Comparison of effect of *Zataria multiflora* and *Rosemarinus officinalis* extracts on quality of minced frozen silver carp

Fahimdezhban Y.[1*]; Motallebi A. A.[2]; Hosseini E.[1]; Khanipour A. A.[3]; Soltani M.[4]

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Abstract

The aim of the this study was to have a comparison between *Zataria multiflora* and *Rosemarinus officinalis* extractson quality of minced frozen silver carp preserved in cold storage temperature -18°C for six months.

In this research, one control and three treatments of minced silver carp were prepared as Tr1 (+ Zataria), Tr2 (+Rosemary) and Tr3 (mixed with Rosemary and Zataria) all in normal packaging. After quick freezing of samples in the spiral freezer they were preserved in cold storage temperature -18°C for six months.

In this period, the changes of Peroxide Value, Total Volatile Nitrogen, Tio Barbituric Acid and Free Fatty Acids in all treatments were measured based ona predetermined schedule. The results of this investigation showed a significant effect of anti-oxidant inall treatments ($p<.05$) and it was concluded that Rosemary containing anti-oxidants maintains the best quality after six months of cold storage and corruption indices are not exceeded. Analysis of Peroxide Value, Total Volatile Nitrogen, Tio Barbituric Acid and Free Fatty Acids in different treatments during six months of reservation in freezing under the temperature of -18°C showed that the obtained results to the end of the reservation period for all treatments has increased and treatment containing Rosemary, with Peroxide Value 6.83±0.35meq.1000g^{-1}, Tio Barbituric Acid 2.1±0.1mgMAL.kg^{-1} and Total Volatile Nitrogen with 19.16±0.28mg.100g $^{-1}$ had the best quality of preservation compared with other treatments during the preservation period. Therefore, based on these results and statistical analyses, the effect of anti-oxidant and time in all treatments is significant ($p<.05$) and the treatments containing Rosemary had the best quality preservation status in -18°C and did not surpass perishing criteria during this period.

Keywords: Extract, *Zataria multiflora,Rosemarinus officinalis,* Freezing, Quality, silvercarp

1-Science and Research Branch, Islamic Azad University, Tehran, Iran

2-Iranian Fisheries Research Organization, P.O.Box:14155-6116,Tehran, Iran

3-National Fish Processing Research Center, P.O.Box:43145-1655, Bandar Anzali, Iran

4-Department of Aquatic Animal Health, Faculty of Veterinary Medicine, University of Tehran, Tehran, Iran

*Corresponding author's email: Dr.Fahim79@yahoo.com

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Introduction

Since *Hypophthalmichthys molitrix* is not as delicious as fish to be high popular for direct human consumption, therefore, there is low interest for consumption by people in market and the statistics show the low value of this species. Consequently to increase the amount of consumption, it is proposed to have various fish products of it.

Today, production of minced fish which are not consumed much can be one of the ways to increase fish consumption (Asgharzadeh et al., 2006). Regarding that fish can be perishable fish and their products and the qualitative speedily change, the most important issue in this process is the prevention of changes or reduction in their rate of speed, which can be obtainable through alertness of the progress and rate of effect of changes on product elements (Fahimdezhban, 2008). On the other hand, due to the importance of consumer's health and the doubt regarding synthetic and chemical preservatives, scientists are trying to find new ways to improve the quality and shelf-life of fish products through eliminating and reducing preservatives, which are chemical and synthetic ingredients.

Since the industry of synthetic anti-oxidants for delaying lipid oxidation wasused, due to poordietary intakes and carcinogenic effects of these compounds, the use of natural anti-oxidants is of interest to researchers. One of these solutions is the use of medicinal plant extractsin food products, especially in fish meat. Considering the wealth of natural anti-oxidants, they can be used incombination with minced fish andby reducing lipid oxidation shelf-life can increase (Razavi Shirazi, 2001).

These types of compounds can use *Rosemarinus officinalis* and *Zataria multi flora* extractnoted because ofstrong anti-oxidants which are very applicable in the food industry and the properties of the compounds present in their structure. Anti-oxidant activity of extracts of Rosemary and Zataria has long been known during this period, much research has been done on the seplants, all of which confirmed their anti-oxidant activity, because of their strong anti-oxidant activity, free radical production chain with one hydrogen atom to break up fat oxide and subsequent delay. On the other hand, freezing and storage is one of the main methods for the maintenance of aquatic animals and nearly 30million tons of fish products in the market supply is usually frozen (FAO, 2010). By just using this method, we can maintain a relatively high level of qualified fish products.

This study was done in The National Fish Processing Research Center (NFPRC) in Bandar Anzali.

The aim of the this study was to comparison of *Zataria multiflora* and *Rosemarinus officinalis* extractson quality of minced frozen silver carp that they were preserved in cold storage temperature -18°C for six months.

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Materials and methods

To prepare samples, live silver carps with the size of 500-700g were purchased from fish farms in Bandar Anzali. Then the fish were transferred to NFPRC using chilled sea water tanks (CSW) with 2 to 1 in ratio ice and water. After weighing up, low temperature was main tained (less than 4°C) to start manufacturing operations. At this stage, after be heading and viscerating, the fish fillets were washed with clean water, then fillets inside deboner were placed and fish meat was separated from the bones. Finally, treatments were prepared after Alcoholic extraction followed the requirements of Zataria and Rosemary (Arashisar, 2008). According to the addition of selected concentrations to minced silver carp they were mixed.

In this research, one control and three treatments of minced silver carp were prepared, all in normal packaging as:

Tr1: minced silver carp
+ Zataria300mg.kg^{-1}
Tr2: minced silver carp
+ Rosemary200mg.kg^{-1}
Tr3: minced silver carp
+ mixed with Rosemary 100mg.kg^{-1} and Zataria 100mg.kg^{-1}

After quick freezing of samplesin the spiral freezer, they were preserved in cold storage temperature -18°C for six months.

In this period, the changes of Peroxide Value (PV), Total Volatile Nitrogen (TVN), Tio Barbituric Acid (TBA) and Free Fatty Acids (FFA) in all treatments were measured based on a predetermined schedule. Peroxide Value (PV), Total Volatile Nitrogen (TVN) and Tio Barbituric Acid (TBA) were determined according to the method of AOAC (2005), and Free Fatty Acid (FFA) was determined according to the method of Perlata et al. (2005).

Data analysis was done in SPSS software (release 17). To statistically analyze data, One-way and Two-way ANOVA were applied to determine the differences between control and three treatments data. The mean value compared using Duncan test at reliability l evel was 5%. Also, Kolmogorove smirnov test was used to determine the differences between data.

Results

As indicated in Figure 1, Peroxide value of different treatments were increased after during storage. Results showed that there was significant difference between Peroxidevalue for different treatments during six monthsstorage ($p<.05$). Also, investigation on the effect of time and anti-oxidant on the Peroxide value showed that there was significant in all treatments ($p<.05$). Results showed thatthe effect of natural anti-oxidants, especially, Rosemary with 6.83±0.35meq.1000g^{-1} has the best quality after six months storage.

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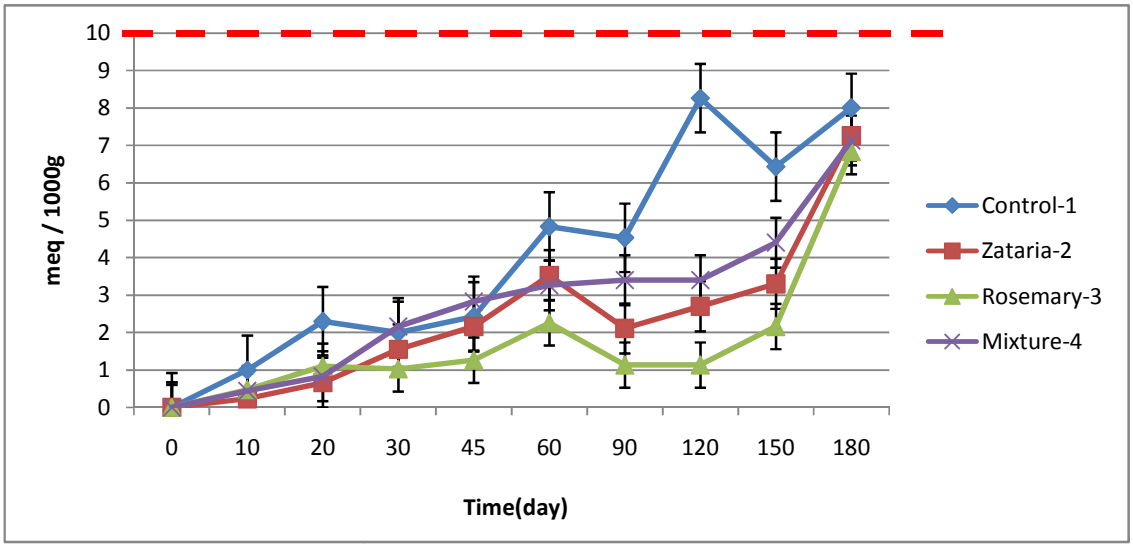

Figure 1: Trend of Peroxide Value changes in the different treatments in minced silver carp

Changes of Tio Barbituric Acid of samples are showed in Figure2. The TBA value in all treatments increased after the storage period and the control treatment after 10 day was excluded from the evaluation. There was significant difference between TBA value for different treatments during the six months storage ($p<.05$). Also, investigation on the effect of time and anti-oxidant on the TBA value showed that there was significant in all treatments ($p<.05$). The obtained results revealed that the effect of natural anti-oxidants, especially, Rosemary with 2.1±0.1 mgMAL.kg^{-1} has the best quality after six months of storage.

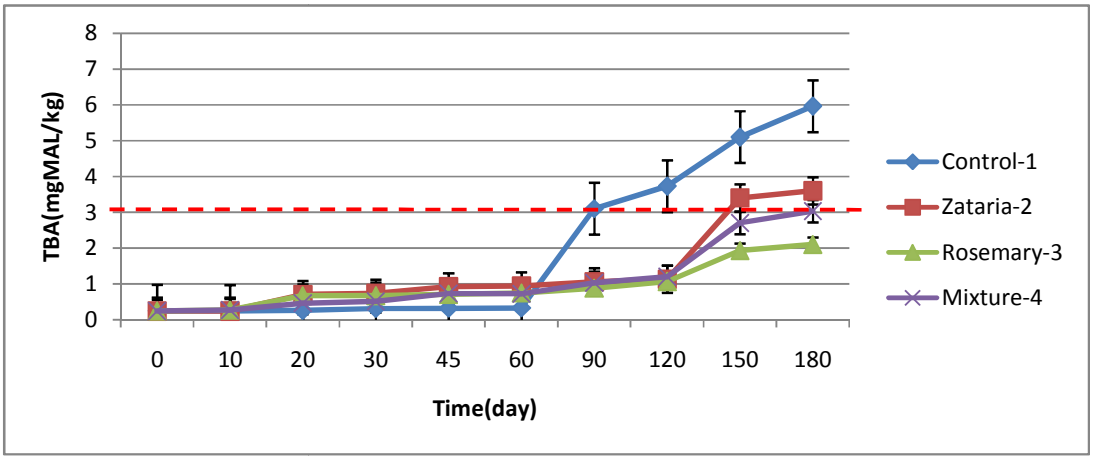

Figure 2: Trend of Tio Barbituric Acid changes in the different treatments in minced silver carp

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Figure 3 shows the changes of Free Fatty Acids of samples. Free Fatty Acids values of different treatments were increased after during storage. Results showed that the control treatment with 3.16 ± 0.001oleic acid has the low quality after six months storage. There was significant difference between Free Fatty Acids value for different treatments during six months of storage ($p<.05$).

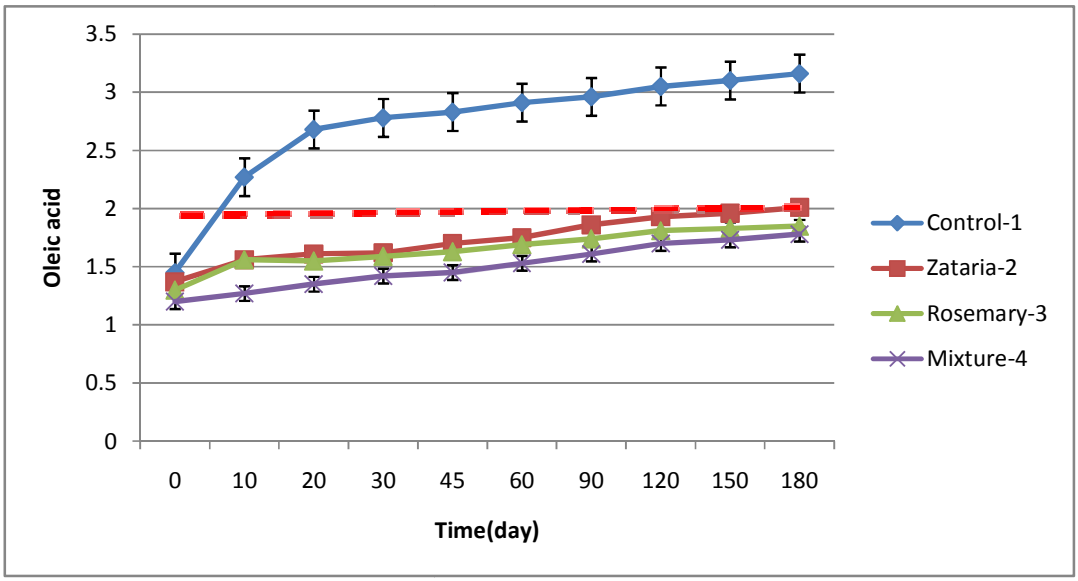

Figure 3: Trend of Free fatty acids changes in the different treatments in minced silver carp

Total volatile nitrogen value bases of all samples are presented in Figure 4. The TVN value in all treatments increased. There was significant difference between TVN value for different treatments during the six months storage ($p<.05$). Also, investigation on the effect of time and anti-oxidant on the TVN value showed that there was significant in all treatments ($p<.05$). Results showed that the effect of natural anti-oxidants, especially, Rosemary with 28.0±16.19 mg. $100g^{-1}$ has the best quality after the six months storage.

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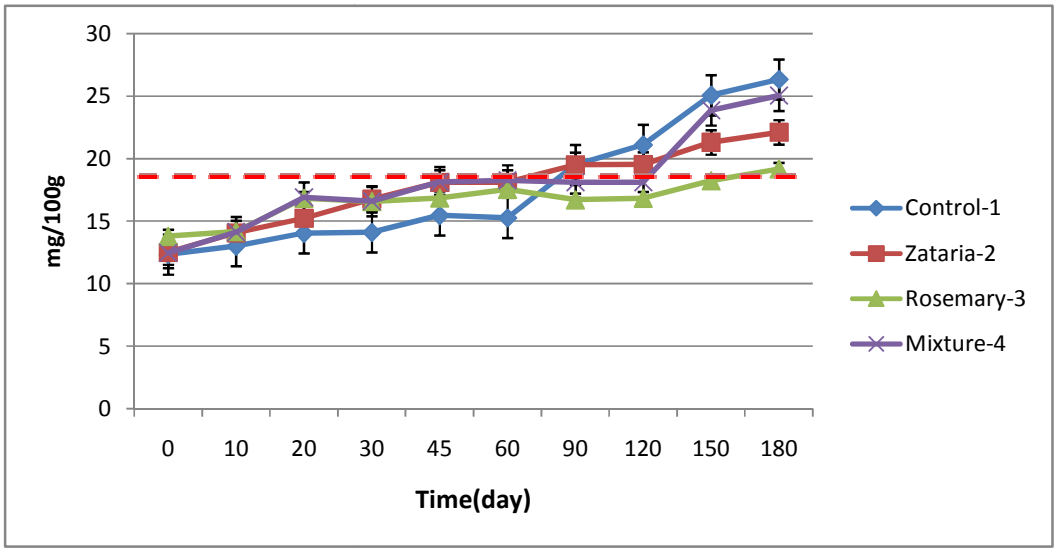

Figure 4: Trend of Total Volatile Nitrogen changes in the different treatments in minced silver carp

Discussion

Peroxide values of many researchers as one of the important parameters measured the fish oil corruption (Perse-Alonso et al., 2003). In the first stage of oxidation, the oxygen-binding intermediates to double bond unsaturated fatty acids, then peroxides areformed (LinandLin, 2005). Primary products of lipid oxidation and polyunsaturated fatty acids (PUFA) are hydroproxide, therefore, the primary oxidation flipid, is assessed by measuring peroxide concentration (Silva and Ammerman, 1993). Since peroxides have no flavor and aroma compounds can not be recognized by consumers (Ozyurt et al., 2007).Peroxide in fresh oil and fatty substances should be less than 5 times and less than 10 international financial methods. If the peroxide is between 10 and 20 with Lee method, an unpleasant taste and odorin the Oil appears. When peroxide is usually higher than 10mgeq.kg^{-1} of fish, people will not eat the product which is introduced. With this in mind, interms of all treatments during storage -18°C not exceeded other words, freezing and storage of fat oxidation has been postponed. The obtained results are in agreement with Fathi (2012); Peroxide production by the end of the study at Fathi, were equivalent to zero in two and five months. After the end of the treatments produced the only number was 3.54, and the other treatments listed below reported from the standard peroxide Fish Burger (maximum five) indicate the end of the fifth month of the product produced still maintained its quality. In another study, oxidative stability of *Sardina pilchardus* minced compared with treatments containing Rosemary extract and Onion extracts was determined by Serdaroglu and Felekoglu (2005). After a month of maintenance,

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treatment with Rosemary and Onion shad lower peroxide values and total peroxide was incontrol in most of the other treatments, and it was ultimately found that Rosemary extract with anti-oxidant property is better, which is consistent with the survey results.

Measuring parameters for determining thiobarbituric acid is a suitable indicator for lipid oxidation development and production of carbonyl compounds (Eun et al., 1994). Such compounds in fish, cause changes in the sensory character is tics such as taste and smell (Ladikos et al., 1990). Thiobarbituric acid is widely used as an indicator of fat secondary oxidation rate, anddue to the presence of TBA-reactive materials from these cond auto oxidation materials such as aldehydes and ketonesin which peroxide is oxidized (Lindasy, 1991). Based on the results of this study, Thiobarbituric acid (TBA) values achieved by the end ofthe storage period for all treatments showed significant increase compared with treatments ($p<.05$) after six months of storage. The TBA value of different treatments were increased after the storage period, this result is the same like obtained results by Jorjani, (2007) and Fathi, (2012). This increase was significant in several months and suggests the development of lipid oxidation is corrupt, and all treatments are standard ranges, that are consistent with these results. In another study oxidative stability of minced meat and sardine (*Sardina pilchardus*) compared with treatments containing Rosemary extract and onion extracts were determined by Serdaroglu and Felekogl (2005). After a month of maintenance treatment, Rosemary and Onion TBA values were less, and thiobarbituric acid control was more than the other treatments. Finally, it was found that Rosemary extract has anti-oxidant property which is better and the results are consistent.

After the death of fish, fat Hydrolytic enzymes can increase the amount of Free Fatty Acids in them; therefore, a good indicator for measuring FFA Lipolytic expression of enzymes of fatty fish and other meat products (Dragoev et al., 1998). Free Fatty Acids in fish muscle develop undesirable flavors and tissue damage caused by a combination of muscle protein. It also accelerates the degeneration and loss of product quality and increase of fat oxidation (Aubourg et al., 2002). In this study, the amount of Free Fatty Acids increased during the six months of storage in freezing conditions treatments showed significant difference compared ($p<.05$) after six months of storage, which is seen as a modelin the study of other researchers (Rezaei et al., 2002). Research results(Asgharzadeh et al., 2006) showed that Free Fatty Acids from fish meat *Hypophthalmichthys molitrix* has increased significantly in the past six months, which is consistent with the results of the investigation.

European Union TVN measurements of the sensory evaluation of doubt for many species of fish are considered. TVN is generally dependent on micro bacterial

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activity and corruption, the free amine bases of separate volatile acids are produced by bacterial enzymes (Cakliet al., 2006). TVN content includes a wide range of volatile compounds such as ammonia base methyl amine, dimethyl amine, three methyl amine and other similar compounds that are produced by microbial activity (Roriguez et al., 2008). TVN is widely used as an indicator to show the corruption of the flesh and surface. Usually mgTVN/100g of fish muscle as much attention is paid to the rotten meat (Fan et al., 2008). TVN determines the levels of corruption and the quality of the fish used during maintenance (Rhbein et al., 2009). Kimura and Kiamakura (1934) showed 20 mg TVN / 100g of fish muscle is to begin corruption and TVN of corrupted fish muscle is 30 mg TVN / 100g. According on the results obtained from this study, The TVN value in all treatments increased, that their cause is to the growth and activity of bacteria and enzymes inside fish. There was significant statistic difference between TVN value for different treatments during six months storage ($p<.05$). The same results were obtained by Mahmoudzadeh et al. (2012) and Fathi (2012). But the total amount of TVN in any of the treatments did not exceed the limit that is consistent with these results.

Based on chemical results and analysing statistical tests, the effect of anti-oxidant and time in all treatments is significant ($p<.05$) and the treatments containing Rosemary had the best quality preservation status in -18°C and did not surpass perishing criteria during this period.

In order to increase the shelf-life of frozen minced fish and reducing oxidative reactions of silver carp, *Rosemary officinalis* extract, can be used.

It is suggested that other natural extracts be compared with Rosemary extract for enhancing the shelf-life of frozen minced fish and reducing oxidative reactions in silver carp.

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