

Changes in Sensory Characteristics of Salted Mullet Fish Products during Storage at Room Temperature

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ABSTRACT

Changes in Sensory characteristics of salted Mullet fish products during storage at room temperature ($22\pm 2^{\circ}\text{C}$) for 105 days were evaluated. Organoleptic measurements include appearance, odour, texture, taste and overall acceptability. The high scores have got for treatments 20 % salt concentration at 45 and 60 days storage, 25% salt at 45 days and 15% salt at 30 days storage. Dry salted gutted fish samples have got high scores of sensory tests when compared to whole fish under the same conditions. Treatments 15% and 20% salt levels were rejected by panelists after 75 and 105 days storage, respectively while trail 25% salt was extended.

Keywords: salting process, sensory evaluation, storage period, and whole fish

INTRODUCTION

Salting techniques are simple and involve salt crystals or brine. There are three types of salting of fish: dry salting, wet salting and a combination of the two methods. Length of salting period as well as salt concentration depends on the expected final product. Salt uptake depends on many factors including the quality and chemical composition of raw material, species, muscle type, fish size, fillet thickness, weight, physiological state, salting method, brine concentration, duration of salting process and fish to salt ratio (Wang et al., 2000; Jittinandana et al., 2002; Barat et al., 2006; Bellagha et al., 2007; Gallart-Jornet et al., 2007). Sensory evaluation is considerable very important parameter to control of fish quality as raw and processed product.

Also, it plays a specific role as a repaid method for assessing the freshness, bedside physico-chemical and microbiological determinations. Organoleptic measurements are including the following parameters: appearance, flavor, texture, etc. which carried out by judgments (Connel and Shewan, 1980). The visual appearance of food and other biological products is a major factor in the judgment of

quality; visual inspection is an important part of quality control in industries (Hunter and Harold, 1987). It could be considered that flavor alone is main factor for purchasing more than texture. However, the texture is more important by some evidence for it on a relative bases (Sawyer et al., 1988).

Texture is one of the most important sensory characteristics that affect overall quality of fish (Kagawa et al., 2002). Therefore the objectives of this study are summarized in following up the changes in organoleptic evaluation of salted mullet fish products during storage at room temperature ($22\pm 2^{\circ}\text{C}$) for 105 days.

MATERIALS AND METHODS

Fish Samples

About 55 kg of Mullet fish (*Mugil cephalus*) were purchased from local landing center (Shakshouk, Fayoum) caught from Qaroun Lake. Average length and weight of fish samples were 31.3 cm and 246 g, respectively. After that, they were transported to Shakshouk Station for Fish Research, National Institute of Oceanography and Fisheries (NIOF) during December, 2011. The fish was quickly washed with tap water.

Edible Salt

Sodium chloride fine refined table (BONO) produced by Egyptian Salts and Minerals Company (EMISAL) was used. It composed of 98.5% sodium Chloride, 30-70 ppm, potassium iodate, and 0.3% humidity.

Plastic Containers and Polyethylene Bags

Queen containers (28×20×14cm) produced by Khorshed Plastic company and polyethylene bags were used.

Dry Salting Technique

Fresh Mullet fish samples were divided into two equal batches:

- **Whole fish batch:** Fish samples were washed with tap water; scales and fins were removed carefully using knife and washed again to get rid of muddy traces.
- **Gutted fish batch:** Fish samples were gutted manually by removing of viscera and tail fins and washed with tap water to remove any blood traces.

Treatments

Three treatments; 15, 20, 25 % salt concentrations (w/w) for both whole and gutted fish batches were done. Each batch was dry salted as follows: Different layers of fish with salt were well mixed as well as abdomen cavity and gills of fish were filled with salt and finally paked in polyethylene bags. In addition, the bottom and surface layers of salt were added. The polyethylene bags were put into plastic containers and tightly closed. All containers were covered by black polyethylene bags and stored at room temperature (22±2°C) for 105 days. Fig. (1) Shows Mullet fish dry salting steps.

Preparation of Samples for Analysis

Fresh mullet fish and salted samples picked in salt were picked up from the container, and the salt above the fish surface was completely removed. Then fresh and salted samples were beheaded, eviscerated, filleted and homogenated. The homogenate was subjected to analysis which was carried in duplicates.

Sensory Evaluation

Sensory evaluation of raw and salted Mullet fish was performed by ten panelists chosen from staff members of Shakshouk fish research station (NIOF). The organoleptic assessment of raw and salted Mullet fish was made according

the scale described by **Barile et al., (1985)**. This scale is:

1-2	rejected;	3-4	accepted;
5-6	good;	7-8	very good;
9-10	excellent.		

The characteristics acceptability which examined: acceptability, appearance, Odour, taste, texture.

Statistical Analysis

The statistical analysis was carried out according to SPSS version 10 software program 1999. Means and standard deviation (SD) measure by L.S.D at 5% level of significant.

RESULT AND DISCUSSION

The Organoleptic Evaluation of Salted Mullet Fish during Storage

Sensory characteristics are the main criteria that affect the consumer acceptability of food products. **Ibrahim, (1994)** said that it was important to evaluate the organolyptic properties of salted mullet fish that related with the prepared salted mullet fish to decide the acceptability of these products. Also, it is very important parameter to control the fish quality as a raw of processed product and it plays a specific role as a rapid method for assessing the freshness, beside physic-chemical and microbiological determinations. Organolyptic measurements include appearance, odour, texture, taste and overall acceptability (**Connel and Shewan, 1980**).

Appearance

Salted mullet fish products at levels of 15, 20 and 25% salt were evaluated for their sensory characteristics; appearance, odour, texture, taste and overall acceptability. Mean values of sensory evaluation data for appearance are tabulated in Table (1).

It was found that the scores in all salted mullet treatments (15, 20 and 25% salt) markedly decreased during storage from zero to 105 days either in whole or gutted fish. After 30 days the appearance scores were relatively high scores for trial 15% salt compared with trials 20 and 25 % salt in salted fish. After 75 days treatment 15% salt was rejected by panelists, while other treatments extended. In the same time at 105 days trial 20% was rejected while sample at 25% salt extended. Also, the decrease in salted whole fish was higher than salted gutted fish in all treatments. The present data are in

Changes in Sensory characteristics of Salted Mullet Fish Products during Storage at Room Temperature

accordance relatively with that reported by **Bellagha et al., (2007)** who found that 21%

brine Sardine salted fish were preferred for appearance, texture and overall acceptability.

Table1. Effect of ambient storage periods ($22\pm 2^{\circ}\text{C}$) for 105 days on Appearance scores ($M\pm SD$) of salted whole and gutted mullet fish products.

Storage period (day)	Salted mullet fish;					
	15 %		20%		25%	
	Whole	Gutted	Whole	Gutted	Whole	Gutted
0	9.5± 0.01	9.5± 0.01	9.5± 0.01	9.5± 0.01	9.5± 0.01	9.5± 0.01
15	6.71±0.23 ^a	7.25±0.35 ^a	6.63±0.38 ^a	6.77±0.19 ^a	6.35±0.20 ^a	6.44±0.28 ^a
30	6.63±0.30 ^a	6.92±0.24 ^a	6.55±0.34 ^a	6.72±0.10 ^{ab}	6.27±0.24 ^a	6.32±0.14 ^b
45	6.37±0.37 ^a	6.46±0.48 ^a	6.43±0.21 ^a	6.61±0.44 ^{ab}	6.15±0.26 ^a	6.25±0.07 ^b
60	5.21±0.14 ^a	5.67±0.17 ^a	6.13±0.12 ^a	6.22±0.14 ^b	6.07±0.22 ^b	6.12±0.02 ^b
75	R*	R	5.99±0.16 ^a	6.11±0.12 ^a	5.47±0.36 ^b	5.82±0.38 ^b
90			5.22±0.10 ^a	5.23±0.02 ^a	5.57±0.28 ^b	5.69±0.30 ^a
105			R	R	5.32±0.07 ^a	5.43±0.29 ^a

R: rejected SD: Standard Deviation. M: Mean.

Superscripts (a, b...) differ significant ($P\leq 0.05$).

Odor

Table (2) shows odor scores of salted mullet fish during ambient storage periods ($22\pm 2^{\circ}\text{C}$) for 105 days. After 15 days of storage, higher odor scores were given for treatment 20% salt level compared with other treatments 15 and 25% salt. After 30 days odor scores were relatively increased in all treatments especially in salted gutted fish. In the same time it was noticed that the increase in odor scores was higher in trial 20% than other treatments. After 45 days odor scores were decreased in trial 15% salt while it increased in other treatments (20 and 25% salt). Also it could be noticed that the increase in odor scores were higher in salted gutted fish than

salted whole fish. After 60 days odor scores were decreased in all treatments and the decrease was higher in trial 15% salt than other treatments. After 75 days trial 15% salt was rejected by panelists, while other treatments extended. At the same period trial 25% salt were given higher scores than trial 20% salt especially gutted salted fish, the same trend was observed at 90 days of storage.

After 105 days trial 20% salt was rejected by panelists, while trial 25% salt extended. The fluctuations observed in odor scores agreed same extent with **Abd El-mageed (1994)**, **Yasin (1997)** and **Bellagha et al., (2007)**.

Table2. Effect of ambient storage periods ($22\pm 2^{\circ}\text{C}$) for 105 days on Odor scores ($M\pm SD$) of salted whole and gutted mullet fish products.

Storage period (day)	Salted mullet fish;					
	15 %		20%		25%	
	Whole	Gutted	Whole	Gutted	Whole	Gutted
0	9.4± 0.05	9.4± 0.05	9.4± 0.05	9.4± 0.05	9.4± 0.05	9.4± 0.05
15	6.32±0.06 ^a	6.52±0.21 ^a	7.52±0.53 ^{ab}	7.63±0.52 ^{ab}	7.42±0.36 ^b	7.55±0.36 ^b
30	6.50±0.70 ^a	6.81±0.28 ^a	7.84±0.21 ^a	7.92±0.24 ^a	7.71±0.07 ^a	7.85±0.4 ^a
45	5.91±0.37 ^a	6.23±0.32 ^a	7.94±0.18 ^a	8.12±0.38 ^a	7.80±0.28 ^b	8.03±0.42 ^b
60	4.51±0.70 ^a	4.56±0.77 ^a	7.78±0.30 ^a	7.92±0.31 ^a	7.73±0.33 ^b	7.85±0.07 ^b
75	*R	R	7.12±0.10 ^b	7.42±0.12 ^b	7.72±0.16 ^a	7.78±0.11 ^a
90			5.88±0.52 ^b	5.91±0.12 ^b	7.30±0.42 ^a	7.42±0.45 ^a
105			R	R	6.12±0.02 ^b	6.21±0.12 ^a

R: rejected SD: Standard Deviation. M: Mean.

Superscripts (a, b...) differ significant ($P\leq 0.05$).

Texture

Table (3) shows texture scores of salted mullet fish during ambient storage ($22\pm 2^{\circ}\text{C}$) for 105 days. After 15 days storage, the high scores

were given for 20% salt level followed by 15% and 25% salt levels. In the same time, these scores level were markedly decreased in three treatments compared with zero time. After 30

Changes in Sensory characteristics of Salted Mullet Fish Products during Storage at Room Temperature

days, it could be observed that the texture scores were increased in all treatments, also the higher levels were given for trial 20% salt. After two months the texture scores were decreased in all treatments especially in trial 15% salt level. After 75 days trial 15% salt was rejected by panelists, while other treatments extended. After 90 days it could be observed that high scores

were given for trial 25% salt than 20% salt. After 105 days the trial 20% salt was rejected by panelists, while others extended. Generally, it could be noticed that the high texture scores were given for trial 20% salt during storage. These results agreed with that obtained by **Yasin (1997)**.

Table3. Effect of ambient storage periods ($22\pm 2^{\circ}\text{C}$) for 105 days on Texture scores ($M\pm SD$) of salted whole and gutted mullet fish products.

Storage period (day)	Salted mullet fish;					
	15 %		20%		25%	
	Whole	Gutted	Whole	Gutted	Whole	Gutted
0	9.0 \pm 0.16	9.0 \pm 0.16	9.0 \pm 0.16	9.0 \pm 0.16	9.0 \pm 0.16	9.0 \pm 0.16
15	7.30 \pm 0.02 ^a	7.63 \pm 0.25 ^a	7.50 \pm 0.70 ^a	7.92 \pm 0.39 ^a	7.09 \pm 0.14 ^a	7.26 \pm 0.36 ^a
30	7.75 \pm 0.35 ^a	8.05 \pm 0.07 ^a	7.90 \pm 0.28 ^a	8.22 \pm 0.29 ^a	7.33 \pm 0.46 ^a	7.51 \pm 0.70 ^a
45	7.79 \pm 0.21 ^a	8.15 \pm 0.21 ^a	7.93 \pm 0.32 ^a	8.25 \pm 0.35 ^a	7.35 \pm 0.49 ^a	7.53 \pm 0.43 ^a
60	6.06 \pm 0.08 ^b	6.13 \pm 0.04 ^c	7.84 \pm 0.22 ^a	8.11 \pm 0.14 ^b	7.26 \pm 0.36 ^a	7.48 \pm 0.11 ^a
75	*R	R	7.23 \pm 0.04 ^b	7.35 \pm 0.21 ^a	7.02 \pm 0.67 ^a	7.30 \pm 0.14 ^a
90			6.23 \pm 0.18 ^a	6.34 \pm 0.55 ^a	6.33 \pm 0.16 ^a	6.40 \pm 0.14 ^a
105			R	R	6.20 \pm 0.28 ^a	5.31 \pm 0.17 ^b

Taste

Salted mullet fish samples were evaluated for taste and results obtained are given in Table (4). It was noticed that the high scores were given for trial 20% salt level; it was 7.50 and 7.71 in salted whole and gutted fish after 15 days respectively. After 30 days the taste scores increased in all treatments especially in trial 20% salt which have high scores compared with other treatments. From the same Table (8) it could be found that salted gutted fish have

Higher scores than salted whole fish in all treatments. After 45 days the taste scores were decreased in trial 15% salt, while it increased in other treatments. After 75 days trial 15% was rejected by panelists, while other treatments extended. At the same period it was noticed that trial 20% salt were given higher scores than trial 25% salt. After 3 months higher scores were given to trial 25% than 20% levels. After 105 days trial 20% salt was rejected by panelists, while trial 25% salt extended.

Table4. Effect of ambient storage periods ($22\pm 2^{\circ}\text{C}$) for 105 days on Taste scores ($M\pm SD$) of salted whole and gutted mullet fish products

Storage period (day)	Salted mullet fish;					
	15 %		20%		25%	
	Whole	Gutted	Whole	Gutted	Whole	Gutted
0	9.1 \pm 0.32	9.1 \pm 0.32	9.1 \pm 0.32	9.1 \pm 0.32	9.1 \pm 0.32	9.1 \pm 0.32
15	6.26 \pm 0.36 ^a	6.45 \pm 0.49 ^b	7.50 \pm 0.56 ^a	7.71 \pm 0.14 ^a	6.50 \pm 0.70 ^a	6.70 \pm 0.42 ^{ab}
30	6.62 \pm 2.41 ^a	6.95 \pm 0.77 ^a	8.01 \pm 0.70 ^a	8.32 \pm 0.45 ^a	6.65 \pm 0.35 ^a	7.02 \pm 0.73 ^a
45	6.20 \pm 0.28 ^b	6.32 \pm 0.31 ^b	8.21 \pm 0.29 ^a	8.52 \pm 0.38 ^a	6.72 \pm 0.34 ^b	7.15 \pm 0.21 ^b
60	5.03 \pm 0.04 ^c	6.12 \pm 0.02 ^b	8.18 \pm 0.12 ^a	8.49 \pm 0.63 ^a	6.70 \pm 0.82 ^b	7.12 \pm 0.16 ^b
75	R	R	6.88 \pm 0.59 ^a	6.95 \pm 0.07 ^a	6.53 \pm 0.04 ^a	6.72 \pm 0.25 ^a
90			5.25 \pm 0.35 ^b	5.31 \pm 0.01 ^b	6.42 \pm 0.16 ^a	6.61 \pm 0.55 ^a
105			R	R	5.79 \pm 0.01 ^b	5.88 \pm 0.43 ^a

Overall Acceptability

Scores of salted mullet fish during ambient storage period ($22\pm 2^{\circ}\text{C}$) for 105 days. From the same Table it could be noticed that the high scores of acceptability were given for 20% salt level during storage, also the salted gutted fish was given higher scores than whole salted fish

in all treatments. After 45 days acceptability scores increased at 20 and 25% while decreased in salted mullet fish at 15%. After two months the acceptability scores decreased in all treatments. The sample salted at 15% was rejected after 75 days while sample salted at 20 % was rejected after the end of storage (105 days). finally it was noticed that panelists

Changes in Sensory characteristics of Salted Mullet Fish Products during Storage at Room Temperature

preferred salted mullet fish treated at 20% salt compared with the other treatments (15 and 25%

salt) because the 20% salt has the higher scores of acceptability.

Table 5. Effect of ambient storage periods for (22±2°C) 105 days on Overall acceptability scores (M±SD) of salted whole and gutted mullet fish products.

Storage period (day)	Salted mullet fish;					
	15 %		20%		25%	
	Whole	Gutted	Whole	Gutted	Whole	Gutted
0	9.2± 0.35	9.2 ± 0.35	9.2 ± 0.35	9.2 ± 0.35	9.2 ± 0.35	9.2 ± 0.35
15	6.65±0.76 ^a	6.96±0.41 ^a	7.29±0.41 ^b	7.51±0.69 ^{ab}	6.84±0.83 ^b	6.99±0.48 ^b
30	6.88±0.94 ^a	7.18±1.30 ^b	7.58±0.11 ^a	7.80±0.98 ^a	6.99±0.18 ^b	7.18±0.21 ^{ab}
45	6.57±0.80 ^a	6.79±0.65 ^a	7.63±0.35 ^a	7.88±0.35 ^{ab}	7.01±0.57 ^a	7.24±1.07 ^b
60	5.20±0.91 ^a	5.62±0.70 ^a	7.48±0.52 ^b	7.69±0.15 ^b	6.94±0.39 ^{ab}	7.14±0.35 ^b
75	R	R	6.81±0.52 ^a	6.96±0.57 ^a	6.69±0.72 ^b	6.91±0.12 ^a
90			5.65±0.48 ^a	5.70±0.60 ^a	6.41±0.73 ^a	6.53±0.59 ^b
105			R	R	5.86±0.35 ^a	5.71±0.41 ^a

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