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Edible Gelatin from Some Fishes Skins as Affected B Y Chemical Treatments

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Abstract: Gelatin isolated from limed split wastes can be a high value product due to its special characteristics and has many potential future applications in Food, functional additives, Food and pharmaceutical industries. Concentrations of sodium hydroxide, sulfuric and acetic acids used in processing gelatin from Narrow barred, Carcharhinus Leucas, Siganus Sutor and Indo Pacific king mackerel skins affected yield. The highest yield of gelatin was obtained when concentrations 3.5%(w/v} of sulfuric acid and sodium hydroxide were applied to the skins followed by treatment with 4%(w/v) acetic acid. The highest yield depends on varieties of fish and the content of collagen exist in fish skins. Gelatin yield of Siganus Sutor skins was shown to be high in comparison with of Indo Pacific king mackerel. Gelatin yield of Narrow barred skins was shown to be high in comparison with others samples. The high yield depends on used chemical compounds concentrations and varieties of fish. Therefore, from the economic point of view, extraction of gelatin from Siganus Sutor, Narrow barred and Indo Pacific king mackerel skins was shown to be suitable. In conclusion, practical application is about to change fishery wastes into valuable edible protein(Gelatin) so that gelatin will used in food industries and other industries as Photographic gelatin and industrial gelatin.

Key words: Gelatin % Fish Skins % Extraction % Acids % Alkaline

INTRODUCTION

Fish Collagen is a complex, structural protein that helps to maintain the strength and flexibility of skin, ligaments, bones, joints, muscles, tendons, gums, teeth, eyes, blood vessels, nails and hair [1]. Food grade fish gelatin is abstracted from fish scales and fish skins, simulating the mechanism of protein digestion in human body and using advanced directed enzymolysis biotechnology. Its protein content is above 90%, having 18 of kinds amino acids, 7 kinds of which are essential for people. These products are of high protein content, low ash and heavy metal content, small molecular weight, easy absorption and utilization, high biological value, promoting absorption of vitamins and minerals. These products also can accommodate physiological function of human as directed enzymolysis technology releases a lot of biologic peptides hidden in big molecular collagen [2,3]. Gelatin has been derived from fish skins and bones, but has been much less studied than the conventional gelatin from animals. Information on fish gelatin is scarce [4,5].

No published studies have concerned optimization of processing fish gelatin from skins. Fish skins are abundant and could be a valuable source of gelatin, especially in ethnic foods where pork may not be acceptable [6-11].

Declaration of fish gelatin as GRAS is under consideration, but it has been produced since 1960 with acid extraction and most of it has been for industrial uses [12, 13].

This work aimed to compare between gelatin extraction yield from some fishes with results of other researchers.

MATERIALS AND METHODS

Fresh fishes skins (Length:24 cm° 6 cm, width: 13 cm° 4 cm) were obtained from a local fish shop in Ahvaz, Iran. They were immediately frozen and stored at -18 °C until use. All reagents were of analytical grade.

Cleaning of Fish Skins: Thawed skins, all coming from the same batch, were washed with tap water (1:6 w/v) in a Stephan homogenizer(position II, very vigorous stirring) (Model UMS; Stephan und Sohne GmbH and Co., Hameln, Germany) at 5°C for 10 min. and were rinsed with abundant running tap water. Skins were further cleaned with 0.8 M NaCl (1:6 w/v), again in the Stephan

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homogenizer at 5° C for 10 min and were rinsed with abundant running tap water. This step was repeated 3 times. Excess water was removed by draining the cleaned skins and manual squeezing [14].

Extraction of Gelatin with the Various Acids and Sodium Hydroxide: Cleaned skins were constantly and slowly stirred for 16 to 18 h at 20° C, with different solutions of acetic acid (1.5, 2,3,3.5 and 4%) and sulfuric acid (f 1, 1.5,2, 2.5, 3 and 3.5%). The mixture with the remains of the skins was then filtered in a Buchner funnel with Whatman no. 4(Maidenstone, England) filter paper and the clear filtrate was then air-dried in a convection oven at 40° C, in the form of very thin layers, until moisture was less than 15%. Extraction with each acid was also done after a pretreatment of skins with sodium hydroxide solutions of 1, 1.5, 2, 2.5, 3 and 3.5% at 5° C for 40 min with constant stirring and rinsing with abundant running tap water (this washing cycle was repeated 3 times). Extraction of collagen was done in different concentrations of acids and sodium hydroxide solutions [15-17].

RESULTS AND DISCUSSION

Table 1. shows that gelatin yield of *Siganus Sutor* skins was high with concentrations of 3.5% $H_2SO4$and 4%CH_3CooH were applied to the skins followed by treatment with 3.5%(w/v) NaOH. The high yield depends on used chemical compounds concentrations.

Comparison of tables 2 and 3 showed that gelatin yield of *Narrow barred* skins with concentrations of 3% H_2SO4 and 3.5% CH_3COOH were applied to the skins followed by treatment with 3%(w/v) NaOH was high in comparison with yield of *Carcharhinus Leucas* Skins. The high yield depends on verities of fish and amount of collagen exist in *Narrow barred* skins.

Comparison of tables 1 and 4 showed that gelatin yield of *Siganus Sutor* skins with used chemical concentrations was high in comparison with gelatin yield of *Indo Pacific king mackerel* skins. The high yield depends on verities of fish and amount of collagen exist in *Indo Pacific king mackerel* skins.

Gelatin yield of *Narrow barred* skins was high in comparison with others samples, the high yield depends on used chemical concentrations and variety of fish.

From the economic point of view, it can concluded that extraction of collagen from *Siganus Sutor*, Narrow barred and *Indo Pacific king mackerel* skins is good.

The precursor for gelatin is collagen, which is the major structural protein found in the skin and bones of all animals, especially skin and bone of fishes [18].

Table1: Gelatin extraction Yield of *Siganus Sutor* fish skins in percentage

NaOH solution	H_2SO_4 solution	CH_3COOH solution	Yield
1.5%	1.5%	2%	12.3° 0.78
1%	1%	1.5%	11.4° 0.86

Siganus Sutor fish was taken from Persian gulf of Iran, sea side city of Ghenaveh.

Each value is the mean of three determinations.

Table 2: Gelatin extraction Yield of *Narrow barred* fish skins in percentage

NaOH solution	H_2SO_4 solution	CH_3COOH solution	Yield
3.5%	3.5%	4%	15.4° 0.21
3%	3%	3.5%	14.2° 0.94

Narrow barred fish was taken from Persian gulf of Iran, sea side city of Ghenaveh.

Each value is the mean of three determinations.

Table3: Gelatin extraction Yield of *Carcharhinus Leucas* fish skins in percentage

NaOH solution	H_2SO_4 solution	CH_3COOH solution	Yield
3%	3%	3.5%	13.8° 0.47
2.5%	2.5%	3%	12.9° 1.1

Carcharhinus Leucas fish was taken from Persian gulf of Iran, sea side city of Ghenaveh.

Each value is the mean of three determinations.

Table 4: Gelatin extraction Yield of *Indo Pacific king mackerel* fish skins in percentage

NaOH solution	H_2SO_4 solution	CH_3COOH solution	Yield
2%	2%	3%	10.4° 1.66
1.5%	1.5%	2%	9.8° 1.09

Indo Pacific king mackerel fish was taken from Persian gulf of Iran, sea side city of Ghenaveh.

Each value is the mean of three determinations.

Comparison of obtained results from this study with other workers results showed that Gelatin extraction Yield from fishes skins in this study was more than other workers results, therefore these kind of fishes are good collagen sources and are suitable for extraction of gelatin in industrial scale [17].

In conclusion, Gelatin is derived from collagen, the principal protein found in skin and bone. A simplified characterization of the applications of gelatin would be into edible gelatin from point of view of food industries and aesthetically suitable for eating.

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