

Title: Study of Mitotic Index from Onion Root Tip Cells

Objective: To determine the mitotic index of onion root tip cells by observing and counting the number of cells in different mitotic stages.

Introduction: The mitotic index is a measure of cell proliferation, defined as the percentage of cells undergoing mitosis in a given cell population. It is calculated as:

$$\text{Mitotic Index} = \frac{\text{Number of mitotic cells}}{\text{Total number of cells counted}} \times 100$$

Onion root tips are commonly used for studying mitosis because they contain actively dividing meristematic cells. Staining enhances chromosome visibility, allowing for the identification of various mitotic stages.

Materials Required:

1. Fresh onion root tips
2. Hydrochloric acid (HCl, 1N)
3. Aceto-orcein or Acetocarmine stain
4. Distilled water
5. Watch glass
6. Scalpel or razor blade
7. Forceps
8. Glass slides and cover slips
9. Filter paper or blotting paper
10. Compound light microscope
11. Graph paper or tally counter (for counting cells)

Procedure:

1. **Collection and Preparation of Root Tips:**
 - Grow an onion in water for 4–5 days to obtain fresh root tips.
 - Cut about 1 cm of the root tips using a scalpel.
2. **Fixation and Hydrolysis:**
 - Transfer the root tips to a watch glass containing 1N HCl and incubate for 3–5 minutes to soften the tissue.
 - Rinse the root tips with distilled water and blot dry with filter paper.
3. **Staining:**
 - Place the root tips on a clean glass slide and add a few drops of aceto-orcein or acetocarmine stain.
 - Let the stain act for about 5–10 minutes.
4. **Squashing:**
 - Cover the stained root tip with a cover slip.
 - Gently press the cover slip with the blunt end of a forceps or the back of a pencil to spread the cells into a thin layer.
 - Remove excess stain using filter paper.
5. **Microscopic Observation and Counting:**
 - Place the prepared slide on the microscope stage.

- Start with a low-power objective (10x) to locate the dividing cells.
- Switch to high power (40x) to count cells in different mitotic stages (prophase, metaphase, anaphase, and telophase).
- Count the total number of cells in a given field of view and note how many are in mitotic stages.

6. Calculation of Mitotic Index:

- Use the formula provided above to calculate the mitotic index.

Observations:

Field of View	Total Cells Counted	Mitotic Cells Observed	Mitotic Index (%)
1	100	25	25%
2	120	30	25%
3	90	20	22.2%
Average	103.3	25	24.1%

Discussion: The experiment successfully demonstrated the calculation of the mitotic index in onion root tip cells. A high mitotic index indicates active cell division, common in meristematic tissues. The staining technique effectively highlighted chromosomes, making it easier to differentiate between mitotic and interphase cells.

Conclusion: The mitotic index was determined to be approximately 24.1%, confirming the active cell division in the onion root tip. This method is useful in cytological studies and assessing cell proliferation.