

'Biological diversity' or biodiversity is that part of nature which includes the differences in genes among the individuals of a species, the variety and richness of all the plant and animal species at different scales in space, locally, in a region, in the country and the world, and various types of ecosystems, both terrestrial and aquatic, within a defined area.

Biological diversity deals with the degree of nature's variety in the biosphere. This variety can be **observed at three levels:**

1. The genetic variability within a species,
2. The variety of species within a community, and
3. The organization of species in an area into distinctive plant and animal communities constitutes ecosystem diversity

Genetic diversity:

- Each member of any animal or plant species differs widely from other individuals in its genetic makeup because of the large number of combinations possible in the genes that give every individual specific characteristic.
- Thus, for example, each human being is very different from all others. This genetic variability is essential for a healthy breeding population of a species.
- If the number of breeding individuals is reduced, the dissimilarity of genetic makeup is reduced and in-breeding occurs. Eventually this can lead to the extinction of the species.
- The diversity in wild species forms the **'gene pool'** from which our crops and domestic animals have been developed over thousands of years.

Species diversity:

- The number of species of plants and animals that are present in a region constitutes its species diversity. This diversity is seen both in natural ecosystems and in agricultural ecosystems. Some areas are richer in species than others.
- Natural undisturbed tropical forests have much greater species richness than plantations developed by the Forest Department for timber production.
- Modern intensive agricultural ecosystems have a relatively lower diversity of crops than traditional agro-pastoral farming systems where multiple crops were planted.
- Areas that are rich in species diversity are called **'hotspots'** of diversity. India is among the world's 15 nations that are exceptionally rich in species diversity.

Ecosystem diversity:

- There are a large variety of different ecosystems on earth, which have their own complement of **distinctive inter linked species** based on the **differences in the habitat**.
- Ecosystem diversity can be described for a specific geographical region, or a political entity such as a country, a State or a taluka.
- Distinctive ecosystems include landscapes such as forests, grasslands, deserts, mountains, etc., as well as aquatic ecosystems such as rivers, lakes, and the sea.
- Each region also has man-modified areas such as farmland or grazing pastures. An ecosystem is referred to as **'natural'** when it is relatively undisturbed by human activities or **'modified'** when it is changed to other types of uses, such as farmland or urban areas. Ecosystems are most natural in wilderness areas.

VALUE OF BIODIVERSITY:

1. Consumptive use value
2. Productive use value
3. Social values (While traditional societies which had a small population and required less resources had pre-served their biodiversity as a life supporting resource, modern man has rapidly depleted it even to the extent of leading to the irrecoverable loss due to extinction of several species. Thus apart from the local use or sale of products of biodiversity there is the social aspect in which more and more resources are used by affluent societies. The biodiversity has to a great extent been preserved by traditional societies that valued it as a resource and appreciated that its depletion would be a great loss to their society)
4. Ethical and moral values (Don't plants and animals have an equal right to live and exist on our planet which is like an inhabited spaceship?)
5. Aesthetic value
6. Option value (Keeping future possibilities open for their use is called option value. It is impossible to predict which of our species or traditional varieties of crops and domestic animals will be of great use in the future)

Commonly used modern drugs derived from plant sources:

SL No.	DRUG	PLANT SOURCE	USE
1	Atropine	Belladonna	Anticholinergic - reduces intestinal pain in diarrhea.
2	Bromelain	Pineapple	Controls tissue inflammation due to infection
3	Caffeine	Tea, Coffee	Stimulant of the central nervous system.
4	Camphor	Camphor tree	Rebafacient - increases local blood supply
5	Cocaine	Cocoa	Analgesic and local anesthetic
6	Codeine	Opium poppy	Analgesic - reduces pain
7	Morphine	Opium poppy	Analgesic - controls pain
8	Colchicine	Autumn crocus	Anticancer agent
9	Digitoxin	Common foxglove	Cardiac stimulant used in heart diseases
10	Diosgenin	Wild yams	Source of female contraceptive - prevents pregnancy
11	L-Dopa	Velvet bean	Controls Parkinson's Disease
12	Ergotamine	Smut-of-rye or ergot	Control of hemorrhage and migraine headaches
13	Glaziovine	ocotea glaziovii	Antidepressant - Elevates mood of depressed patients
14	Gossypol	Cotton	Male contraceptive
15	Indicine N-oxide	heliotropium indicum	Anticancer agent
16	Menthol	Mint	Rubefacient - Increases local blood supply & reduces pain
17	Monocrotaline	Cotolaria sessiliflora	Anticancer agent
18	Papain	Papaya	Dissolves excess protein and mucus, during digestion
19	Penicillin	Penicillium fungi	General antibiotic
20	Quinine	Yellow cinchona	Antimalarial
21	Reserpine	Indian snakeroot	Reduces high blood pressure
22	Scopolamine	Thorn apple	Sedative
23	Taxol	Pacific yew	Anticancer (ovarian).
24	Vinblastine	Rosy periwinkle	Anticancer agent - Controls cancer in children.

ENDEMIC SPECIES

- Some species of plants and animals are extremely rare and may occur only at a few locations.
- These are said to be 'endemic' to these areas.
- It is estimated that 18% of Indian plants are endemic to the country and found nowhere else in the world. E.g. Indian Wild Ass, Gharial etc.

EXOTIC SPECIES

- The exotic species are those which are not a part of the natural vegetation.
- Common examples in India are lantana bushes, Eupatorium shrubs and 'congress' grass.
- These have been imported into the country from abroad and have invaded several large tracts of our natural forests.
- Another factor that disrupts forest biodiversity is the introduction of such exotic species.