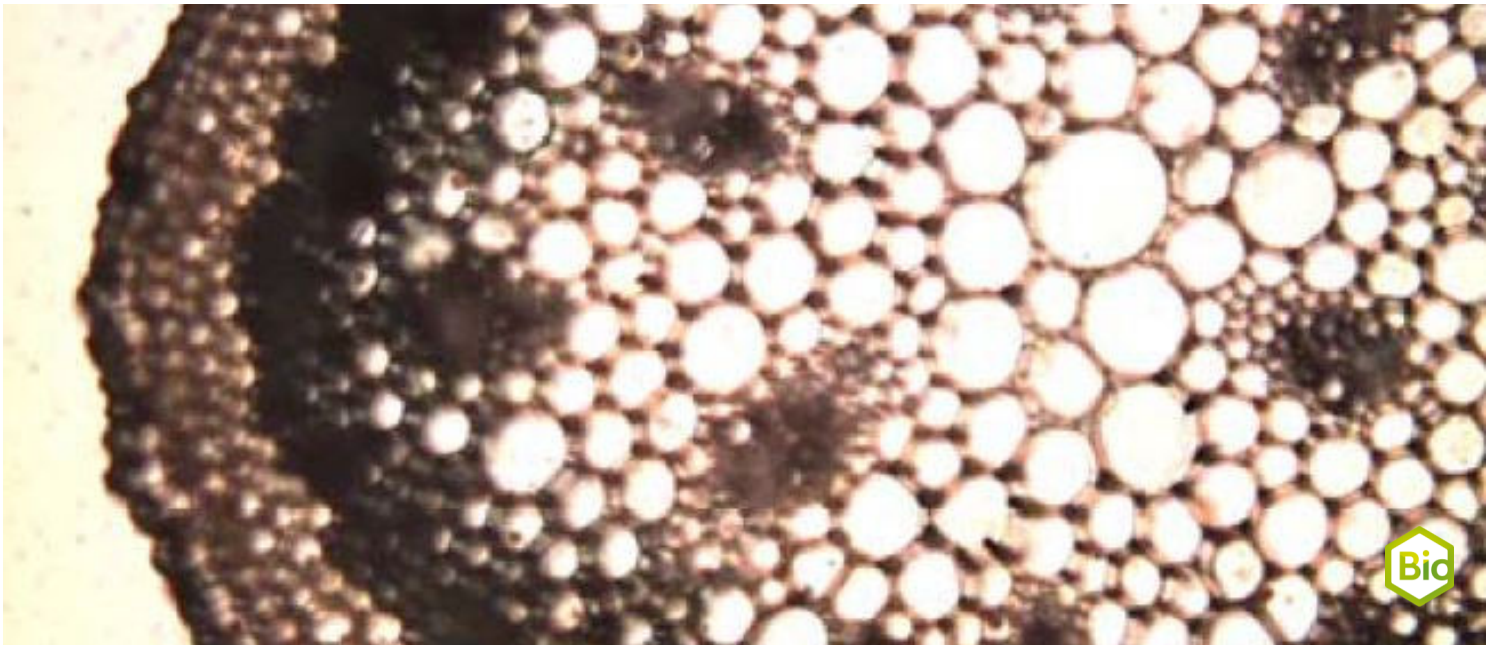
monocotyledonous plant shoot axis



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/618d1c0ef20c940003879e95

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Teacher information

Application

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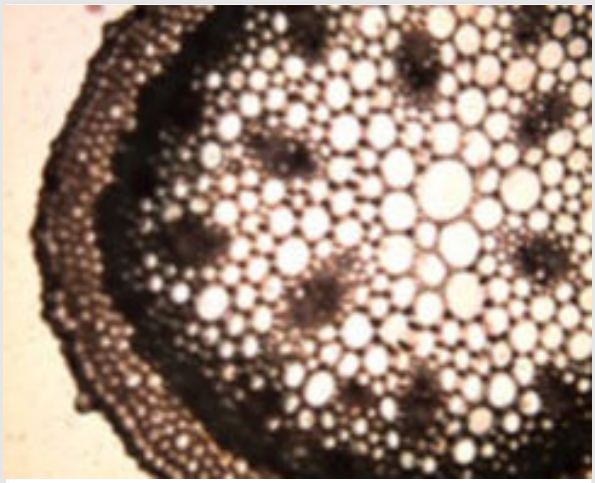

Chlorophytum (100x)

The shoot axis of plants has to perform a variety of tasks: it carries the leaves, the lateral branches and the flowers. The strengthening tissue provides the necessary stability and elasticity. Have you ever thought about how a 20-metre-high tree can transport water from the root to the treetop? And how it is possible for assimilates from the leaves to reach the roots? We want to explore the transport pathway. There is a one-way system for this in all plants. The vascular bundles contain vessels for the transport of water from the bottom to the top and sieve tubes for the transport of assimilates from the top to the bottom. The arrangement of the vascular bundles in dicotyledonous plants differs significantly from the arrangement in monocotyledonous plants.

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Other teacher information (1/5)

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Previous

Students should be familiar with basic terms and schematic illustrations before proceeding to the preparation. They should also be familiar with the preparation of a fresh specimen and microscopy.

Principle

Using cross-sections, students explore the shoot axis of the monocotyledonous plant.

Other teacher information (2/5)

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Learning

Students should be able to recognize and name the structure of the shoot axis of a monocotyledonous plant and distinguish it from that of a dicotyledonous plant.

Tasks

Students should make a preparation of the shoot axis of a monocotyledonous plant and look at it under the microscope.

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Other teacher information (3/5)

Notes on material procurement

The suitable material is the decisive prerequisite for the success of the students. The teacher must look for shoot axes that are no more than 3 mm thick, have a consistency that is not too soft, and are not yet too woody and hardened. Of the potted plants, the green lily (Chlorophytum) is suitable. From the flower and vegetable garden are recommended, for example: Representatives of the lily family (Liliaceae) such as asparagus (Asparagus spec.),daylily (Hemerocallis spec.), tulip (Tulipa), garlic (Allium sativum) and leek (Allium porrum), as far as these have formed a shoot (flower). Of the grasses (Poaceae), maize (Zea mays) is particularly recommended (young plant).

Other teacher information (4/5)

Information on the shoot axis

Shoot axes are the link between the roots and the leaves. They are divided longitudinally into nodes (nodes), from which the leaves and lateral branches branch off, and the intermediate pieces (internodes). Sections should be made in the area of the internodes. In monocotyledonous plants (Liliopsida or monocotyledons), the vascular bundles are scattered over the entire shoot cross-section, but lie more densely in the outer region. They are completely surrounded by sclerenchyma and therefore clearly visible. The forming tissue (cambium) in the middle is absent and so is the capacity for secondary thickness growth in most monocots. Some arborescent lily plants form secondary cambium outside the central bundles (Draceae).

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Other teacher information (5/5)

Notes on implementation

PreparationTo introduce the concepts, the pupils should preferably see a germinating grain (with one cotyledon) and a germinating bean (with two cotyledons). Visualization makes the concepts easier to remember. The distinction of leaves should also be demonstrated (mostly parallel-nerved in monocotyledonous plants and mostly reticulate in dicotyledonous plants). The distinction of rooting types can be omitted as these are usually not visible to the students. Examples of dicotyledonous plants should come from the students' immediate environment and be familiar to them.

Prepare the specimen and microscope it Depending on the tension of the tissue, the hand cutting technique should be used with or without aids, or the cut should be made on a firm base. For naming the parts phloem, cambium, xylem, illustrations should be ready (note: the cambium is missing in the monocotyledons!) As a differentiation measure, colouring the cross-section can be recommended to the fast pupils.

Safety instructions (1/2)

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- Working with microscopes for too long can lead to physical discomfort (fatigue, headache, nausea), especially when students are untrained.
- To avoid accidents, scalpels should be checked for completeness at the beginning and end of the experiment.
- Microscopes are sensitive. During transport and handling, care should be taken to ensure that everything is done carefully and without rushing.
- Ethanol is highly flammable, keep away from open flames!
- Put on protective goggles!
- The general instructions for safe experimentation in science lessons apply to this experiment.

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Safety instructions (2/2)

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H and P phrases Ethanol

H225: Highly flammable liquid and vapor.

P210: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. Do not smoke.

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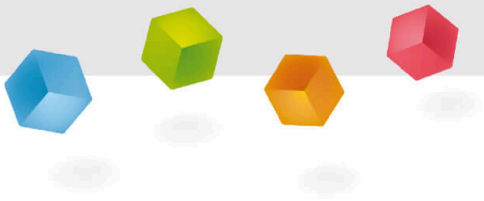

Student Information

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Motivation

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The green lily (Chlorophytum) is a monocotyledonous plant.

The shoot axis of plants has to perform a variety of tasks: it carries the leaves, the lateral branches and the flowers. The strengthening tissue provides the necessary stability and elasticity. Have you ever thought about how a 20-metre-high tree can transport water from the root to the treetop? And how it is possible for assimilates from the leaves to reach the roots? We want to explore the transport pathway. There is a one-way system for this in all plants. The vascular bundles contain vessels for the transport of water from the bottom to the top and sieve tubes for the transport of assimilates from the top to the bottom. The arrangement of the vascular bundles in dicotyledonous plants differs significantly from the arrangement in monocotyledonous plants.

Tasks

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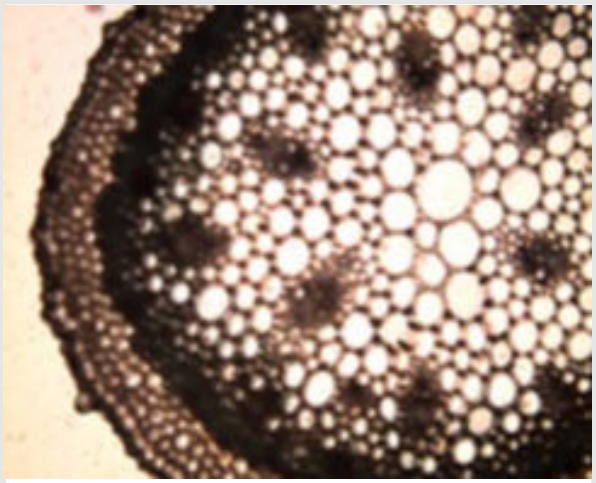

Chlorophytum (100x)

1. Preparation
2. Making the preparation
3. Microscopy

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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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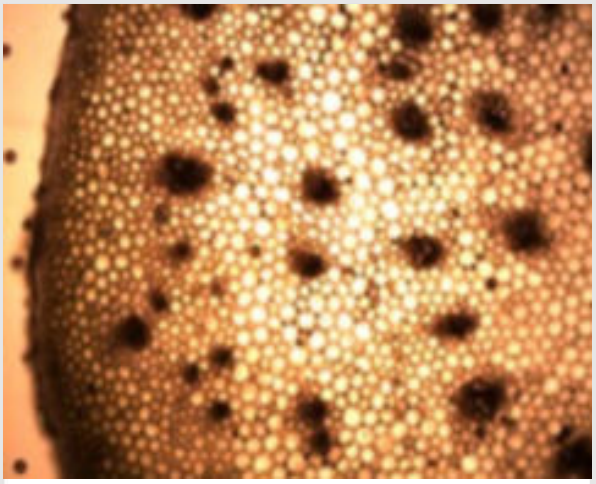
Procedure (1/3)

Preparation

- Find out about the terms: monocotyledonous and dicotyledonous in the biology book.
- Look at the illustration of a vascular bundle. Memorize the appearance of the wood part with vessels (xylem) and the sieve part (phloem) (see also figure on the right).



Tulipa (40x)

Procedure (2/3)

Making the preparation

- Prepare the microscopy liquid: Add a few drops of ethanol to the water. This will slightly displace the air in the shoot axis. Prepare the microscope slide.
- Disturbing leaves are removed. Find a suitable place between the nodes.
- In the direction of the body, cut as thinly as possible. If this does not work, you can also cut on the slide.
- Use the forceps to place the thin sections directly into the drop on the slide.

Make the thinnest possible cuts

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Procedure (3/3)

Microscopy

- Microscope at lowest magnification and describe the arrangement of the vascular bundles:
- Microscope at medium magnification. Look at a vascular bundle. The vessels (tracheae) for water transport are very large. Try to distinguish the xylem, the cambium and the phloem. Can you find the cambium?
- Draw the cross-section of the shoot axis. It should be clear how the vascular bundles are arranged and at which points the shoot axis has particularly thick-walled cells. These are lignified and provide stability.

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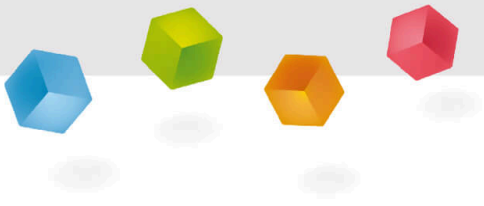

Report

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Task 1

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Drag and drop the correct words into the spaces provided

In monocotyledonous plants (Liliopsida or _____) the _____ are scattered over the whole shoot cross-section, but lie _____ in the outer region. They are completely surrounded by sclerenchyma and therefore clearly visible. The forming tissue (cambium) in the middle _____ absent, and so is the capacity for secondary thickness growth in most _____. Some arborescent lily plants form secondary cambium outside the vascular bundles (Draceae).

- more densely
- monocots
- is
- monocotyledons
- conducting bundles

Check

Task 2

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Dicotyledonous plants are called monocotyledons, monocotyledons dicotyledons.

○ True ○ False

Check

In monocotyledonous plants, the vascular bundles are arranged in a ring.

○ True ○ False

Check

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Task 3

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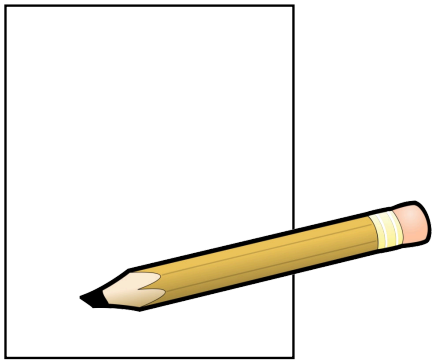
Make a drawing of a shoot axis and label phloem and xylem. It should be clear how the vascular bundles are arranged and where the shoot axis has particularly thick-walled cells. These are lignified and provide stability.



Slide	Score / Total
Slide 18: Monocotyledonous plants	0/5
Slide 19: Multiple tasks	0/2

Total 0 / 7

Solutions Repeat

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