

9.3 GROWTH IN PLANTS

Indeterminate Growth in Plants

- **Animals:** go through a period of DETERMINATE growth – it occurs during an embryonic/juvenile stage & then stops
 - A fixed number of parts develop
- **Plants:** show INDETERMINATE growth = can continue to grow throughout their lifespan
 - Many plant cells (incl. fully differentiated ones) retain TOTIPOTENT POTENTIAL & can give rise to new plants (cuttings/tissue culture)

- Why plants show indeterminate growth

- 1) Have regions where undifferentiated cells continue to divide & grow = **MERISTEMS**
 - **Apical meristems** = in roots & shoots (tip)
 - **Lateral meristems** = in stem
- 2) INDETERMINATE GROWTH because apical meristems can continue to increase lengths of stem & root throughout lifespan & can produce any no. of extra branches, leaves & flowers

• PRIMARY GROWTH:

= Growth at apical meristems in the vertical plane

- Causes:

- Limited mitosis in the meristem under control of CYTOKININS* (hormone produced at root)
- Extensive cell elongation under control of AUXIN

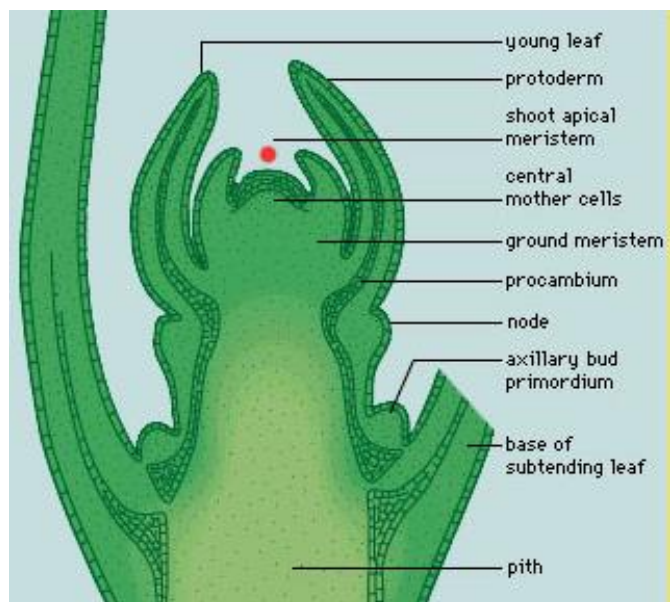
Growth of the Shoot

- Shoot = stem + leaves – at tip of shoot there is the **SHOOT APICAL MERISTEM**

Cells in SAM carry out mitosis & cell division repeatedly = generate new cells needed for extension of stem & development of leaves:

- 1) As cells divide, 1 remains in meristem (so it can continue to go through the cell cycle & produce more cells), whilst the other is pushed out
- 2) Cells on the edge stop dividing & undergo rapid growth & differentiation = become stem/leaf tissue
- 3) Leaves = start as small bumps at side of apical dome
 - Bumps = LEAF PRIMORDIA & through cell division and growth they develop into mature leaves

- PROTODERM creates epidermis
- PROCAMBIUM creates vascular tissues
- GROUND MERISTEM creates pith



9.4 REPRODUCTION IN PLANTS

Flowering

- **Vegetative phase** = when a plant germinates & a young plant is formed that grows roots, stems & leaves = vegetative structures
- **Reproductive phase** = when a trigger causes the plant to produce flowers
 - + This change happens when meristems in the shoot start to produce parts of flowers instead of leaves

- Purpose of flowering

= To allow for pollination, fertilisation & subsequent seed dispersal

POLLINATION

= Transfer of pollen from the ANTHOR of 1 flower to the STIGMA of another

- + SEXUAL REPRODUCTION of flowering plants depends on this

- 1) **Abiotic pollination** – accounts for 10% of pollination in Angiosperms

- + = Without involvement of other organisms e.g. wind, water

- 2) **Biotic pollination** – accounts for 90% of pollination in Angiosperms

- + = With assistance of pollinators e.g. insects, birds, or mammals (rodents/bats)

- **MUTUALISM** = close association between 2 organisms where both organisms benefit from the relationship

- ❖ E.g. POLLINATORS gain food in form of nectar & PLANT gains a means to transfer pollen to another plant

FERTILISATION

- 1) Pollen grain reaches STIGMA
- 2) From each pollen grain on the stigma a POLLEN TUBE grows down the STYLE to the OVARY
- 3) Pollen tube carries male gametes to fertilise the ovary (located in ovule)
- 4) DOUBLE FERTILISATION occurs as there are 2 sperm nuclei
 - + 1 sperm fertilises the central cell
 - + 1 sperm fertilises the egg cell

SEED DISPERSAL

= Travelling of seeds long distances from the parent plant, even though they cannot move themselves

- Method of this depends on the structure of the fruit
 - ❖ E.g. dry & explosive, fleshy & attractive for animals to eat, feathery or winged to catch the wind, covered in hooks that catch onto the coats of animals

WHY? – Reduces competition between offspring & parent and helps to spread the species

Germination

= Early growth of a seed & involves growth of the embryo root & shoot

- + Before germination, seeds are **dormant** with a metabolic rate of nearly 0 (allows time for seed dispersal)

- **Ideal conditions for germination:**

- Water (taken in through micropyle & used to activate the seed) = metabolic process restart
- Oxygen – for aerobic cell respiration