

凍結含浸処理した魚介類の軟化と筋肉タンパク質の変化

永井崇裕, 福馬敬紘, 中津沙弥香, 柴田賢哉, 坂本宏司 : 日本水産学会誌, **77**, 402-408 (2011).

凍結含浸法による魚介類の軟化方法について, マダラおよびスルメイカを用いて検討した。凍結解凍した試料にプロテアーゼ製剤を減圧下で含浸し, 一定時間酵素反応させることで, 試料の形状を保持したまま, 介護食レベルとなる $5 \times 10^4 \text{N/m}^2$ 以下の硬さにまで軟化させることが可能であった。酵素反応後の試料は 40–60°C の加熱で大幅に軟化した, 加熱に伴う筋肉タンパク質の変化が電気泳動により認められた。また, 軟化したタラの遊離アミノ酸量は処理前と比較して増加したが, タンパク質構成アミノ酸の増加が顕著であった。

Production of angiotensin I-converting enzyme-inhibitory peptides in a freeze-thaw infusion-treated soybean

Ryo KAJIHARA, Kenya SHIBATA, Sayaka NAKATSU and Koji SAKAMOTO : *Food Science and Technology Research*, **17**, 561-565 (2011).

Freeze-thaw infusion (FI) is a new technology involving the rapid impregnation of food materials with enzymes under reduced pressure. An FI method employing protease was used to produce an angiotensin I-converting enzyme (ACE)-inhibitory peptide within soybean. Protease N “AMANO” G, the enzyme used for this method was selected after testing 11 commercial enzymes. The ACE-inhibitory peptide isolated from FI-treated soybean was identified by a three-step process involving HPLC and LC/MS/MS. Ile-Tyr was isolated as the dominant component of this ACE-inhibitory peptide, and was present at a concentration of 0.11 mg/g in FI-treated soybean.

UV-Blocking film for food storage using titanium dioxide

Akihiko HASHIMOTO and Koji SAKAMOTO : *Food Science and Technology Research*, **17**, 199-202 (2011).

We aimed to develop UV-blocking clear films for foods using the harmless titanium dioxide. The blocking rate for short-wavelength UV light (200 nm-300 nm) was 99.2%, while that for long-wavelength UV light (300 nm-400 nm) was 70.9%. The coating was transparent

and adhered strongly to the films according to the JIS rule.

Mechanical properties of softened foodstuffs processed by freeze-thaw infusion of macerating enzyme

Sayaka NAKATSU, Kaoru KOHYAMA*, Yayoi WATANABE, Kenya SHIBATA, Koji SAKAMOTO and Mitsuya SHIMODA** : *Innovative Food Science and Emerging Technologies*, **16**, 267-276 (2012).

Mechanical properties of the softened foodstuffs were analyzed for the evaluation of care foods. The softened foodstuffs were prepared by a rapid impregnation of macerating enzymes using freeze-thaw infusion (FI) technique. FI technique using macerating enzymes has been able to soften foodstuffs, while retaining their original shapes. In this study, five foodstuffs (bamboo shoot, burdock root, lotus rhizome, Pacific cod, and shiitake mushroom) were tested. Their firmness, adhesiveness, and cohesiveness were analyzed by texture profiling analysis (TPA). Each firmness was decreased smaller than 1/10 of untreated samples. The adhesiveness of the Pacific cod was 70 times higher than that of the shiitake mushroom. As another mechanical property, fibrous texture was evaluated by the residual weight on the nylon mesh with 1 mm aperture. While the lotus rhizome exhibited the maximum weight of dried residue per sample weight of $1.26 \times 10^{-2} \text{g/g}$, the value for the bamboo shoot was not detected. Industrial relevance: Advanced quality of commercial care foods is an increasing demand in the aging society. FI technique with some macerating enzymes can soften foodstuffs retaining their original shapes. Therefore, FI technique attracts much attention as one of the promising methods to manufacture universally designed foods. To achieve the product development of foodstuffs using FI technique, the information about their mechanical properties is required. It can be also utilized for consumers to estimate the textural safety on purchase. The results from this study will contribute to provide information for judgment of the ease of eating of these softened foods.

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無洗米を用いた実用規模での清酒醸造

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To elucidate suitability of wash-free rice for sake brewing, we carried out practical scale brewing with 50% polished rice at three breweries. The activities of koji(α -amylase, α -glucosidase, glucoamylase, acid protease and acid carboxy peptidase) were almost same as those from ordinary polished rice. The fermentation periods of moromi mash from wash-free rice and ordinary polished rice showed no uniform tendency. General components, yields and flavor components in sake from wash-free rice were almost same as those from ordinary polished rice. Although glucose in sake from wash-free rice was slightly smaller than that from ordinary polished rice, there had no significant difference between the wash-free rice and the ordinary polished rice. Sensory scores of brewed sake from wash-free rice were almost same as those from ordinary polished rice. These results suggest that wash-freeing can not only save labor for rice-washing process but also lead sake to the same quality as that by conventional method.

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凍結含浸法による野菜の煮物の調理工程における食品衛生指標細菌の消長

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The enzyme-infusion method is a new technique used to soften food ingredients without destroying their shape. We studied the change in number of bacteria widely used as food hygiene indicators during the cooking process of vegetables treated by enzyme infusion in order to evaluate its safety. We chose boiled vegetables (burdock roots, lotus roots, carrots, taro and bamboo shoots) in broth as the food sample and measured the

standard plate count, and numbers of coliforms, anaerobic bacteria, *Clostridia* and aerobic spore-forming bacteria. The standard plate count and number of coliforms detected in vegetables before parboiling (e.g., raw, washed, peeled or cut) decreased as the cooking process advanced. No bacterial indicator could be detected after parboiling at 75°C for 1min. Furthermore, no increase in *Clostridia* was apparent in the process when the cooking ingredients were under vacuum or hypoxic. The results indicate that boiled vegetables in broth subjected to enzyme-infusion seem to be safe as long as parboiling is properly conducted.

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Multivariate analyses and characterization of volatile components in citrus species

Kenta YAMAMOTO*, Ayumi YAHADA*, Kumi SAKAKI*, Koji SAKAMOTO, Kazunori OGAWA** and Hideaki OHTA* : *Food Science and Technology Research*, **19**, 39-49 (2013).

The composition of volatile components in 18 Citrus Archicitrus species, 17 Citrus Metacitrus species and two Fortunella species, according to the classification system established by Tanaka, was investigated using headspace gas chromatography-mass spectrometry. The composition of 48 volatile compounds in the juice of these species was determined, and principal component analysis was performed. Scores for the 1st and 2nd principal components (PC) are plotted as a scatter diagram. In Citrus Archicitrus, samples of Citrophorum, Cephacitrus and Aurantium formed individual groups, but others did not. In Citrus Metacitrus, samples of Acrumen were divided into two different groups. The composition of volatile components in citrus juice was consistent with each grouping of Tanaka's system, in particular, in the case of dividing the Citrus genus into the two subgenera Archicitrus and Metacitrus.

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広島県立総合技術研究所食品工業技術センターの取組み

赤繁 悟 : 明日の食品産業, **426**, 36-40 (2012).

広島発 凍結含浸法の実用化と普及に向けた取組みについて

杉岡 光：日本生活支援工学会誌, 12, 64 (2013).

「広島発」凍結含浸の本格普及を目指して

土居睦明：食品の試験と研究, 47, 48 (2013).

酵素による分子改変を利用した動物性素材の食感・食味創造技術の開発

梶原 良, 柴田賢哉, 若崎由香：食品の試験と研究, 47, 70 (2013).

広島県では食品素材を凍結、解凍後に酵素液中で減圧することにより、食品素材内部まで酵素を急速に導入する凍結含浸法を開発した。食材内での酵素分解により、見た目を変えずに軟らかくしたり、食材内に含まれる物質を低分子化することができる。これまで植物性素材を中心に適用食材の拡大を図ってきた。本研究では凍結含浸法を動物性素材に適用するため、使用する酵素の特性について試験を行った。

圧力を利用した食品加工・微生物制御技術

重田有仁：食品の試験と研究, 47, 71 (2013).

圧力を利用したカキの脱殻技術、圧力下での酵素分解によるエキス製造技術、圧力による発芽誘導を利用した芽胞の殺菌技術について商品化事例を中心に技術紹介を行った。

高齢者向け調理食材の開発

坂本宏司：調理食品と技術, 17, 29-37 (2011).

凍結含浸法による食材の軟化

坂本宏司：食品酵素化学の最新技術と応用Ⅱ, 井上國世監修, シーエムシー出版, pp. 242-251 (2011).

凍結含浸法

坂本宏司, 柴田賢哉：進化するテクスチャー研究, 山野善正監修, エヌティエス出版, pp. 467-481 (2011).

凍結含浸法による高齢者・介護用食品製造技術

坂本宏司：高齢者用食品の開発と展望, 大越ひろ, 渡邊 昌, 白澤卓二監修, シーエムシー出版, pp. 152-158 (2011).

高齢化社会に対応する美味技術－凍結含浸技術について－

柴田賢哉：美味技術学会誌, 11, 60-65 (2012).

凍結含浸法によるバリアフリー型介護食の開発と一般食品加工への応用

坂本宏司：化学工学, 77, 103-105 (2013).