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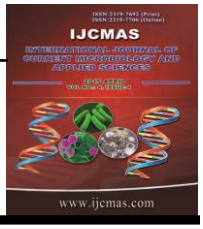


Original Research Article

Physico-Chemical Characteristics and Textural Quality of Myofibrillar Protein Concentrate Prepared from Emu Meat

B. Karthikeyan, G. Naveen Kumar, D. Ramasamy and C. Ashok Kumar

College of Food and Dairy Technology, TANUVAS, Chennai, Tamil Nadu, India
**Corresponding author*

Keywords

Myofibrillar protein concentrate, emu meat, meat gel, proximate composition, texture profile

A B S T R A C T

Myofibrillar protein concentrate from Emu meat was prepared from washed meat after being blended with 0.1% and 0.3% NaCl and initially kept in water bath at 40°C for 30 minutes and then at 90°C for 10 minutes. Proximate composition and textural properties were evaluated on cooked meat gels. Texture profile of meat gel such as firmness, springiness and resilience were better at the concentration of 0.1% NaCl than 0.3%. Further, the addition of 0.1% salt yielded more tenderness over 0.3%. Proximate analysis showed that it contained 0.24% of fat, 14.27% of crude protein, 1.19% of carbohydrate, and 3.82% of ash and energy value of 64kcal/100 gm. It was therefore concluded that a washing cycle in double time and addition of 0.1% salt were sufficient to improve the quality of emu meat gel.

Introduction

The term surimi refers to concentrated myofibrial protein extracted from fish flesh by washing minced meat that has been separated from bones, skin, and guts. During washing with cold water, fat and any other water-soluble contents are removed, whereas insoluble myofibrial protein is isolated (Okada, 1992). It is a stabilized myofibrillar protein obtained from mechanically deboned fish flesh after through washing with water blended with a cryoprotectant (Park, 2005). Surimi is served as a potential raw material for a variety of products such as imitation crab meat, kamaboko, flavored kamaboko, chikuwa, satsumiage / tenpura, hanpen, and fish sausage. It becomes increasingly popular due to its unique textural properties as well as high nutritional value (Zhou *et al.*, 2005). According to Babji *et al.*, (1995), the supply of surimi raw material is decreasing.

Alaska pollock, the largest fishery biomass used for surimi, has decreased in harvest from over 6.5 million ton in late 1980's to less than 3 million ton since the year 2000. Hence, it is needed to look at other economically available resources of protein base raw materials to manufacture value added products from the high quality surimi gel.

Based on the successes with fish surimi, there has been further research in applying surimi processing techniques for non-fish meat such as beef, pork, mutton, sheep,

chicken meat and emu meat. These other types of meat have been known as myofibrillar concentrate which showed improvement in functional, textural and colour properties. Myofibrillar concentrate has also been applied in further processed products such as nuggets and sausages (Nurul *et al.,* 2010). The tenderness and texture of emu meat enables to be fit for preparations which are lightly grilled and pan fried, since emu meat is low in fat, it looses moisture quickly and is best under moist heat cooking.

The aim of this study is to standardize the procedure for preparation myofibrillar protein concentrate (MFC) from Emu meat and evaluate the proximate composition and textural characteristics of MFC in two different salt concentrations.

Materials and Methods

Source of meat

The Emu meat was procured from local farm and slaughtered hygienically frozen at -18°C for two days, then the carcass was thawed. The carcass was manually deboned, excess fat including skin, tendons and connective tissues were removed and cut into small pieces.

Washing procedures

The meat was ground using a meat mincer twice. Ice water (5°C) was added in the ratio of 3:1 (water: meat). Mixing was done manually for 30 sec and the mixture allowed to settle down for 5 min. The fat and top water layers were poured off and the remaining mixture was filtered through a muslin cloth. Filtrate from the sieve was combined with those trapped in the muslin cloth, then pressed manually with a screw press. This procedure was repeated twice to obtain a whitish washed material from the emu meat.

Gel preparation

Washed Mince were added with 0.1% and 0.3% salt and mixed using cutter mixer for one minute until they turned to meat gel. The gel was stuffed into a retort pouch and incubated in water bath at 40°C for 30 minutes and heated at 90°C for 10 minutes. They were then immediately placed and cooled in ice to obtain core temperature of gels below 10°C.

The myofibrillar concentrate was stored in a refrigerated temperature below 5^0C and assessed for their proximate composition and textural quality.

Analysis of proximate composition

Analysis of proximate composition of MFC prepared from Emu meat. The following chemical components viz moisture, ash, fat, protein, crude fiber, energy were assessed by using standard methods (AOAC, 1997).

Assessment of textural quality

Assessment of textural quality was done by Bite jaw method and cylindrical probe method. The following parameters springiness, firmness, resilence were assessed (Volodkevich Bite Jaws Texture Analyzer). The textural assessment of meat samples was conducted using a computer-assisted TA.HD plus Texture Analyzer (Stable Micro Systems, UK) fitted with Volodkevich bite jaws set with setting compression for the test mode, pre-test speed of 0.2 cm/sec, test speed of 0.2 cm/sec, post-test speed of 0.2 cm/sec distance of 0.5 cm and trigger type, auto. Each meat samples at 20^0C that were cut before was placed into the texture analyzer

slot before measurement. Each meat block was sheared and compressed once in the center and perpendicular to the longitudinal direction of the fibers using Volodkevitch bite jaw (stainless steel probe shaped like an incisor) which was fitted to a TA-HD plus texture analyser (Stable Micro Systems, UK) at the angle of 90° angle. The sheared force data, referred to as the reference tenderness, was recorded in kilogram (kg). All the references data and the spectral data from NIR spectroscopy were loaded into Microsoft Office Excel 2007 and processed to perform partial least square (PLS) regression data analysis via MATLAB simulation software (MATLAB_Version 7.12.0.635(R2011a)).

Results and Discussion

Proximate analysis of MFC prepared from emu meat

The Moisture (%), Total carbohydrate (%), Total crude protein (%), Total fat (%), Crude fibre (%), Total ash (%) of 0.1% salt added MFC was 80.27, 1.19, 14.27, 0.24, 0.21, 3.82 respectively showed in table 1. The energy value obtained from the MFC was 64.0 Kcal/100g. According to Kim *et al.*,(2011) the proximate composition of emu meat contained 19.46% of insoluble protein, 1.76% of fat and 73% of moisture in myofibrillar concentrate made from porcine longissimus dorsi muscle for the production of low-fat pork patties.

The above results were found to be similar to Nurul huda *et al.,* (2011) in fish surimi and also he reported that the protein content was reduced because all water soluble proteins were washed out and the final product contained 15-16% of myofibrillar protein concentrated by added salt. Ramadhan *et al.,* (2014) stated that washing processes reduced fat and increased moisture content, after the second washing and most of reduced proteins are sarcoplasmic which is water-soluble.

Bite Jaw Method of Texture analysis

Table 2 showed that the firmness values of 0.1% and 0.3% salt added MFC by Bite jaw method was 288.427, 597.566 and the Resilience value of the 0.1% and 0.3% salt added MFC is 55.060, 52.690 respectively. The similar trend was observed in goat frankfurters in which the addition of salt increased the firmness and decreased the resilience (C.L. Bratcher *et al.,* 2010). Reducing the fat content in frankfurters has been reported to increase toughness (Sofos and Allen, 1977; Paul and Foget, 1983).

Table.1 Proximate compositions of MFC prepared from emu meat

S. No	Parameters	Values
1	Moisture (% w/w)	80.27
2	Total Carbohydrate (% w/w)	1.19
3	Total Crude Protein (% w/w)	14.27
4	Total Fat (% w/w)	0.24
5	Crude Fibre (% w/w)	0.21
6	Total Ash (% w/w)	3.82
7	Energy Value Kcal /100g	64.0

Table.2 Textural quality of Myofibrillar Protein Concentrate

Parameters	Bite jaw method		Cylindrical Probe method	
	0.1%	0.3%	0.1%	0.3%
Firmness	288.427	597.566	286.484	1147.657
Resilence	55.060	52.690	39.398	39.763

Fig.1 Texture analysis of Myofibrillar Protein Concentrate by Bite jaw 0.1%

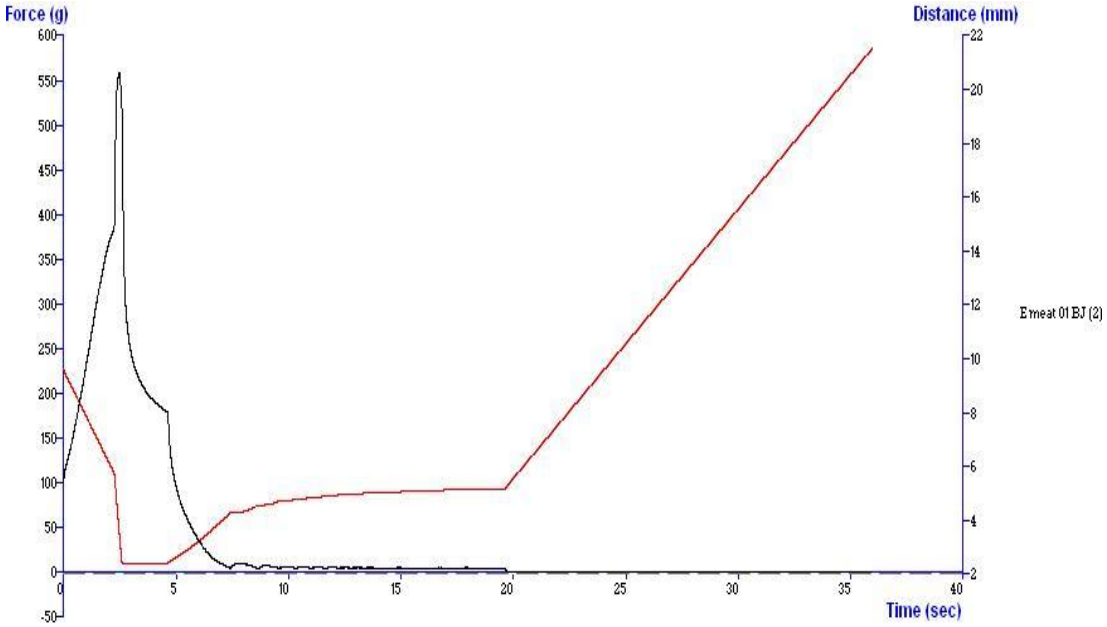


Fig.2 Texture analysis of Myofibrillar Protein Concentrate by Bite jaw 0.3%

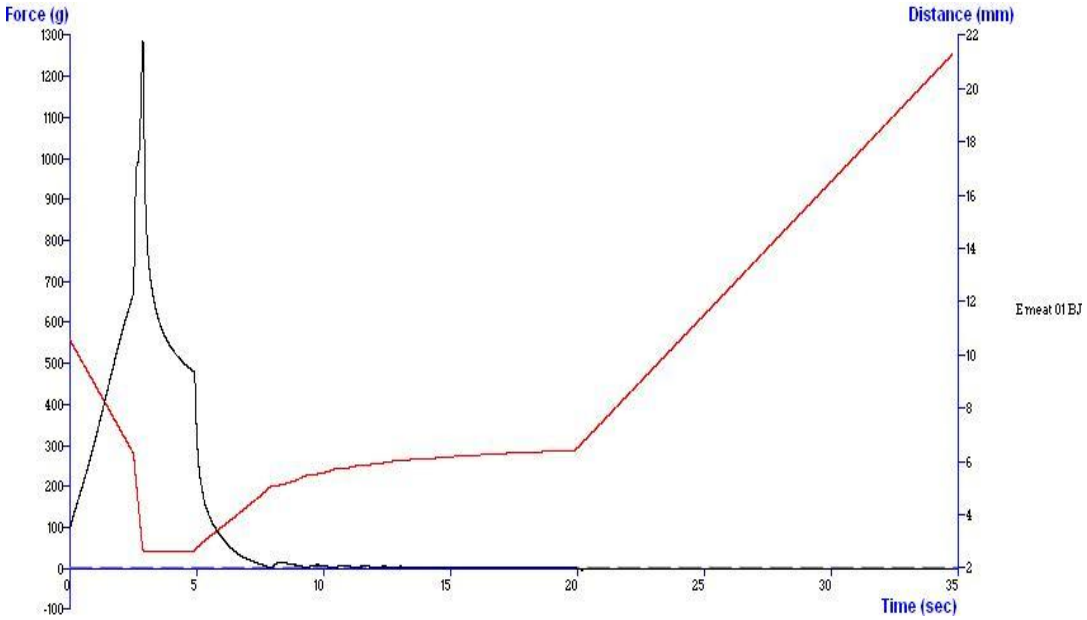


Fig.3 Texture analysis of Myofibrillar Protein Concentrate by Cylindrical Probe 0.1%

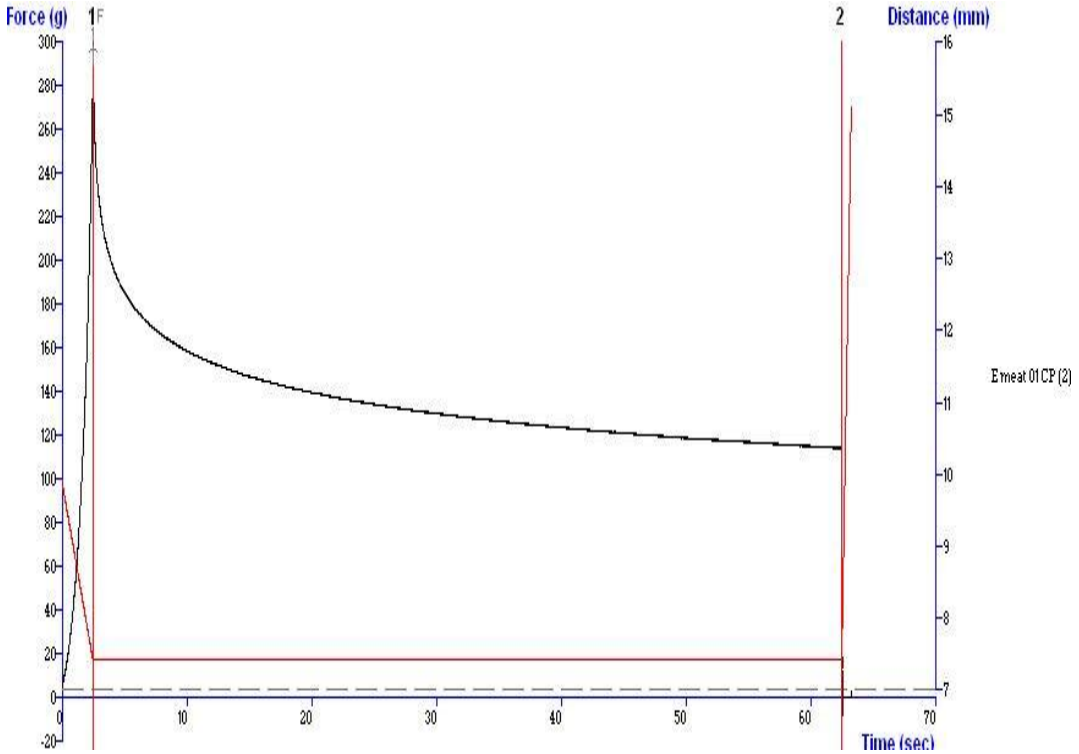
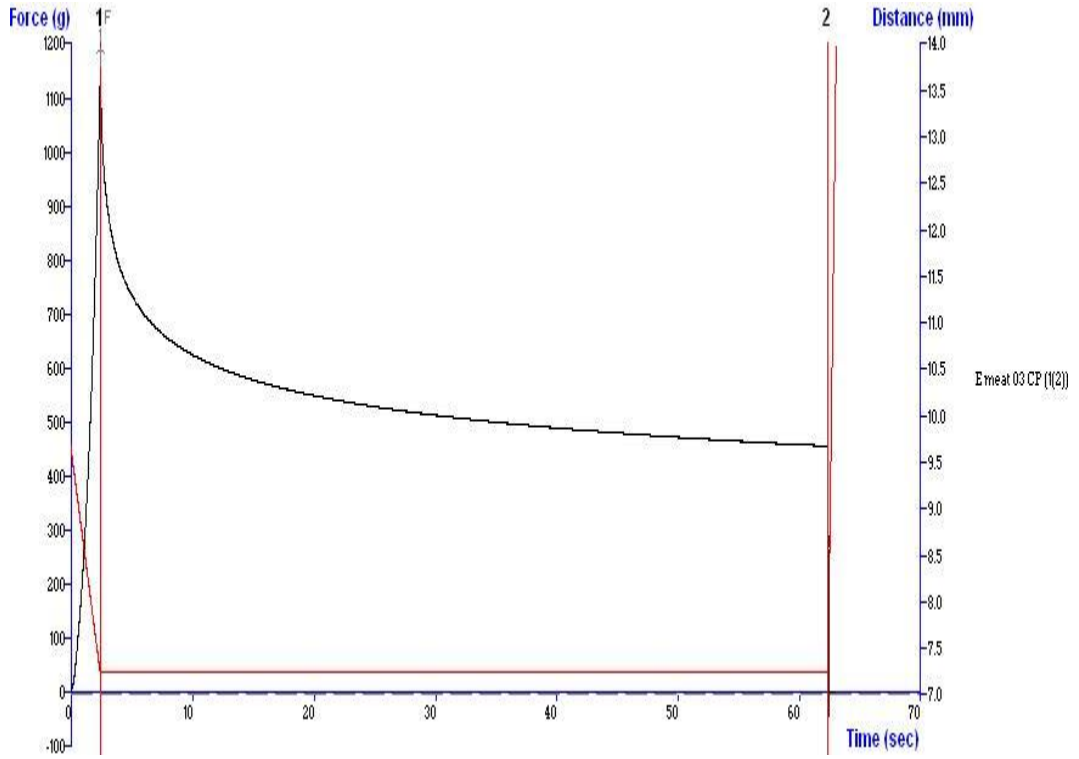
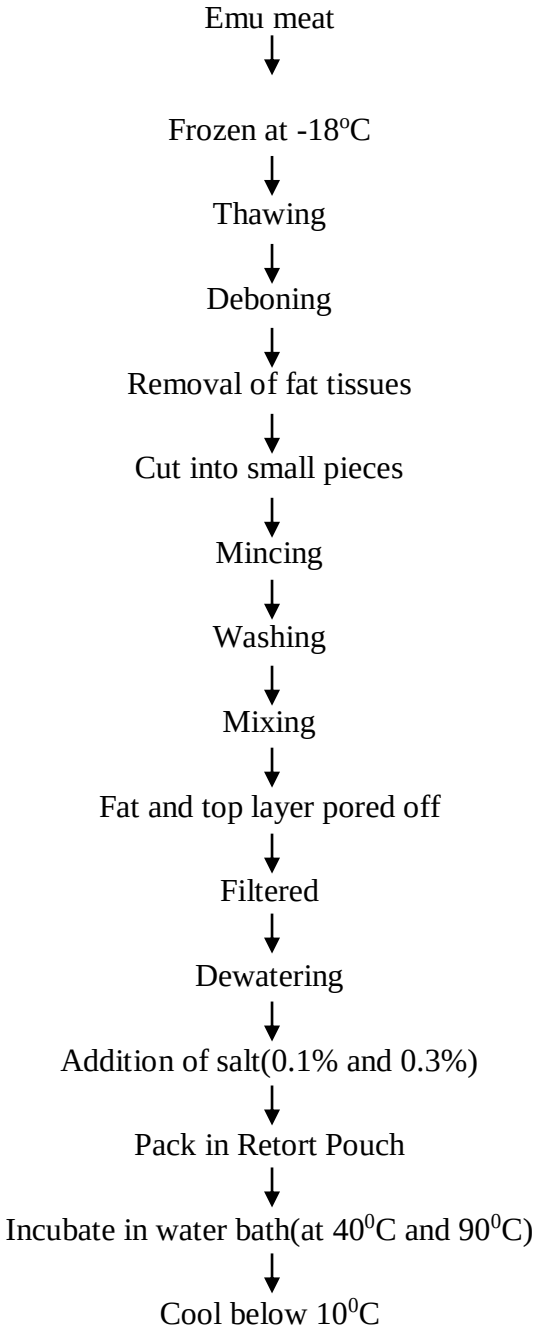


Fig.4 Texture analysis of Myofibrillar Protein Concentrate by Cylindrical Probe 0.3%



Flow chart for preparation of Myofibrillar Protein Concentrate



Cylindrical Probe method of Textural analysis

Table 2 showed that the firmness values of 0.1% and 0.3% salt added MFC by Cylindrical probe method is 286.427, 1147.657 and the springiness values of the 0.1% and 0.3% salt added MFC is 39.398, 39.763 respectively.

The similar trend was observed in goat frankfurters in which the addition of salt increased the firmness and decreased the springiness (C.L. Bratcher *et al.,* 2010).

The results of texture analysis showed that the 0.1% salt added MFC is better tender than the 0.3%. It was therefore concluded that washing cycle in double time and addition of 0.1% salt was sufficient to obtain better quality of MFC from emu meat. Proximate analysis showed that the meat product is cooked, the percentage of protein, fat, and ash decrease as moisture increases. This in turn decreases the caloric content and concentrates the minerals.

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