

The Influence of *Dicranum scoparium* Moss Extract on the Growth of the Yeast *Candida guilliermondii* NP-4

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ABSTRACT

Oxidative stress plays a critical role in the development of numerous pathological conditions, including neurological disorders, ischemia, and cancer. Secondary metabolites in bryophytes - such as flavonoids, terpenoids, and bibenzyls - possess strong antioxidant properties comparable to ascorbic acid and tocopherol. These compounds also exhibit notable antibacterial and antifungal activities. This research aimed to investigate the antifungal effects of *Dicranum scoparium* extract on yeast cells and elucidate the underlying molecular mechanisms. *Candida guilliermondii* was selected as the model organism due to its involvement in human pathologies and its high resistance to multiple antifungal agents. In our study, extracts from the moss *D. scoparium* were found to contain $17.53 \mu\text{g GAE g}^{-1}$ of phenolic compounds, demonstrate catalase activity of $83.91 \mu\text{mol s}^{-1}$, and exhibit an IC_{50} value of $21.12 \mu\text{g mL}^{-1}$. Treatment with aqueous moss extract inhibited yeast colony formation and mitotic activity. The extract also led to a 50% reduction in malondialdehyde levels, indicating suppressed lipid peroxidation, likely due to the activity of bioactive secondary metabolites. Moreover, the moss extract enhanced superoxide dismutase (SOD) activity in yeast by 32%, contributing to reduced intracellular reactive oxygen species (ROS) levels and potential relief from oxidative stress. Mitochondrial enzyme assays revealed a 30% increase in total ATPase activity and a 28% increase in H^+ -ATPase activity in whole-cell homogenates. In contrast, mitochondrial homogenates exhibited significant declines in ATPase (68%) and H^+ -ATPase (48%) activities, suggesting mitochondrial damage and possible respiratory chain disruption. These findings support the potential application of *D. scoparium* extract as a natural antifungal agent with additional antioxidative benefits.

Keywords: mosses, antifungal, SOD, catalase, antioxidant, ATPase

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