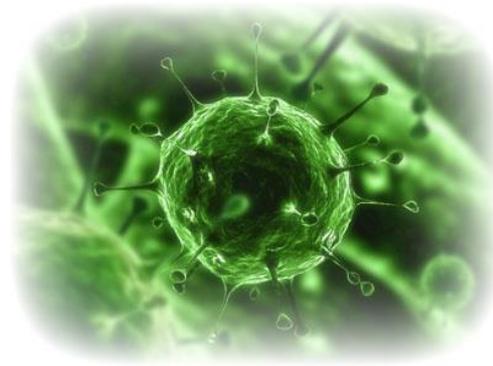




LECTURE 4

of "Pharmaceutical botany 2"



THEME:

**Spore bearing plants
(mosses, club mosses, horsetails,
ferns of medical importance)**



The Plant Kingdom

Kingdom Plantae

Non-Vascular Plants

Bryophytes

Liverworts

Marchantiophyta



Hornworts

Anthocerotophyta



Mosses

Bryophyta



Vascular Plants

Tracheophytes

Spore-Producing Plants

Pteridophyte



Seed-Producing Plants

Spermatophytes



Club Mosses

Lycopodiophyta



Horsetails

Equisetophyta



Ferns

Pteridophyta



Non-Flowering Plants

Gymnosperms



Flowering Plants

Angiosperms



Conifers

Pinophyta



Cycads

Cycadophyta



Ginkgo

Ginkgophyta



Plants with One Seed Leaf

Monocotyledon (Monocots)



Plants with Two Seed Leaves

Dicotyledon (Dicots)



MOSSES

- Mosses are flowerless small plants found under the division Bryophyta along with liverworts and hornworts. They do not possess any vascular system like xylem and phloem, and mainly absorb water and nutrients through their leaves. They are mostly found in damp, shady locations as mats or clumps on the forest floor. They usually grow up only to a height of about 10cm, but have an exceptional genus *Dawsonia* which grows up to 50cm.



Botanical Characteristic and uses

- The plants exist as a haploid gametophyte which is the dominant stage, and diploid sporophyte.
- The leaves are simple and small, spirally arranged and sometimes layered with only one row of cells and thick midribs.
- The roots are present in the form of thread-like structure called rhizoids which help them in attaching to the substrate.
- The stems are weak and free standing, and are usually greenish to brown colored.
- It reproduces by spores
- They are **used** by florists for home decoration.
- In world war I, **Sphagnum** was used as a bandage due to its water absorbing capacity. Sphagnum also has antiseptic properties .
- It was also used as a **fire extinguisher** in old times.
- **Peat**, which is the collected layers of moss, is used as a fuel.





FERNS DIVISION

POLYPODIOPHYTA

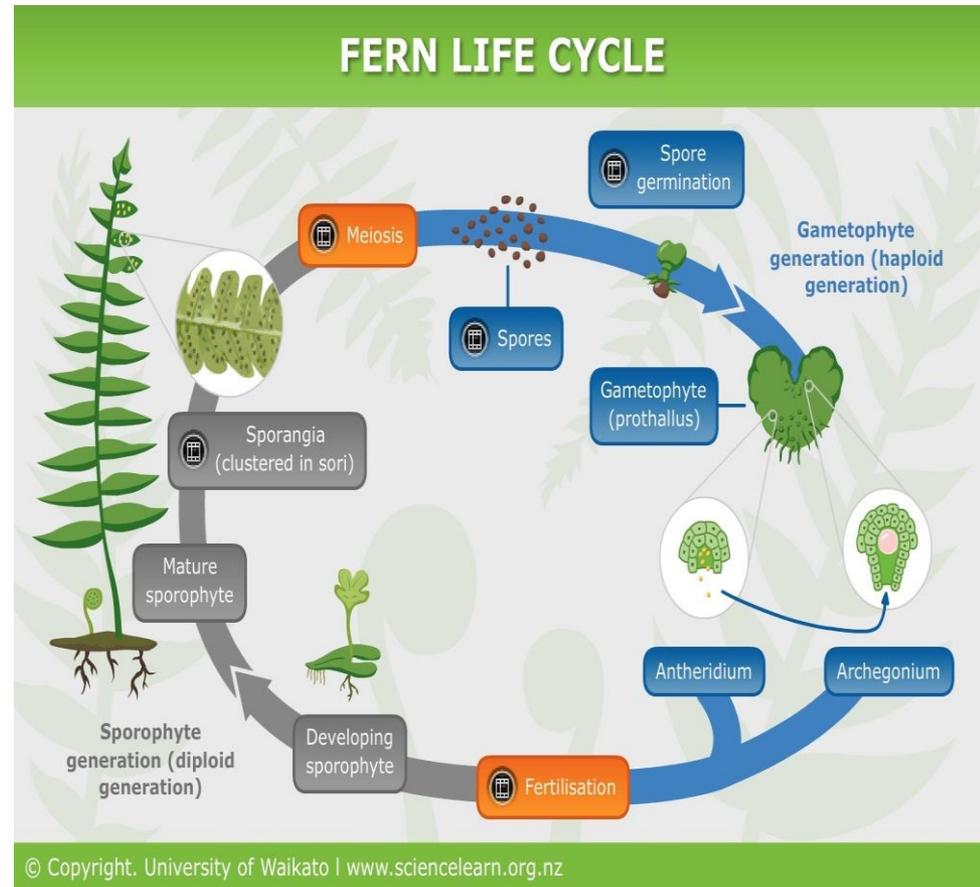
- This is an ancient division of sporous plants. Distributed across the Earth and live in various habitat conditions.
- Ferns are seedless vascular plants of humid tropics and temperate areas. Some ferns live under sub-arctic conditions as well.
- They constitute the largest living group of primitive vascular plants with over 10,000 species. Ferns once dominated the earth in carboniferous period (about 300 million years ago).
- Plant body is a sporophyte. It is differentiated into true stem, leaves and roots.
- The stem is underground rhizome in most of the ferns. Some primitive ferns have above-ground stem with tree-like habit. They are called tree ferns, e.g., Cyathaea, Celeotium. A tree fern is like a small palm. It may reach a maximum height of 20 m.
- Roots are adventitious.
- Leaves are large and are called fronds. They are often graceful. Leaves may be simple or pinnately compound. In a pinnately compound leaf, the lamina is divided laterally into leaflets



Spores of Nephrolepis cordifolia (Davalliaceae)

FERN LIFE CYCLE

- The life cycle has a regular alternation of a dominant sporophyte and an inconspicuous gametophyte. This is called heterologous or heteromorphic alternation of generations.



Dryopteris filix-mas- Mail fern

Dryopteris filix-mas, commonly called male fern, is native to Europe and North America. This is a large, arching, deciduous male fern with erect, stout rhizomes and green leaves.

The rhizome contains fenolic compounds and is used as an antiparasitic agent





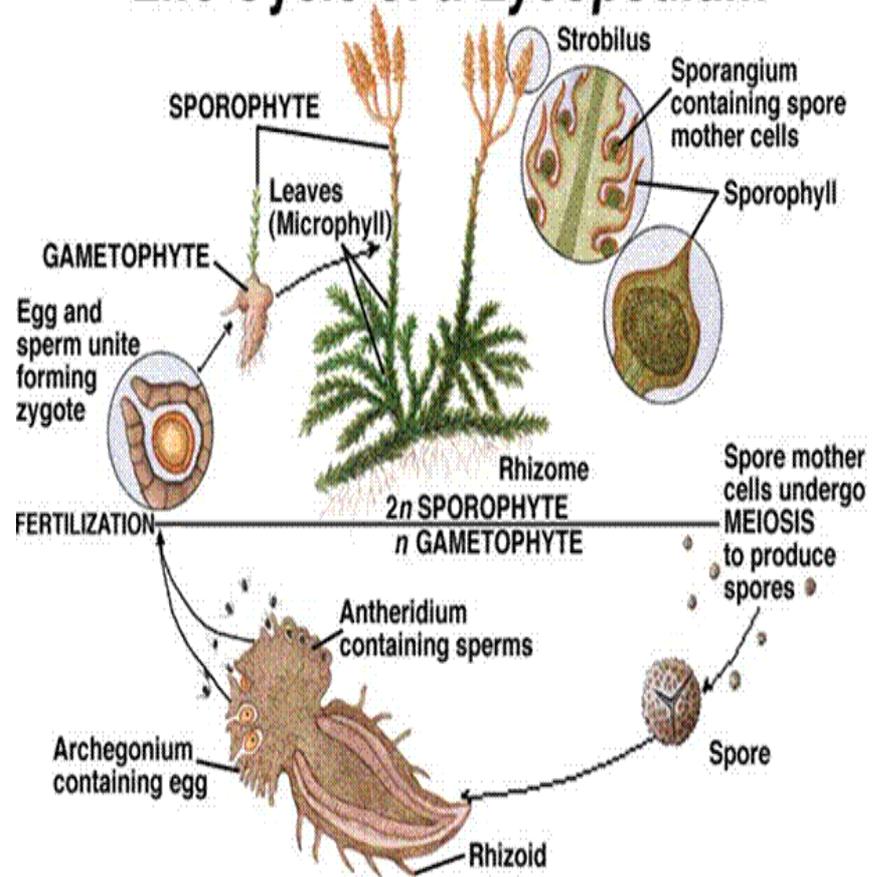
CLUBMOSES DIVISION

LYCOPODIOPHYTA

Modern club mosses are low evergreen herbs, because this living form t has better adapted to the environment.

. The sporophyte has a root, a stem and small scaly or pointed leaves. Most of them are characterized by a microfilia (small leaves). The stem is not dissected by nodes and internodes. Characteristic dichotomous branching. The plants are homosporous, meaning that they produce just one kind of spore.

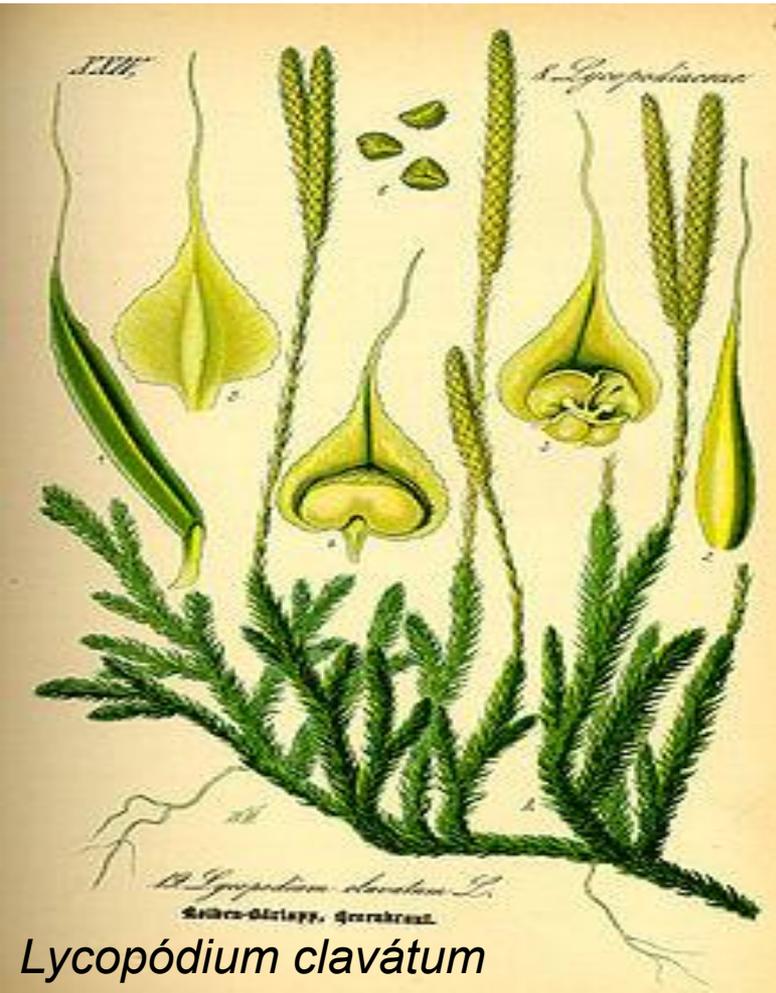
Life Cycle of a *Lycopodium*



Lycopodium clavatum

wolf's-claws

The spores of this plant are used as baby powders



Lycopodium clavatum

CLUBMOSES DIVISION

LYCOPODIOPHYTA

Northern firmoss or fir clubmoss - *Lycopodium*(*Huperziya*) *selago*. Different from wolf's-claws is absence of sporous shoots, sporangium arranged in the axils of upper leaves. Poisonous plant. Used to treat alcoholism.



Huperzia selago

HORSETAILS DIVISION

EQUISETOPHYTA (SPHENOPHYTA)

Modern horsetails are herbs. Stem is characterized by segmented. The stem subdivided into nodes and internodes. These are homosporous plants. The gametophyte (the first one) is one- or two-sexed, small (several millimeters), green.

The Equisetophyta is a very old division—the plants of this division were among the first plants to grow on land. Equisetophyta are sometimes referred to as fern allies, as they have the same life cycles as ferns, and have similar developments that allow them to grow taller than the bryophytes. Horsetails are an ancestor of larger plants that grew 270 million years ago during the carboniferous period.



The horsetails comprise photosynthesising, "segmented", hollow stems, sometimes filled with pith. At the junction ("node", see diagram) between each segment is a whorl of leaves. In the only extant genus *Equisetum*, these are small leaves (microphylls) with a singular vascular trace, fused into a sheath at each stem node.

The underground parts of the plants consist of jointed rhizomes, from which roots and aerial axes emerge.

Horsetails bear cones (technically strobili, sing. strobilus) at the tips of some stems

Field horsetail (*Equisetum arvense*)

Equisetum arvense, the field horsetail or common horsetail, is an herbaceous perennial plant in the Equisetidae (horsetails) sub-class, native throughout the arctic and temperate regions of the Northern Hemisphere. It commonly occurs in damp and open woodlands, pastures, arable lands, roadsides, disturbed areas, and near the edge of streams. It has separate sterile non-reproductive and fertile spore-bearing stems growing from a perennial underground rhizomatous stem system. The fertile stems are produced in early spring and are non-photosynthetic, while the green sterile stems start to grow after the fertile stems have wilted and persist through the summer until the first autumn frosts. Rhizomes can pierce through the soil up to 1.8 m in depth.

Unlike other species, have two types of shoots- spore and vegetative. In medicine vegetative summer shoots contain flavonoids is used as a diuretic.



Equisetum arvense



THANK YOU FOR ATTENTION!

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