

BIO414 (CRYPTOGAMIC BOTANY II)

WEEK 6

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THE ECOLOGICAL ROLE OF BRYOPHYTES

Bryophytes are an important component of the vegetation in many parts of the world. They play a vital role in, and constitute a major part of, the biodiversity in moist forest, wetland, mountain, and tundra ecosystems.

In temperate forests, for example, bryophytes form extensive mixed communities and contribute significantly to community structure and ecosystem functioning.

In Arctic regions, bryophytes are important in maintaining permafrost whilst bryophyte-rich peatlands are important carbon sinks in both Arctic and temperate zones.

Bryophytes frequently dominate (or co-dominate with lichens) severely stressed (Hallingbäck and Hodgetts, 2000, page 6).

Water retention

Bryophytes have a high water-retention capacity due to their structure, and tend to be most abundant in regions with high levels of atmospheric humidity and low rates of evaporation.

They can quickly absorb water and release it slowly into the surrounding environment, and can, therefore, contribute to the retention of humid forest microclimates and the regulation of water flow.

Perhaps more importantly, these properties allow forests to gradually release water into watercourses, preventing flash floods, erosion, and landslides downstream (Hallingbäck and Hodgetts, 2000, page 7).

Large biomass

In some tropical montane forests the dry weight of epiphytic material in the upper canopy has been recorded at over 100kg/m², or about 12% of the total above-ground, dry tree weight. The total dry weight of epiphytes in these forests was estimated at 44 tons/ha (90% being bryophytes).

Bryophytes formed more of the photosynthetically active (i.e., green) biomass in these forests than all the other plant groups put together. It is important to state that the bryophyte mass in this type of forest is a major component of the total biomass and is, therefore, an important component of the hydrological, chemical, and organic matter cycles (Hallingbäck and Hodgetts, 2000, page 7).

Colonisation, soil stabilisation, and accumulation of humus

Mosses are often the first plants to colonise newly exposed ground, bare rocks, and other abiotic surfaces.

They are important in stabilising the soil crust, both in recently established and existing habitats, such as steep, sloping banks in woodland.

They are also valuable in controlling erosion and hydric cycling.

In semi-arid woodlands, bryophytes play important roles as colonisers and soil stabilisers in areas where soil surface conditions have declined as a result of increased infiltration (Hallingbäck and Hodgetts, 2000, page 7).

Peat formation

Sphagnum is often the most important plant in bogs and in peat formation.

Peat is the accumulated and compressed remains of vascular and non-vascular plants (mainly bryophytes, particularly Sphagnum).

The vast and deep peat bogs in temperate and sub-Arctic zones are estimated to cover 1% of the world's surface (Clymo 1970). A deposit 1.5 metres thick may have taken about 6,000 years to accumulate. Today, many of these peatlands are subject to exploitation.

Peatlands are recognised as carbon sinks and it is, therefore, important that they remain undisturbed.

Human activities, including drainage, fertilisation, and peatland cultivation, can increase the amount of carbon dioxide released from peat, owing to increases in microbiological activity.

These disturbed peatlands then become sources rather than sinks for carbon in the global ecosystem.

Relationships with other organisms

Bryophyte communities are critical to the survival of a tremendous diversity of organisms, including insects, millipedes, and earthworms. Numerous arthropods, such as acarinae and collembola, and tardigrades, are dependent on mosses and liverworts as habitat, or as a food source. The nutrient-rich, spore-producing capsules are particularly palatable to some insects, and molluscs such as slugs. Bryophytes are also a food source for birds and mammals in cold environments, and are eaten by reindeer, geese, ducks, sheep, musk-ox, lemmings, and other rodents.

Bryophytes may also be important as nesting material for birds or act as protective habitat for amphibians.

For example, in tropical montane forests, pendant or trailing mosses, specifically *Papillaria*, *Floribundaria*, *Meteorium*, and *Squamidium*, and a number of liverworts are used in nest construction.

Bryophytes also provide suitable substrates for blue-green bacteria; this species fixes nitrogen from the air into solid nitrogen compounds that are then accessible to plants (Hallingbäck and Hodgetts, 2000, page 7).

REFERENCES

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