Keio University

Thesis Abstract

No.

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Title of Thesis:

Seaweed metabolomics and its applications

Summary of Thesis:

Japan is the highest producer and consumer of seaweed in the world. Seaweed are classified into 3 groups; red, brown, and green algae. A comprehensive profiling of metabolites of seaweed is not readily available in mass spectrometry-based (MS) methods. MS-based methods require only a small amount of sample, but sample pre-treatment is necessary. However, the effects of drying and extraction methods are not well established. In the first part of the study, the effects of different pre-treatment methods were initially evaluated on three Japanese brown algae species. Freeze-drying was able to retain a higher number of high concentrations of metabolites as compared to oven-drying, while extraction methods had no significant effect on the metabolites' concentrations. The second study then used the freeze-dried method to investigate the metabolites relationship between the various seaweed' groups collected from Tohuku area; four brown, five red, and two green algae. Two extraction methods were tested. Consequently, the results confirmed that species characterization was the main factor affecting the metabolites profiles, not extraction methods. Particularly, only sugar profiling was able to discriminate between the seaweed' groups. Mannitol is the main constituent in brown algae, while fructose, sucrose, and glucose are in green algae. For red algae, it mostly depends on the individual species. Finally, the effect of heat on individual species was examined as metabolites profiling is unique in each species. Two parts of *Undaria pinnatifida*, Wakame (leaf) and Mekabu (sporophyll), are normally blanched in boiling water for a certain period before consumption. In order to retain the high metabolites concentrations, Wakame and Mekabu were shown to prefer blanching times of less than 20 and 40 seconds, respectively. These comprehensive metabolites data can be used as a basis for further explorations in other fields of research; namely, pharmaceutical (drug) and nutraceutical (food).

Keywords: Seaweed, metabolites, mass spectrometry, pre-treatment methods, blanching

(296 words)

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