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"Effect of ginger dip treatment on quality changes of chill stored Indian mackerel (*Rastrelliger kanagurta*) fish fillet"

Poojaben D. Tanna[1], Chintan J. Kariya[2], Durga C. Fofandi[3], Dr. B.G.Chudasama[4], Dr. D.V.Bhola[5]

[1]*Department of Fish Processing Technology, College of Fisheries Science, JAU, Veraval.*
[2]*Valia Institute of Technology, Bharuch*
[3]*Department of Fish Processing Technology, College of Fisheries Science, JAU, Veraval.*

Abstract - ***The effect of ginger extract on stability and sensory quality of Indian mackerel (Rastrelliger kanagurta) fillets stored in cooler was determined over 10 days. Sensory, physical and chemical analyses were performed to investigate quality changes and to determine the stability of the fillets. The lowest peroxide value (2.03 meq/Kg) was recorded in 3% ginger extract treated samples, while the highest peroxide value (8.33 meq/Kg) in without ginger extract samples (Control). The organoleptic results showed that samples treated with 1% ginger extract had a good acceptance, and were significantly different, when compared to the control after 10 days of storage. Drip loss was decreased with 3% ginger extract. The objective of this study was to examine the effect of ginger extract on the Indian mackerel fillets. During the period of storage, the formation of primary and secondary oxidation were less intensive than that of the control sample.***

Keywords – ***Indian Mackerel (Rastrelliger kanagurta) fish fillets, Ginger extract, Drip loss, Quality changes, Peroxide value and Storage.***

I. INTRODUCTION

The principal constitute of fish flesh is water, which usually accounts for 60-80% of the weight of a fresh fish fillet. Water plays a crucial role in the quality changes occurring in fish muscle during storage and processing of fish. Water content is found to vary considerably within the same species of fish depending on the age, fat content, feeding condition, spawning etc. To remain the authentic property of the fresh fish, the chilling procedure has enormously used in countries where an advance technology is available. Chilled products tend to dominate the market and have high proportions of fish production and human consumption [3].

Improper freezing or storage of fish fillet may result in detrimental quality changes. When foods with high amounts of water are frozen slowly, they may experience a loss of fluid, called **Drip.**

The ability of fish meat to keep its internal water is known as the water-holding capacity (WHC). WHC can affect the quality and yield of the final product [8]. In fresh and uncooked meat, Water holding capacity is known as Drip loss [7]. High drip losses lead to loss of the appearance, texture, color and nutritive value of the fish flesh [4]. A higher amount of fluid loss then it affects in both qualitative and quantitative aspects of muscles. Drip loss of fish fillet was influenced by storage temperature. Low storage temperature can helps to reduce the drip loss of fish fillets.

On other hand, oxidative rancidity is one of the important factor that determines the acceptability of the fish during storage. Peroxide value is a measure of the degree of oxidation of the fat. In fatty fish this is the most important quality problem [5]. The concentration of peroxide is indicative of oxidation during the early stages of lipid deterioration.

However, fish is an extremely perishable food commodity. To prevent or reduce the rate of spoilage we can use some natural or synthetic extract on fillet, but synthetic antioxidants has been associated with certain health problems so, natural antioxidants are best option to extend the shelf life of stored product.

Here, we used ginger extract as an antioxidant agent to reduce the drip loss. Ginger is an aromatic stimulant and flavoring agent [1]. It also has anti-inflammatory and anti-oxidative properties for controlling the process of aging. The present study is designed investigate the effect of ginger extract in improving the stability, organoleptic changes and drip loss in Indian mackerel fish fillets.

The main objectives of this study was to evaluate the effectiveness of different solution of ginger extract on Indian mackerel fillets and to analyze the drip loss; Peroxide value (PV) and sensory evaluation in Indian mackerel fillets before and after dipping into the ginger extract.

II. MATERIALS AND METHODS

Fish (*Rastrelliger kanagurta*, Indian mackerel) were purchased from Veraval fish market. At first, wash the fish with potable water and clean it properly then each of the raw whole mackerel fish were cut into two equal parts, longitudinally, by cutting through the head to tail section and make the fillets then washed & allowed to drain. The fillets of fish were stored into freezer at -18 $\pm$ 2 $^{\circ}$C until use. Other ingredient such as fresh ginger *(Zingiber officinale)* was purchased from veraval market.

A. Generation of samples

Indian mackerel fish fillets were selected for this study. After making the fish fillets; preparation of ginger extract has done. To prepare the ginger extract, first fresh ginger was properly cleaned, washed and ground. Furthermore, filter paper was used to separate the extract from solid waste. Then make the different concentrated solution 0% (control), 1.0%, 2.0 % (200ml distilled water and 20ml ginger solution), 3.0% (300ml distilled water and 30ml ginger solution) respectively. The ginger extracts were stored in dark amber bottles until use. The fillets were coated with ginger extract and stored into chilled storage then analyzed it at 0 days, 2 days, 5 days and 8 days.

B. Analytical procedures

2.1 Determination of drip loss (%)

Drip loss of the treated and untreated fish fillets was measured according to the method; which was given by Sabow et al., 2015. To measure the drip loss, take the fish fillet samples at 0 day were weighted and recorded as initial weight (W1). The weighted samples were packed into polyethylene plastic bags, labeled, and stored into chilling storage. After 2, 5 and 8 day, the samples were removed from the bags, weighted and recorded as W2. Drip loss was measured and expressed as the percentage of difference between initial and final weight of sample after storage divided by the initial weight of the sample.

$$\textbf{Drip loss (\%)} = \frac{W1-W2}{W1} \times 100$$

2.2 Determination of peroxide value (meq/Kg)

The peroxide value is expressed in terms of mill-equivalent (meq) fee iodine per kilogram of fat. It is determined by titrating iodine liberated from Potassium Iodine with Sodium thiosulphate solution. Thus, determination of peroxide value of fish fillets was done by chemical method [2].

$$\textbf{Peroxide value (meq/1000 g)} = \frac{(S-B) \times N}{W} \times 1000$$

Where,
W = Weight of sample taken
S = Volume of sodium thiosulphate used for titration of sample
B = Volume of sodium thiosulphate used for titration of blank
N = Normality of sodium thiosulphate used

2.3 Sensory Evaluation

Five member experienced panel of judges including teachers and post graduate students of Department of Fish Processing Technology evaluated the samples for the sensory attributes viz. appearance, color, odor and overall acceptability using 5-point hedonic scale according to standard procedure [6]. Where, 5 = like very much and 1 = dislike very much.

III. RESULT

3.1 Drip loss

Table 1. Physical analysis includes the yield or drip loss (%) of control and ginger treated Indian mackerel fillets

Time period	Control (0%)	1%	2%	3%
2nd day	8.03 ± 0.64	6.66 ± 0.44	15.19 ± 0.45	3.92 ± 0.11
5th day	37.02 ± 0.59	26.50 ± 0.85	33.31 ± 0.70	25.19 ± 1.81
8th day	64.20 ± 1.59	57.93 ± 0.33	62.92 ± 1.02	55.92 ± 1.56

3.2 Peroxide value

Table 2. Chemical analysis includes peroxide value (meq/Kg) of control and ginger treated Indian mackerel fillets

Time period	Control (0%)	1%	2%	3%
2nd day	3.17 ± 0.15	2.30 ± 0.10	2.43 ± 0.15	2.03 ± 0.01

5th day	6.37 ± 0.35	5.45 ± 0.35	6.10 ± 0.09	5.34 ± 0.14
8th day	8.33 ± 0.09	6.33 ± 0.10	6.94 ± 0.08	5.09 ± 0.09

3.3 Sensory evaluation

Table 3. Sensory panel scores of control (C) and ginger-treated (1%, 2% & 3%) fillet samples during chilled storage

Storage (days) Components	**2nd day**			
	Control	**1%**	**2%**	**3%**
Appearance	4.25 ± 0.10	4.50 ± 0.40	4.17 ± 0.20	4.30 ± 0.09
Color	4.17 ± 0.09	4.21 ± 0.14	4.15 ± 0.10	4.18 ± 0.11
Odor	4.10 ± 0.10	4.33 ± 0.15	4.25 ± 0.20	4.29± 0.06
Overall acceptability	4.13 ± 0.10	4.26 ± 0.21	4.14 ± 0.10	4.19 ± 0.13

Storage (days) Components	**5th day**			
	Control	**1%**	**2%**	**3%**
Appearance	4.07 ± 0.09	4.37 ± 0.21	4.12 ± 0.11	4.22 ± 0.13
Color	3.87 ± 0.26	4.18 ± 0.13	3.96 ± 0.24	4.13 ± 0.11
Odor	3.75 ± 0.64	4.32 ± 0.27	4.17 ± 0.20	4.20 ± 0.16
Overall acceptability	3.67 ± 0.46	4.29 ± 0.09	4.08 ± 0.10	4.18 ± 0.25

Storage (days) Components	**8th day**			
	Control	**1%**	**2%**	**3%**
Appearance	3.40 ± 0.45	4.20 ± 0.27	3.85 ± 0.23	4.18 ± 0.21
Color	3.28 ± 0.26	4.15 ± 0.26	3.42 ± 0.19	4.09 ± 0.13
Odor	3.25 ± 0.21	4.30 ± 0.13	4.07 ± 0.09	4.21 ± 0.11
Overall acceptability	3.31 ± 0.06	4.21 ± 0.07	3.78 ± 0.33	4.16 ± 0.06

IV. CONCLUSION

From the result it is apparent that ginger extract is an imperative additive for the maintenance of fresh fillets which helps to increase the shelf life, inhibit the drip loss and rancidity of fillets. Ginger extract dip treatments were effective in increasing the color, odor and reduce other deterioration of fish fillets quality during chilled storage. So 3% ginger extract could be suggest improving the physical and chemical quality of fish fillets whereas, 1% ginger extract has good acceptance in sensorial quality of fish fillets in chilled storage condition.

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