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Aquatic Procedia 7 (2016) 59 – 65

Aquatic Procedia

www.elsevier.com/locate/procedia

2nd International Symposium on Aquatic Products Processing and Health
ISAPPROSH 2015

The Effect of Different Treatments to the Amino Acid Contents of Micro Algae *Spirulina* sp.

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Abstract

This study purposed to determine of different treatments to broke down the cellular matrixs of *Spirulina* sp. thallus in order to get natural *umami* flavor which is combination between glutamic and aspartic acids. The treatments applied were are as follow drying, refluxing, sonication and maseration. *Spirulina* sp. dried powder has the highest yield of glutamic and aspartic acids as a base combination for *umami* flavour.

Peer-review under responsibility of the science and editorial board of ISAPPROSH 2015

Keywords: Aspartic amino acids; different treatments; glutamic; *Spirulina* sp.; umami

1. Introduction

Umami or savoury is now described as the new fifth taste beside the conventional taste categories that the human tongue has detect: sweet, sour, salty and bitter. *Umami* is the name for the taste sensation produced by the combination of free glutamates and aspartate, those commonly found in fermented and aged foods (Mouritsen, 2015). *Umami* taste is imparted in foods by the free amino acids of glutamate which occur naturally in many foods including meat, fish and dairy products, its therefore plays an important role in making food taste delicious or more pleasant. *Umami* is used by the Japanese to describe the taste of MSG as well as the meaty taste of certain fish (Kuriwada et al., 2012). Free glutamate is an non essential amino acid resulted when glutamate is released during the breakdown of food protein molecule. The free glutamate are found in high levels of 2 240 mg per 100 g of dried

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Peer-review under responsibility of the science and editorial board of ISAPPROSH 2015
doi:10.1016/j.aqpro.2016.07.008

seaweed. Dried *Spirulina* sp. powder has received special attention since these microalgae was very rich in protein for about 51 % to 71%, containing essensial and non essential amino acids. According to studies *Spirulina* sp. has a very high protein efficiency ratio (PER). Protein content of *Spirulina* sp. is higher when it comparing to algae unicellular and cyanobacteria, furthermore it contain four times more absorbable than protein in beef (Cepoi *et al*., 2009).

There are many beneficial contribution of glutamate to savoury flavours, currently increasing attention has more been paid to the high natural glutamate concentrations of some natural source in the production of free glutamate. Amino acids can be produced by the fermentation method, the enzymic reaction and extraction methods. The extraction methods are degraded natural source of complex proteins into simple various amino acids.

In order to have glutamic acid as a source of *umami* flavor it was need to extract those compound from *Spirulina* sp. as a complex matrixs. Therefore, the appropriate extraction method promoting high yield of amino acid compound especially glutamic acids was investigated in this study. Six different treatment methods i.e. drying, maceration, Soxhlet extraction and sonication were carried out for extraxted glutamic acids of *Spirulina* sp. Maceration is preferably used with volatile of thermal instable products, it is a cold extraction of pulverized feed material in any solvent and no heat is applied. Sonication is the procedure involves the use of ultrasound with frequencies ranging from 20 kHz to 2 000 Khz, this increases the permeability of cell walls and produces cavitation however the methods sometimes gives undesirable changes on molecules of the compounds. As a rich source of amino acid, those compound are usually deposit in the cellular matrixs of microalgae thallus, hence microcellular have to breakdown either to dry or extract those compound. Soldo et al. (2003) stated that glutamic acid can be found at pH 5 to pH 7 or at the range of pH 5 to pH 8 until netral condition. The methods of extraction can be applied for example are as followed maceration, infusion, digestion, percolation, hot continuous extraction (Soxhlet) and ultrasonic extraction (sonication) (Azmiret al., 2013). Maceration is suitable for both initial and bulk extraction of plant material.

The aimed of this treatments are to broke down the cellular matrixs of *Spirulina* sp. thallus. Drying material is heat application, hence the water is removed and the material become more concentrated. Reflux as a hot continuous extraction methods was applied in this experiment since the main advantages is that the material is extracted continuously with a much smaller quantity of solvent. The ultrasound extraction or sonication methods is also applied to get glutamic acid compound and applied with frequencies ranging 20 kHz to 2 000 kHz. The ultrasonic frequency (> 20 000 Hz) will activated permeability of thallus cell wall hence more component on the cell can be extracted by the solvent.

The objective of the present study is to determine the processing and extraction procedure that recover the high amount of amino acid contents of glutamic acid as a potential source of *umami* taste in *Spirulina* sp. It also characterized profile of amino acid of *Spirulina* sp. using different methods of extraction on different temperature. It was expected that different methods of processing and extraction, and thereby extraction conditions, would produce different responses due to the temperature. The result of glutamic acid characteristic is compared to the glutamic acid for previous researchs.

2. Material and methods

2.1. Raw material

Spirulina sp. were cultured in open pond of three promil salinity, temperature of 30 ºC to 31 ºC and optimal pH of 9.8 with 5 000 lx (1 lx = 1 lm · m^2). Dried *Spirulina* sp. is prepared by drying the raw material of *Spirulina* sp. in the oven with temperature below 60 ºC for 10 h.

2.2 Samples treatments condition

- Drying

The fresh *Spirulina* sp. was separated from the medium of culture, filtered and then dried for 10 h at the