

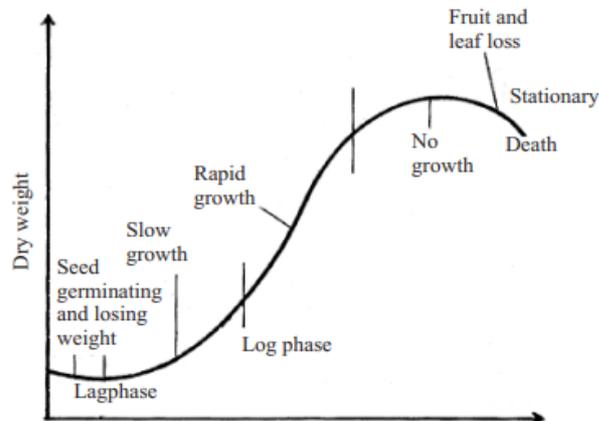
LESSON-24 GROWTH AND DEVELOPMENT IN PLANTS

In this lesson you will learn about growth, development and movements in plants.

- Growth in living organisms may be defined as an irreversible increase in the number and size of a cell, organ or whole organism.
- Development is the whole series of qualitative and quantitative changes (growth, differentiation, maturation), which an organism undergoes throughout its life cycle.
- Growth of cells occurs in three successive stages i.e., cell division, cell enlargement, cell differentiation

Growth Curve

- The rate of growth of a plant or plant part is not always the same during its life span. Sometimes it is slow and at other times rapid. If we plot the increase in cell number (growth rate) against time, a typical **S-shaped curve is obtained**. This is called growth curve or sigmoid growth curve.
- This curve has three phases of growth. (i) **Lag Phase** – This is the initial phase of growth when the rate of growth is very slow. (ii) **Log Phase** – It shows rapid growth and is maximum during the entire life span. (iii) **Stationary Phase** – Here the rate of growth starts decreasing and finally it stops.



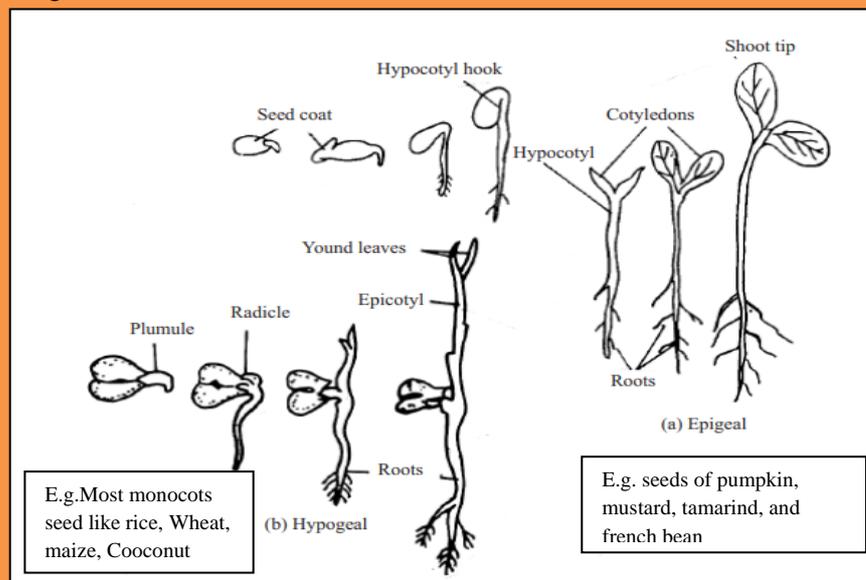
- Auxanometer is specially designed equipment used to measure the rate of growth of shoot length of plants
- Generally plant growth is influenced by a number of factors both external and internal. The **external factors** that affect the growth of the plant are light, temperature, Water and mineral nutrients
- **Internal factors** involved some substances produced in the plant body itself, which affects the growth of the plant. These are called plant hormones or **phytohormones** or growth hormones.
- The internal factors responsible for plant growth are auxin, gibberellins, cytokinins, ethylene, and abscisic acid. These are substances produced in a small quantity in one part of plant body and capable of moving to other parts to influence the growth of that part.

Naturally Produced Growth Hormones

- **Auxin** is a growth promoter, generally produced by the growing apex of stem and root of the plants. It helps in the elongation of shoot and root tips behind apical meristem. The naturally produced auxins is Indole-3-Acetic Acid (IAA)
- **Gibberellin or Gibberellic Acid (GA)** was initially isolated from a fungus *Gibberella fujikuroi*. In plants, it is produced in embryos, roots, and young leaves and it enhances growth.
- **Ethylene** is a gaseous hormone. It is found in ripening fruits, young flowers and young leaves.
- **Abscissic acid** also known as Dormin is a naturally occurring growth inhibitor found in wide variety of plants. It is synthesised in leaves.

DORMANCY AND GERMINATION IN SEEDS

- **Seed germination** is the return of metabolic activities and growth by the seed tissue to give rise to a new plant by the development of the embryo.
- The germination in seeds is mainly affected by factors like Water, temperature, oxygen, light, and hormone.
- Some seeds do not germinate immediately after dispersal even if suitable conditions of growth are provided. In this period growth of the seeds remains suspended and it is said to be in the rest or dormant stage. This phenomenon is called dormancy of seeds
- Flowering plants show two types of germination, Epigeal (epi - above; geo - soil) germination; and Hypogeal (hypo = below, geo = earth) germination



- Some plants, which grow in marshy places show a special type of germination called **Vivipary**. Here the seed germinates inside the fruit while it is attached to the parent plant. For example, *Rhizophora* and *Sonneratia*.

	<ul style="list-style-type: none">✚ Photoperiodism is the biological response in growth, reproduction (flowering) of a plant to the duration of light, which falls on it per day.✚ Florigen is a hypothetical plant hormone, which is responsible for initiation of flowering in plants.✚ The method of accelerating the ability of flowering in plants by keeping them at low temperature for sometime is called Vernalisation✚ Senescence is a gradual process during which any plant part or the whole plant completely loses its function and ultimately dies.✚ The process of detachment of any leaves, fruits, flower or any part of the plant from the main body after getting older is called Abscission.✚ Any change in the environmental conditions that may adversely affect the growth or development in plants is called biological stress. This stress occurs mainly due to temperature, water, salt, shade, light, and various pollutants.✚ Movement in plants or in any part of the plants towards or away from some environmental factors is known as tropic (trope : turn) movement.✚ The nastic (nastein : bending) movements are the growth movements resulting due to difference in the rate of growth on opposite sides of an organ e.g., opening of petals, coiling of leaves, etc✚ Turgor movements are due to change in the volume of water inside the cell. When more water is present in the cell it is fully expanded and becomes rigid or hard. Such a condition is called turgidity and the cell is said to be turgid.

Test Yourself

1. Distinguish between growth and development.
2. State the different phases of sigmoid curve.
3. Define seed germination? Describe the various factors responsible for seed germination?