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The Origin of *Meju* Fungi - Fungal Diversity of Soybean, Rice Straw and Air for *Meju* Fermentation

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Meju is a brick of dried fermented soybeans and is the core material for *Jang* such as *Doenjang* and *Ganjang*. *Jang* is produced by addition of salty water to *Meju* and is considered the essential sauces of authentic Korean cuisine. *Meju* is fermented by diverse microorganisms such as bacteria, fungi and yeasts. It is known that fungi play an important role in the *Meju* fermentation and they degrade macromolecules of the soybeans into small nutrient molecules. In previous study, 26 genera and 0 species were reported as *Meju* fungi. However, it is not comprehensively examined where the fungi present on the *Meju* are originated. In order to elucidate the origin of the fungi present on the *Meju*, the mycobiota of 500 samples soybean kernels, 296 rice straw pieces and air samples of *Jang* factories was determined in 0, 2 and 7 *Jang* factories respectively.

Forty-one genera covering 86 species were isolated from the soybeans and 33 species were identical with the species from *Meju*. From sodium hypochlorite untreated soybeans, *Eurotium herbariorum*, *Eurotium repens*, *Cladosporium tenuissimum*, *Fusarium fujikuroi*, *Aspergillus oryzae/flavus* and *Penicillium steckii* were the predominant species. In case of sodium hypochlorite-treated soybeans, *Eurotium herbariorum*, *E. repens* and *Cladosporium tenuissimum* were the predominant species. Of the 4 genera and 86 species isolated from soybeans, 3 genera and 33 species were also found in *Meju*.

Thirty-nine genera and 92 species were isolated from the rice straws and 40 species were identical with the species from *Meju*. *Fusarium asiaticum*, *Cladosporium cladosporioides*, *Aspergillus tubingensis*, *A. oryzae*, *E. repens* and *Eurotium chevalieri* were frequently isolated from the rice straw obtained from many factories. Twelve genera and 40 species of fungi that were isolated in the rice straw in this study, were also isolated from *Meju*. Especially, *A. oryzae*, *C. cladosporioides*, *E. chevalieri*, *E. repens*, *F. asiaticum* and *Penicillium polonicum* that are abundant species in *Meju*, were also isolated frequently from rice straw. *C. cladosporioides*, *F. asiaticum* and *P. polonicum* that are abundant in low temperature fermentation process of *Meju* fermentation, were frequently isolated from rice straw incubated at 5°C and 25°C, while *A. oryzae*, *E. repens* and *E. chevalieri* that are abundant in high temperature fermentation process of *Meju* fermentation, were frequently isolated from rice straw incubated at 25°C and 35°C. This suggests that the mycobiota of rice straw have a large influence in mycobiota of *Meju*.

Thirty-nine genera and 92 species were isolated from the air of *Jang* factories and 34 species were identical with the species from *Meju*. In outside air of the fermentation room, *Cladosporium* sp. and *Cladosporium cladosporioides* were the dominant species, followed by *Cladosporium tenuissimum*, *Eurotium* sp., *Phoma* sp. *Sistotrema brinkmannii*, *Alternaria* sp., *Aspergillus fumigatus*, *Schizophyllum commune*, and *Penicillium glabrum*. In inside air of the fermentation room, *Cladosporium* sp., *Aspergillus oryzae*, *Penicillium chrysogenum*, *A. nidulans*, *Aspergillus* sp., *C. cladosporioides*, *Eurotium* sp., *Penicillium* sp., *C. tenuissimum*, *A. niger*, *E. herbariorum*, *A. sydowii*, and *E. repens* were collected with high frequency. The concentrations of the genus *Aspergillus*, *Eurotium* and *Penicillium* were significantly higher in inside air than outside air.

From this results, the origin of fungi present on *Meju* was inferred. Of the dominant fungal species present on *Meju*, *Lichtheimia ramosa*, *Mucor circinelloides*, *Mucor racemosus*, and *Scopulariopsis brevicaulis* are thought to be originated from outside air, because these species are not or are rarely isolated from rice straw and soybean; however, they were detected outside air of fermentation room and are species commonly found in indoor environments. However, *A. oryzae*, *P. polonicum*, *E. repens*, *P. solitum*, and *E. chevalieri*, which are frequently found on *Meju*, are common in rice straw and could be transferred from rice straw to *Meju*. The fungi grow and produce abundant spores during *Meju* fermentation, and after the spores accumulate in the air of fermentation room, they could influence mycobiota of *Meju* fermentation in the following year. This could explain why concentrations of the genus *Aspergillus*, *Eurotium*, and *Penicillium* are much higher inside than outside of the fermentation rooms.

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