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Review Article

GLOBAL ENVIRONMENT INFLUENCES BIODIVERSITY

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ABSTRACT

Biodiversity of earth is influenced by the environmental factors and environment is also affected by human activity. Global biodiversity can be divided broadely on the basis of environmental conditions which vary in different parts of the globe. Mainly 12 zones have been identified globally and India has several regions starting from temperate Himalayan region to dry tropical to arid and semi arid regions. The effects of global warming on global vegetation will be discussed. The paper will concentrate on biodiversity of major regions of earth with special reference to India.

Keywords: Global regions, Biodiversity, Tropical, Temperate, Himalayan region.

INTRODUCTION

Biodiversity

Biodiversity is Important for Ecological Balance and Human Survival (2014). The term biodiversity was first coined by the entomologist E.O. Wilson in 1986. Biodiversity is most commonly used to replace the more clearly defined and long established terms, species diversity and species richness[1]. Biologists most often define biodiversity as the "totality of genes, species, and ecosystems of a region". The Convention on Biological Diversity defines biodiversity as the variability among living organisms from all sources including, among other things, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems.

Conservation of Biodiversity

Modern methods of biodiversity conservation include plant tissue culture and cryopreservation[6-9]. Molecular markers have played in conservation and fidelity tests besides providing modern methods of biodiversity conservation[10]. Biotechnological approach on conservation of ferns has also been reviewed[12].

Environment:

Global environment can be divided into 12 zones (Fig 1). Major subdivisions can be in

I. Tropical which can be montane, wet, moist and dry zones,

II. Temperate having moist , dry, cool and moist and dry and cool

III. Boreal moist and dry and

IV. Polar dry and moist. Each zone has different biodiversity which also depends on height above MSL. Almost no vegetation is see above 5000 meters and in semi arid zones alike except scrub vegetation or grasslands. Not going in to much detail the paper shall present broad biodiversity of these zones. Out of the total 4,20,000 flowering plants reported from the World more than50,000 are used for medicinal purposes[13].

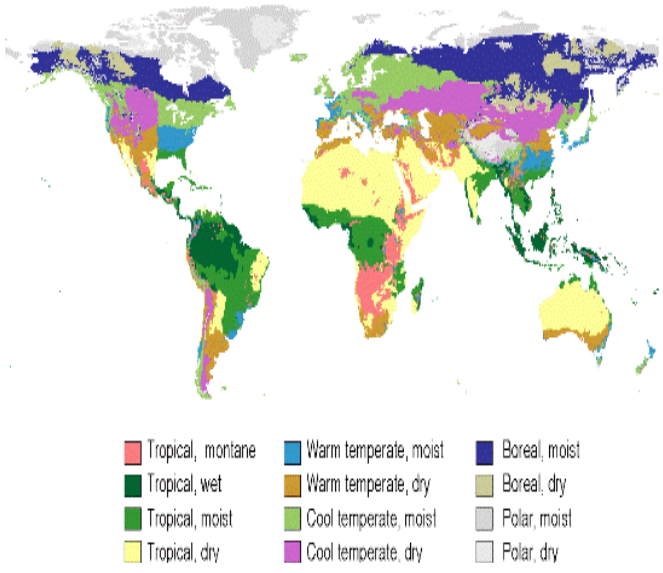

Figure 1: Global Environment

Figure 2: *Euphorbia resinifera* a plants of arid region

TROPICAL ZONE FOOD PLANTS:

- Bael fruit (*Aegle marmelos*)
- Bamboo (various species)
- Banana or plantain (*Musa* species)
- Bignay (*Anti esmabunius*)
- Breadfruit (*Artrocarpus incisa*)
- Coconut palm (*Cocos nucifera*)
- Fishtail palm (*Caryotaurens*)
- Horseradish tree (*Moringa pterygosperma*)
- Lotus (*Nelumbo* species)
- Mango (*Mangiferaindica*)
- Manioc (*Manihotutillissima*)
- Nipa palm (*Nipa fruticans*)
- Papaya (*Carica papaya*)
- Persimmon (*Diospyrosvirginiana*)
- Rattan palm (*Calamus* species)
- Sago palm (*Metroxylonsagu*)
- Sterculia (*Sterculia foeti a*)
- Sugarcane (*Saccharum officinarum*)
- Sugar palm (*Arengapinnata*)
- Sweetsop (*Annona squamosa*)
- Taro (*Colocasia* and *Alocasia* species)
- Water lily (*Nymphaea odorata*)
- Wild fig (*Ficus* species)
- Wild rice (*Zizania aquatica*)
- Wild yam (*Dioscorea* species)

Tropical region ornamental plants:

Figure 3: *Adeniumobesum*

Ornamental plant of tropical region

Nitrogen fixing crop plants

1. **Soybean**
   As indicated earlier, soybean which generally nodulates with *Bradyrhizobimjaponicum*, also nodulates with fast-growing strains of the genus *Rhizobium*, which are now designated as *Rhizobium fredii*, and with *Bradyrhizobium* of the cowpea.

2. **Nitrogen fixing Tropical trees:**
   Nitrogen compounds comprise from 40 to 50 per cent of the dry matter of protoplasm, the living substance of plant cells. Nitrogen is required in large quantities by growing plants and is indeed the key to soil fertility. Non-nitrogen-fixing plants, for example cereals, obtain all the nitrogen they need from the soil. In tropical conditions of Africa this uptake is estimated to be as follows: 79-132 kg N ha/crop for pearl millet; 74-84 kg N/ ha crop for rice; 134 kg N ha/crop for sorghum; and 121-139 kg N ha/crop for maize. Nitrogen-fixing plants, essentially legumes, take a part of the nitrogen they require from the atmosphere, the other part being provided by the soil.
3. Tropical tree legumes can be classified into three groups according to effective nodulation patterns with *Rhizobium* and *Bradyrhizobium.*

i. Trees of group 1 nodulate effectively with Bradyrhizobium, e.g. *Acacia albida, Dalbergia melanoxylon, Pterocarpu serinaceus Dalbergia sisso, Prosopis africana,*,

ii. Trees of group 2 nodulate effectively with Rhizobium, e.g. *Acacia nilotica, Acacia senegal, Sesbania grandiflora. Prosopis julqlora, Acacia raddiana*,

iii. Trees of group 3 nodulate with both genera, *Rhizobium and Bradyrhizobium*, e.g. *Acacia senegal, A. sieberana, Erythrophleum guineense.*

The host plants known to nodulate with strains of Rhizobium alone or of Bradyrhizobium alone were later found to nodulate with both genera. This has been already reported in *Acacia senegal* (section 1.1.2.), and is also well known in *Leucaena leucocephala*, a species that generally nodulates with Rhizobium, but which occasionally nodulates with *Bradyrhizobium*[2].

4. **Tropical nitrogen fixing bacteria**
   It is now recognized that bacteria which form nodules on legumes, and which are known under the general name of rhizobia, belong to two genera: *Rhizobium* and *Bradyrhizobium.* All strains of the Rhizobium genus are fast-growing. The genus Rhizobium comprises four species: *Rhizobium lepminosarum*, *Rhizobium meliloti*, *Rhizobium loti*, and *Rhizobium fredii.* These bacteria are able to fix nitrogen.
5. **Non bacterial nitrogen fixation:**
   Apart from rhizobia, about 200 plant species covering 20genera and 9 families are nodulated by nitrogen-fixing micro-organisms known as Frankia spp. Frankia is actinomycetal in nature and has been isolated from *Casuanna cunninghamiam* and *Myrìca gale.*

A. **Temperate zone :**
   The cool Temperate with temperature ranges between minus 40 degrees to 30 degrees Celsius. Rainfall is delivered fairly consistently throughout the year except in drought years when January and February are usually dry. Rainfall in a drought year will still reach about 500mm/year and in a wet year it can be over 1,400mm/year. The plants of the region are thin leaved and suffer from physiological drought. One can witness Pines on hills with needle shaped leaves.

B. Plants of temperate climate:

i. ***Apiumgraveolens* and *Apiumrepens*** Celery is growing nicely at this time of year and it is a pick and come again type of vegetable.

Figure 4: *Apiumrepens*

ii. ***Asparagus officinalis*** The plants range between one and three years with the oldest plants producing the earliest spears. Asparagus is a real giver at this time of the year.

iii. ***Brassica rapa***Turnip when purchased don't have a lot of flavour, but when home grown have an almost sweet taste. I think that some varieties can get as high as 20% sugar content.

iv. ***Citrus maxima*** The fruits of the tree taste just like a grapefruit, but with quite a thick skin.

v. ***Daucuscarota*** Carrot is typical plant of temperate region.Carrots are always better grown from seed and seed grown carrots tend to be arrow straight

vi. ***Erucasativa*** Rocket has spread right through the food forest and herbage

vii. ***Foeniculumvulgare*** Fennel is an excellent addition to any salad, but I find that it has to be used in small quantities or it overpowers all other flavours[3].

Figure 5: Biodiversity of temperate region: Vegetables

Some of the other plants of temperate region include*Allium cepa var. proliferum*, *Allium schoenoprasum*, *Beta vulgaris var. cicla*, *Brassica juncea*, *Centella asiatica*, *Citrus limon 'Eureka'*, *Diplotaxis tenuifolia*, *Polygonum odoratum*, *Rosmarinus officinalis*, *Salvia officinalis, Sanguisorba minor*, *Thymus citriodorus* and *Tropaeolum majus*.***Raphanussativus***

Ornamental plants of temperate region:

Figure 6: *Geranium senguineum*an ornamental plant of temperate region

Figure 7: Aquatic plant *Nymphaea alba*

Figure 8: Shalgam or chukundar (*Brassica napus)* is used to obtain sugars in temperate climate

Biodiversity and climatic zones of India

A climatic region for agriculture is defined as an area having homogeneity in relief, soil type, climatic conditions, farming practices, crops produced and crop association. India is a vast country and is endowed with diverse geographical conditions which are bound to bring in regional variations in agriculture.The scheme suggested by the Indian Council for Agricultural Research (ICAR) is simple and comprehensive and is reproduced here. It is based on the predominance of crops and crop associations. Accordingly India can be divided into following agricultural regions (Fig 8).

1. Rice-Jute-Tea Region:

This vast region includes lowlands, valleys and river deltas in the states of Assam, Arunachal Pradesh, Tripura,

Meghalaya, West Bengal, Orissa, northern and eastern Bihar parts of Jharkhand and Chhattisgarh and Tarai region of Uttar Pradesh.

The rainfall vanes from 180 to 250 cm. Rice are the predominant crop due to fertile alluvial soils, abundant rainfall and high summer temperatures. Jute is mainly grown in the Hugli basin of West Bengal but some areas have been brought under jute cultivation in Assam, Meghalaya, Tripura, Orissa and Tarai region of U.P. Tea is mainly grown in Assam, Darjeeling and Jalpaiguri areas of West Bengal and Tripura. Sugarcane and tobacco are grown in Bihar. Coconut is grown in coastal areas. Mango, pineapple, betal leaves, bananas, jack fruits, and oranges are the main fruit crops.

2. **Wheat and Sugarcane Region:**

Irrigation is a vital input in drier areas. This region comprises Bihar, Uttar Pradesh, Punjab, Haryana, Western Madhya Pradesh and north eastern Rajasthan. Most of the areas have rich fertile alluvial soils with some parts having black and red soils. Rainfall is moderate, large part of which is caused by south-west monsoons in summer. Some rainfall is caused by western disturbances in winter.

As its name indicates, this region is dominated by wheat and sugarcane cultivation. The main wheat belt of India extends over Punjab, Haryana, Ganga-Yamuna doab of Uttar Pradesh and north-eastern Rajasthan. Sugercane is mainly grown in Uttar Pradesh and contiguous parts of Bihar. Rice, pulses and maize are the other important crops.

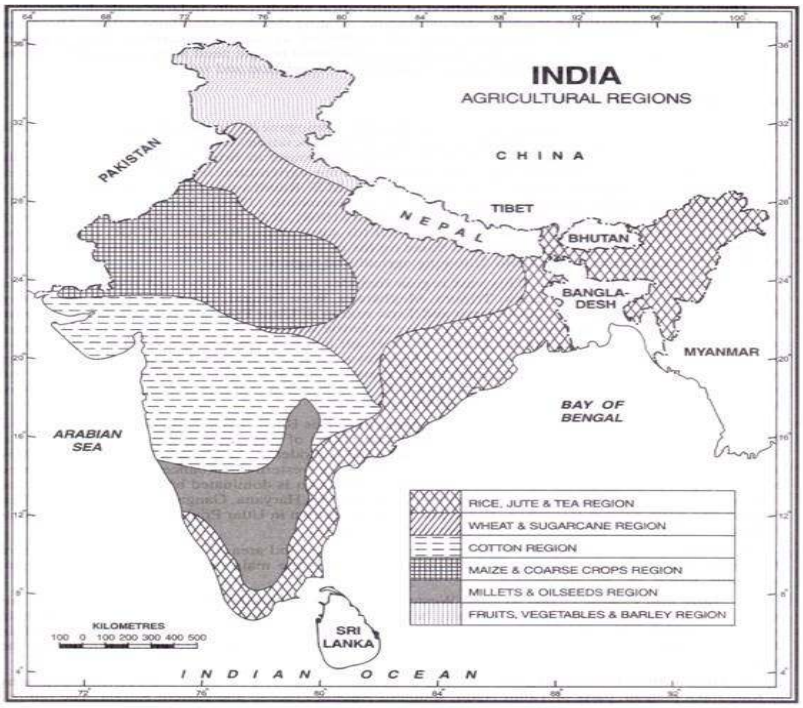

FIG. 22.1. India : Agricultural Regions

Figure 9: Different agroclimatic zones of India.

3. **Cotton Region:**

Obviously, cotton is the main crop but jowar, bajra, gram, sugarcane, wheat, etc. are also grown.It spreads on the regur or black cotton soil area of the Deccan plateau, where the rainfall varies from 75 to 100 cm.

4. **Maize and Coarse Crops Region:** Maize is mainly grown in the Mewar plateau where wheat and ragi are also produced. In the southern part, rice, cotton and sugarcane are grown. Bajra and pulses are grown throughout the region.

estern Rajasthan and northern Gujarat are included in this region. The rainfall is scanty and is normally below 50 cm. Agriculture is possible only with the help of irrigation.

5. **Millets and Oilseeds Region:**

The rainfall varies from 75 to 125 cm. This region includes areas of poor soils and broken topography in Karnataka plateau, parts of Tamil Nadu, southern Andhra Pradesh and eastern Kerala. The millets include bajra, ragi and jowar while the oilseeds grown are groundnut and caster. Pulses are also grown. Mangoes and bananas are important fruit crops.

6. **Fruits and Vegetable Region:**

The rainfall varies from 60 cm in the west to 200 cm in the east. This region extends from Kashmir Valley in the west to Assam in the east. Apple, peach, cherries, plum, apricot are grown in the west while oranges are important in the east. Besides, rice, maize, ragi potatoes, chillies and vegetables are also grown.

DISCUSSION

Biodiversity encompasses the variety of life on earth, or within one particular ecosystem, in terms of the number of distinct biological species present. Forests, botanical gardens,

national parks, sanctuaries, wetlands, water bodies arid and semi arid regions preserve large amount of biodiversity.UN Agenda 21 proposed in a conference, "United Nations Conference on Environment and Development (UNCED)" at Rio de Janeiro, Brazil (1992) submits that sustainable development is based on the satisfaction of basic needs in developing countries. Biodiversity of a region can be utilized by human developmental activities. Tropical rainforests, for example, support a huge variety of species, so are highly biodiverse, while polar-regions are far less so[3]. Biodiversity provides products such as food, medicines and materials for industry. Biodiversity is the foundation upon which human civilization has been built[11]. Deforestation, animal feed and human consumption is reducing biodiversity[3,12]. The conservation of specific information (genes), their libraries (species), and support systems (habitats) should be of urgent concern given the current changes in extinction rates caused by human impacts. Greenhouse gases are causing temperature rise which is causing loss of biodiversity. There is considerable change in natural forests, and plantations have been taken-up in the developed world while developing countries are losing biodiversity at a faster rate and in a broader area.

CONCLUSION

Global biodiversity can be divided broadely on the basis of environmental conditions which vary in different parts of the globe. Mainly 12 zones have been identified globally and India has several regions starting from temperate Himalayan region to dry tropical to arid and semi arid regions.Biodiversity of a region can be utilized by human developmental activities.There is considerable change in natural forests, and plantations have been taken-up in the developed world while developing countries are losing biodiversity at a faster rate and in a broader area. It is important to keep biodiversity intact to save human civilization.

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