

Genetics and breeding of *Flammulina velutipes* in Korea

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Artificial mass production of *Flammulina velutipes* has been started by mechanized bottle cultivation system under controlled environment condition since the late 1980's in Korea. Its production is being rapidly increased and estimated about 55,000 M/T followed by oyster mushroom and oak mushroom in Korea in 2008. *Flammulina velutipes* shows brown caps and dark brown stipes in wild habitat. Brown fruiting body was not popular in the market as consumers prefer white color. Therefore, it is important to develop new variants producing white fruiting body in cultivation. Genetic diversity of collected strains was investigated by molecular tools and fruiting body color. Phylogenetic tree based on ITS sequencing data of 101 strains showed a good result reflecting geographic origin of strains. White fruiting body forming strains which seemed to be originated from Japan were bound very closely. Genetic analysis on fruiting body color provides breeding information for developing a new white strain, whose gene must be recessive to brown. We found that the inheritance of fruiting body color was controlled by two major genes. Based on this result, back-crossing method was used to develop the color isogenic lines and the white commercial strains. Molecular marker related to the color was also developed. Total 454 combinations between monokaryons from 17 collected brown strains were tested. Two F1 strains, showing light brown fruiting bodies, out of them were selected. In the next step we adopted multi-sporous random mating method to shorten breeding time. Fortunately several pure white strains which did not change color during cultivation under lighting were selected and showed different DNA polymorphism from Japan origin strains. These lines will be devoted to breeding promising the better white commercial strains. Now we are focusing the complete genome sequencing project on this mushroom. Results from this project will give many important research information related to inherent mushroom functions like edible and medicinal properties and characteristics involved in CO₂ re-circulation.