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ROLE OF BRYOPHYTES IN PLANT SUCCESSION

Bryophytes are found **worldwide**, practically in all habitats—except the sea. Surviving even in the frozen arctic tundra, bryophytes are however commonly found in the **moist tropical and temperate forests**. Bryophytes, especially the mosses, play key ecological roles in **plant succession**[a] in diverse habitats. Some mosses can colonize **extreme habitats** where most other plants cannot survive and they can transform the substratum to make it suitable for **colonization** by other plant that results in the formation of **forest communities**. Mosses are commonly involved in two types of **plant successions**: on **bare rock**s and in **peat bogs**.

Plant Succession on Bare Rocks

Plant succession on a rock surface is called **lithosere**. These habitats are characterized by **extreme temperatures** and **aridity**. During this succession, the first or **crustose lichen**[b] **stage** is followed by the second or **foliose lichen**[c] **stage**. These **pioneers** in the form of **xeric** (drought resistant) lichens can colonize the inhospitable rock surface (where other plants can't grow) to form the first, thin layer of **soil** with some **humus** and **wate**r. This makes the conditions favourable for the third or **moss stage**. During this phase a thick, extensive **soil cover** is formed over the rock surface (which then allows the growth of larger plants). **Spores** of mosses are carried by **air currents** to these habitats where they germinate during the rainy season in the little soil present in **rock crevices**. This phase has in **two sub-stages**. Initially, **xeric mosses** with the ability to withstand **desiccation** such as *Grimmia*, *Polytrichum* and *Tortula* grow and their **leafy shoots** shade out and gradually replace the **foliose lichens** dominating these nutrient-poor sites. Later, as **moderate conditions** develop, these **xeric mosses** are in turn replaced by **mesophytic mosses** such as *Bryum*, *Fissidens* and *Hypnum*. Sometimes even **fruticose lichens**[d] such as *Cladonia* and *Usnea* may develop. Mosses are **gregarious** (growing in clusters) and can rapidly **colonize** new areas due to their efficient methods of **vegetative multiplication**. Their **dense growth** can capture **air-borne soil particles**. Their **rhizoids** can **penetrate** deep into the **substratum**. Thus, they gradually build up thick, extensive **spongy mats** on the rock surfaces. As the soil becomes increasingly thick, its **water retention capacity** also increases. The **death and decay** of **older plant parts** form **humus** which increases **soil fertility**. This increased **organic matter** in turn supports the growth of **soil microorganisms** which can increase **nutrient availability** for the plants. The **extreme temperature variations** on the rock surface are also reduced. These changes make the habitat more favourable for the growth of **ferns** and **seed plants**, leading to the **herbaceous stage**, **shrub stage**, and ultimately the **climax woodland stage**.

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[a] Plant succession is a natural process by which a specific habitat becomes successively colonized by different plant communities. This begins with the pioneer stage, then develops through several intermediate stages and finally stabilizes at the climax stage. This succession of stages (or plant communities) are called seral stages (or seral communities). Depending on the nature of the habitat, a plant succession may in the form of a hydrosere (in an aquatic habitat), xerosere (in an dry habitat), and many others.

[b] These form thin crusts adhering to the substratum.

[c] These have flat leaf-like form.

[d] These have branched bush-like form.

Plant Succession in Peat Bogs

The **aquatic moss** *Sphagnum* spp.—commonly called **peat moss** or **bog moss**—play the key role of a **pioneer** in the **plant succession** in **peat bogs**[e] by **stabilizing** the moist **substratum**. This moss forms dense **mats** across these wetlands due to the efficient modes of **vegetative multiplication**. Special cells in the **stem**[f] and **leaves**[g] increases the **absorption** and **retention** of **water**. **Acidic substances** released by the plant body **lowers** the **water pH** (4.0). This in turn **inhibits** the growth of **decomposers** (*i.e.* bacteria and fungi) in these ecosystems. Thus, the continuous **accumulation** in layers of the **dead organic remains** of this moss, followed by its **compression** and **coalification** results in the formation of spongy, black layers of **peat** (the **first stage** of **coal formation**). Due to this, gradually, the water in these wetlands becomes **drained** off as the **surface rises**. As these **wetlands** become completely **filled** up with the thick, spongy **peat-like** soil, they turns into **quaking bogs**. This is accompanied by the **invasion** and **encroachment** of **ferns** and **seed plants** from the surrounding **forest vegetations** which leads to the **herbaceous stage**, **shrub stage**, and finally the **climax forest stage**. Sometimes, this **mat** of **bog moss** can grow out of these **wetland**s and **invade** the adjoining **forest margins** to form **creeping bogs**. If this process continues the **bog moss** can form an **extensive cover** across the entire surrounding **landscape** to form **blanket bogs**. However, these **creeping** and **blanket blogs** can cause **water-logging** by raise the water table and thus **damage** these **forest ecosystems**.

Further Reading

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Shukla, RS & PS Chandel (1996) Plant Ecology. S Chand & Co, Jalandhar.

[e] Temperate wetlands that accumulate peat form the dead plant remains of the peat moss.

[f] Retort cells of the stem.

[g] Hyaline cells of the leaf.