

## UNIT – II

### BIODIVERSITY

Biodiversity in the context of plant systems refers to the variety and variability of plant species within a given ecosystem. This includes the diversity within species (genetic diversity), between species (species diversity), and of ecosystems (ecosystem diversity).

1. **Genetic Diversity:** The variation in genes within a particular species. This is important for adaptation to changing environments and for the overall health and resilience of the species.
2. **Species Diversity:** The variety of species within a habitat or a region. Higher species diversity generally indicates a more resilient and stable ecosystem.
3. **Ecosystem Diversity:** The diversity of ecosystems in a certain area. This includes forests, deserts, wetlands, grasslands, and more. Each ecosystem has different communities of plants that interact with each other and with their environment.

### **Importance of Plant Biodiversity**

1. **Ecosystem Services:** Plants provide essential services such as oxygen production, carbon sequestration, soil fertility, water purification, and habitat for wildlife.
2. **Food Security:** A diverse range of plant species is critical for food security as it provides a variety of crops that can withstand pests, diseases, and changing climate conditions.
3. **Medicinal Resources:** Many plants are sources of medicines and other health-related products.
4. **Economic Value:** Biodiversity can have economic benefits through agriculture, forestry, horticulture, and tourism.
5. **Cultural Importance:** Plants are integral to many cultures and religions, providing materials for rituals, foods, and traditional medicines.

## **Threats to Plant Biodiversity**

1. **Habitat Destruction:** Urbanization, deforestation, and agriculture can lead to the loss of plant habitats.
2. **Climate Change:** Changes in temperature and precipitation patterns affect plant growth and survival.
3. **Invasive Species:** Non-native species can outcompete, prey on, or bring diseases to native plants.
4. **Pollution:** Air, water, and soil pollution can negatively impact plant health and diversity.
5. **Overexploitation:** Unsustainable logging, farming, and harvesting can deplete plant populations.

## **Conservation Efforts**

1. **Protected Areas:** Establishing reserves and parks to protect plant habitats.
2. **Sustainable Practices:** Promoting sustainable agriculture and forestry practices to reduce impact on plant systems.
3. **Restoration Projects:** Initiating projects to restore degraded ecosystems.
4. **Seed Banks and Botanical Gardens:** Storing seeds and growing plants in controlled environments to preserve genetic diversity.
5. **Legislation and Policies:** Implementing laws and policies to protect endangered plant species and habitats.

## **Conclusion**

Plant biodiversity is crucial for the health and stability of ecosystems. It supports life on Earth through various ecosystem services and provides resources essential for human survival. Protecting and conserving plant diversity is vital for ecological balance and sustainability.

## BASIC CONCEPTS OF PLANT GROWTH

Plant growth is a complex process that involves various physiological and biochemical activities. Here are some of the basic concepts:

### 1. Photosynthesis

- **Process:** Plants convert light energy, usually from the sun, into chemical energy in the form of glucose. This process occurs in the chloroplasts within plant cells.
- **Equation:**  $6\text{CO}_2 + 6\text{H}_2\text{O} + \text{light energy} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$

### 2. Respiration

- **Process:** The breakdown of glucose to release energy for cellular activities. This occurs in the mitochondria.
- **Equation:**  $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + \text{energy}$

### 3. Transpiration

- **Process:** The evaporation of water from the plant, mainly through the stomata in the leaves. This helps in the uptake of nutrients and cooling the plant.

### 4. Nutrient Uptake

- **Macronutrients:** Essential nutrients required in large amounts (e.g., nitrogen, phosphorus, potassium).
- **Micronutrients:** Essential nutrients required in smaller amounts (e.g., iron, manganese, zinc).

### 5. Growth Phases

- **Germination:** The process by which a seed develops into a new plant. Requires water, oxygen, and suitable temperature.
- **Vegetative Growth:** The phase where the plant focuses on growing leaves, stems, and roots. High nutrient and water demand.
- **Reproductive Growth:** The phase where the plant develops flowers, fruits, and seeds.

## 6. Plant Hormones

- **Auxins:** Promote cell elongation, root formation, and are involved in the regulation of growth.
- **Gibberellins:** Stimulate stem elongation, seed germination, and flowering.
- **Cytokinins:** Promote cell division and delay aging of leaves.
- **Ethylene:** Involved in fruit ripening and response to stress.
- **Abscisic Acid (ABA):** Regulates stress responses and promotes seed dormancy.

## 7. Environmental Factors

- **Light:** Essential for photosynthesis; influences plant development and flowering.
- **Temperature:** Affects enzymatic activities and overall metabolism.
- **Water:** Vital for nutrient transport, photosynthesis, and maintaining cell turgidity.
- **Soil Quality:** Influences nutrient availability and root growth.

## 8. Genetics

- **Genotype:** The genetic makeup of a plant, which determines its growth potential.
- **Phenotype:** The observable characteristics of a plant, influenced by both genetics and the environment.

## 9. Cellular Growth

- **Cell Division:** Increase in cell number through mitosis.
- **Cell Enlargement:** Increase in cell size, mainly through water uptake.
- **Differentiation:** Specialization of cells into different types (e.g., xylem, phloem).

## Conclusion

Understanding the basic concepts of plant growth helps in optimizing conditions for better yield and health of plants. Proper management of light, water, nutrients, and other environmental factors, along with an understanding of plant physiology, can lead to successful plant growth and development.

## UNIT - II

**Photosynthesis** is the process by which green plants, algae, and some bacteria convert light energy, usually from the sun, into chemical energy stored in glucose (a type of sugar). This process is essential for life on Earth as it forms the basis of the food chain and is responsible for producing the oxygen we breathe.

### **Key Steps of Photosynthesis:**

#### **1. Light Absorption:**

- Occurs in the chloroplasts of plant cells, specifically within structures called thylakoids. Chlorophyll, the green pigment in plants, absorbs sunlight, which energizes electrons.

#### **2. Water Splitting (Photolysis):**

- Light energy is used to split water molecules ( $\text{H}_2\text{O}$ ) into oxygen ( $\text{O}_2$ ), protons ( $\text{H}^+$ ), and electrons ( $\text{e}^-$ ). This process releases oxygen as a by-product.

#### **3. Electron Transport Chain:**

- The energized electrons move through a series of proteins embedded in the thylakoid membrane, creating a flow of protons across the membrane. This flow generates ATP (adenosine triphosphate), an energy-carrying molecule.

#### **4. Production of NADPH:**

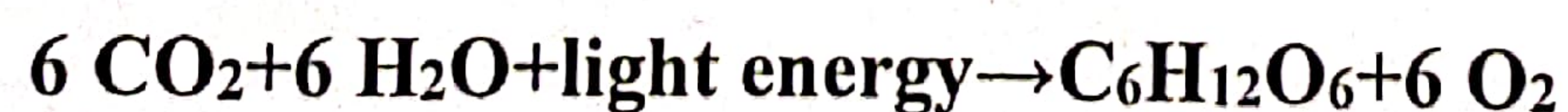
- The electrons eventually reduce  $\text{NADP}^+$  (nicotinamide adenine dinucleotide phosphate) to form NADPH, another energy carrier used in the next stage of photosynthesis.

#### **5. Calvin Cycle (Light-Independent Reactions):**

- Occurs in the stroma of the chloroplast. Here, the ATP and NADPH produced in the light-dependent reactions are used to convert carbon dioxide ( $\text{CO}_2$ ) from the atmosphere into glucose ( $\text{C}_6\text{H}_{12}\text{O}_6$ ) through a series of enzyme-mediated steps.

### **Photosynthesis Equation:**

The overall chemical equation for photosynthesis can be summarized as:



This shows that carbon dioxide and water, in the presence of light energy, are converted into glucose and oxygen.

## Importance of Photosynthesis:

- **Energy Source:** Photosynthesis provides the primary energy source for nearly all life on Earth.
- **Oxygen Production:** It is responsible for the oxygen in our atmosphere.
- **Carbon Fixation:** Photosynthesis helps remove carbon dioxide from the atmosphere, playing a crucial role in the carbon cycle.

## Animal system: elementary study of digestive

The digestive system in animals is responsible for breaking down food into nutrients that the body can use for energy, growth, and repair. Here's a simple overview of the digestive system focusing on its key parts and functions:

### Key Parts of the Digestive System:

#### 1. Mouth:

- The digestive process begins in the mouth, where food is chewed and mixed with saliva. Saliva contains enzymes like amylase that start breaking down carbohydrates.

#### 2. Esophagus:

- The esophagus is a muscular tube that connects the mouth to the stomach. When food is swallowed, it moves down the esophagus through a process called peristalsis, which is a series of muscle contractions.

#### 3. Stomach:

- The stomach is a hollow organ that holds food while it is mixed with stomach acids and digestive enzymes. These acids and enzymes help break down proteins into smaller molecules. The stomach's churning action further aids in the digestion of food.

#### 4. Small Intestine:

- The small intestine is a long, coiled tube where most digestion and nutrient absorption occur. Here, enzymes from the pancreas and bile from the liver continue to break down food. The nutrients are then absorbed through the walls of the small intestine into the bloodstream.

#### 5. Liver:

- The liver produces bile, which helps digest fats. Bile is stored in the gallbladder and released into the small intestine as needed.

## 6. Pancreas:

- The pancreas produces digestive enzymes that help break down carbohydrates, proteins, and fats in the small intestine. It also produces insulin, which helps regulate blood sugar levels.

## 7. Large Intestine (Colon):

- The large intestine absorbs water and salts from the remaining food matter, turning it into solid waste (feces). The waste is stored in the rectum until it is excreted from the body through the anus.

## 8. Rectum and Anus:

- The rectum stores feces until it is ready to be expelled. The anus is the opening at the end of the digestive tract through which feces leave the body.

## Summary of the Digestive Process:

1. **Ingestion:** Food enters the mouth.
2. **Digestion:** Food is broken down into smaller components by enzymes and stomach acid.
3. **Absorption:** Nutrients are absorbed into the bloodstream primarily in the small intestine.
4. **Excretion:** Waste products are expelled from the body.

## Importance:

- **Nutrient Supply:** The digestive system ensures that the body receives essential nutrients needed for energy, growth, and cell repair.
  - **Waste Removal:** It also helps the body remove waste products that cannot be used.
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