（様式）

専攻分野及び研究計画

Field of Study and Research Plan

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≪Guide for Creating a Field of Study and Research Plan Sheet/作成要領≫

1. As this sheet is one of the most important references for selection and university placement, outline your field of study and specify your research theme and plan in line with the following items 1 and 2. If plagiarism or fraud is discovered after selection, the selection will be canceled retroactively.

本様式は選考及び大学配置の重要な参考となるので、下記の項目 1 及び 2 に沿って専攻分野の概要及び研究計画の詳細を具体的に記入すること。なお、採用後に不正、盗用等が判明した場合は遡って採用を取り消す。

1. This sheet must be typewritten or written in block letters. If possible, please write in Japanese.

記入はタイプ又は楷書によるものとする。相当の日本語能力を有する者は日本語により記入すること。

1. This sheet must be created within two pages. Additional materials may be attached if necessary. Both a single-side and dual-side printing will be acceptable.

本様式は２ページ以内で作成すること。ただし必要な場合は別紙を付してもよい。印刷は片面印刷、両面印刷のどちらも可。

1. Past and present field of study（これまでの専攻分野）

My past research study was based on the reutilization of fish processing wastes into high-value products by using fermentation technology. Thus, the study aimed at determining the fertilizing and immune-stimulating efficiency of biodegraded fish processing wastes as bio-fertilizers in aquaculture. Fish processing wastes, including heads, viscera, fins, bones, skin, and scales, were collected from the Kunduchi fish market, dried under a shed for five days, ground, and fermented using a typical useful bacterium *Bacillus subtilis*. The fermented fish processing wastes were tested of its efficiency as biofertilizers in which primary productivity in fish-rearing tanks was recorded at different concentrations (2 gL-1, 4 gL-1, and 6 gL-1 respectively) in three replicates of 20 L tanks. The control tanks were fertilized with cow dung manure at a concentration of 1.5 gL-1. Immune stimulation was determined by calculating the survival percentage of reared fish following the challenge test by exposing them to pathogenic bacteria (*Aeromonas hydrophilla*) at a concentration of 100 μL containing 2\* 106 CFU mL-1 live bacteria in tanks fertilized with the fermented fish processing wastes biofertilizer and the control.

The results of this study showed that primary productivity was well improved in tanks fertilized with fermented fish processing waste biofertilizer (Phytoplankton and zooplankton abundances were higher, p = 0.048 and p = 0.026, respectively) compared with the control. Nitrite and reactive phosphate concentrations were higher (p = 0.0019 and p = 0.028, respectively) in tanks fertilized with 6 gL-1, with mean values of 0.1645 ± 0.0033 mgL-1 and 0.00483 ± 0.00162 mgL-1 of fermented fish processing wastes bio-fertilizer, respectively.

Based on the survival of the cultured fish stressed with pathogenic bacteria, the tank fertilized with 4 gL-1 of fermented fish processing waste bio-fertilizer had the highest survival percentage (p = 0.037) of 73.3%, while the lowest was observed in the tank fertilized with cow dung manure (40%). Therefore, based on this study, it can be concluded that the use of fermented fish processing waste, especially at concentrations of 4 gL-1 and 6 gL-1, represents an effective fertilizing strategy. This study presented the first report on the reutilization of fish processing wastes as bio-activated organic fertilizer in aquaculture.

2. Research theme and plan in Japan（渡日後の研究テーマ及び研究計画）

Describe articulately the research theme and plan you wish to carry out in Japan. Specify particularly the ultimate goal(s) of your research in

Japan.（日本において希望する研究テーマ及び研究計画を明確に記入すること。特に研究の最終目標を具体的に記入すること。）

1. Research theme（研究テーマ）

I want to research marine-derived nutritional and functional food ingredients, especially the rarely utilized or ignored marine biomaterials. In this theme, I want to find out the novel compounds, and important functional properties of the marine-derived biomaterials that offer unique health benefits and that can revolutionize the field of functional foods and nutraceuticals. This research has the potential to contribute to improving human well-being, developing innovative food ingredients, and promoting environmental sustainability by utilizing the untapped potential of marine bioresources.

1. Research plan（研究計画）

**Introduction**

In recent years, there has been a growing global concern regarding health and nutrition. As the prevalence of diet-related diseases continues to rise, there is an increasing demand for functional foods and nutraceuticals that offer not only basic nutrition but also additional health benefits. These products have gained popularity due to their potential to promote well-being, prevent chronic diseases, and improve overall quality of life.

**Problem Statement**

Most of the research in the field of nutraceuticals and functional foods has predominantly focused on terrestrial sources. However, marine environments have plenty of biomaterials that have untapped potential when it comes to the field of functional materials and nutraceuticals. This is revealed in developing countries whereby, most of the traditional medicine and functional food specialists relied on the terrestrial bio-resources and left aside the marine ones. Marine ecosystems are believed to contain potent resources that offer abundant and untapped bioactive and functional compounds that are important for our life and daily life perfections. Therefore, it’s also imperative to investigate and report on the potential marine-derived ingredients that have potential functional properties.

**Justification and Novelty**

Marine resources include the microbiome, plankton, micro and macrobenthos, fish, mammals, and many more. However, the assessment of the potential of these resources is based most particularly on fish and some common species, leaving aside other resources untapped. While traditional nutraceutical sources have been extensively studied, the utilization of marine resources represents a novel approach that offers distinct bioactive compounds and potentially unique prebiotic properties. y assessing the prebiotic potential of marine-derived ingredients, we can uncover new opportunities for developing functional food ingredients that promote gut health, providing innovative solutions for enhancing human well-being and nutritional interventions.

**Objectives**

**General objective**

To assess the functional and nutraceutical properties of compounds extracted from marine benthos by using biodegradation technology.

**Specific objectives:**

1. Determine the functional properties of marine-derived ingredients extracted from the selected marine macrobenthos.
2. To determine the nutraceutical properties of marine-derived compounds extracted from the selected marine macrobenthos.
3. To determine the chemical and physical properties of the extracted compounds from the selected macrobenthos

**Methodology**

To achieve the objectives, I will employ a combination of in vitro fermentation studies and microbiological analyses. The selected marine-derived ingredients will undergo fermentation using specific inoculum or simulated models to evaluate their fermentability and production of short-chain molecules with functional and nutraceutical properties. Additionally, I will assess the functional and nutraceutical potentials of the extracts by testing different properties; from antioxidative, anti-inflammatory, anti-hypertensive, prebiotic, and probiotic potentials following fermentation and bioactivation of the extracts. changes in gut microbiota composition using advanced sequencing techniques to identify shifts in beneficial bacteria populations upon exposure to marine-derived ingredients.

**Expected Outcomes**

By conducting this research, I anticipate uncovering new insights into the nutraceutical, nutritional, and functional potential of marine-derived macrobenthos. Our findings will provide valuable information on their extractability, potential for human health and wellbeing, and potential to promote sustainable utilization of marine macrobenthos. These outcomes will contribute to the development of novel prebiotic ingredients sourced from marine ecosystems and expand the range of options for enhancing gut health.

**Conclusion**

I aim to fill the existing gap in knowledge and unlock the potential of marine macrobenthos resources as a potential source of nutritional and functional compounds. This research has the potential to revolutionize the field of macrobenthos nutritional resources, functional foods, and nutraceutical compounds, offering innovative solutions for improving human well-being and promoting sustainable utilization of marine bioresources.

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