

Changes in Nutritional Factors of Freezed Kutum (*Rutilus frisii kutum*)

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Abstract: In this survey, protein, fat, wet, pH and ash in fresh and frozen kutum (*Rutilus frisii kutum*) stored in -18°C in period of 4 months were examined. Three samples of fresh kutum (immediately after fishing) and 21 samples stored in -18°C for 15, 30, 45, 60, 80, 100 and 120 days were investigated as AOAC reference for nutritive factors. The results showed that the value of protein, fat and wet in zero time (fresh Kutum) were 18.96%, 6.16% and 73.68% respectively that reached to 18.7%, 4.78% and 71.4% respectively in frozen Kutum after 120 days. These show that the amount of above factors decline in frozen fish. The value of PH in fresh and frozen Kutum (zero and 120 days of storage) was 6.35 and 6.75 respectively. Percent of ash have been changed in different time. Maximum and minimum of ash was 1.10% (day 100) and 1.01% (day 30).

Key words: Physical parameters • Chemical parameters • *Rutilus frisii kutum* • Nutritional value

INTRODUCTION

Fish freshness is the most important and fundamental single criterion for judging the quality of fish and fishery products. The loss of freshness and quality depends on many factors, including the fish species, handling conditions and storage temperature. One of the most important and economic aquatics of Caspian Sea is Kutum (*Rutilus frisii kutum*) which devoted approximately 44 % of bony fish catch in 2006 (9631 tons) (Deputy of production and exploration, 2007). Due to high captured fish, its transportation and maintaining has special importance. One method to increase food shelf-life is using freezing system. However, some chemical process is occurred in freeze temperature [1]. Generally, different chemical parameters affected on deterioration rate of fish are rancidity, protein denaturation, muscle color change, wet decrease and PH changes that some mentioned factors are caused to decreasing of quality in frozen fish. In this research, some of physical and chemical indications such as protein, fat, wet and ash in fish stored in -18°C were studied.

MATERIALS AND METHODS

Captured Kutum caught from Goharbaran sophisticated breeding center in Sari during spawning season in February until March 2007. Twenty four

samples including 3 fresh fish (as control) and 21 fish stored in -18°C were examined. Sampling was done as random and from fish ranging length and weight approximately equal (weight 450 ± 20 g and length 35 ± 5 cm). Fish were put in ice layers and 3 samples were transported to the Caspian Sea Ecological Research institute laboratory and 21 samples were transported to the Parastoo Co. to freezing and maintain in cold storage (-18°C). Three fresh samples and samples maintained in -18°C for 15, 30, 45, 60, 80, 100, 120 days were examined for protein, fat, wet, PH and ash. Protein and fat percent were examined with Kjedal and Soksele methods respectively. High temperature ($103\pm 2^{\circ}\text{C}$), electrical oven and PH meter were used for wet, ash and PH respectively [2].

Data for the different parameters were analyzed using one-way ANOVA method ($p < 0.05$). Comparison of means was performed using a least-significant difference (TUKEY) test.

RESULTS

Mean of total protein percent in Kutum maintained in -18°C were 18.87 % and 0.22 % and ranged between 18.57% and 19.37% (Table 1). The highest and least concentrations of protein were 45 and 60 days after catch respectively. Total protein value, in different time, was not significant.

Table 1: Mean of total protein percent in Kutum stored in -18°C

Storage time (day)	0.00	15.00	30.0	45.0	60.00	80.00	100.00	120.00
Protein (%)	18.96	18.93	18.8	19.1	18.59	18.97	18.88	18.8

Table 2: Mean of total fat percent in Kutum stored in -18°C

Storage time (day)	0.00	15.0	30.00	45.00	60.00	80.00	100.00	120.00
Fat (%)	6.16	6.1	5.83	5.66	5.43	5.24	5.06	4.78

Table 3: Mean of wet percent in Kutum stored in -18°C

Storage time (day)	0.00	15.00	30.00	45.00	60.00	80.00	100.00	120.00
Wet (%)	73.68	73.55	73.47	73.41	73.34	72.55	72.32	71.49

Table 4: Mean of pH value in Kutum stored in -18°C

Storage time (day)	0.0	15.00	30.00	45.00	60.00	80.00	100.00	120.00
pH	5.6	6.41	6.40	6.42	6.48	6.50	6.56	6.74

Table 5: Mean of ash percent in Kutum stored in -18°C

Storage time (day)	0.00	15.00	30.00	45.00	60.00	80.00	100.0	120.00
Ash (%)	1.09	1.04	1.01	1.03	1.03	1.08	1.1	1.09

Mean of total fat percent in Kutum stored in -18°C were 5.53 % and 0.49 % and ranged between 4.78% and 6.16 % (Table 2). The highest and least concentrations of fat were zero and 120 days after catch respectively. Total fat value, in different time, was not significant.

Mean of wet percent in Kutum stored in -18°C were 73.04 % and 0.64 % and ranged between 71.89% and 73.86% (Table 3). The highest and least percent of wet were zero and 120 days after catch respectively. Wet percent, in different time, was not significant.

Mean of pH value in Kutum stored in -18°C were 6.4 and 0.11 and ranged between 6.3 and 6.7 (Table 4). The highest and least values of pH were zero and 120 days after catch respectively. pH value, in different time, was significant.

Mean of ash percent in Kutum stored in -18°C were 1.07 % and 3.95 % and ranged between 0.99 and 1.11% (Table 5). Ash percent was more than in 100 days after catch. Ash value, in different time, was not significant difference.

DISCUSSION

Huss showed that denaturation of protein occur when fish store in freezing temperature for long time [3]. According to Connell, following forming of ice crystals, minerals intensity increase in muscle cells which result in pH and ionic power changes and subsequently protein forms [4]. In this research, protein changes in frozen Kutum were very limited and statistical analysis did not showed significant difference for protein indication. Fat is of important indications of quality drop in fish [5]. The results showed that total fat content in freezed Kutum has been decreased which was due to increasing in fat

oxidation and subsequently free fatty acids [6,7]. Similar results were obtained in studies on frozen Anchovy (*Clupeonella engrauliformes*) [8] and grey Mugil (*Mugil cephalus*) [9]. Wet is also one of quality indications of fish deterioration during maintaining. The results showed that although wet changes in frozen Kutum were not very high but the results were significant. Studies are showed that decreasing of fish moisture during storage period, in addition to weight decrease, increases fat oxidation, protein denaturation, and so product quality drop [10,11]. Ash like wet is one of quality factors and shows mineral change process. In this research also ash changes in frozen Kutum was limited and results were not significant. Conditions and time of frozen fish storage affect on fish body minerals and drops it). Studies on Katsuwonus pelamis stored in zero showed that ash rate did not change [12]. One of other physical factors to measure fish quality is pH. In this research, pH rate was different and results were significant. Fresh fish pH was about 6.6 which increases or reaches to 8 or more with storage long time in -18°C researchers showed that because of glycogen degradation after fish death, pH decreases that its reason is production of lactic acid. In next stages, lactic acid omits and different bases produce such as NH₃ and subsequently pH increases relatively.

The results of this research showed that lapsing Kutum maintaining in -18°C, decrease nutrition value of fish and food factors and subsequently fish quality drops.

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