

A Brief Note on Lifecycle and Uses of Fern

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Opinion Article

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ABOUT THE STUDY

A fern (*Polypodiopsida* or Polypodiophyta) is a kind of vascular plant (plant having xylem and phloem) that reproduces by spores and does not contain seeds or flowers. They vary from mosses and other bryophytes in that they are vascular, meaning they have specialised tissues that carry water and nutrients, and they have life cycles in which the branching sporophyte is the dominant phase. Ferns have complex leaves termed megaphylls, which are more complex than clubmoss microphylls. The majority of ferns are leptosporangiate ferns. They make coiled fiddleheads, which uncoil and spread into fronds. There are around 10,560 identified living species in the category. Ferns are defined broadly here as all of the *Polypodiopsida*, which includes both leptosporangiate (Polypodiidae) and eusporangiate ferns.

Life cycle

Ferns are vascular plants that vary from lycophytes in that they have real leaves (megaphylls) that are typically pinnate. They vary from seed plants (gymnosperms and angiosperms) in that they reproduce by spores and lack flowers and seeds. They, like other terrestrial plants, have an alternation of generations life cycle, which is characterised by alternating diploid sporophytic and haploid gametophytic stages. The diploid sporophyte has 2n paired chromosomes, with n varying across species. The haploid gametophyte has n unpaired chromosomes, or half as many as the sporophyte. The fern gametophyte is a self-contained organism, whereas the gametophyte of gymnosperms and angiosperms is dependent on the sporophyte.

The life cycle of a typical fern proceeds as follows: Meiosis creates haploid spores from a diploid sporophyte phase (a process of cell division which reduces the number of chromosomes by a half). Mitosis transforms a spore into a free-living haploid gametophyte (a process of cell division which maintains the number of chromosomes). A photosynthetic prothallus is typical of a gametophyte. Mitosis is the process by which the gametophyte creates gametes (typically both sperm and eggs on the same prothallus). A flagellate sperm that moves about fertilises an egg that remains connected to the prothallus. The fertilised egg becomes a diploid zygote and develops into a diploid sporophyte (the standard fern plan) through mitosis.

Uses

Ferns have been shown to be resistant to phytophagous insects. The gene that codes for the protein, Tma12 in the edible fern *Tectaria macrodonta* has been transferred to cotton plants, which have become resistant to whitefly infestations.

Many ferns, particularly the Boston fern and other members of the genus *Nephrolepis*, are grown in horticulture as landscape plants, cut foliage, and houseplants. The bird's nest fern and staghorn ferns are also popular. Perennial (also known as hardy) ferns grown in gardens in the northern hemisphere are very popular.

Several ferns, including bracken and *Azolla*, are noxious weeds or invasive species. Other examples are Japanese climbing fern, sensitive fern, and giant water fern, one of the world's worst aquatic weeds. The essential fossil fuel coal is composed of the remnants of prehistoric plants, including ferns.

Ferns have been investigated and proven to be beneficial in the removal of heavy metals, particularly arsenic, from soil. Other ferns of economic relevance include: *Dryopteris filix-mas* (male fern), used as a vermifuge and formerly in the US Pharmacopeia; also, this fern unintentionally growing in a bottle led in Nathaniel Bagshaw Ward's 1829 development of the terrarium or Wardian case. *Microsorium pteropus* (Java fern), one of the most popular freshwater aquarium plants *Rumohra adiantiformis* (floral fern), widely utilised in the florist trade. The root fibre of *Osmunda regalis* (royal fern) and *Osmunda cinnamomea* (cinnamon fern) is used horticulturally; the fiddleheads of *O. cinnamomea* are also eaten as a cooked vegetable. The fiddleheads of *Matteuccia struthiopteris* (ostrich fern) are consumed as a cooked vegetable in North America. The fiddleheads eaten as a cooked vegetable in Japan, *Pteridium aquilinum* and *Pteridium esculentum* (bracken), are thought to be responsible for the high occurrence of stomach cancer in Japan. It is also one of the most significant agricultural weeds in the world, particularly in the British highlands, and frequently poisons livestock and horses. *Diplazium esculentum* (vegetable fern), is a dietary source for some.