

Changes in soymilk protein behavior with NaCl in freeze-thaw processing

MATSUNO M. (1,2), MORITA K. (3), MURAKAMI K. (2), SHIMOYAMADA M. (2)

1 Industrial Research Institute of Shizuoka Prefecture, Shizuoka, Japan

2 University of Shizuoka, Shizuoka, Japan

3 Jissen Women's University, Tokyo, Japan

Objective: Proteins in unheated soymilk are easily fractionated using freeze-thaw processing. The freeze-thaw soymilk is divided into two layers, the supernatant is rich in 7S (b-conglycinin) and the precipitation is rich in 11S (glycinin). The former is suitable for making soft pudding-like tofu, and the latter for hard tofu. To further elucidate the detailed fractionation mechanism, the effect of NaCl on fractionation was investigated. Moreover, to clarify the reversibility of soymilk proteins, once salted, the soymilk was desalted by dialysis and frozen and thawed.

Methods: Soymilk was made from *Glycine max* cv. Fukuyutaka. After the soymilk samples containing various concentrations of NaCl were frozen at $-30\text{ }^{\circ}\text{C}$ for a week, they were thawed at $5\text{ }^{\circ}\text{C}$ and centrifuged at $3,000\text{ } \times g$ to separate the supernatant and the precipitate. In addition, for reversibility testing, the added salt was removed from the soymilk by dialysis followed by freeze-thawing. The particle size of soymilk was measured with a laser diffraction particle size analyzer. Zeta potential was measured with an electrophoresis light scattering analyzer.

Results: Unheated soymilk was not divided into two layers when NaCl concentration was 0.22 M or higher. When the salt concentration of the aqueous protein solution becomes quite high, precipitation usually occurs, but it's so interesting that no precipitation occurs after freezing and thawing. However, when the soymilk, which had a NaCl concentration of 0.22 M or higher, was desalted by dialysis, it was divided after freeze-thaw processing. This result suggested that the unheated soymilk proteins, once structurally changed by the addition of NaCl, returned reversibly upon desalting.

Conclusion: Proteins in unheated soymilk underwent structural changes with the addition of high salt concentrations. This caused the proteins were no longer fractionated by freeze-thaw processing. However, after desalting by dialysis, the structure of the proteins reversibly returned and the soymilk was able to be fractionated using freeze-thaw processing again.