

Optimum Condition Expressed by Diffusion Coefficient during Soy Sauce Seasoning Process

-Transportation of Pigment, Taste and Aroma Substance and Sensory Evaluation -

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Summary

Soy sauce is one of the most famous Japanese traditional food products made from soybeans. In addition to soybeans, wheat, sodium chloride and *koji* (malted rice, e.g. *A. sojae* and *A. oryzae*) are essential ingredients. After fermentation, soy sauce generally contains 67.6% water, 15.4% ash, 8.7% protein and 8.3% carbohydrate. It consists of sodium chloride, amino acids, organic acids, saccharides and pigments whose molecular weight differs approximately from 60 to 100,000. This study was undertaken to understand how soy sauce components diffuse into foods, which is one of the most basic phenomena occurring during processing.

Japanese radish (*Raphanus sativus* L.), potatoes (*Solanum tuberosum* L.), egg albumin gel (Q. P. CORPORATION) and surimi-gel (KIBUN FOODS INC.) were used as food materials. Japanese radish and potatoes were heated for 15 minute at 100°C. Every sample was cut into cube of 1.5 × 1.5 × 1.5cm and kept at 5°C for 3 hours before soaking in soy sauce (Kikkoman Corporation, regular soy sauce). After soaking in soy sauce for 0-168 hours at 5°C and stirring using 50 rpm magnetic stirrer, water content, sodium chloride content and color (Hunter L, a and b by color meter) were measured. Diffusion coefficients of sodium chloride were calculated using computer best fitting.

The rate of change of the sodium chloride concentration and the surface color difference in Japanese radish were almost the same. They changed dynamically at the beginning of the soaking period, and after 24 hours the changes became slighter. The other samples (potato, egg albumin gel and surimi gel) showed the same results as Japanese radish. With regard to sodium chloride transportation, it reached equilibrium 24 hours after soaking in soy sauce in all samples. The surface color of all the samples also almost reached equilibrium after 24 hours' soaking. However when the section of the samples was investigated, the inside profiles were different in each sample. The pigments transportation in Japanese radish reached equilibrium after soaking for 24 hours. On the other hand, the intrinsic color of the center of the section of potato and surimi gel still remained even after soaking for 168 hours. It was suggested that diffusion coefficients of sodium chloride were influenced by water content of each food sample and also depended on sample porosity.