

VIVEKANANDA COLLEGE
THAKURPUKUR
KOLKATA-700063

NAAC ACCREDITED 'A' GRADE



Topic: Economic importance of Gymnosperms

Course Title: B.Sc. Botany Honours (under CBCS)

Paper: CC4 (Theoretical)

Unit: 4 (under Gymnosperms)

Semester: 2

Name of the Teacher: Dr. Ashutosh Mukherjee

Name of the Department: Botany

Introduction

The gymnosperms are an economically important group of plants. They are used in landscaping, as timber, in building construction, resin, as well as for the manufacture of paper and board. They are also used in medicines, perfumes, varnishes, and essential oils. Some of the uses of gymnosperms are described below:

Wood

The coniferous wood is generally straight-grained, light-coloured and light-weighted. It consists of tracheids, xylem parenchyma and xylem rays. The wood lacks xylem fibres but has more cellulose. It, therefore, has a softer texture than the angiospermous wood. There is hardly any difference between the heartwood and the sapwood.

The wood of *Abies alba*, an important timber tree of Europe, is used in general carpentry. It is used in the sound boards of musical instruments, carving, wood wool, boxes, paper pulp, planks and boards. After treatment with preservatives or copper sulphate, it can be used as telephone and telegraph poles.

A. balsamea is distributed mainly in North America and Canada. The wood is light, weak, knotty and is used for ordinary buildings and box making. It is, however, increasingly being used in association with spruce, as pulp-wood for paper making.

Cedrus atlantica (Algeria, Morocco), *C. deodara* (India) and *C. libani* (Lebanon) are much valued among conifers. The wood of *Cedrus* is in great demand as it is very durable, oily, sweet scented and generally without resin ducts. The cedar of Lebanon (*C. libani*) was called the "Tree of God" by the ancients as its wood was used as roof beams in all the sacred and all celebrated temples of Egypt.

C. deodara, the deodar, is one of the most important timbers of North India. It is considered strongest among the Indian coniferous woods and weight for weight, about as strong as teak. The seasoned wood is resistant to the insect attack due to the presence of oil. It is used for making doors, poles, furniture, beams, ceilings, columns, carriages, wagons, boats, flooring and wood carving.

Cryptomeria japonica yields a coarse-grained, fragrant, strong, durable, and easy to work wood. It is one of the most utilized timbers of Japan. The bark is carefully stripped from trees and is used for roofing of houses. The wood is used for building construction, paneling, furniture and joinery.

The wood of *Picea abies*, the common spruce, is light weight, soft, long fibred and straight-grained, but not much durable. The timber exhibits a natural lustre. It is used for making plywoods, carpentry, dairy and kitchen table-tops, indoor finishing, pit-props, sound boards of musical instruments, carving and match-boxes. Moreover, at the Christmas, this tree is the most popular among all conifers. Ropes and finishing lines are made from its pliable roots.

The wood of *Thuja plicata* is one of the most durable ones due to the presence of certain antibiotics. Because of its weather resistant properties, it is useful for glass house construction, weather boarding, lumber, piling, and outhouses. It is also used for telephone and telegraph poles and beehives. The hollowed out trunks have been used as canoes. The

inner bark on maceration and beating, yields fibres that are woven into mats, baskets, hats, etc. Young branches have also been used for similar work. Roots make fish-hooks.

The wood of *T. occidentalis* is used for fence post-sleepers, building purposes, and boats.

Resins:

Resins are plant exudates which make the wood resistant to decay. Conifers are amongst the major resin yielders of the world. Resins are insoluble in water but soluble in organic solvents. The superior grade resin is used in paper sizing, varnishes, enamels, plasters, medicines and ointments. The inferior grades of resins go in the manufacture of yellow laundry soap, printing ink, oil cloth, insulators, oil and grease, insecticides, adhesives, plastics, disinfectants and shoe polish.

Rosin:

The pine oleoresin was used to smear mummies by ancient Egyptians. An oleoresin (also called pine gum, pine pitch or turpentine) is the mixture of rosin and essential oil. A pine tree yields only oleoresins from which rosin could be separated by distillation. The residue after the distillation of oleoresin is called the gum rosin or Colophony. The important species are *Pinus palustris* and *P. caribaea* (USA), *P. pinaster*, *P. halepensis*, *P. nigra*, *P. pinea* and *P. sylvestris* (Europe), *P. roxburghii* and *P. wallichiana* (India), *P. khasya* (Philippines) and *P. merkusii* (East Indies).

Picea abies yields Burgundy pitch which is the purified resin. From the branchlets and leaves is distilled Swiss turpentine. A type of fermented liquor, spruce beer, is obtained from an extract of young shoots and leaves mixed with treacle and some other sugary substances.

Canada balsam

The resin obtained from *Abies balsamea* has a very high refractive index nearing that of glass. Moreover, it does not crystallize or granulate on drying. This makes Canada balsam as the most preferred mounting medium for microscopic objects and a cement for lenses in optical work. A somewhat similar resin is obtained from *Pseudotsuga taxifolia* and *Tsuga canadensis* in very small quantities.

Essential oils

Essential oils, obtained from almost all those conifers that yield resin, have not been exploited on a commercial basis because of their low content or replacement by some other superior or synthetic ones.

In India, the oil extracted from *Cedrus deodara* is used in perfumery and scented soaps. It is also recommended for clearing tissues in histological work and for use with oil immersion lens of the microscope. A similar use is made of Cedar oil obtained from red cedar (*Juniperus virginiana*) mainly in USA. *Cedrus atlantica* yields a type of oil with medicinal properties. It is used against bronchitis, tuberculosis, skin diseases and gonorrhoea. It also serves as an excellent odour fixative.

The cedarwood oil, obtained from *Juniperus mexicana*, finds its use in scenting soaps, room sprays, deodorants, insecticides, moth proofing, floor polishes, lubricating greases etc. The white cedar leaf oil (also called oil of *Thuja*) is obtained from leaves and twigs of *Thuja occidentalis*. It is used in mixture for room sprays, disinfectants, insecticides and as household and industrial cleanser.

A large number of species of *Pinus* are tapped for turpentine oil. The turpentine oil obtained by distillation of oleoresin is used as a solvent, paint and varnish thinner, chemical raw material and pharmaceutical. It is also widely used in stains, enamels, inks, lubricants, waxes, stain removers, polishes, crayons, insecticides, liniments, medicated soaps, disinfectants and chemicals such as camphene, camphor and terpineol.

Drugs

The alkaloid ephedrine is extracted from the green branches of *Ephedra sinica*, *E. equisetina* and *E. gerardiana*. Ephedrine is an important ingredient in the cough mixtures because of its action in dilating the bronchial tube. It also contracts mucous membranes and is used in nasal drops and inhalents. Ephedrine is now synthesized commercially still local requirements are made from plants.

An extract of leaves of *Ginkgo biloba* is useful in the treatment of cerebral insufficiency and vertigo. *G. biloba* is an important source of C₂₀ trilactone ginkgolide compounds which antagonize platelet activating factor (PAF) in vertebrate blood systems.

The leaves of *Taxus baccata* are used in asthma, bronchitis, hiccough, epilepsy and for indigestion. The whole plant contains taxine, a toxic principle, which is higher in leaves, shoots and seeds. It is an active heart poison. Taxol (from *Taxus brevifolia*) has been shown to be effective against ovarian cancer, breast cancer, non-small-cell cancer, melanoma and colon cancer.

Other uses

Wood wool and leaf wool are obtained by longitudinally cutting wood chips or leaves of conifers into tiny small pieces. The wool is used for stuffing pillows, cushions, etc.

Cycas is known for the production of gum, which exudes through gum canals exposed by wounds in megasporophylls, stems and leaves. It has been used medicinally as an antidote for snake and insect bites.

Reference

Bhatnagar, S. P. and Moitra, A. 1996. Gymnosperms. New Age International (P) Limited, Publishers, India.