

Influences of drying methods processing on nutritional properties of three fish species *Govazym stranded tail*, *Hamoor* and *Zeminkan*

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Abstract

The process selection for fish drying by fish processor depend on the fish species and consumer demand. Three fish species such as *Govazym stranded tail*, *Hamoor* and *Zeminkan* were purchased from market fish Behbahan. *Govazim stranded tail*, *Hamoor* and *Zeminkan* hold in 70°C oven for 24 h until completely dried. Fish drying carried out in the sun by placing it on a tray with a traditional outdoor sunlight at temperatures up to 37°C for 3 days. International standard AOAC methods were used for nutrients analysis of dried fish samples, Protein content of *Hamoor* in the oven method (85.66 ± 0.26) was higher than in others. The highest fat content (5.56 ± 0.04) in the sun method found for *Hamoor* and the lowest content (3.22 ± 0.12) is also in solar dry found for *Govazym*. The results showed that sun method creates a relative stability of the compounds. The oven drying method had a good effect on decreasing drying time. It is recommended that the fish drying with electric oven method is more suitable for feeding health nutrition and good shelf life.

Keywords

Govazym

Hamoor

Zeminkan

Solar and oven methods

Nutrient compounds

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Introduction

The processes, which usually reduce moisture content, involve drying in solar and oven, smoking and frying. Although the method of drying depends on the species used and the interest of consumers, but in many countries, fish is cooked before drying. The drying process effects on protein quality and composition of fish which is in the open space. This method is a cheap and inexpensive method, however, the oven drying method is faster than the sunshine. The oven method is safer than the sun method. Smaller fish species were exposed to air velocity and relative humidity of the surrounding environment suitable equipment for 30 minutes to several months for drying. Different drying methods (sun and oven) have different effects on nutrient composition of fish. The quality of dried fish in different ways is different. However, the methods selected by a process of drying fish depend on fish species and consumer demand. Fresh fish was exposed in sunshine, often in tropical dry areas where moisture is low and the heat energy from the sun is extremely impressive, causes the during of loss of water from the fish before spoilage is reduced. In some countries, traditional sun drying of fish by placing it on a dish can be done in an open environment. Fish drying in the sun may be cheap but its problems have been reported in the literature. Limitations of this approach are significant losses in product, lower quality fish because of contamination by foreign materials, insects and microorganisms,

as well as discoloration by UV light. Effects of two drying methods such as smoking and electric oven on the approximate composition of catfish and tilapia have been studied. Electric oven for healthy eating recommended and this method is more suitable for long-term storage of dried fish (Clucas and Sutcliffe, 1981; Basha and Pancholy, 1982; Fennema, 1996; Eyo, 1998; Andrew, 2001; Bala and Mondol, 2001; Eyo, 2001; Adeparusi *et al.* 2003; Azam *et al.*, 2004; Gokoglu *et al.* 2004; Dahl *et al.* 2006; Akinneye *et al.* 2007; Edijala *et al.*, 2009). The results of research work Azam *et al.* (2004) showed that the amounts of protein, fat and ash of ten fish species were different according to drying methods and varieties. The minimum amount of fat obtained from three species of fish dried in the sun, could related to fat oxidation during periods when the fish is dried (Akinneye *et al.* 2007). Aim of this study was analysis of nutrients, nutritional values and percentage of energy of three fish species *Govazym stranded tail*, *Hamoor* and *Zeminkan* were affected electric oven and solar drying methods.

Materials and Methods

Materials and preparation of sample

The fish species used in this study were *Govazym stranded tail*, *Hamoor* and *Zeminkan* in southern Iran. These fishes were chosen because of readily available, cheap and affordable. The fish species were purchased from Behbahan fishes market in southern

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Table 1. Mean of length (cm) and weight (g) three fresh fish species

Samples	Standard length	Fork length	Total length	Weight (g)
Local names	(cm)	(cm)	(cm)	
<i>Govazym stranded tail</i>	28	32.33	32.33	410.1
<i>Hamoor</i>	32.16	34.83	38.33	426.63
<i>Zeminkan</i>	19	28	23	172.7

Iran. The fishes *Govazym stranded tail*, *Hamoor* and *Zeminkan* were thoroughly washed, cut into about 175, 214 and 261.5 g pieces respectively and washed again with tap and distilled water. The processed fish samples were analyzed for determination of fat, ash, moisture and protein contents by (AOAC, 2005).

Processing and analytical methods

The fish species *Govazym stranded tail*, *Hamoor* and *Zeminkan* respectively were placed in an oven at 70°C for 24 h to obtain sample constant weight and to dry completely, also *Govazym stranded tail*, *Hamoor* and *Zeminkan* fillets respectively were put in separate trays and placed in the sun for 3 days, in low humidity, the sample to dry completely, then all samples in mixer were powdered. In this study we were analyzed the different nutritional components in processed samples. Moisture, ash, protein and lipid contents were determined in each samples according to (AOAC, 2005). Briefly, the moisture content was obtained by drying the sample overnight at 105°C, ash was quantified after combustion for 16 h at 550 °C, crude protein content was determined by the Kjeldahl method using a conversion factor of 6.25 (AOAC, 2005) and total lipid was determined with the Soxhlet extraction method using ethyl ether (AOAC, 2005). The energy values were expressed as kcal/100 g, was estimated using factors: 9.02 and 4.27 kcal/g for fat and protein, respectively (FAO, 2003).

Statistical analyses

The data were presented in duplicate and results were representative of the mean \pm standard deviations. All results were submitted to the analysis of variance (ANOVA) at $p < 0.05$.

Results and Discussion

Nutrients amounts of three fish species for solar and oven drying methods were presented in Table

2. Fish as a protein good source is generally is considered, which is widely accepted in developing countries. There are unsuitable maintenance techniques which make problems for access to its protein. Drying process is a treatment for maintenance of fish and another animal proteins, because its quality is preserved for long time period and little changes and lost minimum in production. There are noticeable changes in color, odor, taste and texture of the fish species discussed in all drying methods oven and sun. Generally, in the oven drying method, moisture content of fish, faster and more evenly than the sun, are taken. The total amount of body water of fish species, depend on morphological and chemical differences, physical properties and the fish storing. In dried fish with moisture level of 6 to 8% from the microbial spoilage is prevented. If we the dried fish put in place to absorb moisture, water activity increase in during storage to %75 or more and bacteria and mold result to them spoilage. A significant increase in the amount of protein in the dried fishes indicates that fish protein nitrogen in drying period is not going to lose ($p < 0.05$), this is same to obtained results by Gokoglu *et al.* (2004) and Tao and Linchun, (2008). Increase in protein content in during drying is due to dehydration in during heating is obtained which to increase the nutritional value of fish. Similarly, the method of drying in the sun, overheating and evaporation increases the fat content of the fish (Norimah *et al.*, 2008). As we showed in Table 2, protein content of *Hamoor* in the oven method (85.66 ± 0.26) was higher than in others. The highest fat content (5.56 ± 0.04) in the solar sun way found in *Hamoor* and the lowest (3.22 ± 0.12) also observed in solar method for fish *Govazym* that can to be dependent on lipid oxidation during the solar drying. The maximum amount of ash (12.44 ± 0.27) found for *Zeminkan* using the solar method and the lowest (5.53 ± 0.41) in oven method is related to fish *Hamoor*. The moisture

Table 2. Proximate composition of dried three fish species by two solar and oven methods

Samples	Method	Moisture(%)	Ash(%)	Fat (%)	Protein(%)	Carbohydrate(%)	Energy value (kcal)
<i>Zeminkan</i>	Oven	14.12±0.01 ^a	11.79±0.11 ^a	4.03±0.13 ^a	72.49±0.39 ^a	1.89 ^a	333.79 ^a
<i>Zeminkan</i>	Solar	7.96±0.19 ^b	12.44±0.27 ^b	3.77±0.11 ^b	77.61±0.26 ^b	2.42 ^b	354.05 ^b
<i>Govazym</i>	Oven	14.35±0.13 ^a	5.53±0.41 ^c	3.46±0.02 ^b	77.44±0.26 ^b	2.87 ^b	352.68 ^b
<i>stranded tail</i>							
<i>Govazym</i>	Solar	4.84±0.34 ^c	6.32±0.11 ^d	3.22±0.12 ^b	82.44±0.14 ^c	0.78 ^c	361.86 ^c
<i>stranded tail</i>							
<i>Hamoor</i>	Oven	8.24±0.02 ^d	6.03±0.01 ^e	4.1±0.14 ^a	85.66±0.26 ^d	3.93 ^d	395.26 ^d
<i>Hamoor</i>	Solar	7.98±0.19 ^b	6.43±0.13 ^e	5.56±0.04 ^c	83.82±0.17 ^c	4.05 ^d	401.52 ^d

Data are expressed as mean ± standard deviation

Same letters in each column indicates the lack of significant differences.(P< 0.05)

content in oven method for fish *Govazym* was the highest (%14.35±0.13), but the lowest amount (%7.96± 0.19) found for *Zeminkan*. The highest value of carbohydrate found for fish *Hamoor*. Major function of carbohydrate is production of energy for body cells. For accumulation and shrinkage some of the food molecules and many of the physiological functions, it needs to carbohydrates. Energetic value in *Hamoor* was higher than others. The results of dried fishes nutrients in oven in this research with obtained results by Ogbonnaya and Ibrahim (2009) were compared, showed that percentage of protein and ash contents in dried fillets in oven in this research were more and percentage of fat and moisture contents in dried fillets in oven in this research were less, and except percentage of carbohydrate of dried *Hamoor* fillet that was same, percentages of carbohydrate of another two fish species in this research were less, but energetic value of obtained (550.6 kcal/100g) by Ogbonnaya and Ibrahim was very higher than energetic values of dried fillets in this research, that its reasons related to the type and environmental conditions of fish species.

Conclusions

Results of this research showed that both drying methods of sun and oven effect on fish fat, ash, protein and carbohydrate contents, and also related to used drying method for fish storage. A sun drying method were created relative stability in the food compounds, but the effects of drying method in oven was in drying time so it can decrease drying time. *Hamoor* fish found highest protein and fat contents and best nutritive value in both methods. This experiment also

showed the importance of fish drying in the lack of losing valuable nutrients. Also, these results indicate that fish nutrients composition resistant against high temperature so it will not be destroyed. This research also indicates the use of the electric oven method for fish drying in Iran.

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