ABSTRACTS (PH D THESIS)

Evaluation of the Nutritional Requirement and Wood Decay Properties of a Termite Mushroom, *Termitomyces eurrhizus*

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The *Termitomyces eurrhizus* mushroom has high potential market value. The fungi in this genus are called "termite mushrooms", and have a symbiotic relationship with Mactotermitinae termites. Since to date, most researchers have been focused on this symbiotic relationship, the biological and physiological properties of the fungi themselves are less understood. The purpose of this study was to evaluate the possibility of artificial cultivation of *T. eurrhizus* by examining the nutritional characteristics of the fungus.

Fig. 1. The fruit bodies of *T. eurrhizus* from the comb in the termite nest

Screening of strains and media of *T. eurrhizus* collected in Japan

Strains of *T. eurrhizus* collected in Okinawa Prefecture were screened for the following experiments. Four strains were selected from 27 strains. Strain T3, collected from Okinawa Main Island, had low media specificity and grew tractably. Strain T11 from Ishigaki Island was easy to handle, with a medium growth rate on any media. Strain T25, collected from Iriomote Island, had low media specificity and grew fast, while T26 from Iriomote Island grew very fast on any media.

Effects of carbohydrate substrates on vegetative mycelial growth of *T. eurrhizus*

Effects of carbohydrate substrates on the mycelial growth of *T. eurrhizus* were surveyed using 4 strains. Thirteen carbohydrates were tested in this experiment, and all the 4 strains showed the most rapid growth on the fructose- and maltose-containing media. In addition, all the 4 strains grew positively on mannose-, sucrose- and trehalose-containing media. *T. eurrhizus* might utilize starch and cellulose similarly, and demonstrated a poor ability to catabolize lactose.

Wood decaying properties of *T. eurrhizus*

The decay properties of *T. eurrhizus* were examined. Three softwood species, akamatsu (*Pinus densiflora)*, sugi (*Cryptomeria japonica)* and hinoki (*Chamaecyparis obtuse)*, and two hardwood species, buna (*Fagus crenata)* and konara (*Quercus miyagii)*, were used as wood specimens. Scanning Electron Microscope (SEM) observations suggested that *T. eurrhizus* could only attack the surfaces of small wood samples (1.0 (R) × 1.0 (T) × 0.5 (L) cm). There was no significant difference in mass-loss rate between heartwood and sapwood specimens exposed to *T. eurrhizus* for 12 weeks. Moreover, the mass loss rates of

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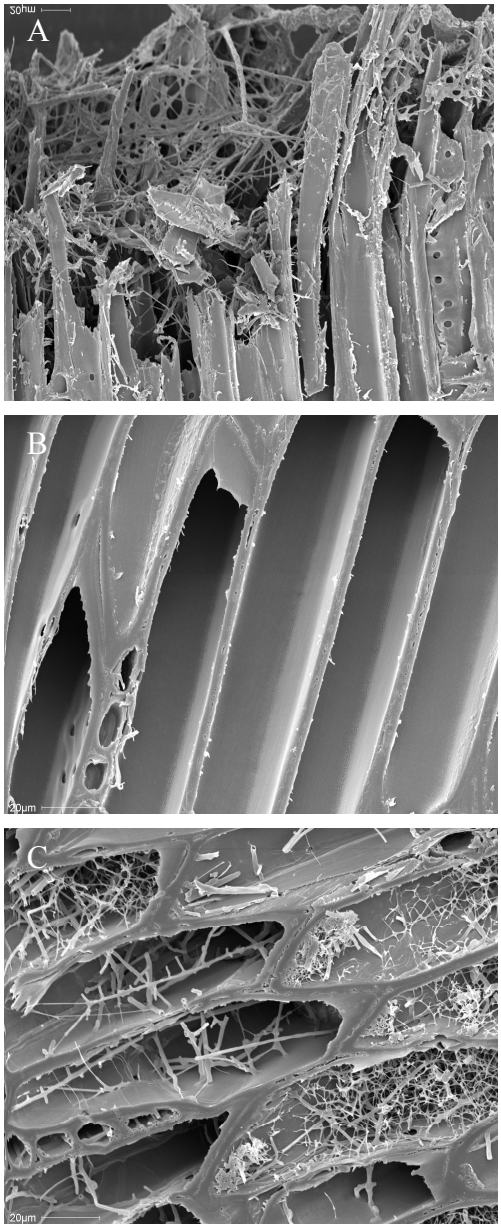

Fig. 2. SEM images of decayed wood samples of sapwood of sugi (*Cryptomeria japonica)*
A: The surface of sample decayed by *T. eurrhizus*
B: Core sample decayed by *T. eurrhizus*
C: Core sample decayed by *Trametes versicolor*

softwood specimens were generally higher than those of hardwood specimens. Chemical analyses of decayed wood specimens suggested that *T. eurrhizus* does not have high lignin-degradation ability, even though it has been categorized as a white-rot fungus.

Decay properties of *T. eurrhizus* on moso bamboo (*Phyllostachys edulis*)

Decay property of the fungus against moso bamboo, *Phyllostachys edulis*, was investigated. *T. eurrhizus* preferentially catabolized free sugars in the bamboo. The bamboo showed a high concentration of starch (approx. 1%), which the fungus found difficult to utilize.

Laccase activity in *T. eurrhizus*

The existence of laccase, one of lignin decomposing enzymes, was detected using Bavendamm test. This is a simple detection method of phenol-oxidase activities. *Termitomyces eurrhizus* strains did not show positive results except for one strain. The results suggested that *T. eurrhizus* has laccase but its activity is very weak.

From the results of these experiments, the use of fine wood chips or sawdust is strongly recommended as a media matrix for the artificial cultivation of *T. eurrhizus*. Wood species with lower lignin content are more favorable. Fagaseae trees such as Japanese beech (*Fagus crenata*), which are preferentially used for the media matrix of mushroom production in Japan, would not be suitable for *T. eurrhizus*. On the other hand, sugi (*Cryptomeria japonica*) and moso bamboo (*Phyllostachys edulis*), which are the most easily obtained forest resources in Japan, have been suggested as possibilities for use as a media matrix for *T. eurrhizus*.