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BRYOPHYTES AS INDICATORS AND MONITORS IN HABITATS

Bryophytes are Poikilohydric plants so they provide the water from the surrounding water. This makes them directly affected by changes in their environment. Therefore, mosses are indicator plants for the detection of environmental pollution. Due to these properties, they can be used both in the determination of the presence of air pollutants in urban and industrial areas and in controlling the concentration of pollutants. In the last 30 years, air pollution maps of cities have been drawn by using mosses and lichens in developed countries. According to these biological maps, new zoning areas are being opened in the cities. They are also selective even for small differences as a determinant of the pH factor. For this reason, mosses have an important place in the synecological studies.

Some bryophytes have structures similar to internal conduction systems (endohydric). Such plants should not be used as biological monitors. The ectohydric mosses absorb the pollutants mainly from the bottom of their bodies and transfer them to the later developing ends. Ecohydric mosses, which do not have this kind of water transmission system and take metal ions with all their surfaces, are more preferred as biomonitor. They have many features suitable for monitoring pollutants. For example; as they do not have real roots, they receive nutrients with wet and dry accumulation. Other key features are slow growth rates, undeveloped conduction bundles, minimal morphological changes in life span, longevity, wide distribution, easy aggregability and the ability to determine the concentration of annual growth segments (Uğuz, 2007).

Pollution indicators

As bryophytes lack a protective layer or cuticle, they are extremely sensitive to pollutants in the immediate environment. Bryophytes can be used as indicator species, as the

presence of pollution-sensitive species can help indicate low levels of air pollution. Air pollution can also create “moss deserts” and force many sensitive species to retreat. They are very widely used to measure heavy metal air pollution, especially in large cities and in areas surrounding power stations and metallurgical Works. Heavy metals, such as lead, chromium, copper, cadmium, nickel, and vanadium, accumulate in the cell walls. Bryophytes are also suitable as bio-indicators of water pollution and for the monitoring of radioactive caesium. Other species may indicate specific ecological conditions, such as Ph levels in soil and water. Bryophytes are, in general, considered to be just as sensitive to air pollution as lichen (Hallingbäck and Hodgetts, 2000, page 7).

Indicators of natural environmental conditions

Bryophytes are also sensitive to natural fluctuations in humidity. Many species are, therefore, restricted to microhabitats with specific microclimates. Unlike flowering plants, bryophytes lack a leaf cuticle and are, therefore, capable of gaining an losing water more quickly. This means that bryophytes dry out very quickly, but they can also absorb minute quantities of available moisture from fog, mist, and dew – sources of water that other plants cannot utilise. However, during dry days there may be little physiological activity,and during droughts all physiological processes are quickly reduced to a minimum. Reproduction is highly dependable on water availability as the spermatozoids must swim from the antheridia to the archegonia in order to fuse with egg cells, initiating the spore-producing capsule generation; drought hampers this process. Plants in a dry state are also more vulnerable to disturbance, and since most bryophytes are not firmly attached to the substrate, a severe drought can eradicate these plants by desiccating their anchoring appendages. Activities that lead to a drier environment can, therefore, be considered potential threats to bryophytes (Hallingbäck and Hodgetts, 2000, page 7).

Some species are strongly associated with calcareous substrates while others will grow

only on acid ground. Certain bryophytes have been found to be closely associated with particular mineral or metal deposits such as copper ore. Bryophytes can, therefore, assist in geobotanical prospecting and are very useful ecologica indicators for botanical survey work, capable of revealing subtle changes in substrate. Bryophytes may also be used as indicators of ecological continuity. Lists of species thought to be characteristic of ancient, semi-natural temperate forests have been devised for lowland Britain and for boreal sites with high nature conservation values in Sweden (Hallingbäck and Hodgetts, 2000, page 7).

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