

Original article

Utilization of the sawdust from frozen tuna processing – Composition analysis and quality evaluation of trial products

Emi Shinohara ¹, Naoko Yoshikawa ² and Yoshihiro Ochiai ^{3,*}¹ School of Marine Science and Technology, Tokai University, Orido, Shizuoka 424-8610, Japan² Department of Materials and Life Science, Shizuoka Institute of Science and Technology, Fukuroi, Shizuoka 437-8555, Japan³ Graduate School of Agricultural Science, Tohoku University, Aramaki, Aoba, Sendai, Miyagi 980-0845, Japan

* Correspondence: yochiai@tohoku.ac.jp; Tel.: +81-22-757-4163

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Introduction

The by-products or waste from fish industry are estimated to be up to 75% of the catch, depending on postharvest or industrial processes [1]. Tunas, especially those caught by longline fishing, are transported in frozen state. More than 100 thousand tons of frozen tunas have been landed in Japan in 2015. During cutting process of frozen tuna with a chain saw, a lot of sawdust is unintentionally produced. Such sawdusts from frozen tunas are considered to be the waste, however, there has been no effective use, even though a tremendous amount of efforts have been made in utilizing the wastes from tuna industries [1]. So-called 'zero emission' explores the way to completely utilize the natural resources [2,3], and so some necessary actions should be performed for the tuna by-products.

In the present study, attempts were made to explore a way of utilization by referring to the functional components in the dust.

Materials and methods

The sawdust of frozen bigeye tuna was obtained on the spot at a tuna processing company, and was kept at -80°C until used. Free amino acid composition were determined by HPLC method. pH values and lactate content were also measured. The color stimulus values and histamine content was measured during storage at 4°C after thawing. Organoleptic evaluation was carried out on the trial products (seasoned broth and fish ball). The breaking strength was measured for the fish balls.

Results and discussion

Free amino acids were effectively extracted by boiling from the sawdust. The major components were anserine (ca. 520 mg/100 g), histidine (ca. 220 mg/100 g) and taurine (ca. 100 mg/100 g) (Fig. 1). The L* value

slightly increased 31.0 to 35.1, while the a* value greatly decreased from 21.4 to 6.5 during three days of chilled storage after thawing. The organoleptic scores for the broth exceeded those for skipjack one as a control. Curry powder was useful in masking a slight fishy odor. The gel strength of the dumpling was improved from about 115 g to 150 g by the addition of gelation improver consisting of transglutaminase (Fig. 2), and such an increment successfully improved the organoleptic scores (data not shown).

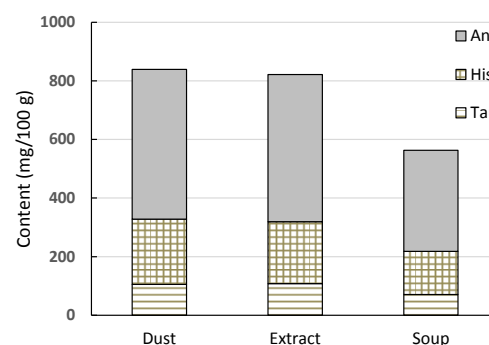


Fig. 1. The contents of taurine (Tau), histidine (His), and anserine (Ans) in the saw dust, the extract, and the soup.

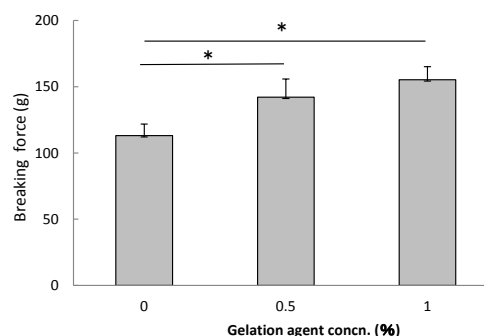


Fig. 2. Effect of gelling agent on the gel strength of the fish balls prepared from the saw dust. *, $p < 0.05$, $n = 3$.

Regarding the hygienic safety [4], histamine concentration increased from 2.3 ppm at the start up to as low as 4.4 ppm after 3 days of chilled storage (Fig. 3). It is suggested the sawdust can be effectively utilized for the materials for delicacies equipped the health promoting functions by using the fresh one just after thawing and processing quickly. Further attention, however, should be paid against tiny metal pieces from chainsaw edges. From the viewpoint of safety, preparation of extract from the saw dust is reasonable way of utilization, but the direct use of the dust for processing of surimi or any other food could be hazardous for human consumption.

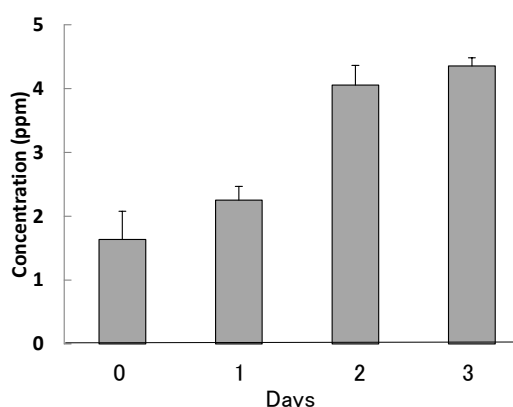


Fig. 3. Changes in histamine concentration during the chilled storage of the saw dust after thawing.

Conclusions

The saw dust from frozen tuna is rich in free amino acids, thus can be utilized as a source of functional substances. It was found to be safe as far as histamine level is concerned. However, preparing food directly from the dust could involve the physical hazard by contamination of metal pieces from saw blades.

Acknowledgements

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