

Cultural Characteristics of Ectomycorrhizal Mushrooms

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Ectomycorrhizal (ECM) mushrooms play a major role in plant growth promotion through symbiotic association with roots of forest trees. They also provide an economically important food resource to us and therefore they have been studied for their artificial cultivation for decades in Korea. We have secured bio-resources of ECM mushrooms from Korean forests and performed their physiological studies.

To investigate the cultural characteristics, the fungi were cultured under different conditions (medium, temperature, pH of the medium, inorganic nitrogen source). More than 90% of total 160 strains grew on three solid media (potato dextrose agar, PDA; sabouraud dextrose agar, SDA; modified Melin-Norkrans medium, MMN). The rate of mycelial growth on malt extract agar (MEA) was lower than those of three media (PDA, SDA, MMN). None of the Tricholomataceae strains grew on MEA. Many strains of ECM mushrooms were able to grow at the temperature range of 15~25°C on PDA, while they showed poor growth at 10°C or 30°C. In particular, the growth rates of both Gomphaceae and Tricholomataceae were significantly lower at 10°C than at 30°C. The optimal pH of many strains was pH 5.0 when they cultured in potato dextrose broth (PDB). Fifty-seven percent of tested strains grew well on medium containing ammonium source than nitrate source. Many strains of Tricholomataceae showed a notable growth on ammonium medium than nitrate medium. Twenty-three percent of strains preferred nitrate source than ammonium source for their mycelial growth. The production and activity of two enzymes (cellulase and laccase) by ECM fungi were also assayed on the enzyme screening media containing CMC or ABTS. Each strains exhibited different levels of enzymatic activities as well as enzyme production. The number of laccase-producing strains was less than that of cellulase-producing strains. We found that 77% of tested strains produced both cellulase and laccase, whereas 2% of strains did not produce any enzymes.

The morphological characteristics of mycelial colony were also examined on four different solid media. Yellow was a dominant color in mycelial colony and followed by white and brown on all culture media. ECM mushrooms formed mycelial colonies with a single or multiple colors within a culture medium depending on the strains and culture media. The most common shape of mycelial colony was a circular form on all media tested. Other families except for Amanitaceae formed an irregular colony on MMN than PDA. All strains of Tricholomataceae did not form a filamentous colony on all media. The pigmentation of culture media by mycelial colonies was observed in more than 50% of strains tested on both PDA and SDA. The degree of pigmentation on PDA or SDA was higher than MMN and brown color was dominant than yellow color. The production of exudates from mycelial colony was higher on PDA than MMN. Brown exudates were mainly produced by many strains on PDA or SDA, whereas transparent exudates were mainly produced by strains on MMN. We observed the mycelial colonies with a single or multiple textures in just one culture plate. Wrinkled or uneven colony surfaces were remarkably observed in many strains on PDA or SDA, while an even colony surface was observed in many strains on MMN. Sixty percent of Tricholomataceae strains formed wrinkled surface on PDA. However, they did not form any wrinkle on MMN plate. Cottony texture was observed in mycelia colonies of many strains. Velvety texture was often observed in the mycelial colonies on SDA than PDA and accounted for 60% of Suillaceae strains on SDA.