Austin Journal of Nutrition and Food Sciences

Austin Publishing Group

Open Access
Full Text Article

Editorial

Sustainable Seafood Processing: Utilisation of Fish Gelatin

Xiao Feng [a,b], Shaojuan Lai [c,d], Hongshun Yang [a,b,*]

[a]Department of Chemistry, National University of Singapore, 3 Science Drive 3, Singapore
[b]National University of Singapore (Suzhou) Research Institute, 377 Lin Quan Street, Suzhou Industrial Park, Suzhou, Jiangsu 215123, P.R. China
[c]College of Biological Engineering, Henan University of Technology, Zhengzhou, Henan, 450052, China
[d]Department of Physical Medicine & Rehabilitation, University of Minnesota, Minneapolis, MN 55455, USA

***Corresponding author:** Hongshun Yang, Food Science and Technology Programme, c/o Department of Chemistry, National University of Singapore, 3 Science Drive 3, Singapore 117543, Republic of Singapore. Tel: 65-65164695; Fax: 65-67757895; Email: chmynghs@nus.edu.sg

Received: January 10, 2014; Accepted: February 10, 2014; Published: February 17, 2014

Gelatin is a partially hydrolysed product of collagen, which can be applied to different industries, such as food and medicine. Gelatin is formed when the polypeptide chains of collagen are hydrolysed with water molecules under certain conditions such as, thermal and acid treatment [1].

Usually gelatin manufacturer utilises mammalian sources as principle sources to produce collagen. The collagen is partially hydrolysed to generate gelatin. However, Muslims and Jews can't consume gelatin from pork products because of their religion and culture reasons. On the other hand, potential safety issue for gelatin made from slaughtered beef processing byproducts will pose problems such as bovine spongiform encephalopathy. Therefore, gelatins produced from alternative sources are highly desired.

Fish is a promising resource for gelatin extraction. The fish head, bone and skin take up almost half weight of the whole fish, which can be utilised to improve food security in some regions. Furthermore, fish gelatin from fish byproducts has demonstrated better aroma release ability with less off-flavour and characteristics compared to mammalian gelatin [2]. Therefore, it is an ideal alternative for pork and beef gelatin for manufacturers and consumers. The percentage of gelatin derived from fish species has increased continuously, for instance, from 0.7% to 1.3% in the world market from 2003 to 2005, [3]. However, compared to mammalian gelatins, fish gelatins usually have lower gel strength.

Comprehension and improvement of fish gelatin physical properties is considered important for its utilisation. Fish gelatin extraction has been improved to generate gelatin with better texture properties [3]. Since the structure of gelatin affects its physical characteristics, analysis of gelatin structure is indeed necessary in order to further optimise gelatin's properties. To date, gelatin's structure has not been characterised specifically. Due to its high heterogeneity, characterisation of the molecular structure of gelatin remains a challenge.

Gas chromatography, high performance liquid chromatography, rheometer, spectrometer, scanning electron microscope (SEM), transmission electron microscope (TEM), electrophoretic analysis, differential scanning calorimetry, and fourier transform infrared spectroscopy have been used to determine the major gelatin constitutes, physical characteristics, as well as structure. Except SEM/TEM, most other methods could not reveal the configuration of gelatin. Moreover, the structure of gelatin is often compromised by the complex treatment prior to SEM/TEM examination [4].

Atomic force microscopy (AFM), which is an effective method for characterising nanoscale structure, can be applied in imaging gelatin [5]. For example, AFM has been used to characterize the nanostructure of catfish skin gelatin [4;6], which indicates that this method is effective in microstructure characterization. By identifying the structure, the properties of gelatin can be elucidated via the structure. To date, research in fish gelatin has made a tremendous progress in recent years.

Despite the advantages of fish gelatin, the disadvantages should also be considered in future research. For instance, the flavour disruption induced by the addition of fish gelatin to other food products, and the change of texture after the addition of fish gelatin, both of which will have a significant impact on the product acceptability by the consumers. Due to these concerns, technologies such as odour removal should be developed in order to relieve the flavour disruption by fish gelatin. Additionally, the relationship between the structure and texture of fish gelatin should be understood to further improve the physicochemical properties of fish gelatin and meet the demand of customers.

In conclusion, fish gelatin is an admirable substitute of mammalian gelatin. And the resources for fish gelatin from fish processing byproducts like skin and bones are abundant. Fish gelatin has many benefits over mamalian gelatin such as a better release of aroma with less off-flavour as well as its ability to reversibly gel and melt below 37°C [7]. It is promising that the superior function, appropriate quality as well as affordable price of fish gelatin will enable it to be a favorable ingredients for food and medicine industry [8]. Future in-depth research in fish gelatin is needed in order to continue promoting the properties and applications of fish gelatin. Fish gelatin's wide applications will thereby help relieve the contamination of fish processing wastes as well as benefit the sustainable economy.

Acknowledgements

We thank the start-up grant (R-143-000-561-133) and teaching enhancement grant (C-143-000-041-001) provided by the National

Citation: Feng X, Lai S, Yang H. Sustainable Seafood Processing: Utilisation of Fish Gelatin. Austin J Nutri Food Sci. 2014;2(1): 1006.

University of Singapore for supporting this work. Projects 31371851, 31071617 and 31200801 supported by NSFC also contributed to this report.

References

1. Badii F, Howell NK. Fish gelatin: structure, gelling properties and interaction with egg albumen proteins. Food Hydrocolloid 2006; 20: 630–640.

2. Cho SH, Jahncke ML, Chin KB, Eun JB. The effect of processing conditions on the properties of gelatin from skate (Raja kenojei) skins. Food Hydrocolloid 2006; 20: 810–816.

3. Yang H, Wang Y, Jiang M, Oh JH, Herring J. 2-step optimization of the extraction and subsequent physical properties of channel catfish (Ictalurus punctatus) skin gelatin. J Food Sci. 2007; 72: C188-195.

4. Yang H, Wang Y, Regenstein JM, Rouse DB. Nanostructural characterization of catfish skin gelatin using atomic force microscopy. J Food Sci. 2007; 72: C430-440.

5. Benmouna F, Johannsmann D. Viscoelasticity of gelatin surfaces probed by AFM noise analysis. Langmuir. 2004; 20: 188-193.

6. Yang H, Wang Y. Effects of concentration on nanostructural images and physical properties of gelatin from channel catfish skins. Food Hydrocolloid 2009; 23: 577–584.

7. Jamilah B, Harvinder KG. Properties of gelatins from skins of fish--black tilapia (Oreochromis mossambicus) and red tilapia (Oreochromis nilotica). Food Chem 2002; 77: 81–84.

8. Pang Z, Deeth H, Sopade P, Sharma R, Bansal N. Rhelogy, texture and microstructure of gelatin gels with and without milk proteins. Food Hydrocolloid 2014; 35: 484-493.

Austin J Nutri Food Sci - Volume 2 Issue 1 - 2014
ISSN : 2381-8980 | www.austinpublishinggroup.org

Citation: Feng X, Lai S, Yang H. Sustainable Seafood Processing: Utilisation of Fish Gelatin. Austin J Nutri Food Sci. 2014;2(1): 1006.