Environmental Engineering and Management Journal

June 2025, Vol. 24, No. 6, 1273-1281
http://www.eemj.icpm.tuiasi.ro/; http://www.eemj.eu
http://doi.org/10.30638/eemj.2025.099

"Gheorghe Asachi" Technical University of Iasi, Romania

NOVEL SOLUTION TO IMPROVE THE MOSS BAG TECHNIQUE IN ENVIRONMENTAL BIOLOGICAL MONITORING

Nguyen Thi Minh Sang[1], Nguyen An Son[1], Le Hong Khiem[2,3], Truong Van Minh[4], Le Ngoc Trieu[1*]

[1]Dalat University, Lam Dong, Vietnam
[2]Institute of Physics, Vietnam Academy of Science and Technology, Hanoi, Vietnam
[3]University of Science and Technology, Vietnam Academy of Science and Technology, Hanoi, Vietnam
[4]Dong Nai University, Dong Nai, Vietnam

Abstract

Low doses of radiation can stimulate growth in plants in general and in mosses in particular and thereby enhance the ability of mosses to absorb airborne elements in the moss bag technique. The effect of low-energy X-ray radiation on the growth of *Barbula indica* moss was experimentally investigated with 20 doses of 1 to 20 Gy with a 1 Gy increment. The results showed that doses from 2 to 16 Gy improved the growth of moss compared to non-irradiated control samples and that the 14 Gy dose provided the optimal stimulation in terms of morphological characteristics, weight gain, and total chlorophyll content of the phyllids in the treated moss. The 14 Gy dose was chosen to irradiate moss that was exposed to the monitoring environment. The concentrations of the elements absorbed from the air were measured using the total reflection X-ray fluorescence technique for irradiated, non-irradiated, and native moss samples. The results showed that irradiated moss had a significantly higher ability to absorb elements from the air than non-irradiated moss, but the absorption was generally lower than for native moss. Our findings show that low-dose (14 Gy) radiation treatment of mosses is promising as an effective method to improve the accuracy of environmental monitoring by the moss bag technique.

Key words: airborne elements, irradiated moss, low-energy X-ray, moss growth

Received: March, 2023; Revised final: September, 2024; Accepted: November, 2024; Published in final edited form: June, 2025

* Author to whom all correspondence should be addressed: e-mail: trieuln@dlu.edu.vn, Phone: +84918564197
Pre-published manuscript in Research Square: https://www.researchsquare.com/article/rs-1779545/v1