

PLANT GROWTH AND DEVELOPMENT L-1

XI BIOLOGY
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Characteristics of plant growth

- It is irreversible permanent increase in size of an organ or its parts or an individual
- Indeterminate, intrinsic and open
- Meristem at certain regions causes growth
- Caused by anabolic and catabolic reaction
- Apical meristems cause primary growth, elongation(Root and stem apex)
- Lateral meristems increase the girth of organs (CAMBIUM ,CORK CAMBIUM)(only Dicot, gymnosperms)

PHASES OF GROWTH

- MERISTEMATIC PHASE (cell increase in protoplasm ,large nuclei ,primary cell wall have more plasmodesmata)
- PHASE OF ELONGATION (cell elongation, increase vacuolation ,new cell wall deposition)
- PHASE OF MATURATION(wall thickening ,protoplasmic change)

Growth is Measurable

It is measured by a variety of parameters as

- Increase in fresh weight | dry weight, length, area, volume and cell number
- One single maize root apical meristem can give rise to more than 17,500 new cells per hour
- Watermelon may increase in size by upto 3,50,000 times

Growth Rates

The increased growth per unit time is termed as growth rate

It expressed mathematically as

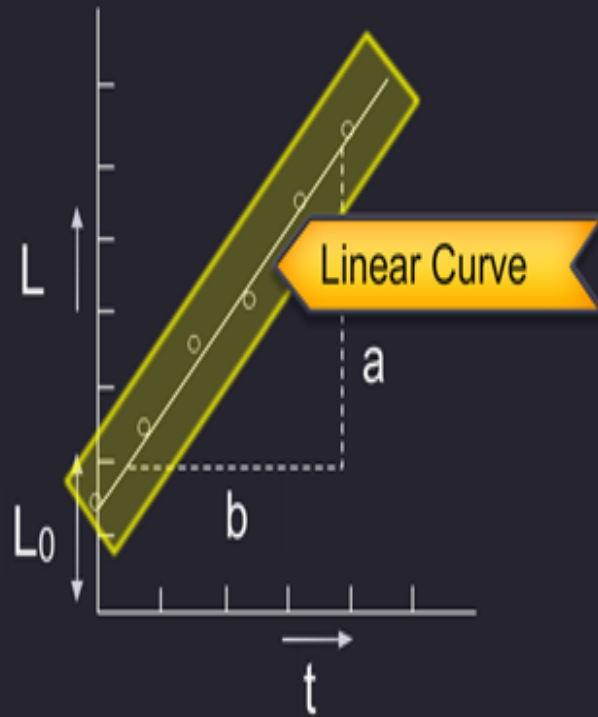
1. Arithmetic—one cell continues to divide while other matures

$$L_t = L_o + rt$$

2. Geometric –All dividing or progeny cells continues to divide

$$W_1 = W_o e^{rt}$$

Arithmetic Graph



Mathematical Expression

$$L_t = L_0 + rt$$

L_t = Length of the root at time 't'

L_0 = Length of the root at time '0'

$rt = \frac{a}{b}$, elongation of root per unit time or growth rate

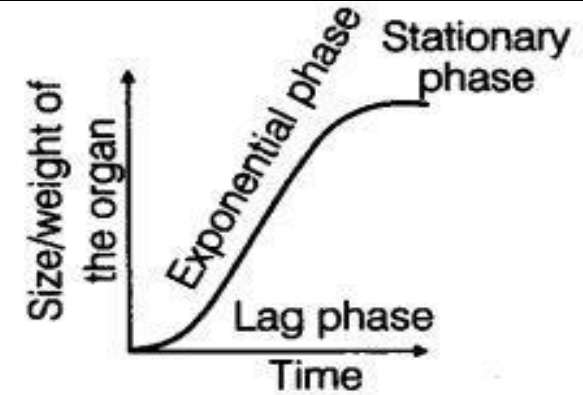


Fig. 15.7 An Ideal sigmoid growth curve typical of cells in culture and many higher plants and plant organs

The exponential growth can be expressed as

$$W_1 = W_0 e^{rt}$$

where, W_1 = Final size (weight, height, number, etc.)

W_0 = Initial size at the beginning of the period

t = Time of growth

e = Base of natural logarithms

A sigmoid curve is a characteristic of living organism growing in a natural environment.

On the basis of quantitative comparisons ,growth rates are two types

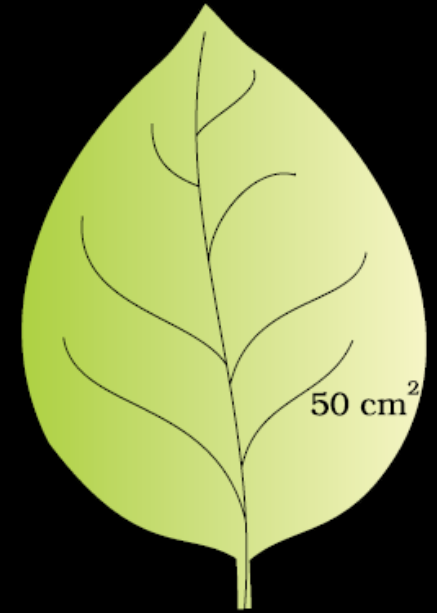
- 1.Absolute growth rate- total growth per unit time
- 2.Relative growth rate-per unit initial parameter

Conditions for growth

- Nutrients
- Water
- Oxygen
- Temperature
- Light
- Mineral elements

DIFFERENTIATION

- Mature cells loose the ability to divide as tracheary element



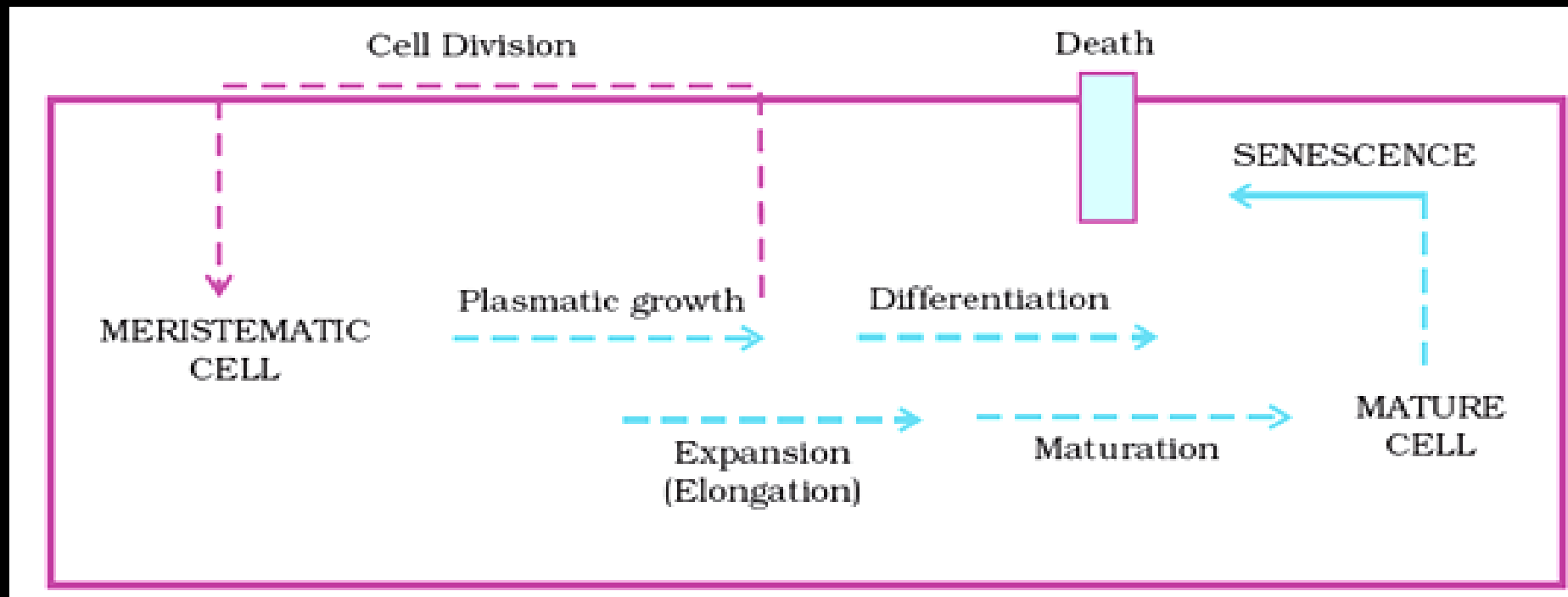
DEDIFFERENTIATION

-differentiated cells regaining ability to divide as interfascicular cambium and cork cambium

REDIFFERENTIATION-Cells produced by dedifferentiated again lose ability to divide as woody dicot plant (tumour)

DEVELOPMENT

All changes that an organism goes through during its life cycle from germination of the seed to senescence.



Plasticity

Plants follow different pathways in response to different environment or phases

of life to form different kinds of structures.

e.g., **heterophylly** in cotton, coriander and larkspur (leaves of the juvenile plant are different in shape from those in mature)

-difference in shapes of leaves produced in air and those produced in water in **buttercup** plants.

THANKS TO ALL

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