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## Cell fusion and heterokaryon incompatibility: Variety of *Aspergillus oryzae* industrial strains used in Japanese traditional food fermentation

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**Purpose:** *Aspergillus oryzae* is the industrial filamentous fungus used in Japanese traditional food fermentation such as manufactures of sake, soy sauce and *miso*. As sexual reproduction has not been found in *A. oryzae*, it is quite difficult to breed strains with industrially useful characteristics. We previously identified two mating types of *A. oryzae* strains (MAT1-1 and MAT1-2)<sup>1)</sup>, indicating the potential for sexual reproduction. Cell fusion is the first process in sexual reproduction, and filamentous fungi also undergo cell fusion during the vegetative growth (asexually) to form heterokaryon. In this study, we examined cell fusion ability among various *A. oryzae* industrial strains.

**Methods:** Methods to sensitively detect the cell fusion were developed by employing auxotrophic complementation and BiFC (Bimolecular Fluorescence Complementation) technique<sup>2,3,4)</sup>.

**Results and conclusions:** The methods enabled us to demonstrate the ability of cell fusion in *A. oryzae*. There are numerous *A. oryzae* strains industrially used for sake, soy sauce and *miso*. Most of the *A. oryzae* industrial strains are capable of cell fusion, however, cell fusion was not detected with many strain pairs, a phenomenon related to heterokaryon incompatibility. Molecular investigation of the heterokaryon incompatibility by genome editing technique<sup>5)</sup> and comparative genomics<sup>6)</sup> would help efficiently induce sexual reproduction for crossbreeding in *A. oryzae*.

1) Wada et al. (2012) Appl. Environ. Microbiol. Vol. 78, 2819-2829

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3) Wada et al. (2014) Appl. Microbiol. Biotechnol. Vol. 8, 325-334

4) Okabe et al. (2018) Sci. Rep. Vol. 8, 2922

5) Katayama et al. (2019) Appl. Environ. Microbiol. Vol. 85, e01896-18

6) Mori et al. (2019) Biosci. Biotechnol. Biochem. Vol. 83, 1557-1569