

Development and Evaluation of a Wasabi Substitute Using Microgreen Mustard Green

Abstract

A seasoning formula alternative to fresh wasabi, designed for dipping with similar consumption characteristics, utilizes young *Brassica juncea* (mustard greens) microgreen. This offers a cost-effective option for the food industry. The aseptically prepared mustard greens, harvested at 21 days, contain isothiocyanates responsible for the signature pungent flavor of wasabi. The most abundant compound, Allyl Isothiocyanate, demonstrates anti-colorectal cancer properties. Volatile compounds like Carvone and β -Caryophyllene contribute to antioxidant and anti-inflammatory benefits, enhancing product health value. This innovation is a novel wasabi substitute with cancer-inhibiting properties.

Summary

The experiment involved developing a formulation, evaluating its chemical and biological properties, and conducting a consumer acceptance test with 30 participants (Hedonic scale) on taste, texture, and spiciness. The formula with the highest acceptance score was refined and re-tested to determine the optimal formulation.

Analysis showed that the seasoning made from microgreen mustard greens exhibited high antioxidant activity. The formula containing **12.65% blended mustard green, 18.90% horseradish, 10.54% yellow mustard, and 1.26% wasabi** had the highest DPPH radical scavenging activity (**131.69 mg TE/g DW**) and DPPH inhibition (**49.76%**). It also had the highest **total phenolic content (TPC)** and **total flavonoid content (TFC)**, aligning with its strong antioxidant potential. The **isothiocyanate content was 0.13 mmol/100g DW**, higher than the commercial formula (0.2 mmol/100g DW). The product received the highest sensory score for color, significantly different from commercial wasabi, and was highly rated for taste and overall preference.

The product contained **17.69% protein, 9.77% fat, 7.90% crude fiber, 7.46% ash, 5.77% moisture, and 51.42% carbohydrates**. Cytotoxicity testing on HaCaT (human skin cells) and HT-29 (human colon cancer cells) at concentrations of 12.5-800 $\mu\text{g/mL}$ indicated selective toxicity, with **over 93% viability of HaCaT cells even at 800 $\mu\text{g/mL}$** . The wasabi substitute significantly affected HT-29 cancer cells while having minimal impact on non-

cancerous HaCaT cells, likely due to **AITC (allyl isothiocyanate)**, known for its anticancer properties.

Stored at **4°C for 90 days**, the product costs **1 THB per gram**, half the price of market **wasabi**, reducing production costs. It closely resembles commercial wasabi in sensory characteristics and is **the first wasabi substitute with anticancer properties**, offering industrial production potential at a lower cost than fresh wasabi imports in Thailand.

Target Consumers

1. General consumers who enjoy Japanese cuisine
2. Japanese food ingredient distribution companies
3. Japanese restaurant businesses
4. Mustard green seed producers



