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Identification of 4-mercapto-4-methylpentan-2-one as the characteristic aroma of sake made from low-glutelin rice

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The grassy characteristic aroma perceived in brewed sake made from low-glutelin rice (*Oryza sativa* L. Mizuhonoka) was examined by gas chromatography-olfactometry and gas chromatography-mass spectrometry. By comparing the odor properties and Kovats retention indices to those of standard compounds, 4-mercapto-4-methylpentan-2-one (4MMP) was found to contribute to the characteristic aroma. Sake brewing using Mizuhonoka, low-glutelin rice, and Gin-ohmi (a control) revealed that 4MMP concentrations in Mizuhonoka sake samples were higher than those in Gin-ohmi samples over the fermentation period. The concentration in final Mizuhonoka sake was twice that of Gin-ohmi. To investigate the mechanism of 4MMP formation, the putative precursors, 4-S-cysteiny-4-methylpentan-2-one (cys-4MMP) and 4-S-glutathionyl-4-methylpentan-2-one (glut-4MMP), in sake and its materials (rice and koji) were analyzed by ultra-performance liquid chromatography tandem mass-spectrometry. Cys-4MMP was not detected in all samples, while glut-4MMP was present in sake and its materials. The glut-4MMP concentration in sake was lower than that in Gin-ohmi over nearly the entire fermentation period, suggesting that conversion of the precursors to 4MMP was more effective in the mash of low-glutelin rice Mizuhonoka than in Gin-ohmi. The release of 4MMP during alcoholic fermentation from a model medium containing its precursors was examined. While no 4MMP release was observed in the control (no addition), with the addition of its precursors, the release of 4MMP increased as fermentation progressed. It was suggested that 4MMP was generated from both cys- and glut-4MMP by sake yeast. The perception threshold of 4MMP in sake was determined as 1.2 ng/L.

Biography

Sachiko Iizuka has completed her PhD from Kyoto Prefectural University, Japan. She worked at Kizakura Co., Ltd. until January 2015, and moved to National Research Institute of Brewing (NRIB). She is a Researcher of Quality and Evaluation Research Division at NRIB and collaborative Researcher of Laboratory of Genetic Engineering, Graduate School of Life Sciences, and Kyoto Prefectural University.

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