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ORIGINAL PAPER

A real-time polymerase chain reaction (PCR) method for the detection of wasabi (*Eutrema wasabi*) in foods

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Abstract Wasabi (commonly described as Japanese horseradish, *Eutrema wasabi* syn. *Wasabia japonica*) has gained substantial attractiveness in recent years because of its characteristic flavour as ingredient in Japanese-style food products. Wasabi rhizomes are expensive compared to roots of common horseradish (*Armoracia rusticana*). A quantitative analytical method for the detection of wasabi plant is required for official food control authority laboratories to detect potential frauds. This paper presents a real-time PCR method allowing the detection and semi-quantification of wasabi (*Eutrema wasabi* syn. *Wasabia japonica*) in complex food matrices. The wasabi-specific primers and the TaqMan fluorescent probe are targeted at the multi-copy gene of the enzyme myrosinase. This method was found to be specific for wasabi and did not show any cross-reactivity with 24 food-relevant plant species, including 20 members of the *Brassicaceae* family. Because of using the multi-copy gene myrosinase, the sensitivity is very high with less than about 1 pg wasabi DNA per PCR. This real-time PCR method was applied to verify the correct declaration of 10 commercially available products containing wasabi according to the declared ingredients or the product description (wasabi powders, pastes, dressing, and snacks): 6 samples showed positive PCR results and in 4 samples it was not possible to detect any wasabi DNA. The reasons could be the lack of the wasabi plant material or the destruction of wasabi DNA during food processing. As a conclusion, the presented quantitative real-time PCR method is useful for sensitive and selective detection of wasabi in food products in routine analysis.

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Introduction

Wasabi (commonly described as Japanese horseradish, *Eutrema wasabi* syn. *Wasabia japonica*) is a perennial Japanese traditional spice. The consumption of wasabi is increasing as Japanese foods spread around the world. Therefore, this plant has reached the western hemisphere also where wasabi is used as ingredient for the preparation of sushi and sashimi or for the seasoning of roasted nuts, peas, beans, and potato chips eaten as snacks. Wasabi is traded either as unprocessed rhizome in the form of a root which must be finely grated before use or as processed as a paste in tubes. It also exists as dry powders that have to be combined with water to allow enzymatic reactions and release the volatile compounds (mustard oils) that give the hotness. The wasabi plant that belongs to the family *Brassicaceae* naturally grows along the stream beds in mountain river valleys in Japan. As the demand for real wasabi is very high, Japan has to import a large amount of it from China, Taiwan, or Unites States. The cultivation is delicate and still needs a lot of expenditure of work so the wasabi is very expensive. The chance of fraudulency by replacing wasabi by other similar aromatic plants or wasabi flavor only remains. If wasabi is declared as ingredient in a product or is part of the product description, so according to food legislation wasabi plant material must be contained in the corresponding product. Due to the verdict of the district court Landgericht Munich II, it is not allowed to use wasabi flavor only (Verdict from November 18, 2009, reference 1HL4 O 4243/09). Therefore, there is still a demand for a quantitative analytical method for the detection of wasabi plant material for official food control authorities.