（学位第３号様式）

# 学　位　論　文　要　旨

| | |
|---|---|
| 氏　名 | Yohei Shiraishi |
| 題　目 | Application of the biological characteristics of *Aspergillus* species for the formation of various flavors of *Shochu*<br>(本格焼酎の香味形成の差異に及ぼすタイプ別麹菌の醸造学的特性とその応用) |


*Koji* is a raw material for Japanese fermented products such as *Sake* and *Shochu*. Although it has been reported that yeast strains affect the alcoholic fermentation and the formation of compounds responsible for aroma in *shochu*, there are few studies on the effect of *koji* types and their metabolites on the quality and flavor of *shochu*. Therefore, we investigated the effects of different *koji* types and their enzymes on the quality of *shochu* with an aim of diversifying the flavor of *imo-shochu*.

At first, we subsequently investigated the influence of amino acids in *moromi* on the quality of *imo-shochu*. The addition of a protease agent to *imo-shochu moromi* decreased the content of higher alcohols in *shochu*, which was associated with amino acid increases in *moromi*. In addition, protease treatment increased the aldehyde content and made the flavor fruity and roasty. In addition, the formation of furfural from reducing sugars was synergistically increased in the presence of amino acids during distillation. Hence, we selected black *koji* fungi *(Aspergillus luchuensis*) strains with higher protease activity and made *imo-shochu* using them. The amino acid content in the *moromi* was increased and the aldehyde content in *imo-shochu* was also slightly increased after using the selected strains. In addition, 1-octen-3-ol was increased by using the selected strains. It was reported that 1-octen-3-ol was derived from *koji*, and hence, it is expected that higher 1-octen-3-ol would be a unique feature for the selected strains. *Imo-shochu* made with the selected strains was evaluated as sweet, mild, and *koji-ka*.

We investigated the influence of rice *koji* on the aroma of *shochu*. We compared the volatile compounds in “rice *koji shochu*”, which is made from rice *koji* with those in “enzyme *shochu*”, which is made from steamed rice and an enzymatic agent instead of rice *koji*. The olfactometric analysis revealed that the aroma of rice *koji shochu* was characterized by isovaleraldehyde, ethyl caprylate, ethyl caproate, and ethyl 2-methylbutyrate.

We prepared *imo-shochu* with yellow *koji*, white *koji*, or black *koji*, and investigated the effects of the *koji* type on the flavor of *imo-shochu*. Organic acid and amino acid contents in the *moromi* were changed depending on the *koji* type. The flavor of *imo-shochu* prepared with yellow *koji* was evaluated as *koji-ka*, baked confectioneries-like, and herb-like, that with white *koji* was roasty and sharp, and that with black *koji* had a roasty, oily, and mild flavor. GC-MS analyses indicated that the concentrations of higher alcohols, acetic acid ethyl esters, and sulfur compounds were higher in yellow *koji imo-shochu*. The aldehyde and terpene content in white *koji* or black *koji imo-shochu* was higher than that in yellow *koji imo-shochu*. However, white *koji imo-shochu* contained more 2-methylbutyrate, and black *koji imo-shochu* contained more methyl salicylate and 1-octen-3-ol.

In this study, we found that the *koji* types and strains affected the sensory quality and volatile compounds of *shochu*, and the selection of the *koji* strain would help to diversify the flavor of *imo-shochu*.