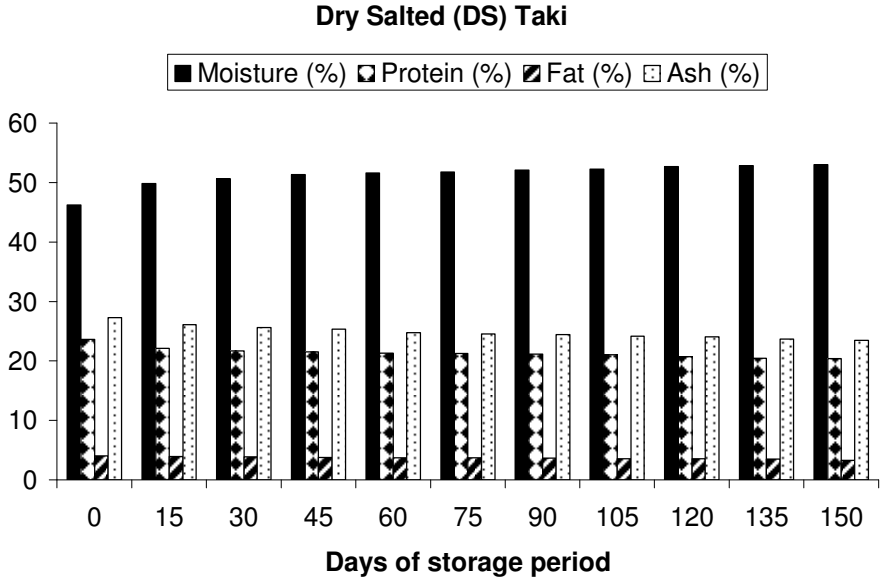

Figure-3
Changes in Proximate Composition of Dry-Salted Taki fish during Storage at Room Temperature

Moisture (%): In present experiment, moisture content was 48.84% and 46.21% in freshly processed dry-salted shoal and taki fish and after completing the duration of storage period, it was found 53.69% (165 days) and 50.92% (150 days) respectively (figure 2 and 3). The moisture uptake during the storage period was significant in the products stored in room-temperature. Moisture absorption in such products is obvious during monsoon due to high relative humidity difference.

Protein (%): In dry-salted shoal and taki fish products, protein content was found 28.21%, and 23.58%, in fresh-process condition and after completing the duration of storage period it was decreased into 25.52% (165 days) and 21.53% (150 days) respectively (figure 2 and 3). The decrease of protein level was found to be significantly proportional ($P<0.05$). Protein decreased with storage of cured meat was attributed to some changes during storage that caused by 'maillard reaction and changes in pH[17]. Salt causes the proteins in fish muscle to swell and salt lead the protein become denatured if increases in the muscle[18].

Fat (%): Fat content may be influenced by season and geographic location[19]. In dry-salted shoal and taki fish products, fat content was found 3.99%, and 3.93%, in fresh-process condition and after completing the duration of storage period it was 3.30% (165 days) and 3.49% (150 days) respectively (figure 2 and 3). It is clear from the present results that fat content was decreased significantly ($p<0.05$). This might be due to oxidative deterioration, thereby affecting lipid extraction[20]. Decrease in the level of crude protein and fat contents of small and large salted Bouri fish muscle (*Mugil cephalus*) were reported[21].

Ash (%): In dry-salted shoal and taki fish products, ash content was found 18.98%, and 26.37%, in fresh-process condition and after completing the duration of storage period it was found 17.58 % (165 days) and 24.55% (150 days) respectively (figure 2 and 3). The higher value of total ash content in freshly processed dry-salted shoal and taki fish than fresh fish was attributed to high salt content. Similar levels of ash content in salted fish were noticed by several workers[22].

Changes in pH value: The pH of freshwater fish flesh at fresh-condition is almost neutral[23]. In post-mortem period, decomposition of nitrogenous compounds often tends to increase in pH level in fish flesh[24]. Increase in pH indicates the loss of quality in fishes. The pH value of DS shoal and taki fish-product was significantly ($P<0.05$) increased during storage time. pH value of fresh Shoal and taki fish was 6.9 and 7 in our study . But when salt is added with the fish, pH value decrease due to increase of acidic compound and after that among shelf life study pH value increases in the time interval due to increase of basic compounds. In the present study pH value were found to vary from 6.3 (0 day) to 8.1 (165 days) for DS shoal and 6.5 (0 day) to 7.9 (150 days) for DS taki (figure 4).

The acceptable range of fish pH is 6. 8 but are considered to be spoiled above 7 [25]. The initial pH values in the samples were similar with other researchers. The increase in pH values during the storage of room temperature (27-31^{0}C) was higher than reported in other researches. The probable reason behind these differences was due to differences in fish species and different methods of salting used.

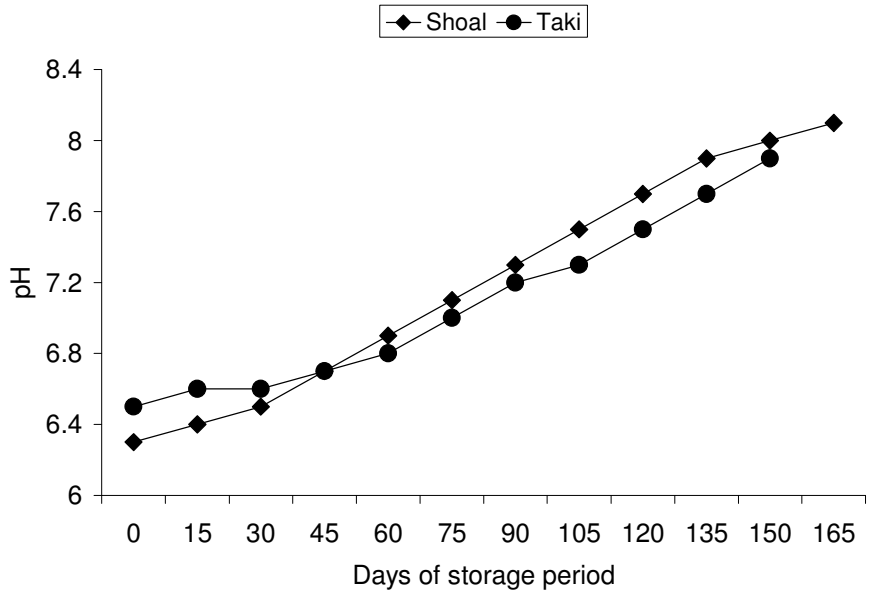

Figure-4
Changes in pH value of Dry-Salted Shoal and Taki fish during Storage at Room Temperature

Conclusion

From the result of this study, the proximate analysis and pH value showed that dry salted shoal product have grater nutritive value in terms of percentage crude protein and experimentally it has been proved that this product has longer shelf life (165 days) and has found better way for preservation at laboratory condition.

Acknowledgement

The author acknowledges the scientists and technicians of Fish technology laboratory, IFST, BCSIR, Dhaka, Bangladesh for their supports and assistance to carry out the present study.

References

1. Hardy R. and Smith J.G.M., The storage of Mackeral (*Scomber scoulbrus*) Development of Histamine and rancity, *J.Sci. Food and Agri.,* **27,** 595-599 **(1976)**

2. Botta J.R. Nooman P.B. and Lauder J.T., Chemical and sensory analysis of un gutted offshore capelin (*Mallotus villous*) stored in ice, *Journal of fish Biology*, Can, **35,** 971-980 **(1978)**

3. Shewan J.M., The bacteriology of fresh and spoiling fish and the biochemical changes induced by bacterial action. In, proceedings of the conference on handling, processing and marketing of tropical fish, London, Tropical products Institutes, 51-66 **(1977)**

4. Klaassen C.D. Amdur M.O. and Doull J.A., Principles of Toxicology, *In Casarett and Doull's Toxicology: The Basic Science of Poisons,* New York: Macmillan **(1986)**

5. Turan H., Sonmez G., Celic M.Y. and Yalcin M., Effects of different salting process on the storage quality of Mediterranean Muscle (*Mystus Galloprovincialis* L. 1819), *J. Muscle Foods*, **18,** 380-390 **(2007)**

6. Leroi F., Joffraud J.J. and Chevalier F., Effect of salt and smoke on the microbiological quality of cold- smoked salmon during storage at 5 Degrees C as estimated by the factorial design method, *J. Food Prot*., **63,** 502-508 **(2000)**

7. Bahri P., Ayse G.I., Gulsum O. and Irfan I., Microbiological and chemical qualities of salted grey mullet, *Int. J. Sci. Techno*., **2,** 91-98 **(2006)**

8. AOAC, Association of Official Analytical Chemist, Official methods of Analysis (15th ed.), Inc., Suite, 400, Arlington, Virginia, **2,** 685-1298 **(1990)**

9. Pearson D., Pearson's composition and analysis of foods, University of Reading, **(1999)**

10. Vynke W., pH of fish muscle comparison of methods, Western European Fish Technologists' Association (WEFTA), Copenhagen, Denmark **(1981)**

11. Stansby M.E., Proximate Composition of fish, Fish in Nutrition, 55-61 **(1962)**

12. Graves T.D.D., Body composition changes during growing in young sockeye (*Oncorhynchus nerka*) in fresh water, *Bangladesh Journal fish research*, Can. **27,** 929-942 **(1970)**

13. Parker R.R. and Vanstin W.E., Changes in the chemical composition of central British Colombia pink salmon during early sea life, *Bangladesh Journal of Fisheries Research,* **23,** 1353-1384 **(1966)**

14. Niimi A.J., Changes in the proximate body composition of large mouth (*Micropterus salmoides*) under starvation, *Jurnal of Zoology*, **50,** 815-819 **(1972)**

15. Eyo A.A., Shelf-life of Moon fish *(Citharinus citharus)* and Tumk Fish *(Mormyrus rume)* During storage at ambient temperature and on Ice, FAO Fisheries Report No. **574,** 35-37 **(1998)**

16. Mohammed G.F., Hegazy E.M. and Abdellatef M., Physicochemical Properties and Mycootoxins contents of Tilapia Fish-Fillets after Solar Drying and storage, *Global Veterinaria J.*, **7(2),** 138-148 **(2011)**

17. Lawrie K.A., Meat science. 5th ed. Program Press, Oxford, UK, **(1990)**

18. Hamm R., Influence of pH on the protein net charge in the myofibrillar system. Rec. Meat Conf. Proc. **47,** 5-9 **(1994)**

19. Agren J.J., Al-Ahmed H. and Hanninen O., Fatty acid content and composition of five fish spesies in the Persian Gulf, Comp, *Biochem. Physiol*., **100B,** 339-341 **(1991)**

20. Gandotra R., Meenakshi K., Sweta G. and Shallini S., Change In Proximate Composition And Microbial Count By Low Temperature preservation In Fish Muscle Of *Labeo rohita* (Ham-Buch), *IOSR J. Pharm. Biol. Sci.* (IOSRJPBS) **2(1),** 13-17 **(2012)**

21. El-Sebahy L.A. and Metwalli M.S., Changes in some chemical characteristics and lipid composition of salted fermented Bouri (*M. cephalus*) fish muscle, *Food Chemistry,* **31,** 41-50 **(1988)**

22. Kiin-Kabari D.B., Barimalaa I.S., Achinewhu S.C. and Adeniji T.A., Effect of extracts from three indigenous species on the chemical stability of smoke-dried catfish (*Clarias lezera*) during storage, *Afr. J. Food Agric. Nut.* Develop, **11(6),** 5335-5343 **(2011)**

23. Virta S., Bachelor's Thesis, Isolation and Identification of Rainbow Trout spoiling Microbiota. Biotechnology and Food Technology, Turku University of Applied Science, 8pp. (Unpublished) **(2009)**

24. Shenderyuk V.I. and Bykowski P.J., Salting and Marinating of fish. In: Seafood Resources. Nutritional Composition and preservation, Sikorski, Z.E.(Ed.) CRC Press Inc. Boca Raton, Florida **(1989)**

25. Huss H.H., Fresh Fish-quality and quality changes, *FAO Fihs. Series 29*, FAO DANINAQ, Rome, Italy, 132 **(1988)**