

Good questions to investigate plant water relations

Objective

- Show how to carry out an investigation to determine the turgor potential and therefore water potential of plant epidermal cells.

Safety

- Work care with glassware, mounting needles and cutting equipment.

Specifications code

- Practical techniques (3, 4, 5)
- CPAC (1a, 1b, 2b, 4a, 4b)

Procedure

Before you start this practical make sure that you understand the terms turgid and plasmolysed. One easy way to see when cells in these conditions might lead that under a microscope.

When plant cells are placed in a range of solutions, the concentration that has the same osmotic potential as the cell sap is just concentrated to cause a different water loss so that the plasma membrane begins to separate from the cell wall (incipient plasmolysis). It is difficult to measure this because cells within plant tissue demonstrate an apparent water content so use the simple potential of the solution that causes incipient plasmolysis in 50% of the cells.

1. Take out the sections of the available plant tissue. Turn in a suitable size block. The tissue must only be one cell thick to allow the cells to be examined clearly.
2. Label six small pieces with the different concentrations of salt solution, including 0.1 mol mol⁻¹. Transfer some of each cell section into the appropriate small glass with a pipette. Make glass one of the five small sections and each of the other glasses and leave for 20 minutes.
3. Remove each tissue section with forceps and place in a slide already coated with the appropriate concentration. Put a drop of the corresponding solution on the slide and heat the tissue in it.
4. Cover each section with a cover slip and observe under the microscope.
5. Observe 10 cells and record how many of them show plasmolysis. Record your findings in a suitable table. Repeat a solution to record the percentage of cells showing plasmolysis.

Notes and precautions

- Tissue is a suitable size of about 10 cells, as if too small to see, it is important that the tissue has only a single cell layer to allow the cells to be examined clearly under the microscope. Plasmolysed cells should be visible at higher concentrations. If not, cells can be impregnated with iodine solution.
- The prepared salt solutions may be used to save time.
- Careful labelling of the small glasses and microscope slides with the concentrations being used prevents confusion. Heating the tissue in a drop of the solution prevents the tissue drying.
- 20 cells is a suitable number to count and allow students to estimate the number plasmolysed from their groups. However, each cell accounts for 5% of the sample in the final calculations. Including accuracy, students should comment on this in their evaluation as larger sample size would be better. An initial estimation of cells as plasmolysed or not is necessary. Subjective and hard to be over-strict. This may reduce accuracy.
- Tables used to display results should have the independent variable (concentration) on the first column and the number of cells showing plasmolysis in the column to the right. The percentage of the cells that show plasmolysis should be in the far right column for each concentration. This is a good opportunity to remind students of the correct way to calculate area.
- Students should be warned of the dangers of damaging microscopes.

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O García

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