

**EFFECT OF CANNED IN DIFFERENT PACKING SOLUTIONS  
ON QUALITY OF ROES COMMON CARP *CYPRINUS CARPIO L.*  
DURING STORAGE PERIOD**

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***Abstract***

Modifications in chemical quality [thiobarbituric acid TBA, total volatile bases nitrogen TVBN and trimethylamine nitrogen TMAN (mg./100g)], fatty acids and total bacterial count (TBC) as well as changes in traits, were studied in canned roes of common carp (*Cyprinus carpio l.*) treated with different packing solution: [salt solution (S.S), S.S + tomato sauce 3%, S.S + minced garlic 3% and S.S + tomato sauce / minced garlic 3%] during storage period at room temperature for 6 months.

During the storage period of canned roes common carp (*Cyprinus carpio l.*), chemical indices, fatty acids and bacterial count showed increasing trends till the end of storage period at room temperature for 6 months especially canned roes in : salt solution (S.S), S.S + tomato sauce (3%), S.S + minced garlic 3% and S.S + tomato sauce / minced garlic 3%].

Sensory evaluation scores of taste, flavour and overall acceptability were highest after canned roes immediately and they were considerably lower in the samples till the end of storage period at room temperature for 6 months especially canned roes in : salt solution (S.S), S.S + tomato sauce 3%, S.S + minced garlic 3% and S.S + tomato sauce / minced garlic 3% respectively.

The results showed that the best of these transactions canned of fish eggs packaged in S.S + tomato sauce / minced garlic 3%, followed by S.S + tomato sauce 3%, and S.S + minced garlic 3% , and then salt solution (S.S), respectively.

## INTORDUTION

Fish is widely consumed in many parts of the world because it has high protein content, low saturated fat and also contains omega fatty acids known to support good health. The chemical composition of fish flesh varies not only between species, but also between individuals depending on sex, age, feed, stage of maturity, environment, season and also muscle location. Fish is a major source of protein and it also contains nutritionally valuable lipids and fatty acids. It is widely consumed in many parts of the world because it has high protein content, low saturated fat and also contains omega fatty acids known as healthy food. Fish muscle consists of a series of amino acid compositions and is an unique source for nutrients and easily digestible protein. Ikem and Egiebor (2005). Fatty fish, especially herring *Clupea harengus* is rich in long chain polyunsaturated fatty acids, which make them susceptible to oxidation. Furthermore, herring appears to have higher oxidation rates than other fish species, perhaps due to higher activity of enzymatic oxidation Undeland *et al.* (1999).

Uriarte-Montoya *et al.* (2009) found that, quality of fresh Monterey sardine (*Sardinops sagax caurela*) muscle intended for canning was assessed in a local Mexican plant. Post harvest and processing times and temperatures were monitored at 5 different processing stages, in order to evaluate their impact on product quality and to compare their biochemical their chronological age. Postmortem muscle spoilage indices were analysed (pH, nitrogen from total volatile bases, trimethylamine, histamine, peroxide value, and thiobarbituric acid-reactive substances) and the *K* value was analysed as the freshness indicator. Inadequate temperature increments were detected during the canning process. Spoilage indices remained constant throughout the process, indicating that no deterioration occurred in the raw material. Concerning the *K* value, although sardine showed a good quality for canning, its freshness

reduction occurred 3 times faster than would otherwise occur under optimum handling conditions (0 °C), thus affecting (increasing) its biochemical age. Actual sardine management and treatment by the processor requires better control during the canning process, thus reducing their impact on the freshness and biochemical age of sardine intended for this process.

Periago *et al.* (2003) reported that, during storage of tuna roe TMA-N and TBVN levels increased significantly after the fourth week of storage at 30°C, whereas biogenic amine contents remained more or less constant. However, samples stored at 30°C showed histamine formation after the first week of storage, with a concentration of < 50 ppm. The volatile and nonvolatile amine concentrations in tuna roe were below the consumer safety limit, with the exception of the total biogenic amine level in roe stored at 30°C, which exceeded the European Community's recommended limit (300 ppm). These results indicate that in properly stored tuna roe, histamine formation will not represent a serious health risk to consumers unless the tuna roe has previously been mishandled. Thiobarbituric acid value (TBA) is widely used for measuring oxidative rancidity in fishery products. Fish is more susceptible to oxidative rancidity and off-flavor than other kinds of meat. This is mainly due to their higher content of polyunsaturated fatty acids. Autoxidation of lipids normally lead to the formation of hydro peroxides which are further degraded to different types of ketones and acids. Malonaldehydes is a secondary degradation product of the hydroperoxides and is considered one of the most successful components for the determination of fish spoilage.

Sheriand *et al.* (2005) decided that, the objective in the canning industry is the destruction of micro-organism, the commercially canned foods after processing contain some spores of highly heat-resistant organisms which under certain conditions can cause spoilage of these

products. A thermal process severe enough to ensure sterility may not be practicable because it would give an unacceptable products, ruining flavor or texture or both, moreover the nutritional value of food may be impaired. The antibiotic nisin was actually the first to be permitted in foods. It is produced by certain strains of *Streptococcus lactis*.

Beyza and Akif (2009) fish is sometimes eaten raw, but it is usually treated by various processes, such as boiling, grilling, baking, frying and canned before consumption. Heating (boiling, grilling, baking, frying and canned) is applied to food to enhance its flavor and taste, inactivate pathogenic microorganisms and increase shelf life. On the other hand, the use of the canned process has increased greatly during recent decades.

Kirschbaum *et al.* (2010) demonstrated that, caviar is the eggs or roe of sturgeon preserved with salt. It is prepared by removing the egg masses from freshly caught fish and passing them carefully through a fine mesh screen to separate the eggs and remove extraneous bits of tissue and fat. At the same time, 4-6 percent salt is added to preserve the eggs and bring out the flavor. Most caviar is produced in Russia and Iran from fish taken from the Caspian Sea, the Black Sea, and the Sea of Azov. It's average protein content varied between 26.2 and 31.1% (wet wt.) and fat content from 10.9 to 19.4% with lowest values for caviar from farmed sturgeon.

Manat *et al.* (2010) reported that, the white flesh fish muscle contains lipids less than the dark flesh fish muscle and usually possesses about 18–23% of protein, depending on the species and time of harvesting. The nutritional importance of fish consumption is in great extent associated with the content of omega-3 fatty acids.

The objective of the study is aimed at investigating of canned roes common carp (*Cyprinus carpio l.*) treated with different packing solution during storage period at room temperature for 6 months. The changes on

biochemical, microbial and organoleptic quality were compared in different packing solution during storage period at room temperature for 6 months.

## MATERIALS AND METHODS

### Sampling:

Fresh roes (Batarekh) removed from ovaries of common carp (*Cyprinus carpio l.*) obtained from Aquaculture Abbassa-Abou-Hammad –Sharkia Governorate, immediately after catching and transported to the laboratory. The samples were soaking in saturated salt solution with a little acetic acid (6%) and 1% sodium carbonate for 1 hr. After that, washing the fish roes (Batarekh) using tap water to remove the over salt. The fish roes (Batarekh) were packed in the cans. Stocks of packing solution were divided into the following four treatments trials: salt solution (S.S), S.S + tomato sauce 3%, S.S + minced garlic 3% and S.S + tomato sauce / minced garlic 3% (1:1v/w). A stock of salt packing solution was prepared from: sodium chloride 2.0% (w/w), 3.5% vinegar (6% conc.), 3% cotton seed oil and 1.5% spices mixture consists of 22.5% coriander, 7.5% cubeb, 15.0% cummin, 32.0% black pepper, 9.0% red pepper, 10.0% cardamon and 40.0% clove) were purchased from local market, Zagzig city. Thereafter, the fish roes (Batarekh) were canned in cans (capacity 140g each).

The roes cans were divided into the following four treatments trials:

- (1) 75.0gm. roes (Batarekh) and 25.0 ml. salt solution (S.S).
- (2) 75.0gm. roes (Batarekh), 25.0 ml. packing solution S.S + tomato sauce (3%)
- (3) 75.0gm. roes (Batarekh), 25.0 ml. packing solution S.S + minced garlic 3% .

(4) 75.0gm. roes (Batarekh), 25.0 ml. packing solution S.S + tomato sauce / minced garlic 3%.

Roes cans were pre-heated at 100°C for 30 min before being double seamed. Sterilization of the roes cans were performed at 121°C for 45min. After sterilization the cans were cooled for 30 min using cold water. After that, the cans were carefully dried and incubated for 21 days at 37°C. Then, the samples were stored at room temperature for 6 months, where after. Samples were periodically with drawn every month for analyses.

### **Analytical procedures:**

Thiobarbituric acid value (TBA) was estimated as described by Tarlagis *et al.* (1960). **Total volatile bases nitrogen (TVBN)**, and **Trimethylamine nitrogen (TMAN)** were determined according to the method recommended by the AMC (1979). **Total bacterial count (TBC)** was determined according to the method described by Swanson *et al.* (1992).

### **Fatty acids:**

Fatty acids were analyzed as described by Jeong *et al.* (2000). Fatty acid methyl ester (FAME) was derived by methylation with 14% BF<sub>3</sub> in methanol. The FAME composition of total lipids (TL) was analyzed using a gas-liquid chromatograph (Shimadzu GC14A; Shimadzu Seisakusho, Co. Ltd., Kyoto, Japan) equipped with an Omegawax 320 fused silica capillary column (30m x 0.32 mm, ID; Supelco, Bellefonte, PA, USA). Injection port and a flame-ionization detector were held at 250°C, and the column oven temperature was initially held at 180°C for 8 min and then programmed to a final temp. of 230°C at 3°C/min. Helium was used as a carrier gas at the constant column inlet pressure of 1.0 kg/cm<sup>2</sup> with a split ratio of 1:50. Peak assignments were carried out by comparison of retention times of authentic standards (Sigma Chemical Co., St Louis, MO, USA) as well as oyster fatty acids which had been

analyzed. Methyl tricosanoate (99%; Aldrich Chem. Co., Milwaukee, WI, USA) was used as an internal standard. This procedure was carried at the Central Laboratory, Faculty of Agriculture, Ain Shams University.

### **Organoleptic evaluation:**

Samples were organoleptically evaluated for taste, flavour and overall acceptability of roes. A group of 10 staff members of technology and quality control department, control laboratory for Aquaculture research abbassa abouhammad sharkia as judges were always called upon for scoring the organoleptic properties of the samples by given grades ranging from zero to 10 according to Teeny and Miyauchi (1972) as estimated by the following scheme:

<b>Score</b>	<b>Description</b>	<b>Score</b>	<b>Description</b>
10	Ideal	4	Fair
9	Excellent	3	Poorly fair
8	Very good	2	Poor
7	Good	1	Very poor
6	Fairly good	0	Repulsive
5	Acceptable		

### **Statistical analysis:**

Three replicates of each trial were performed for analysis. TBA, TVBN, TMAN, TBC and sensory data were statistically analyzed using ANOVA and means were separated by Duncan' test at a probability level of  $P < 0.05$  (SAS, 2000).

## **RESULTS AND DISSECTION**

Results presented in Table (1) indicated a gradual increase in thiobarbituric acid (TBA) value of canned roes of common carp (*Cyprinus carpio l.*) treated with different packing solution during storage period at room temperature for 6 months. Minimum of TBA was found in

canned roes treated with S.S + tomato sauce / minced garlic 3%. From the other side, there were insignificant differences ( $P < 0.05$ ) in TBA value between canned roes treated with different packing solution during storage period at room temperature for 6 months. Bonnell (1994) showed that, fish and fish products of good quality will have TBA-value less than 2 while poorer quality fish will have a TBA-value within 3 and 27. Fish with TBA greater than 2 will probably smell and taste rancid. These results are in agreement with those reported by Khuntia *et al.* (1993).

**Table 1:** Changes in thiobarbituric acid values (TBA) (mg. malonaldehyde / Kg.) of canned roes common carp (*Cyprinus carpio l.*) treated with different packing solution during storage period at room temperature for 6 months.

Treatment	Salt solution (S.S)	S.S + Tomato sauce (3%)	S.S + Minced garlic (3%)	S.S + (Tomato sauce / Minced garlic) 3%
Storage period (Months)	0	0.32±0.01 <sup>a</sup>	0.32±0.01 <sup>a</sup>	0.32±0.01 <sup>a</sup>
	1	0.55±0.01 <sup>a</sup>	0.44±0.02 <sup>a</sup>	0.39±0.02 <sup>a</sup>
	2	0.95±0.02 <sup>a</sup>	0.74±0.01 <sup>ab</sup>	0.81±0.01 <sup>ab</sup>
	3	1.30±0.03 <sup>a</sup>	1.10±0.03 <sup>ab</sup>	1.20±0.02 <sup>ab</sup>
	4	1.70±0.04 <sup>a</sup>	1.49±0.03 <sup>b</sup>	1.55±0.04 <sup>ab</sup>
	5	1.95±0.03 <sup>a</sup>	1.79±0.04 <sup>b</sup>	1.88±0.03 <sup>ab</sup>
	6	2.47±0.05 <sup>a</sup>	2.10±0.03 <sup>b</sup>	2.20±0.04 <sup>b</sup>

<sup>a-bc</sup> Means within a column with the same superscript significantly different ( $P < 0.05$ ).

Values are expressed as Mean ± SD.

### Total volatile bases nitrogen and trimethylamine nitrogen:

Results presented in Table (2 and 3) indicate that the formation of total volatile bases nitrogen TVBN and trimethylamine nitrogen TMAN (mg./100g) were affected by all treatments. Throughout storage a gradual increase in TVBN and TMAN occurred and were 3.65 and 1.86 (mg/100g) at zero time, respectively, then reached to 33.00, 30.41, 31.70 and 29.11 (mg/100g) for TVBN, and 16.55, 15.13, 15.43 and 14.70



(mg/100g) for TMAN of canned roes treated with different packing solution [salt solution (S.S), S.S + tomato sauce 3%, S.S + minced garlic 3% and S.S + tomato sauce / minced garlic 3% .] during storage period at room temperature for 6 months, respectively. From the other side, there was insignificant difference ( $P < 0.05$ ) in TVBN and TMAN values between canned roes treated with different packing solution. The lowest values TVBN and TMAN occurred in canned roes treated with S.S. + tomato sauce / minced garlic 3%. While maximum TVBN and TMAN were found in canned roes treated with packing salt solution (S.S.). Connel (1990) reported that the content of TVBN is a useful indicator of freshness of lean fish and suggested 30-40mg N/100g (on fresh weight basis) as the upper limit for fresh – water fish and marine fish, respectively. Also Maga (1978) reported that perfectly fresh fish had 3.37mg/100g of TMAN, good grade fish showed 3.79-5.90mg/100g, fair fish had 12.65-16.02mg/100g while spoiled fish contained as high as 59.01mg/100g. However, the increment in TVBN and TMAN during storage could be the result of decomposition and degradation of nitrogen substance which may be due to the activity of microorganisms. These results are in line with those obtained by Woyewoda and Bligh (1986); Khuntia *et al.* (1993) and Undeland *et al.* (1999).

**Table 2:** Changes in Total volatile basic nitrogen (TVBN) (mg./100g.) of canned roes common carp (*Cyprinus carpio l.*) treated with different packing solution during storage period at room temperature for 6 months.

Treatment	Salt solution (S.S)	S.S + Tomato sauce (3%)	S.S + Minced garlic (3%)	S.S + (Tomato sauce / Minced garlic) 3%
Storage period (Months)	0	3.65±0.03 <sup>a</sup>	3.65±0.03 <sup>a</sup>	3.65±0.03 <sup>a</sup>
	1	8.50±0.03 <sup>a</sup>	8.02±0.04 <sup>ab</sup>	8.37±0.04 <sup>a</sup>
	2	13.19±0.04 <sup>a</sup>	12.29±0.03 <sup>b</sup>	12.70±0.04 <sup>ab</sup>
	3	18.21±0.05 <sup>a</sup>	17.18±0.05 <sup>b</sup>	17.50±0.04 <sup>ab</sup>
	4	23.77±0.04 <sup>a</sup>	22.01±0.05 <sup>bc</sup>	22.60±0.03 <sup>b</sup>
	5	28.10±0.05 <sup>a</sup>	26.50±0.04 <sup>b</sup>	27.79±0.04 <sup>ab</sup>

	<b>6</b>	33.00±0.05 <sup>a</sup>	30.41±0.05 <sup>c</sup>	31.70±0.05 <sup>b</sup>	29.11±0.05 <sup>d</sup>
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<sup>a-d</sup> Means within a column with the same superscript significantly different (P<0.05).

Values are expressed as Mean ± SD.

**Table 3:** Changes in Trimethylamine nitrogen (TMAN) (mg./100g.) of canned roes common carp (*Cyprinus carpio l.*) treated with different packing solution during storage period at room temperature for 6 months.

Treatment		Salt solution (S.S)	S.S + Tomato sauce (3%)	S.S + Minced garlic (3%)	S.S + (Tomato sauce / Minced garlic) 3%
Storage period (Months)	<b>0</b>	1.86±0.01 <sup>a</sup>	1.86±0.01 <sup>a</sup>	1.86±0.02 <sup>a</sup>	1.86±0.02 <sup>a</sup>
	<b>1</b>	4.40±0.02 <sup>a</sup>	3.18±0.02 <sup>bc</sup>	3.31±0.03 <sup>b</sup>	2.89±0.02 <sup>c</sup>
	<b>2</b>	5.57±0.03 <sup>a</sup>	4.25±0.03 <sup>bc</sup>	4.50±0.03 <sup>b</sup>	4.00±0.02 <sup>c</sup>
	<b>3</b>	8.41±0.04 <sup>a</sup>	7.05±0.03 <sup>bc</sup>	7.30±0.03 <sup>b</sup>	6.89±0.03 <sup>c</sup>
	<b>4</b>	11.00±0.05 <sup>a</sup>	9.75±0.05 <sup>c</sup>	10.00±0.05 <sup>b</sup>	9.40±0.04 <sup>cd</sup>
	<b>5</b>	13.51±0.04 <sup>a</sup>	12.00±0.04 <sup>bc</sup>	12.39±0.05 <sup>b</sup>	11.25±0.05 <sup>c</sup>
	<b>6</b>	16.55±0.06 <sup>a</sup>	15.13±0.06 <sup>bc</sup>	15.43±0.05 <sup>b</sup>	14.70±0.06 <sup>c</sup>

<sup>a-cd</sup> Means within a column with the same superscript significantly different (P<0.05).

Values are expressed as Mean ± SD.

### Fatty acids composition:

The results in Table (4) showed saturated fatty acids composition (%) of canned roes treated with different packing solution [salt solution (S.S), S.S + tomato sauce (3%), S.S + minced garlic 3% and S.S + tomato sauce / minced garlic 3% .] during storage period at room temperature for 6 months. It is evident that packing salt solution had 46.2% saturated fatty acids, while in other treatments there were 43.0, 44.4 and 41.4% for canned roes treated with different packing solution [S.S + tomato sauce, S.S. + minced garlic 3% and S.S.+ tomato sauce / minced garlic 3% ] treatments, respectively. Monounsaturated fatty acids compositions (%) were 33.3, 31.5, 32.5 and 29.5%, respectively. Polyunsaturated fatty acids compositions (%) were 17.4, 15.4, 20.0 and 24.5%, respectively. These

results are in harmony with those obtained by Wu and Lillard (1998); Cengarle *et al.* (2000) and Jeong *et al.* (2000).

**Table 4:** Fatty acid (%) of canned roes common carp (*Cyprinus carpio l.*) treated with different packing solution salt solution, tomato sauce, minced garlic and tomato sauce / minced garlic.

		Salt solution (S.S)	S.S + Tomato sauce (3%)	S.S + Minced garlic (3%)	S.S + (Tomato sauce / Minced garlic) 3%
<b>Saturated</b>					
Lauric	12:0	0.4	0.4	0.3	0.4
Tridecanoic	13:0	0.2	0.2	0.2	0.4
Miristic	14:0	4.3	4.6	3.1	4.0
Palmitic	16:0	27.5	26.9	28.0	24.9
Heptadecanoic	17:0	1.4	1.2	1.4	1.5
Stearic	18:0	11.6	9.1	11.0	10.2
Heneicosanoic	21:0	0.5	0.4	0.3	0.0
Behenic	22:0	0.3	0.2	0.1	0.0
Σ		46.2	43.0	44.4	41.4
<b>Monounsaturated</b>					
Miristoleic	14:1	1.7	1.7	1.9	2.2
Palmitoleic	16:1	5.3	0.5	4.0*	4.7
cis-10 Heptadecanoic	17:1	0.8	0.7	0.5	1.0
Elaidic	18:1 9t	2.6	2.7	2.2	2.5
Oleic	18:1 9c	22.7	25.6	23.6	19.1
Vacenic	18:1 7c	0.2	0.3*	0.3	0.0
Σ		33.3	31.5	32.5	29.5
<b>Polyunsaturated</b>					
Linoleic	18:2 ω6	3.5	4.8	4.6	5.5
α-Linolenic	18:3 ω3	1.4	2.1	1.5	2.1
cis-11,14 Eicosadienoic	20:2	0.8	1.1	1.2	1.1
Cis 8,11,14 Eicosatrienoic	20:3 ω6	1.0	0.6	0.8	1.0
cis-11,14,17 Eicotrienoic	20:3	0.1	0.3	0.3	0.4
<b>Eicosatrienoic</b>					
Arachidonic	20:4 ω6	4.9	2.2	4.0	6.1
cis-13,16 Docosadienoic	22:2	0.3	0.5	0.4	0.4
EPA	20:5 ω3	0.8	0.6	0.9	1.0
DHA	22:6 ω3	4.8	3.2	6.3	6.9
Σ		17.4	15.4	20.0	24.5
Not identified		5.0	4.3	3.1	4.5

**Total bacterial count:**

Results presented in Table (5) indicate that maximum of total bacterial count (TBC) was affected by all treatments. Throughout storage, a gradual increase in TBC occurred was 1.36 Log<sub>10</sub> CFU/g at zero time, then reached to 3.46, 3.20, 3.30 and 2.90 Log<sub>10</sub> CFU/g for TBC, of canned roes treated with different packing solution [salt solution (S.S), S.S + tomato sauce 3%, S.S + minced garlic 3% and S.S + tomato sauce / minced garlic 3% .] during storage period at room temperature for 6 months, respectively. From the other side, there were significant different (P< 0.05) in TBC Log<sub>10</sub> CFU/g between canned roes treated with different packing solution [salt solution (S.S), S.S + tomato sauce 3%, S.S + minced garlic 3% and S.S + tomato sauce / minced garlic 3% .] during storage period at room temperature for 6 months. These results coincide with those given by Mendonca *et al.* (1989); Khuntia *et al.* (1993); Kim *et al.* (1995); Zhuang *et al.* (1996) and Marshall and Jindal (1997).

**Table 5:** Changes in Total bacterial count (Log<sub>10</sub> CFU/g) of canned roes common carp (*Cyprinus carpio l.*) treated with different packing solution during storage period at room temperature for 6 months.

Treatment		Salt solution (S.S)	S.S + Tomato sauce (3%)	S.S + Minced garlic (3%)	S.S + (Tomato sauce / Minced garlic) 3%
Storage period (Months)	0	1.36±0.01 <sup>a</sup>	1.36±0.01 <sup>a</sup>	1.36±0.01 <sup>a</sup>	1.36±0.01 <sup>a</sup>
	1	1.67±0.02 <sup>a</sup>	1.40±0.02 <sup>ab</sup>	1.50±0.01 <sup>ab</sup>	1.29±0.02 <sup>b</sup>
	2	2.00±0.01 <sup>a</sup>	1.74±0.02 <sup>b</sup>	1.89±0.02 <sup>ab</sup>	1.63±0.02 <sup>b</sup>
	3	2.42±0.03 <sup>a</sup>	2.24±0.03 <sup>b</sup>	2.30±0.02 <sup>ab</sup>	2.09±0.02 <sup>c</sup>
	4	2.80±0.02 <sup>a</sup>	2.50±0.02 <sup>bc</sup>	2.65±0.03 <sup>b</sup>	2.30±0.03 <sup>c</sup>
	5	3.20±0.03 <sup>a</sup>	2.95±0.04 <sup>bc</sup>	3.08±0.04 <sup>b</sup>	2.79±0.04 <sup>c</sup>
	6	3.46±0.05 <sup>a</sup>	3.20±0.05 <sup>bc</sup>	3.30±0.04 <sup>b</sup>	2.90±0.05 <sup>c</sup>

<sup>a-c</sup> Means within a column with the same superscript significantly different (P<0.05).

Values are expressed as Mean ± SD.

### Sensory Evaluation:

Results in Tables (6, 7 and 8) shows that the changes in taste, flavor and over all acceptability of canned roes treated with different packing solution [salt solution (S.S), S.S + tomato sauce 3%, S.S + minced garlic 3% and S.S + tomato sauce / minced garlic 3% .] during storage period at room temperature for 6 months. Taste, flavor and over all acceptability significantly decreased ( $P < .05$ ) during storage of all treated samples. The higher scores at zero day of storage period. The highest grade occurred in canned roes treated with S.S + tomato sauce / minced garlic 3% showed at the end of storage period.

The gradual decrease in taste, flavor and over all acceptability throughout storage could be attributed to the protein hydrolysis and its derogative products (TVBN) and fat oxidation which are considered major factors of changes in organoleptic properties. These results are in agreements with those given by Woyewoda and Bligh (1986); Mendonca *et al.* (1989); Khuntia *et al.* (1993) and Kim *et al.* (1995).

**Table 6:** Changes in Taste of canned roes common carp (*Cyprinus carpio l.*) treated with different packing solution during storage period at room temperature for 6 months.

Treatment		Salt solution (S.S)	S.S + Tomato sauce (3%)	S.S + Minced garlic (3%)	S.S + (Tomato sauce / Minced garlic) 3%
Storage period (Months)	0	9.0±0.01 <sup>a</sup>	9.0±0.01 <sup>a</sup>	9.0±0.01 <sup>a</sup>	9.0±0.01 <sup>a</sup>
	1	8.1±0.02 <sup>b</sup>	8.5±0.01 <sup>ab</sup>	8.3±0.01 <sup>a<sup>b</sup></sup>	8.8±0.02 <sup>a</sup>
	2	7.7±0.02 <sup>b</sup>	8.3±0.01 <sup>ab</sup>	8.1±0.01 <sup>a<sup>b</sup></sup>	8.5±0.01 <sup>a</sup>
	3	6.5±0.03 <sup>c</sup>	7.6±0.03 <sup>ab</sup>	7.4±0.02 <sup>b</sup>	8.0±0.02 <sup>a</sup>
	4	5.8±0.04 <sup>c</sup>	6.8±0.03 <sup>ab</sup>	6.7±0.04 <sup>b</sup>	7.5±0.03 <sup>a</sup>
	5	5.3±0.03 <sup>c</sup>	6.1±0.04 <sup>b</sup>	5.9±0.03 <sup>b<sup>c</sup></sup>	7.0±0.04 <sup>a</sup>
	6	5.0±0.05 <sup>c</sup>	5.6±0.03 <sup>b</sup>	5.3±0.04 <sup>b<sup>c</sup></sup>	6.5±0.03 <sup>a</sup>

<sup>a-c</sup> Means within a column with the same superscript significantly different ( $P < 0.05$ ).

Values are expressed as Mean ± SD.

**Table 7:** Changes in Flavor of canned roes common carp (*Cyprinus carpio l.*) treated with different packing solution during storage period at room temperature for 6 months.

Treatment		Salt solution (S.S)	S.S + Tomato sauce (3%)	S.S + Minced garlic (3%)	S.S + (Tomato sauce / Minced garlic) 3%
Storage period (Months)	0	9.0±0.03 <sup>a</sup>	9.2±0.03 <sup>a</sup>	9.1±0.03 <sup>a</sup>	9.2±0.03 <sup>a</sup>
	1	8.0±0.03 <sup>b</sup>	8.5±0.04 <sup>a</sup> <sup>b</sup>	8.3±0.04 <sup>ab</sup>	8.9±0.05 <sup>a</sup>
	2	7.7±0.04 <sup>b</sup>	8.4±0.03 <sup>a</sup> <sup>b</sup>	8.0±0.03 <sup>ab</sup>	8.6±0.04 <sup>a</sup>
	3	7.0±0.05 <sup>b</sup>	7.7±0.04 <sup>a</sup> <sup>b</sup>	7.5±0.04 <sup>ab</sup>	8.0±0.05 <sup>a</sup>
	4	6.3±0.04 <sup>b</sup>	6.9±0.05 <sup>a</sup> <sup>b</sup>	6.7±0.03 <sup>ab</sup>	7.5±0.05 <sup>a</sup>
	5	5.5±0.05 <sup>c</sup>	6.2±0.04 <sup>b</sup>	5.8±0.03 <sup>bc</sup>	7.0±0.04 <sup>a</sup>
	6	5.0±0.05 <sup>c</sup>	5.5±0.05 <sup>b</sup>	5.3±0.05 <sup>bc</sup>	6.7±0.05 <sup>a</sup>

<sup>a-c</sup> Means within a column with the same superscript significantly different (P<0.05).

Values are expressed as Mean ± SD.

**Table 8:** Changes in Overall acceptability of canned roes common carp (*Cyprinus carpio l.*) treated with different packing solution during storage period at room temperature for 6 months.

Treatment		Salt solution (S.S)	S.S + Tomato sauce (3%)	S.S + Minced garlic (3%)	S.S + (Tomato sauce / Minced garlic) 3%
Storage period (Months)	0	9.0±0.01 <sup>a</sup>	9.1±0.01 <sup>a</sup>	9.1±0.01 <sup>a</sup>	9.2±0.01 <sup>a</sup>
	1	8.1±0.02 <sup>b</sup>	8.6±0.02 <sup>ab</sup>	8.4±0.03 <sup>ab</sup>	8.9±0.02 <sup>a</sup>
	2	7.8±0.04 <sup>b</sup>	8.3±0.03 <sup>ab</sup>	8.2±0.03 <sup>ab</sup>	8.5±0.02 <sup>a</sup>
	3	7.0±0.05 <sup>bc</sup>	7.5±0.03 <sup>ab</sup>	7.3±0.03 <sup>b</sup>	7.9±0.03 <sup>a</sup>
	4	6.3±0.04 <sup>c</sup>	6.8±0.03 <sup>b</sup>	6.6±0.04 <sup>bc</sup>	7.5±0.03 <sup>a</sup>
	5	5.3±0.04 <sup>c</sup>	5.9±0.04 <sup>b</sup>	5.5±0.03 <sup>bc</sup>	6.9±0.04 <sup>a</sup>
	6	5.0±0.05 <sup>c</sup>	5.4±0.04 <sup>b</sup>	5.2±0.05 <sup>bc</sup>	6.6±0.05 <sup>a</sup>

<sup>a-c</sup> Means within a column with the same superscript significantly different (P<0.05).

Values are expressed as Mean  $\pm$  SD.

## CONCLUSION

Chemical indices, fatty acids, bacterial count and sensory evaluation scores of, (taste, flavour and overall acceptability) of canned roes common carp (*Cyprinus carpio l.*) (Batarekh) treated with different packing solution [salt solution (S.S), S.S + tomato sauce 3%, S.S + minced garlic 3% and S.S + tomato sauce / minced garlic 3% .] during storage period at room temperature for 6 months were highest after canned roes immediately and they were considerably lower in the samples tell the end of storage period at room temperature for 6 months especially canned roes in salt solution S.S., S.S. + minced garlic 3% and S.S. + tomato sauce compared with canned roes treated with packing solution S.S. + tomato sauce / minced garlic 3% respectively. Accordingly treatment canned with S.S + tomato sauce / minced garlic 3% is the best treatment to extend shelf-life of roes during storage at room temperature for 6 months.

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## تأثير التعليب في محاليل تعبئه مختلفة على جودة بطارخ اسماك المبروك العادى خلال فترة التخزين

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### الملخص العربى

أظهرت نتائج هذه الدراسة، أن خواص الطزاجة الكيمائية (حمض الثيوباريتيوريك، القواعد النيتروجينية الكلية الطيارة والأمين ثلاثى الميثيل) والاحماض الدهنية والمحتوى البكتريولوجى (العدد الكلى للبكتريا) لبطارخ اسماك المبروك العادى المعلبة والمعبأة فى محاليل مختلفة (محلول ملحي، محلول ملحي مضاف اليه مفروم الثوم 3%، محلول ملحي مضاف اليه صلصة الطماطم 3%، محلول ملحي مضاف اليه 3% من مخلوط مفروم الثوم : صلصة الطماطم بنسبة 1:1 وزن/حجم). أظهرت قيم تلك الخواص ارتفاعا تدريجيا في جميع المعاملات خلال فترة التخزين على درجة حرارة الغرفة لمدة ستة اشهر وبخاصة البطارخ المعلبة فى محلول ملحي يتبعها المعلبة فى محلول ملحي مضاف اليه مفروم الثوم 3% ثم المعلبة فى محلول ملحي مضاف اليه صلصة الطماطم 3% ثم المعلبة فى محلول ملحي مضاف 3% من مخلوط مفروم الثوم : صلصة الطماطم بنسبة 1:1 حجم/حجم. كما أظهرت قيم الخواص الحسية (الطعم، الرائحة، والقابلية العامة) أعلى درجاتها للعينات بعد التعليب مباشرة، بينما أظهرت انخفاضا معنويا بعد التخزين على درجة حرارة الغرفة لمدة 6 شهور ، وبخاصة البطارخ المعلبة فى محلول ملحي يتبعها المعلبة فى محلول ملحي مضاف اليه مفروم الثوم 3% ثم المعلبة فى محلول ملحي مضاف اليه صلصة الطماطم 3% ثم المعلبة فى محلول ملحي مضاف 3% من مخلوط مفروم الثوم : صلصة الطماطم بنسبة 1:1 حجم/حجم. على الترتيب.

اظهرت النتائج ان افضل المعاملات تلك المعلبات من بيض السمك المعبأ فى المخلوط من الطماطم والثوم يليها المعبأه فى الطماطم ثم الثوم ثم المحلول الملحي على الترتيب.