

OPHIOGLOSSALES & HYMENOPHYLLALES

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Ophioglossales

- 3 Genera - Sporangia borne – Fertile
- Sclerenchyma – Absent
- Sporangia – receive vascular supply
- *Ophioglossum* - Adders Tongue
- *Botrychium* – Grape Fern / Moon Wort
- *Helminthostachys*
- Perennial – Herb – Moderate size
- Tropical *Ophioglossum* – Epiphytes
- Stem – Subterranean – Adventitious Roots

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Ophioglossales – Leaves

- *Botrychium dissectum* & *Botrychium multifidum* – evergreen
- *Botrychium* leaves – Non-circinate
- *Botrychium multifidum* – circinate
- *Ophioglossum* leaves – simple with reticulate venation
- Leaves lobed – dichotomously forked
- *Botrychium* – Pinnate with open dichotomous venation
- *Helminthostachys* – blade – tentately compound
- *Ophioglossum* – Sheathing stipules

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Ophioglossales – Leaves

- Spike – Simple, linear – *Ophioglossum* – laterally fused elongate synangia
- Spike – Dichotomously branched
- *Botrychium* Spike – Pinnate with terminal sporangia
- *Helminthostachys* – elongate main axis – bears – spore-bearing structures – bearing several sporangia
- Sporangia – Ophioglossales – marginal in origin and massive – receive individual vascular supply – produce large number of spores
- *Ophioglossum* – Sporangia originate from group of cells
- Line of dehiscence – *Botrychium* & *Ophioglossum* – transverse; Longitudinal – *Helminthostachys*

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Ophioglossales – Stem

- Soft and fleshy – lack sclerenchyma
- Young – protostele – later pith – developed
- Prominent leaf gap – *Ophioglossum* – gaps – extensive and overlapping – dictyostele
- Xylem – mesarch – *Helminthostachys*
- Endarch – *Botrychium* and *Ophioglossum*
- *Botrychium* – Unique – Secondary growth – Sec. vascular tissue – continuous with Pri. Tissue – consisting of tracheids and wood rays
- Cambium – b/w Pri. Xy. & Ph. – Sec. Xy.
- Extensive Periderm, Phellogen originate – outer cortex – Produce Cork – Pheloderm – Internally – *Botrychium*
- Xy. Elements – Ophioglossaceae
- Early Xy. – Lycopodiaceae; Metaxylems – Scalariform bordered pits – *Ophioglossum*
- *Botrychium* & *Helminthostachys* – Circular bordered pits
- *Helminthostachys* – Anomalous Sec. Vascular tissue

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Ophioglossales

- Gametophytes – Subterranean – Mycorrhizic
- Gametophytes – Parenchymatous
- Prothallus – Spherical mass of cells – with a apical cell
- Endophytic fungus
- *Botrychium* - G – irregular – spherical to distinctly dorsiventral - Young G – rhizoids
- Sex organs – uniformly – distributed
- Antheridia – ridges and sunken ; Archegonia – flat
- In *Ophioglossum* and *Helminthostachys* – Archegonia also sunken

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Anomalous features of Ophioglossales

- Peculiar Plant Body – Single leaf fertile & sterile segments
- Non-circinate vernation
- Absence of Sclerenchyma
- Collateral Vascular bundle
- Sec. growth – *Botrychium*, *Helminthostachys*
- Presence of vessels - *Botrychium*, *Helminthostachys*
- Structure of Trachery elements - progymnosperm affinity
- Root with Endophytic fungus and absence of root hairs
- Subterranean Axial gametophytes with an associated fungus

Hymenophyllales

- Hymenophyllaceae – Hymenophyllum and Trichomanes – Filmy ferns
- Delicate, translucent leaf lamina
- Light passing – lamina – glistening green - beauty and interest
- Primarily of Humid rain forests and warm temperate regions
- Rhizome – creeping and extensive with spaced leaf attachments ; Root – adventitious – many species rootless – absorbing hairs all along rhizomes
- Epiphytes – covering trunks of trees . Dwarf forms – common – leaves in mm. Leaf shape – simple unlobed to highly dissected, pinnate, dichotomous
- Filmy ferns – tough wiry stems, roots and leaf veins – withstand drying

Hymenophyllales

- Stem – narrow cortex - all cells – thick walled
- Cortex – Two zones outer – thin walled; inner – thick
- Vascular cylinder – Protostele; Leaf traces – simple without associated leaf gap
- C- shape stele; Sps. With large rhizome – metaxylem – continuous ring around the central parenchymatous – in which – embedded- protoxylem elements
- Metaxylem ring – interrupted – transversely – tracheids on dorsal side – larger than ventral side
- Pericycle – around the xylem and phloem
- Endodermis

Hymenophyllales

- Sori – Marginal
- *T. spicatum* – Entire leaf – fertile
- Trichomanes – Sporangia – elongated receptacle – enclosed by campanulate indusium
- Hymenophyllum – receptacle – short with two liped indusium united at the base
- After the dispersal of sporangia – the receptacle projects beyond leaf margin – trichomes – Trichomanes
- 32 spores – Trichomanes; 128 / 256 – Hymenophyllum
- Spores – green

Hymenophyllales

- Characteristic pattern of germination
- ERMANTION – initiated by – three radiately arranged cells
- Each of three cells – divides transversely – growth in two of the arms – arrested by differentiation – rhizoids ; third arms continues – prothallys
- G – surface living, green, perennial
- Trichomanes – filamentous in delicate thallus with filamentous branches
- Hymenophyllum – G – highly branched delicate thalli- sex organs – under surface of the thallus
- Trichomanes – Antheridia – filamentous; archegonia – specialized – several cell thick branches