

BRYOLOGY

ECONOMIC IMPORTANCE OF BRYOPHYTES

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Bryophytes as Fuel

- Liverworts and mosses have long been tried and used as a fuel in developed countries like Finland, Sweden, Ireland, West Germany, Poland and Soviet Union.
- Peat a brown, soil-like material characteristic of boggy, acid ground, consisting of partly decomposed vegetable matter.
- Peat is suitable for production of low and intermediate BTU gas as well as hydrogen, ethylene, natural gas, methanol and Fisher Tropsch gasoline.
- Peat mosses are best suited for the production of methane, and peat is likely to become an important source of fuel for production of heat, methane, or electricity in the future.



Horticultural Uses

- There is a long tradition of use of bryophytes in horticulture as soil additives, because of their high water holding capacity and to air. Peat is an important soil conditioner and is commonly used for agricultural and horticultural purposes around the world.



Bryophytes as ornamental plant

- Bryophytes have also been used for green house crops, potted ornamental plants and seedlings, and in garden soil.



Moss industry

- Moss industries in France manufacture moss carpets in various sizes.
- They are easy to fix along the
- roads, lawns, play grounds, etc.
- In Sri Lanka, a wide range of eco-friendly products such as coir pots, coir fiber pith (coco - peat), moss sticks, hanging wire baskets and basket liners are made using bryophytes.



House Construction

- These tiny plants are used in the construction of houses and their furnishings.
- At Kapkot in the Himalayas, villagers use moss mats with shrubs, grasses, and bamboo to make a pharki, a kind of door placed at the openings of their temporary huts. Sphagnumpeat, peatcrete and peatwood are the new material use for making houses ,they are low cost and easy to transport.



Household Uses

- The Himalayans also use mosses as insect repellents when storing food.
- Local mosses and liverworts are dried, made into a coarse powder that is sprinkled over grains and other goods to be stored in containers.



As Packing Material:

- Dried mosses and Bryophytes have great ability to hold water. Due to this ability the Bryophytes are used as packing material for shipment of cut flowers, vegetables, perishable fruits, bulbs, tubers etc.
- **As Bedding Stock:**
- Because of great ability of holding and absorbing water, in nurseries beds are covered with thalli of Bryophytes.

Fibre industries

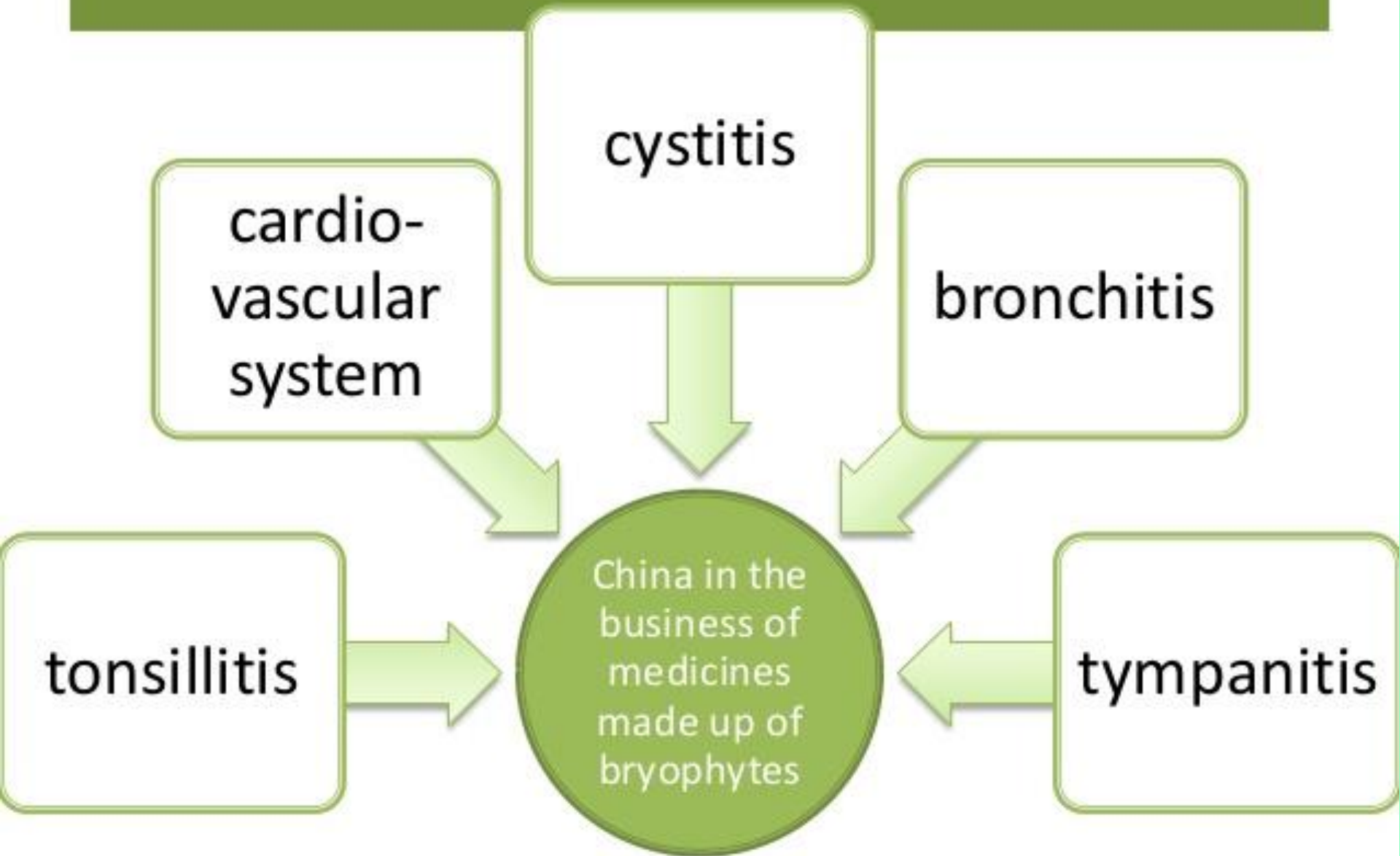


- Mosses are mixed with wool to make cheap clothes.
- They are used in decoration of net bags and other objects.
- Women also wear their steam like structure in their hair and as decorations in bracelets .
- Used in hiking boots to absorb odour and moisture.
- Used in lining of diapers to improve absorbing power.

Medicinal Uses



Medicines



• Medicinal use of Bryophytes

- Information on medicinal use of bryophytes is scanty.
- Watt(1891) had reported to the medicinal use of *Marchantia polymorpha*, *Anthoceros* and *Riccia*.



Marchantia polymorpha



Riccia



Anthoceros

- Some Bryophytes are used medicinally in various diseases for e.g.,
- (a) Pulmonary tuberculosis and affliction of liver—*Marchantia* spp.
- (c) Acute hemorrhage and diseases of eye—Decoction of *Sphagnum*.
- (d) Stone of kidney and gall bladder—*Polytrichum commune*.
- (e) Antiseptic properties and healing of wounds—*Sphagnum* leaves and extracts of some Bryophytes for e.g., *Conocephalum conicum*, *Dumortiera*, *Sphagnum protoricense*, *S. strictum* show antiseptic properties.

- **However, the use of mosses in the treatment of ailments is more pronounced.**
- **Shiu - ying (1945) reported that dried Sphagnum is boiled in water. The decoction is used in the treatment of acute haemorrhage and disease of the eye.**
- **The use of Sphagnum for making absorbent bandages in the treatment of boils and discharging wounds has been described above.**

Use in Biotechnology

- Transgenic *Physcomitrella* are now being used to produce 'blood-clotting factor IX', for the treatment of haemophilia' B and other proteins



Ecological Importance of Bryophytes



- (a) Pioneer of the land plants. Bryophytes are pioneer of the land plants because they are the first plants to grow and colonize the barren rocks and lands.
- (b) Soil erosion. Bryophytes prevent soil erosion. They usually grow densely and hence act as soil binders. Mosses grow in dense strands forming mat or carpet like structure.

- **They prevent soil erosion by:**
- (i) Bearing the impact of falling rain drops
- (ii) Holding much of the falling water and reducing the amount of run-off water.
- (c) Formation of soil. Mosses and lichens are slow but efficient soil formers. The acid secreted by the lichens and progressive death and decay of mosses help in the formation of soil.

- (d) Bog succession. Peat mosses change the banks of lakes or shallow bodies of water into solid soil which supports vegetation e.g., Sphagnum.
- (e) Rock builders. Some mosses in association with some green algae (e.g., Chara) grow in water of streams and lakes which contain large amount of calcium bicarbonate. These mosses bring about decomposition of bi-carbonic ions by abstracting free carbon dioxide. The insoluble calcium carbonate precipitates and on exposure hardens, forming calcareous (lime) rock like deposits.

• **2. Formation of Peat:**

- Peat is a brown or dark colour substance formed by the gradual compression and carbonization of the partially decomposed pieces of dead vegetative matter in the bogs. Sphagnum is an aquatic moss. While growing in water it secretes certain acids in the water body.
- This acid makes conditions unfavorable for the growth of decomposing organisms like bacteria and fungi. Absence of oxygen and decomposing microorganisms slows down the decaying process of dead material and a large amount of dead material is added year by year. It is called peat (that is why Sphagnum is called peat moss).

- **Various Uses of Peat are:**
- (a) Used as fuel in Ireland, Scotland and Northern Europe.
- (b) In production of various products like ethyl alcohol, ammonium sulphate, peat, tar, ammonia, paraffin, dye, tannin materials etc.
- (c) In horticulture to improve the soil texture.
- (d) In surgical dressings.

SOIL CONSERVATION

- Bryophytes form a mat and prevent soil erosion.
- The intertwined moss stems and rhizoids bind soil particles firmly.
- Hold large amount of water and reduce run off.



- As aids in soil conservation.

- **The mosses prevent sheet erosion of soil.they grow in dence stands forming a mat or carpet like structure.**
- **Firstly it bears the impact of the falling rains drops and secondly it holds much of the water that falls.**
- **Grout(1912) held that even the moss protonema mat checks soil erosion.**

- **Formation of soil development of vegetation cover.**

- **The lichen and mosses play an important role in soil formation. Both are slow but efficient soil formers.**
- **The lichen thallus secrete organic acids which gradually dissolve and disintegrate the rocks to which they cling.**
- **The rock particle together with the dead and decaying older parts of the lichen thallus form fertile soil.**

- **Role as rock builders.**
- **These plants grow in shall waters of lakes streams and springs which contain a large amount of calcium bicarbonate.**
- **The plants bring about decomposition of bicarbonic ions by abstracting free carbon dioxide.**

PEAT FORMATION



- Peat is a brown dark colour spongy matter produce due to compression and carbonization by deposits and water.
- Sphagnum and other mosses form peat.
- used in horticulture, making ethyl alcohol and illuminating gas.

Seed Beds



- Bryophyte mats may provide ideal sites for the germination of vascular plant seeds.
- Bryophyte mat can provide a fairly stable micro-habitat, protected against the drying effects of sun and wind and the extremes of temperature.
- Therefore a seed that falls into such a carpet could find itself in a relatively sheltered micro-habitat that is conducive to successful germination.

Food AND SHELTER

- Many animals make use of bryophytes. Numerous invertebrates eat bryophytes, lay their eggs on them or shelter in them. They form a vital part of the construction material of the nest of some birds



- In Vertebrates the range of associations is much less.
- Northern Corroboree Frog are found near *Sphagnum* bogs . These endangered frogs breed in *Sphagnum* bogs in the alpine and sub-alpine areas but move away from boggy areas outside of the breeding season.



POLLUTION

- Pollutants come in many forms from both urban and rural areas. Sulfur dioxide has been a significant industrial pollutant for many years, being a by-product of the use of high sulfur fuels.
- Sulfur dioxide is very damaging but some bryophytes are highly tolerant of sulfur dioxide pollution and examples of these are the mosses *Funaria hygrometrica* and *Bryum argenteum*



Water Erosion and Nutrient Recycling

WATER EROSION and nutrient recycling:

- Bryophytes on tree trunks absorb rainwater that's flowing down the trunk and those hanging like curtains absorb water, both from rain and help maintain a humid atmosphere and so greatly influence the micro-climate.
- Bryophytes will also trap any nutrients that are dissolved in the rain or mist droplets, in many cases trapping nutrients that would otherwise be washed away. Living bryophytes make use of the nutrients they trap and dead, decaying bryophytes release nutrients to the surrounding plants. In these ways bryophytes play an important role in nutrient recycling.

Diagram



Indicator of soil ph

- Liverworts and mosses are good indicators of soil ph.
- Some bryophytes can grow in narrow and specific range of ph so therefore their presence can be used as an indicator of soil ph.
- For example campylopus paradxus indicates acidic soil.



Indicator of acid rain

- Mosses are good indicators of acid rain because they lack a protective epidermis and cuticle hence are most susceptible than vascular plants.
- For example *neckera crispa* indicates high ph as like of acid rain.



- Use of bryophytes in experimental Botany

- The liverworts and mosses have played an important role as research tools in the various phase of botany such as genetics ,experimental , morphology and physiology.
- The mechanism of sex determination in plants was discovered for the first time in a liverwort Sphaerocarpos.



- **In Experimental Botany:**
- The liverworts and mosses play an important role as research tools in various fields of Botany such as genetics. For the first time in a liverwort, *Sphaerocarpos*, the mechanism of sex determination in plants was discovered.

Thank You

This class prepared for
Third Semester BSc Botany Students
Little Flower College, Guruvayur
Affiliated to University of Calicut

Next Class
Fossil Bryophytes