Intragranular distribution of inhibitory effect on retrogradation in cooked rice grains achieved from addition of ?-glucosidase (AG) and branching enzyme (BE).

OHMOTO C. (1), TAGUCHI T. (2), OHNISHI M. (2), YAMAGUCHI H. (1), HASHIMOTO T. (1), HIRATA Y. (2), KATSUNO N. (2), NISHIZU T. (2)
1 AJINOMOTO CO.,INC, kanagawa, Japan
2 Gifu University, Gifu, Japan

Retrogradation of cooked rice progresses over time, and hardens the rice, causing a parched texture, so controlling this retrogradation is an important issue. The main factor contributing to rice retrogradation is recrystallization of starch in gelatinized rice. Adding ?-glucosidase (AG) or branching enzyme (BE) when cooking the rice was found to inhibit retrogradation. We previously established a method utilizing X-ray diffraction to quantify the degree of starch retrogradation. In this study, we investigate the intragranular distribution of the inhibitory effect obtained from AG and BE on starch retrogradation by measuring X-ray diffraction at different sites on the cooked rice grain.
Rice was cooked and stored at 15 ? for two days. The sample was made by slicing a rice grain near its lengthwise center, perpendicular to its longitudinal axis into a 1 mm-thick disc. Cyanoacrylate adhesive was applied to the sample surface to suppress moisture evaporation from the rice surface. X-ray diffraction was measured at 6 sites respectively by irradiating X-rays with a beam size of 100 ?m toward the core from the sample cross-section surface using BL-5A beamline from the High Energy Accelerator Research Organization. The degree of starch retrogradation was then calculated from the X-ray diffractogram obtained using the 4a peak area.
Compared with an identical rice grain, the degree of starch retrogradation increased the closer to the core at up to 600 µm from the rice grain surface. From 600 µm, the degree of starch retrogradation declined the closer to the core, however, the starch retrogradation was not less than the surface starch retrogradation. The AG and BE-added sections showed less of starch retrogradation compared to the control sample at all measurement sites and the inhibitory effect on retrogradation from adding AG and BE was confirmed. When compared by site, the inhibitory effect on starch retrogradation achieved by adding AG and BE was greater on the surface than in the rice grain core. These results revealed that the inhibitory effect on retrogradation achieved by AG and BE was especially noticeable in starch near the rice grain surface.