

Experiment 1 : Study of Mitosis in Onion Root Tip

Aim To study the different stages of **mitosis** in actively dividing cells of **onion root tip** (*Allium cepa*).

Principle

Mitosis is a type of **equational cell division** in which one parent cell divides to form **two genetically identical daughter cells**. It helps in growth, repair, and cell replacement.

Mitosis occurs in somatic cells and includes stages:

- Prophase
- Metaphase
- Anaphase
- Telophase

Onion root tip is used because it has a **meristematic region with active cell division**.

Requirements

- Fresh onion root tips
- Microscope slides and coverslip
- Acetocarmine or aceto-orcein stain
- 1N HCl (optional for softening)
- Needle and forceps
- Compound microscope
- Dropper
- Blotting paper

Procedure

1. Grow onion in water until small roots appear.
2. Cut 1–2 cm long **root tips**.
3. Fix root tips in suitable fixative (optional).
4. Place root tip on slide.
5. Add **acetocarmine stain**.
6. Warm slightly (if required) to enhance staining.
7. Crush the root tip gently using needle.
8. Place coverslip carefully (squash method).
9. Remove excess stain using blotting paper.
10. Observe under **compound microscope** (low to high power).

Observations

Different stages of mitosis can be observed:

1. Prophase

- Chromosomes condense and become visible
- Nuclear membrane starts disappearing
- Spindle fibers begin to form

2. Metaphase

- Chromosomes align at the equatorial plate
- Spindle fibers attach to centromeres

3. Anaphase

- Sister chromatids separate
- Move toward opposite poles

4. Telophase

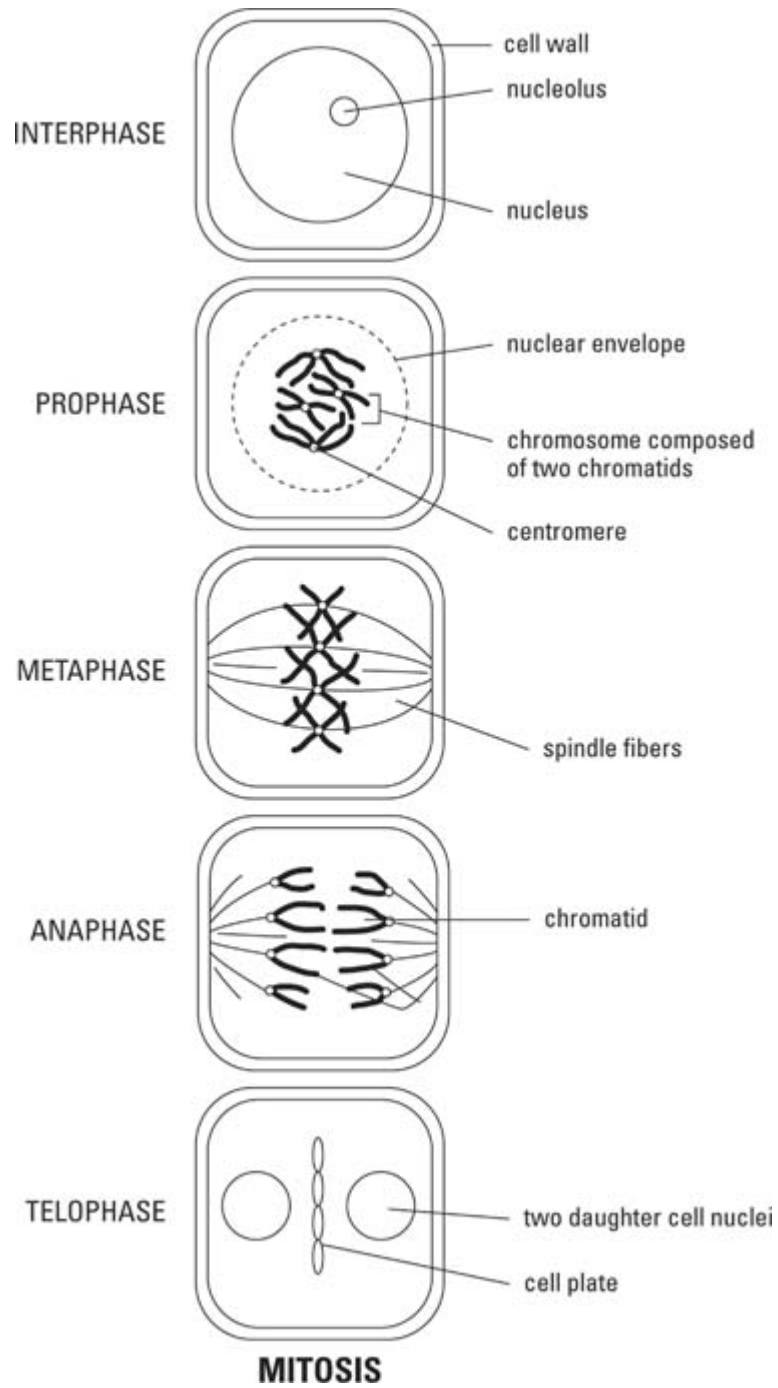
- Chromosomes reach poles
- Nuclear membrane reforms
- Two daughter nuclei are formed

Cytokinesis

- Cytoplasm divides
- Two identical daughter cells are formed

Result

All stages of mitosis were observed in onion root tip cells. It was confirmed that mitosis produces **two identical diploid daughter cells**.



Experiment 2 : Study of Meiosis using Onion Flower Buds

Aim To study the stages of **meiosis** in pollen mother cells of **onion (*Allium cepa*) flower buds**.

Principle Meiosis is a type of cell division in which a diploid cell divides to form four haploid cells. It occurs in reproductive cells and has two divisions:

Meiosis I: Reductional division (chromosome number becomes half)

Meiosis II: Equational division (sister chromatids separate)

Onion flower buds are used because their anthers contain actively dividing pollen mother cells (PMCs) where meiosis can be easily observed.

Requirements

- Fresh onion flower buds
- Microscope slides and coverslip
- Acetocarmine stain
- Needle and forceps
- Compound microscope
- Dropper
- Blotting paper

Procedure

1. Collect young onion flower buds.
2. Remove an anther using a needle.
3. Place it on a clean slide.
4. Add a drop of **acetocarmine stain**.
5. Crush the anther gently to release pollen mother cells.
6. Place a coverslip carefully.
7. Press gently using blotting paper (squash technique).
8. Observe under **compound microscope** first low power, then high power.

Result

Different stages of meiosis were observed in onion flower bud cells. It was confirmed that **one diploid cell produces four haploid cells**.

