

APPLICATION OF MOSSES IN ACTIVE BIOMONITORING IN URBAN AREAS

ABSTRACT:

The dissertation addresses the issue of using mosses in active biomonitoring of urbanized areas. This topic is important because of the increasing use of indicator organisms in assessing environmental pollution, including air pollution, in relation to expensive methods of classical pollution monitoring.

The following objectives were established: to carry out studies on the effect of heavy metals present in the moss-water solution system on the condition of mosses and bioaccumulation of elements; to evaluate the homogeneity of the chemical composition of mosses on the basis of their analysis for heavy metal pollution; to test selected methods of exposure of moss samples in an urbanized area; assessing the influence of environmental factors on the concentrations of heavy metals accumulated in mosses exposed by the selected method; conducting an assessment of air pollution by heavy metals using mosses, within the framework of active biomonitoring and by the classical method [assessment of air pollution by analyzing heavy metals in the particulate matter]. The research was carried out in selected urbanized areas in the Opole and Swietokrzyskie provinces.

Based on the research performed, it was concluded that an important preparatory element prior to exposure of moss samples is their prior proper conditioning in demineralized water. Statistical analyses have shown that the most effective method of moss exposure for active biomonitoring is the moss-bag technique. It is important to measure and control the vital parameters of mosses based on, among other things, the measurement of chlorophyll content combined with the measurement of photosynthetic activity, in order to call the exposed samples a living organism and not to work on the devitalized natural sorbent of air pollutants. The time of exposure, the species chosen for testing, along with other abiotic factors, are a number of elements that affect the quality of the results of the biomonitoring studies carried out. The feasibility of the practical application of mosses for monitoring air pollution indoors as well as in open areas in short- and long-term biomonitoring to identify characteristic sources of pollution and their identification is demonstrated. A summary of research using mosses in the biological monitoring of atmospheric aerosol ties the applicability of this research to the classical method of air monitoring.

I have shown that of the three species analyzed, *Pleurozium schreberi* moss is the most suitable for monitoring air pollution in urban areas. It works well with both a few days and several months of exposure to study air pollution in a given area. It is resistant to changing exposure conditions and retains its viability under environmental stress. The moss *Sphagnum fallax*, due to its peat characteristics and the need to function in a moist environment, should only be used in areas where it will have adequate access to water. *Dicranum polysetum*, on the other hand, should be included in biomonitoring studies for monitoring mercury pollution, where it is the best accumulator of this element compared to other species. The conducted research indicates the importance of methodological elements in biomonitoring studies affecting the final result and the possibility of effective monitoring using living organisms as indicators of heavy metal air pollution in urban areas.

KEYWORDS: active biomonitoring, mosses, heavy metals, moss bag technique, organismal vitality, chlorophyll