Course: B.Sc.(Hons) Botany
Paper: Medicinal Botany (SEC)
Topic: Endemic and endangered medicinal plants, Red list criteria,
*In situ* conservation: Biosphere reserve, Sacred groves, National parks
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• Endemics are species which are confined to a particular geographical region. They are mostly concentrated in the North Eastern region, Western Ghats and North West Himalayas and Andaman and Nicobar islands.

• More than 3000 species of medicinally important plants are known of which many of them have been used in the traditional system of medicine.

• According to 2003 Red list data in India, 45 plants have been listed as critically endangered, 113 as endangered and 88 vulnerable.
Some of the endemic and endangered plants

- *Gymnocalclus assamicus* endemic to North-East India (Arunachal Pradesh, Meghalaya and Nagaland). Seed pod, which is rich in saponin are used as a soap or detergent for washing hair in Arunachal, has anthelminthic properties, cures dermatological disorders and removes leaches.

- *Saussurea costea* known as kuth is endemic to Jammu and Kashmir and Himachal Pradesh. Used as antiseptic and in treating bronchial asthma. Roots used as strong insecticide to protect shawls and woolen fabrics.

- *Tribulus rajasthanensis*, a critically endangered plant distributed in Rajasthan and Gujarat, whole plant used to treat fever, sterility and skin problems. Fruit used in Ayurveda and Unani system of medicine.

- *Comniphora wightii* known as guggulu is restricted to dry regions of Western India and Pakistan. Used to decrease cholesterol synthesis in liver.

- *Lilium polypyllum* known as Ksirakakoli occurring in Jammu and Kashmir, Himachal Pradesh and Uttrakhand, the bulbs of which are used as an expectorant, astringent, aphrodisiac, antipyretic and general debility. Considered as a vital ingredient of Chyawanprash but due to over exploitation and its status as critically endangered, it has been replaced by another plant.
Red list criteria

- IUCN Red List is a catalogue of taxa that are facing risk of extinction. This list shows where actions are to be taken to save the species from extinction. It is a critical indicator of the health of world’s biodiversity.

- More than 116,117 species have been assessed so far, 31,000 species are threatened with extinction.

- It aims to impart information about the urgency and scale of conservation problems to the public and policy makers.

- IUCN Red list is used to guide scientific research and contribute to conservation planning.

- It is used to inform decisions taken by the Multilateral Environmental Agreements and as a guide to revise the annexes of some agreements such as Convention of International Trade in Endangered Species (CITES) and Convention on Migratory Species (CMS).

- Assessment of freshwater species have also contributed to the Ramsar Convention in selecting sites that are important for freshwater biodiversity.

- It also contributes to the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBESS) to strengthen the science policy interface on biodiversity and ecosystem services to improve decision making.
IUCN has recognized 9 Red List categories of species:

- Extinct: when the last individual has died.
- Extinct in the wild: when exhaustive surveys in known or expected habitats cannot record an individual.
- Critically endangered: 50% probability of extinction in 5 years, in immediate future.
- Endangered: 20% probability in 20 years, high risk in the near future.
- Vulnerable: 10% probability in 100 years, in medium-term future.
- Near threatened: likely to be threatened in the near future.
- Least concern: species at lower risk when it has been evaluated.
- Data deficient: data deficient when there is inadequate information to make a direct or indirect, assessment of its risk of extinction.
- Not evaluated: species not evaluated when it has not yet been assessed against the above criteria.
- 567 plants listed in International Union of Conservation of Nature and Natural resources (IUCN) red list threatened species of which 247 are in the threatened category.
Conservation of Biodiversity

• Biodiversity is variability of living organisms from all sources, aquatic, terrestrial, marine and the ecological complex including diversity within species, between species and of ecosystem (CBD, 1972)

• Measures include genetic diversity, species and ecosystem diversity which are interlinked with each other.

• Major strategies of conservation:
  • *In situ*: establish protected areas with appropriate management practices, restore degraded habitats within and outside protected areas.
  • *Ex situ*: establish botanical and zoological gardens, conservation stands, germplasm banks, seed, pollen, gene and DNA banks
• Protected area: area of land/sea to protect biodiversity and natural resources either managed through legal or effective means.
• It conserves the resident species as well as ecological processes and indirect ecosystem services.
• Maintains viable population of all native species and subspecies, maintains number and distribution of communities and habitats and conserves the genetic diversity of all species present, prevention of alien species.
• Eg. National parks and wild life sanctuaries.
Biosphere reserve

- A special category of protected areas of land, wherein people are an integral component of the system.
- Representatives of natural biomes and unique biological communities.
- Concept was launched in 1975 as a part of UNESCO’s Man and Biosphere programme dealing with conservation of ecosystem and genetic resources.
- It consists of core, buffer and transition zones.
  - natural or core zone comprises an undisturbed and legally protected ecosystem.
  - buffer zone surrounds the core area to accommodate a greater variety of resource use strategies, research and educational activities.
  - transition zone, an area of active cooperation between reserve management and local people.
Functions:

• i) conservation of landscapes, ecosystems, species and genetic resource use.

• ii) to promote economic development, which is culturally, socially and ecologically sustainable.

• iii) to provide support for research, monitoring, education and information exchange related to local, national and global issues of conservation and development.
Ex-situ conservation strategies

- Botanical gardens, zoos, conservation stands, field gene banks as well as pollen, seed, seedling, tissue culture and DNA banks help in conservation outside the natural habitat.

- Seed banks store germplasm of wild and cultivated plants at low temperature in cold rooms. In case of bananas and plantains, they are preserved in field gene banks under normal growing conditions.
Sacred groves

- A patch of land protected by the local people for religious beliefs and cultures, usually dedicated to local folk deities or tree spirits.
- Manifest spiritual and ecological ethos of rural communities.
- Play an important role in keeping environment clean, conserving flora and fauna and also the traditional knowledge of the tribal people.
- Serve as a home for the fauna undisturbed and hence contribute to biodiversity conservation.
- Trees eg. *Ficus religiosa*, rivers and even lakes are considered sacred and hence no felling of trees, thus contributing to conservation.

![Sacred grove (Mawphlang, Meghalaya)](image)
Sacred groves are classified into two types:
   - Traditional sacred groves — where village deity resides
   - Temple groves — groves created around a temple and conserved.

Some taboos and beliefs like use of tools angers the sentiments of goddess, hence it is forbidden to use any such things near it.

Myths associated with temples inside the grove.

Even the dry foliage and fallen fruits are untouched in some groves with the belief that the local dieties may get angry causing natural calamities and diseases.

Distributed all over India specially in the Western Ghats, Kerala and Karnataka. The number of sacred groves may range from 1,00,000-150,000.
National parks

• A national park is an area within a sanctuary or not for protecting or propagating the flora, fauna or developing wildlife therein or its environment. No human activity is allowed except for those permitted by the Chief wildlife warden of the state given in Chapter IV, WPA 1972.

• There are 104 National parks in India covering an area of 40501.13 km$^2$ which is 1.23% of total geographical area. (National wildlife database, 2019)

• Jim Corbett national park was the first National park established in India.

• Kaziranga National park (Assam), Keoladeo Ghana national park (Rajasthan), Manas wildlife sanctuary (Assam), Nanda Devi National park (Uttar Pradesh) and Sunderbans national Park (West Bengal) have been declared as “World Heritage Sites”.

• Keibul Lamjao National park in Manipur is the only floating park in the world which is home for the endangered species “Sangai” (Cervus eldi eldi).

• Hemis National park in Kashmir is the largest park in India.