Effective Proteolysis of Soy and Wheat Proteins with Addition of Salts and Development of New Food Materials

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We have examined effective procedures for proteolysis of un-utilized proteins for expanding the proteins for foods. Coagulation is observed often in the proteolysis of soy and wheat proteins, and prevents the complete proteolysis. We have studied the coagulation process observed when soy protein isolates (SPI) are treated by subtilisin Carlasberg (SC) [1,2]. We describe here the characteristics of the coagula formed in SPI-digestion by SC, and the effects of salts, alcohol, and pH on the coagulation of SPI by SC. Regarding wheat proteins, we have isolated an amylase-inhibitor, and examined its inhibition mechanism against amylase [3].

MATERIALS AND METHODS. SPI (10 mg/mL) and SC (1 μM) were mixed at pH 8 and 37°C, and the turbidity (OD_{660}) change was measured continuously. Coagula formed for 60-min reaction were collected, and amino acid composition, effects of NaCl and ethanol, and pH (pH 2.2-10.5) on the solubility were examined. Coagula formed by other proteases (ficin, bromelain, pronase, and subtilisin BPN') were also analyzed. Effects of salts on the coagulation of the SC-treated SPI were examined.

RESULTS AND DISCUSSION. Coagula contained higher content of charged amino acids (AA) and lower content of hydrophobic AA than SPI, suggesting that high content of non-polar groups may be a key clue for the coagulation. The solubility of coagula was not changed by adding 0-4 M NaCl or 0-40% ethanol, but it was lowest at pH 3-8, while that of SPI was lowest at pH 4-5. Coagula may be formed by complex interaction including electrostatic, hydrophobic interactions. Coagulation was enhanced 5 times by adding 100 mM NaCl, but there are no difference between NaCl and Na_2SO_4 on the basis of $[Na^+]$. The effects of $MgCl_2$ and $CaCl_2$ were the same, and much stronger than those of other salts; 2 mM $MgCl_2$ or $CaCl_2$ has the same potential as 50 mM Na_2SO_4 or 100 mM NaCl. As SC activity was not affected by the salts used, the salts effects described above must be on the interaction between peptides formed during the SPI proteolysis.

1. K. Inouye, K. Nagai, and T. Takita (2002) *J. Agric. Food Chem.* **50**, 1237-1242.
2. K. Nagai and K. Inouye (2004) *J. Agric. Food Chem.*, in press.
3. H. Oneda, S. Lee, and K. Inouye (2004) *J. Biochem.* **135**, 421-427.