

Studies on the Effect of Potassium Sorbate Treatment on Fillets of *Tor tor*

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Abstract—The aim of present study was to investigate the effect of 5% potassium sorbate dip treatment on the fillets of Silver carp stored for 30 days. The fillets were divided into two groups viz. Gp. A (untreated control) and Gp. B (treated with potassium sorbate) and were analyzed for biochemical and microbial parameters. The Gp. B (treated) fillets showed lower values for TBA (Thiobarbituric acid), FFA (Free fatty acid) and ERV (Extract release volume) than the Gp. A at the end of storage period i.e. 30 days. Also, the microbial count was lower in Gp. B as compared to Gp. A. The values were 7.52log cfu/g, 7.68log cfu/g and 5.9log cfu/g in Gp. A and 2.82 log cfu/g, 1.61log cfu/g and 2.12log cfu/g in Gp.B for Total plate count (TPC), Coliform count (CC) and Psychrophillic count (PC) respectively. Thus, the treatment of potassium sorbate is particularly effective in reducing the microbial load and thereby extending the shelf life of refrigerated fish fillets.

Keywords: potassium sorbate, biochemical, microbial, *Tor tor* and shelf life.

Introduction

Speaking for fish, it is a world- wide distributed food commodity. It is regarded as a potentially a cheap source of protein, especially greater significance to developing countries like India, where problems of nutritional deficiencies persist. As a rich source of nutrient, fishes provide a good balance of protein, vitamins and minerals and relatively low caloric content. The reason why fish is such an important source of nutrition is that it both provides substances necessary for the human body and also reduces the risk of various diseases. For example, it has been revealed that when fish-which acts as a shield in terms of health with the omega-3 acid it contains-is consumed on a regular basis, it reduces the risk of heart disease and strengthens the immune system. However, fish is a very perishable commodity, more than cattle, sheep and poultry. So, it must be properly preserved before it is disposed off. Major factors responsible for its perishable nature are the microbial growth and oxidation of lipids which influence the colour, texture, nutrition, safety along with flavour. All these negative changes limit the marketing process of fish products and hence to satisfy the consumer demand, it is necessary to produce good quality and safe fish. Delay in microbial contamination of fish may be achieved by different preservatives like potassium sorbate, citric acid, ascorbic acid and lactic acid etc. Potassium sorbate is considered to be an

effective preservative against a wide spectrum of food spoilage microorganisms. They are among the safest, most efficient and versatile preservatives used in the food industry today. Sorbates are tasteless and odourless (Omojowo et al,2009). As they are non-toxic, they are used in a wide variety of foods, including cheese, yogurt, sour cream, bread, cakes, baking mixes etc. The antimicrobial activity of sorbates against molds, bacteria and fungi has been reported by researchers (Sofos, 2000).Considering the antimicrobial activity of Sorbate, the aim of present study was to determine the microbial and nutritional quality changes in the *Tor tor* fillets stored under frozen conditions($12\pm 2^{\circ}\text{C}$) for 30 days.

MATERIALS AND METHODS

Collection of fish samples: Fresh samples of *Tor tor* were purchased from local market of Jammu city. They were immediately brought to the lab in polythene bags along with crushed ice. The viscera of fish were removed and the fish was washed with large amount of water. Analytical procedures for biochemical and microbiological changes were done on 0, 10th, 20th and 30th day of storage.

Fish Treatment: The fish was cut in to pieces and these pieces were divided into two groups viz. Gp. A and Gp. B. Gp. A samples were considered as untreated (Control), wrapped in aluminum foil, kept in air tight plastic container without pre treatment and stored at $12\pm 2^{\circ}\text{C}$ while the second group i.e Gp.B samples were dipped in the solution of 5% potassium sorbate for 15 minutes, taken out and immediately wrapped in aluminum foil, kept in air tight plastic container and stored at $12\pm 2^{\circ}\text{C}$ (frozen storage).

Analyses: The proximate composition (ash and moisture) of the fish samples were evaluated using the standard AOAC procedure (AOAC, 1995). The protein content was determined using the Lowry et al. (1951). Fat content was determined using Folch et al (1957). Thiobarbituric acid value of fish muscle during storage was determined using the method of Witte et al (1970). Free Fatty Acid (FFA) was determined by method of US Army laboratories (Natick) described by Koniecko (1979). Extract Release Volume (ERV) was determined as per the method of Strange et al.(1977). The pH of fish muscles was determined by the method of Keller et al.

(1974). The microbiological profile was determined according to APHA method (1984). Data were expressed as mean \pm SD and were analyzed by one-way ANOVA test using SPSS statistical programme.

Statistical Analysis: Means and standard errors were calculated for different parameters. The data analyses were performed using SPSS software (12.0 for Windows). Differences between treatments were analyzed using independent-measures one-way ANOVA. Post-hoc comparisons were conducted using Duncan's test. The values were expressed as mean \pm SE. values <0.05 were considered as significant and p values <0.001 were considered as highly significant.

RESULTS AND DISCUSSIONS

Chemical Analysis:

Lipid hydrolysis development: Free fatty acids (FFA) formation due to the lipid hydrolysis is also an evaluator of fish damage. The formation of FFA itself does not lead to nutritional loss but the extent of lipid hydrolysis is related to the loss of body fat. Also, free fatty acids are known to form off-flavour and undesirable taste producing low molecular weight compounds after oxidation (Refsgaard et al., 2000).

DAYS	FFA (%)	TBA
	Gp.A	Gp. B
0 DAY	1.44 \pm 0.01	0.70 \pm 0.03
10 th DAY	5.67 \pm 0.05	4.45 \pm 0.04
20 th DAY	8.85 \pm 0.04	7.87 \pm 0.01
30 th DAY	12.55 \pm 0.05	9.45 \pm 0.04

It is observed in both Table-1 and 2 that values for free fatty acid (FFA) formation in both control (Gp. A) and treated samples (Gp. B) show an increasing trend. In (Gp. A), the initial values for FFA were 1.44 \pm 0.01, which rose to 12.55 \pm 0.05 on 30th day of storage. Similarly, in (Gp. B), the values rose from 0.42 \pm 0.01 to 3.96 \pm 0.02 on the final day of storage. However, the increase was too low in treated (Gp. B) samples. These results are in line with the studies of Omojowo et al, 2009 in smoked Catfish and Arekemase et al, 2012 in Tilapia and Mackerel, who observed a higher fat content or low fat loss in potassium sorbate treated fishes.

Lipid oxidation development: The Thiobarbituric acid (TBA) value is an index of lipid oxidation measuring malondialdehyde (MDA) content and widely used for assessment of degree of lipid oxidation. MDA is formed through hydroperoxides, which are the initial reaction product of polyunsaturated fatty acids with oxygen (Sallam, 2007).

From the table 1 and 2, it is observed that values for TBA in Gp. A are 0.70 \pm 0.03 on initial day and rising upto 9.45 \pm 0.04 on the last day of experiment. In Gp. B also the values followed the same increasing trend, i.e. 0.11 \pm 0.4 on day 0, 1.86 \pm 0.1 on day 10th, 3.65 \pm 0.1 on day 20th and 5.44 \pm 0.2 on day 30th. But the increase was too low when compared with

Gp. A. These results are supported by the studies of Debevere and Voets, 1972 in potassium sorbate treated cod fillets who observed lower TMA (Trimethylamine) values in treated samples. Barnett et al., 1982 observed doubled (from 10 to 20 days) shelf life of fresh trout treated with 2.3% potassium sorbate dip. Zhao et al, 2013 observed lower values for TBA in shredded meat treated with potassium sorbate as compared to the control samples. It may be due to the antioxidant inhibition of secondary oxidation products by potassium sorbate (Mishra et al., 2011).

Microbial Quality: For the determination of freshness quality of fish before and after treatment, Total plate count (TPC), Coliform count (CC) and Psychrophillic count (PC) were analyzed during frozen storage of one month for both untreated (Gp. A) and treated samples (Gp. B).

Table-2: Changes in Total Plate Count (TPC), Coliform count (CC) and Psychrophillic count (PC) in Gp. A and Gp. B muscle fillets of *Tor tor*.

Day s	TPC (log cfu/g)		CC (log cfu/g)		PC (log cfu/g)	
	Gp. A	Gp. B	Gp. A	Gp. B	Gp. A	Gp. B
0 day	2.11 \pm 0.03	1.10 \pm 0.02	2.16 \pm 0.01	1.11 \pm 0.01	1.67 \pm 0.01	1.01 \pm 0.3
10 th day	3.65 \pm 0.01	1.16 \pm 0.01	3.64 \pm 0.01	1.20 \pm 0.01	2.52 \pm 0.01	1.24 \pm 0.01
20 th day	6.93 \pm 0.01	1.27 \pm 0.01	6.60 \pm 0.01	1.31 \pm 0.01	3.84 \pm 0.01	1.59 \pm 0.01
30 th day	7.12 \pm 0.04	1.52 \pm 0.01	7.88 \pm 0.01	1.71 \pm 0.01	4.96 \pm 0.01	1.72 \pm 0.01

The results presented in Table-2 depicted that TPC in Gp. A (untreated) was 2.11 \pm 0.03 log cfu/g on day 0, 3.65 \pm 0.01 log cfu/g on day 10th, 6.93 \pm 0.01 log cfu/g on day 20th, 7.12 \pm 0.04 log cfu/g on day 30th, thus crossing the permissible limit of 6 log cfu/g (ICMSF, 1986) on 20th day of storage. However, in treated samples, Gp. B (5% potassium sorbate), the initial values were 1.10 \pm 0.02 log cfu/g, 1.11 \pm 0.01 log cfu/g and 1.01 \pm 0.3 log cfu/g for TPC, CC and PC respectively which rose to 1.52 \pm 0.03 log cfu/g, 1.71 \pm 0.03 log cfu/g and 1.72 \pm 0.01 log cfu/g respectively on 30th day of frozen storage and hence were within the permissible limits. The present results are supported by the studies of Kim and Hearnberger (1994) who reported that combination of sodium acetate and potassium sorbate with lactic acid culture could provide the inhibition required for extended storage, with respect to the growth of aerobic gram-negative bacteria in refrigerated catfish fillets.

Abu-Ghazaleh (2012) reported that potassium sorbate alone or in combination with citric acid is effective in reducing the growth of *Staphylococcus aureus* and *E. coli*. Similarly, the studies done by Omojowo et al, 2009 revealed the role of 3-5% potassium sorbate in reducing the TVC, CC and fungal count in smoked Tilapia fillets. Also, in 3% potassium sorbate treated smoked Cat fish, lower microbial counts were reported by Omojowo et al, 2009. Similarly, Yesudhasan et al., 2008 reported the role of potassium sorbate in extending the shelf

life of Seer fish (*Scomberomorus commerson*) by reducing total aerobic mesophilic count and clostridial counts. The decrease in microbial count may be attributed to the fact that potassium sorbate inhibits bacterial spore formation in fish fillets (Smoot and Pierson, 1981 and Laxma Reddy and Benarjee, 2013).

CONCLUSION

The result of present studies suggest that 5% potassium sorbate acts as an effective preservative for extending the shelf life of frozen fish fillets. A delayed chemical and microbial deterioration was observed in treated fish fillets and the fillets were in good condition till the end of storage period i.e. 30 days. Hence, a pretreatment with 5% potassium sorbate is recommended for enhancing the shelf life of fish

However, in treated samples, Gp. B (5% potassium sorbate), the initial values were 1.10 ± 0.02 log cfu/g, 1.11 ± 0.01 log cfu/g and 1.01 ± 0.3 log cfu/g for TPC, CC and PC respectively which rose to 1.52 ± 0.03 log cfu/g, 1.71 ± 0.03 log cfu/g and 1.72 ± 0.01 log cfu/g respectively on 30th day of frozen storage and hence were within the permissible limits. The present results are supported by the studies of Kim and Hearnberger (1994) who reported that combination of sodium acetate and potassium sorbate with lactic acid culture could provide the inhibition required for extended storage, with respect to the growth of aerobic gram-negative bacteria in refrigerated catfish fillets.

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