

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

Gayane Semerjyan*, Inesa Semerjyan, Syuzan Marutyan,
Hasmik Karapetyan, Hripsime Ter-Sahakyan, Seda Marutyan

Faculty of Biology, Yerevan State University, Yerevan, Armenia

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

References:

1. Commisso, M.; Guarino, F.; Marchi, L.; Muto, A.; Piro, A.; Degola, F. Bryo-Activities: A Review on How Bryophytes Are Contributing to the Arsenal of Natural Bioactive Compounds against Fungi. *Plants* **2021**, *10*, 203. DOI:10.3390/plants10020203
2. Cianciullo, P.; Maresca, V.; Sorbo, S. Basile, A. Antioxidant and Antibacterial Properties of Extracts and Bioactive Compounds in Bryophytes. *Appl. Sci.* **2022**, *12*, 160. DOI:10.3390/app12010160

*Corresponding Author:

Gayane Semerjyan, Institute of Biology, Faculty of Biology, Yerevan State University, 1 Alex Manoogian str., Yerevan, 0025, Armenia.

Email: gaysemerjyan@ysu.am