

are endangered.

ECONOMIC IMPORTANCE OF PTERIDOPHYTES

It is generally thought that the pteridophytes are quite useless members of the plant kingdom, or at the best they can be considered to be of limited horticultural importance. It is because the deleterious effects of fern growth are well discussed, but their useful effects are largely ignored. Various members of Pteridophytes specially ferns are found to provide food, fibres, medicines etc. almost associated with every aspect of human life. In India, various papers have been published on economically useful pteridophytes specially in the field of medicines (Kapur & Sarin, 1978, Puri & Arora, 1961, Single & Viswanathan, 1996, Kirtikar & Basu, 1985). Gurung (1988) described useful pteridophytes of Nepal. Powell (1976) provides a detailed summary of the ethnobotany of New Guinea and lists many references to pteridophytes. Recently Singh (2000) highlighted economic viability of pteridophytes in India. In the following paragraphs economic importance of pteridophytes in various fields have been discussed..

Pteridophytes as food

✓ Ferns are found to be good source of starch, greens and additives. Starch has been obtained from pulpy apical part of the caudex of certain species of *Cyathea*, *Angiopteris* and *Marattia*. Sporocarps of *Marsilea drummondii* (Australian swamp fern) are grounded into paste to prepare bread. These are considered to be starvation food used by tribals in various parts of the world. Fern greens like fresh uncurled frond of *Diplazium esculentum*, *Pneumatopteris sorgerensis* are sold in low land markets in New Guinea. *Diplazium* is eaten in Philippines and in Malaysia. Other freshly edible ferns are *Ampelopteris prolifera*, (*Angiopteris evceta*), *Ceratopteris*, *Pteridium esculentum*, *Helminthostachys* etc. Rhizome of *Blechnum orientale* and pith of *Cyathea khasyana*, *C. nilgirensis*, *C. spinulosa* and many other species are cooked and eaten by tribals in many parts of the country. A salt has been prepared from the residual ash of *Asplenium atrobryum* (Croft & Leach, 1984) that contain higher percentage of Potassium.)

Pteridophytes as fibre, handicraft & construction Material

Several species of ferns produce soft, sultry hairs on its surface that are being used to stuff pillows in many parts of the world. These species include *Cystodium sorbifolium*, *Ceiba pentandra* etc. Stem of *Cyathea magna*, *C. angienis* are used as picket fences in the highlands of New Guinea. Stems and rachises of ferns are often reinforced with strong sclerotic vascular strands or the outer layer itself is extremely tough and durable. Therefore several tree ferns are good fencing material. Even baskets are being made from *Lygodium* stems. *Equisetum debile* is used to clean cooking and dining utensils. The stem of this plant contains crystals of silica and fine abrasive action of the crystals make it useful cleaning agent.

Pteridophytes as Horticultural Plants and ritual items

Pteridophytes specially ferns occupy a special place almost in all green houses and gardens. Leafless green dichotomously branched "whisk-fern" *Psilotum* is one of the common plants ^{for decoration} every one likes to have in their surroundings. In urban gardens, ornamental ferns are common. Tree ferns *Cyathea contaminans*, *C. felina* and *C. magna* are encouraged to grow in gardens in many parts of world. Ferns like *Angiopteris* and *Marattia* are of high aesthetic value. They find their place in garden because of their beautiful appearance and elegance.

Ferns are often used as personal decoration materials, either casually or for ceremonial occasions. Wagner & Grether (1948) showed that *Selaginella* and *Dicranopteris* are two such species. *Lycopodium* is used as head dress ornamentation on ceremonial occasions.

Almost every garden has plants like several species of *Nephrolepis* and *Pityrogramma calomelanos* (the silver backed fern), although these are present as reasonably attractive weeds rather than actively encouraged. "Maiden hair fern" - *Adiantum cuneatum*, *A. tenerum*, *A. trapeziform* and other cultivar varieties often supplement the garden beauty.

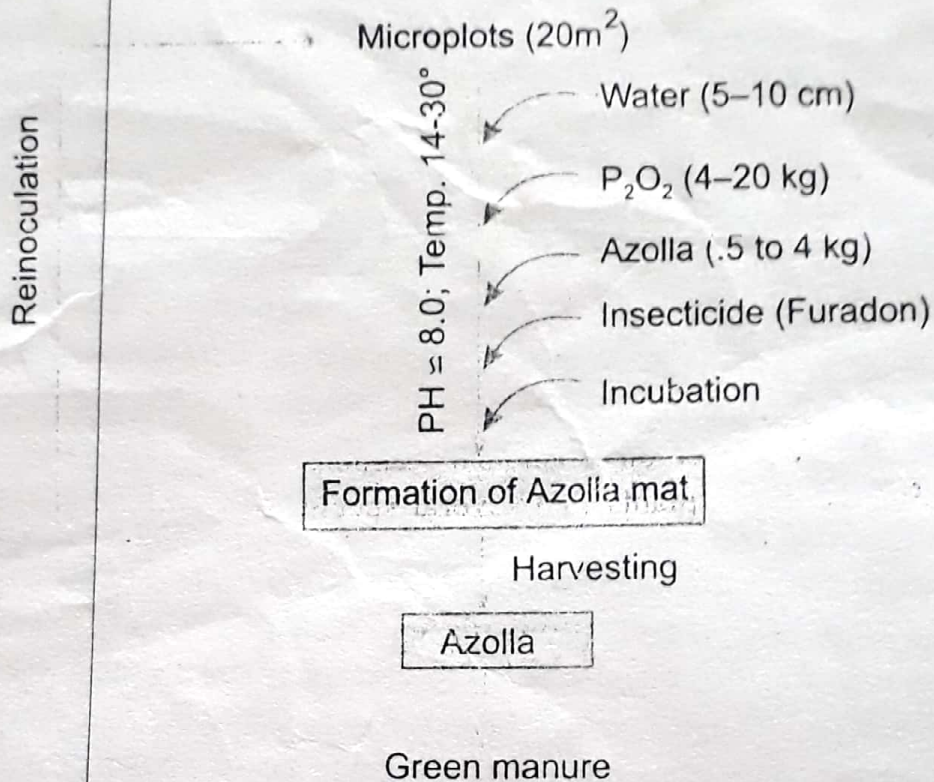
Various species of *Selaginella* have been used by green houses as border plants. *S. lepidophylla* is sold as dried plant on roadsides local markets and the plant rejuvenates once gets wet with water. Another pteridophyte i.e., *Lycopodium* has the status of Ground ring as far as horticultural aspects are concerned. Both the pendulous epiphytic Lycopods as well as creepers, the ground lycopods (Club moss) has aesthetic values. *Lycopodium* is being used on various ceremonial occasions.

Pteridophytes as weed

Salvinia. The waterfern is one of the trouble some and dangerous weeds that propagates very easily in any water reservoir. It can block free flow of water. This plant has long been known as a pest in tropical and sub-tropical countries (Anon, 1979, Klein Schmidt, 1973, Wild, 1961). Its eradication by physical means is quite difficult or impossible. Introduction of save predators (Hentry & Perichard, 1982) as its biological control agent would help to reduce its growth and multiplication in water bodies. Terrestrial fernweeds, like *Pteridium sp.*, *Sphaerostephanos*, *Christella*, *Nephrolepis* etc. are also some of the troublesome weeds because of their habit of quick spreading by long creeping rhizomes. The braken fern *Pteridium aquilinum* is capable of rapid colonization of bare grounds by establishment of numerous sporelings, especially after fire (Gliessman, 1978) and this is a particular problem in tropical regions where the burning of grasslands is a common practice. The plant is toxic to livestock although the animals seem to do poorly in areas heavily infested with braken fern.

Pteridophyte as Biofertilizer

Azolla - a heterosporous water fern which contains endophytic cyanobacterium *Anabaena azollae* in its leaf cavity, used as biofertilizer in rice fields Out of six known species of *Azolla* (*A. nilotica*, *A. mexicana*, *A. microphylla*, *A. rubra*, *A. pinnata* & *A. caroliniana*). *A. pinnata* is common in our country. A rice farmer is sure of at least two good successive crops whenever *Azolla* plants in full bloom occupy the rice fields. It is referred as goddess of fertility. Its maximum cultivation is being done in nurseries (microplots 20m²) which were harvested and dried to be used as green manuring. Mostly in rice fields it can be used either prior to rice plantation or after transplantation of rice followed by water drainage and incorporation of *Azolla* (Singh, 1980). *Azolla* is also a heavy metal resistant plant and shows good tolerance against heavy metals viz. As, Hg, Pb, Cu, Cd, Cr etc.

Fig. 20.25. Mass cultivation of *Azolla*.

Pteridophyte as Medicines

While going through the literature available on medicinal use of plants many names of pteridophytes come across which are being used in medical purposes. It has been known since time immemorial that *Dryopteris filix-mas*-a fern has been used for the treatment of tapeworm. Almost all parts of the plant be it root, stem or frond of pteridophytes are being used as medicine. Some important diseases and their treatment with pteridophytes are being discussed here.

Stomach pains

Holdsworth and Giheno (1955) record that a species of *Lycopodium* is chewed in the central high land of new Guinea to induce vomiting after food poisoning or acute stomach ache. *Lycopodium clavatum* as well as *Lygodium longifolium* are used for treatments of stomach ache and diarrhoea.

Fever, headaches & colds

Pteridium aquilinum is used to treat tooth ache and mouth infection (Powell, 1976 b). Leaves of *Cyclosorus* is used for treatment of nasal infection. *Selaginella flabellata* is used to control fever, headaches and menstruation (Blackwood, 1935).

Boils, Ulcers, Wounds

Futschner (1959) reports *Gleichenia linearis* (*Dicranopteris linearis*) is being bound externally onto wounds. Leaves of *Pteris ensiformis* and *Aspidium latifolium* and roots of *Dryopteris milneana* are being applied to boils, ulcers and arrow wounds. Hot fronds of *Polystichum* sp. are applied to groin swellings by tribals. Fronds of fleshy terrestrial fern *Angiopteris evecta* was bound on to fractured limbs in same countries (Scheifenhovel, 1978).