Upper epidermis of a deciduous leaf

Biology	Microscopy / Cell Biology	Plants & Fungi
Biology	Microscopy / Cell Biology	Cell structure
Biology	Plant Physiology / Botany	Physiology of plants

Difficulty level	Group size	Preparation time	Execution time
easy	1	10 minutes	30 minutes

This content can also be found online at:

http://localhost:1337/c/5f512bcb739d0a0003ee3ece

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Teacher information

Application

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Almost all foliage leaves that do not have too strong a cuticle and are not hairy are suitable for these tests. So one should rather choose tender-leaved plants. In the biology room some houseplants can be kept, which are available for the experiments. Very suitable is the hanging basket plant (Tradescantia virginica). You can simply propagate them by means of cuttings and thus keep fresh potted plants available. For the imprint you should use transparent, solvent-containing glue or nail varnish. Try this material to determine the drying time and suitability.

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Other teacher information (1/5)

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Prior knowledge

The foliage of a plant consists of different layers. In the inner areas there are cells with many chloroplasts. The outer layer of tissue protects the plant from evaporation, but at the same time it must be permeable to the light that is needed in the deeper layers for photosynthesis.

Scientific principle

The terminal tissue contains a densely packed association of cells. Most plants have no chloroplasts in the upper epidermis. The light can therefore pass through unhindered and reach the palisade tissue, which is very rich in chloroplasts.

Other teacher information (2/5)

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Learning objective

The students learn to make an impression preparation and a preparation of a surface section. In these preparations they are to recognize the single-layer epidermis.

Tasks

1. Make and microscope the impression preparation
2. Making and microscoping a surface section

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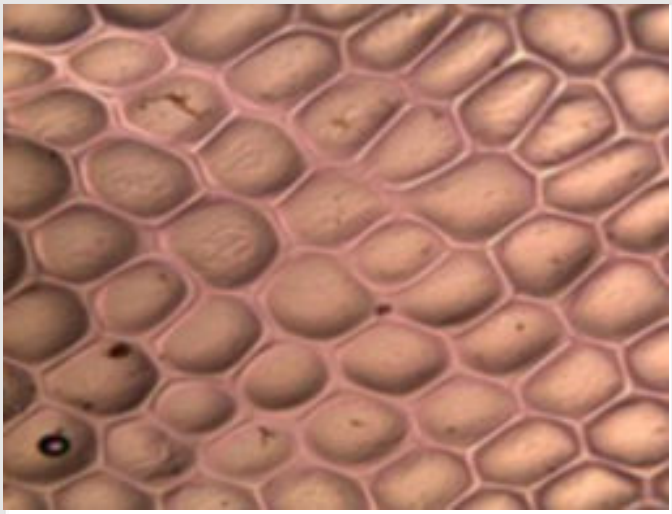
Other teacher information (3/5)

Make and microscope the impression preparation

Depending on the drying time, the preparation may have to be made in the previous hour. If parallel impressions are also to be taken from the underside, a clear assignment above and below must be ensured by applying letters.

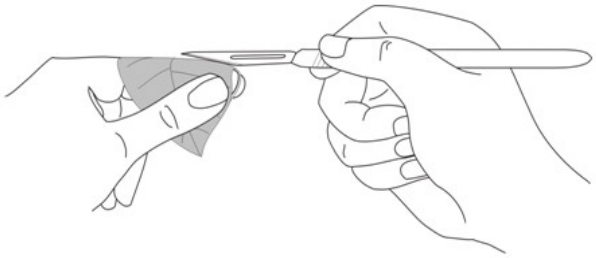


Impression preparation of the hanging basket plant (100x)

Other teacher information (4/5)

Making and microscoping a surface section

In a surface incision, only a few areas of the preparation are thin enough to clearly show the single-layer epidermis. In the thicker areas of the preparation we find incised cells lying underneath. They appear round and rich in chloroplasts. They are palisade cells in cross section. The cell nucleus is more clearly visible by staining.



Making the surface cut

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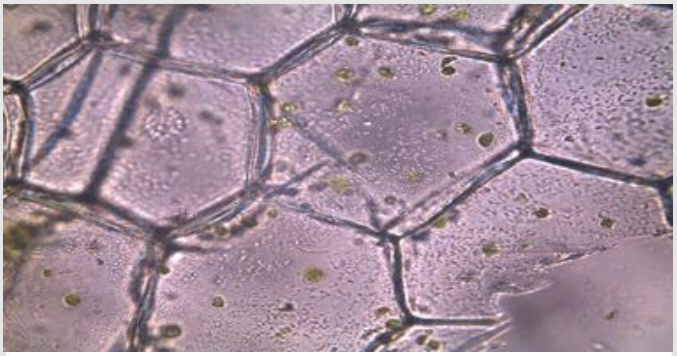
Other teacher information (5/5)

Evaluation

In the preparation of the upper epidermis the cell wall, the protoplasm and the nucleus are visible. The chloroplasts typical for plant cells are missing. For the plant, this transparency is advantageous due to the lack of plastids, as all the incident light can penetrate into the deeper tissue layers. In the underlying palisade tissue, the chloroplasts are very densely packed and absorb the light. Here the supply of carbon dioxide and water is also optimal for photosynthetic activity.



hanging basket plant (400x): upper epidermis; the chloroplasts come from other cells

Safety instructions

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- Working with microscopes for too long can lead to physical discomfort (fatigue, headaches, nausea), especially if the students are untrained.
- Extreme caution is required when handling the razor and scalpel blades due to the risk of injury.
- To avoid accidents after the lesson, the number of scalpel blades must be checked at the end of the lesson!
- Microscopes are sensitive. During transport and handling, care should be taken to ensure that everything is done carefully and without rushing.
- The general instructions for safe experimentation in science teaching apply to this experiment.

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Student Information

Motivation

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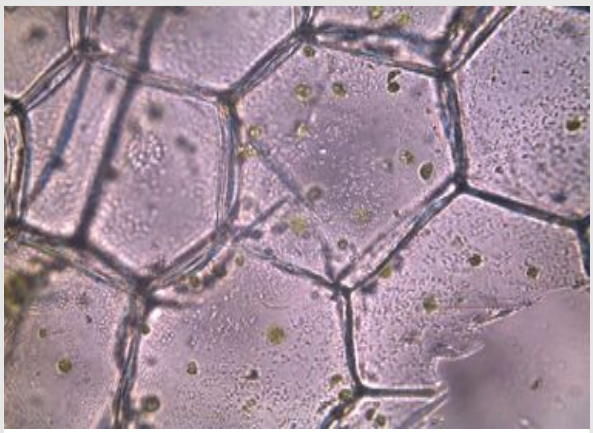

Upper epidermis of the hanging basket plant

(The chloroplasts originate from deeper cell layers).

Most plants have no chloroplasts in the upper epidermis. The light can therefore pass through unhindered and reach the palisade tissue which is very rich in chloroplasts. Here the supply of carbon dioxide and water is also optimal for photosynthetic activity. Can you see the differences between the cells under the microscope?

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Tasks

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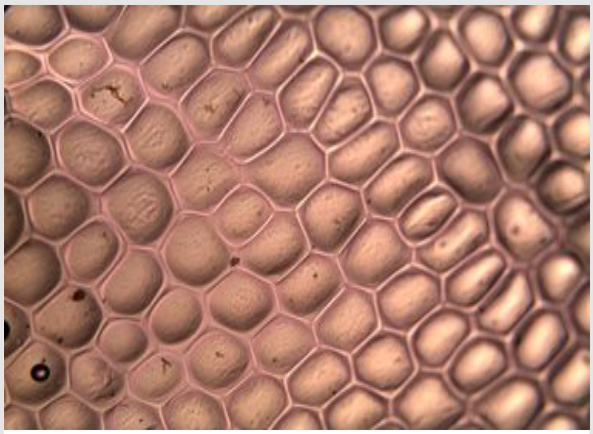

Impression preparation of the hanging basket plant (100x)

1. Make and microscope the impression preparation
2. Making and microscoping a surface section

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Equipment

Position	Material	Item No.	Quantity
1	PHYWE Binocular student microscope, 1000x, mechanical stage	MIC-129A	1
2	Microscopic slides, 50 pcs	64691-00	1
3	Cover glasses 18x18 mm, 50 pcs	64685-00	1
4	Beaker, 100 ml, plastic (PP)	36011-01	1
5	Dropping pipette with bulb, 10pcs	47131-01	1
6	Tweezers,straight,pointed,120mm	64607-00	1
7	Scalpel holder	64615-00	1
8	Scalpel blades,rounded tip,10 off	64615-02	1
9	Chemicals set for TESS advanced Microscopy	13290-10	1

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Procedure (1/2)

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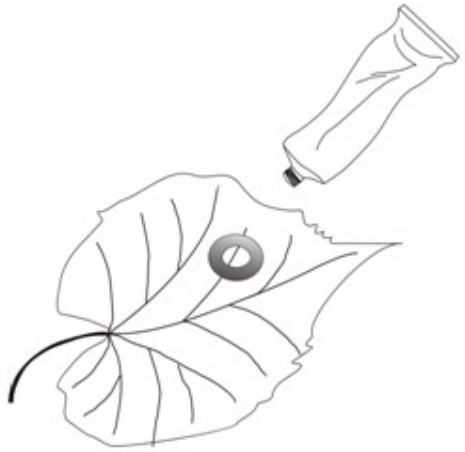


Put some glue on the bottom of a sheet

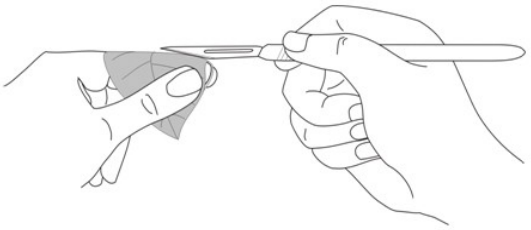
(1) Make and microscope the impression preparation

- Apply some glue or nail polish to the top of a sheet. Draw a letter that stands for "top side".
- Wait until the glue is dry (one hour to one day).
- Use the tweezers to place the impression on the slide.
- The preparation is prepared dry.

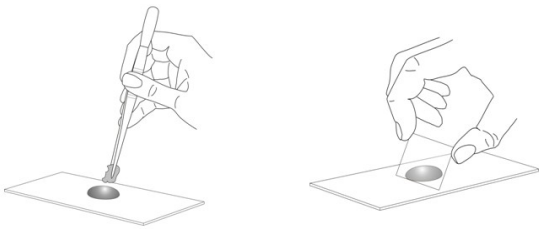
Procedure (2/2)

(2) Make a surface section and microscope

- The sheet is wrapped around the finger with the upper side of the sheet facing upwards.
- A wafer-thin, flat incision is made with the scalpel.
- Place the preparation in water and cover.
- Microscope ascending. Search for the areas of the specimen where only one cell layer is visible.
- Additional task: Stain the preparation with Lugol's solution. You can then recognize another cell component.



Make the preparation of the surface section



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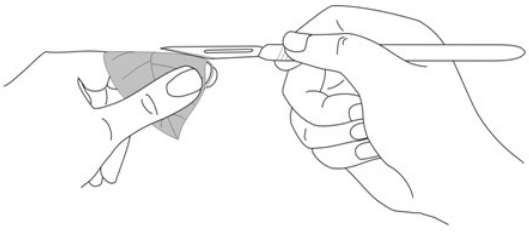
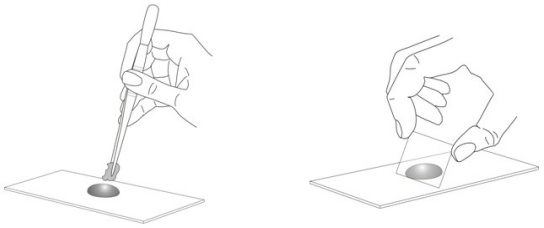


Make the preparation of the surface section



Report

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Task 1

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Which typical component of a plant cell is missing?

- Chloroplasts
- Nucleus
- Cell wall
- protoplasm

What advantages does this have for the plant?

- All the incident light can penetrate into the deeper tissue layers.
- The plant does not have to turn green.
- There is more space for other cell organelles.

Task 2

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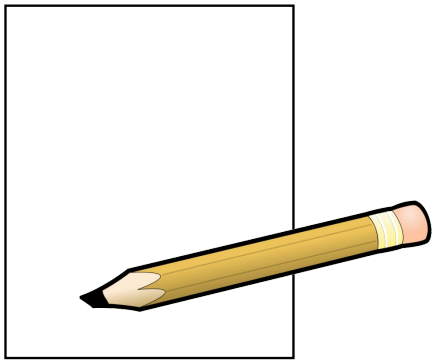
Make a drawing of a piece of tissue (some adjacent cells). Pay special attention to the arrangement and shape of the cells. Label the cell components!



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