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STUDY ON THE EFFECTS OF ANTIOXIDANTS CITRIC ACID AND ASCORBIC ACID ON THE QUALITY OF SILVER POMFRET, *Pampus argenteus*, STEAKS DURING CHILLED STORAGE

Zoology

Dr. Devdatta Lad Department of Zoology, Wilson College, Chowpatty, Mumbai - 400 007

Mubashira Gandhi Department of Zoology, Wilson College, Chowpatty, Mumbai - 400 007

ABSTRACT

Fishes contain high amount of Polyunsaturated Fatty Acids once the fish dies these Polyunsaturated Fatty Acids reacts with free oxygen radicals and undergoes oxidation. Upon oxidation the fatty acids present in the fish muscles become rancid and this leads to rancidity. The present research aims in studying the effects of antioxidants Citric acid and Ascorbic acid on the quality of Silver Pomfret, *Pampus argenteus,* steaks during chilled storage. Results of the research shows that the Acid value and free fatty acid value is observed to be less in steaks treated with Ascorbic acid then Citric acid and control steaks. Overall the Ascorbic acid is found to be a good antioxidant for the Silver Pomfret fish steaks. It has kept the pH value stable by controlling the rancidification by forming less free fatty acid and Peroxide, which are important indicators of the level of rancidification of the fats.

KEYWORDS

Silver Pomfret, Citric Acid, Ascorbic Acid, pH, Peroxide Value, Acid Value.

Introduction

Fishes are considered to be an important part of human nutrition as they are rich in proteins, Lipids, Vitamins and Minerals. (H. Mandakini Devi and Gaihiamngam Kamei, 2017) Fishes have high content of Polyunsaturated Fatty Acid (PUFAs) especially Omega 3 family. (Rostamzad H., et. al., 2009) These polyunsaturated fatty acids helps to reduce the risks of cardiovascular diseases and are linked with curing certain types of cancers. Fish proteins is easily digestible and give shiny appearance to our face and body. Fish consumption is good for vitamins deficiency people as it contains Vitamin B6, B12and minerals like Potassium, Sodium, Calcium, Magnesium and Copper. (H. Mandakini Devi and Gaihiamngam Kamei, 2017)

When the fish is caught it dies after that its immune system collapses and the bacteria are allowed to proliferate freely and that deteriorates the fish. It leads to Autolysis meaning self digestion. After the death the anaerobic muscles cannot maintain its normal level of ATP and when the intracellular level declines from 7 – 10 micromoles/g to 1.0 micromoles/g the tissues, muscles enter rigor mortis. The resolution of rigor always results in subsequent softening of muscle tissue which is coincidental with autolytic changes. Fishes contain high amount of Polyunsaturated Fatty Acids once the fish dies these Polyunsaturated Fatty Acids reacts with free oxygen radicals and undergoes oxidation. Upon oxidation the fatty acids present in the fish muscles become rancid and this leads to rancidity. Rancidity is a sign of spoilage and a range of volatile, unpleasant smelling substances are produced depending upon the fish species. Some volatile compounds produced are Trimethylamine and Hydrogen Peroxide, which have a characteristic fleshy smell. The pH level of the fish is also affected. During the latter stages strong rancid smell develops. The texture becomes either soft and watery or tough and dry. The fish can be characterized as spoiled or rancid. (www.fao.org)

Consuming rancid fish fatty acid could be harmful such as instead of providing heart protection oxidized oil may increase the rate of Atherosclerosis. Animal studies have found that oxidized fatty acid have lead to organ damages and inflammations. Consuming oxidized oil may cause carcinogenesis. Studies found that consuming oxidized oil had a negative effect on cholesterol level and could linked with Alzheimer's disease (www.Omega3innovations.com)

Antioxidants prevent direct oxidation of Polyunsaturated Fatty Acids. It is also valuable in intercepting free radicals that travel through the aquaceous parts of food. There are two types of antioxidants - natural and synthetic. Natural antioxidants sometimes tend to be short lived while synthetic antioxidants have a longer shelf - life. Sometimes the combination of natural and synthetic antioxidant is used when the fat material is more. Antioxidants prevents rancidification of fats, maintains pH and Acid value. They also prevent the formation of Hydrogen Peroxide. Thus, antioxidants are useful in preservation of high fat content food such as fishes. In general fresh fish oils have a peroxide value of upto 10 mEq/Kg while peroxide values in the 30 - 40 mEq/Kg range are generally associated with a rancid taste. (Sabine Samples, 2013) The basic aim of the present research is to determine the most effective antioxidant between Citric acid and Ascorbic acid for fish steaks of Silver Pomfret *(Pampus argenteus)*.

Materials and Methods

Freshly landed fish that is Silver Pomfret, *Pampus argenteus* was collected from Sassoon dock. It was immediately preserved in ice and brought to the laboratory. Once the fish was brought to the laboratory, it was washed with distilled water and blood stains and mud spots were removed. The scales were removed with the help of sharp knife taking care that no damage was done to skin. All the fins and the gut were removed. Once again the fish was washed with distilled water. Then with the help of the sharp knife the fish was cut into steaks. Out of all steaks one steak from the fish was taken as Control. And two steaks from the fish were taken as Experimental 1 and 2 respectively which were treated with 10% Citric acid and 10% Ascorbic acid respectively.

On the 1st Day i.e. initial day once the control and experimental fish steaks of Silver Pomfret, *Pampus argenteus* were ready then they were immediately subjected to analysis of pH, Acid value and Peroxide value. Once the analysis was done then the control steak was placed in refrigerator without being subjected to any antioxidant. The Experimental steaks 1 and 2 respectively were treated with 10% Citric acid and 10% Ascorbic acid respectively before placing them in refrigerator. Similarly the analysis was carried out periodically on 3rd, 6th, and 9th day. On all the mentioned days the control steak was not exposed to any antioxidants and was used for analysis. While the experimental steaks i.e. E1 and E2 were subjected to antioxidants 10% Citric acid and 10% Ascorbic acid respectively for 15 min before freezing.

Sr. No.	Parameters	Methods
1	pH	Standardized pH meter
2	Peroxide value	Iodometric Titration method
3	Acid value	KOH Titration method

(A. D. Woyewoda, 1986)

Results

Table 1 pH and Acid Value of the Control and Experimental fish steaks of Silver Pomfret

Parameters	pH			Acid value (mg of KOH)		
Days	Control	Citric acid	Ascorbic acid	Control	Citric acid	Ascorbic acid
1th day	6.51	6.57	6.54	0.05	0.06	0.06
3rd day	6.59	6.60	6.61	0.06	0.08	0.08
6th day	6.75	6.69	6.65	0.14	0.15	0.11
9th day	6.92	6.70	6.77	0.28	0.20	0.19

Table 2 Peroxide value and Free fatty acid of the Control and Experimental fish steaks of Silver Pomfret

Parameters	Peroxide value mEq O_2/Kg			% of free fatty acid		
Days	Control	Citric acid	Ascorbic acid	Control	Citric acid	Ascorbic acid
1th day	6	4	4.5	0.02	0.03	0.03
3rd day	7.5	2.5	1	0.03	0.04	0.04
6th day	8.5	2.5	1	0.07	0.07	0.05
9th day	10	6	5	0.14	0.10	0.09

Conclusion and Discussion

The results of the present research clearly highlights that the control steaks of Silver Pomfret that were not subjected to any antioxidants had increased levels of pH, Acid value, Peroxide value and free fatty acid. This was due to rancidification of the fats present in the tissues of the Silver Pomfret. In the experimental fish steaks the pH and Peroxide value is less in the steaks treated with Ascorbic acid then Citric acid and control steaks. Whereas the Acid value and free fatty acid value is observed to be less in steaks treated with Ascorbic acid then Citric acid and control steaks. Overall the Ascorbic acid is found to be a good antioxidant for the Silver Pomfret fish steaks. It has kept the pH value stable by controlling the rancidification by forming less free fatty acid and Peroxide, which are important indicators of the level of rancidification of the fats.

Similar studies have been conducted earlier by Copes Julio et. al., (2014), where they investigated the effect of Chloride, Citric acid and Ascorbic acid dip treatments in conjugation with two types of packaging films on Pejerry fillets, *Odonthested bonariensis* at three storage temperature. Results showed that the use of Chloride, Citric and Ascorbic acids and vacuum packaging showed good organoleptic character. Aydin Kilic et. al., (2013), investigated the effect of Ascorbic acid on the quality of cold smoked trout *Oncorhynchus mykiss* with or without sodium nitrite. During the experiment minced fish were subjected to 6 forms of brine and was freezed at 4°C. Various parameters like pH, lipid oxidation, moisture, protein, salts were analysed. The results revealed that sample treated with only Ascorbic acid increased the shelf life of smoked fish. Santiago P. Aubourg et. al. (2016) investigated on inhibition of rancidity of frozen horse mackerel fillet *(Trachurus trachurus)* by using citric acid and ascorbic acid. The results showed that both the antioxidant used has good effect but ascorbic acid had best effect on increasing the shelf life of the fish fillet.

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