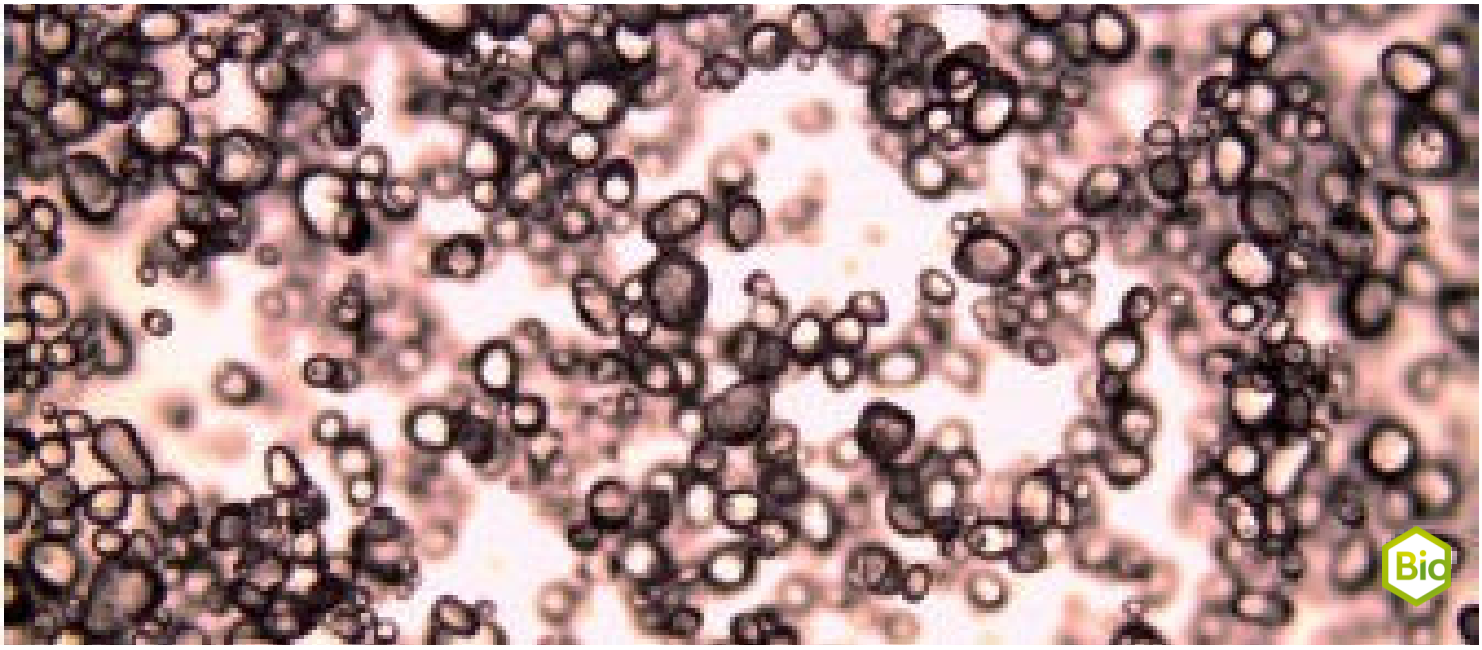
Starch as a plant reserve



Biology > Microscopy / Cell Biology > Plants & Fungi

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/6128aacd4839a1000394db7e

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Teacher information

Application

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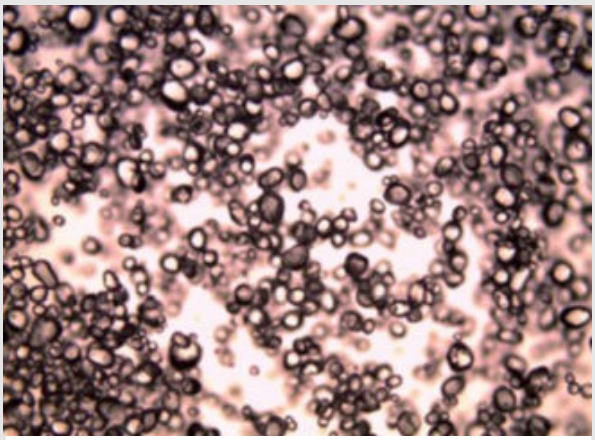

Dry starch (100x)

The most important process on earth, photosynthesis, takes place in the chloroplasts of the cell. The energy-rich glucose and oxygen are formed from the energy-poor substances carbon dioxide and water. The energy comes from the sun. Glucose is converted into starch by the plant for storage.

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Other teacher information (1/4)

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Prior knowledge

The students should know that starch is the most important storage substance of plants. They should also be informed about the energy balance of plants.

Scientific Principle

The reserve starch contained in plants is made clearly visible by changing the illumination and by staining.

Other teacher information (2/4)

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Learning objective

Have students detect starch in different grain sizes and recognize the pattern of starch.

Tasks

The students are to make and microscope a preparation of the starch once stained and once not stained, and both wet and dry.

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Other teacher information (3/4)

Notes on material procurement

Potato starch can be easily obtained at the grocery store.

Alternatively, you can make pure starch yourself:

- Grate or chop a raw potato, separate the juice from the solid substances (squeeze or pass through a sieve). The starch sediments in the liquid. For further cleaning, stir several times with clean water, settle again.
- Plants contain different starch: isolate starch grains of different plants (e.g. oats and wheat), microscope them and compare the shape with the known shape of potato starch.

Other teacher information (4/4)

Notes on implementation

Microscopy without staining: Already in the dry preparation one can recognize innumerable elongated grains in different sizes. In the aqueous preparation the shell-shaped form becomes clearer. The outer rim is to be seen very rich in contrast. The eccentric rings are less visible. With the variation of the fine drive, the students practice making the different depths of a preparation visible.

Microscopy with staining: Starch detection with potassium iodide solution is a common, very sensitive experiment, which is usually only carried out macroscopically. Starch turns blue-black in the process. The iodine molecules are taken up by the helical amylose, which changes the light absorption and thus triggers the colour change.

Examination of a potato: The starch test can of course also be carried out macroscopically. Various parts of the plant (the potato tuber in the worksheet) can be examined in this way. Depending on the starch content, the emerging sap is coloured more or less intensively.

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Safety instructions

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- Working with microscopes for too long can lead to physical discomfort (fatigue, headache, nausea), especially when students are untrained.
- Wear protective goggles!
- 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 lessons to be applied to this experiment.

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Student Information

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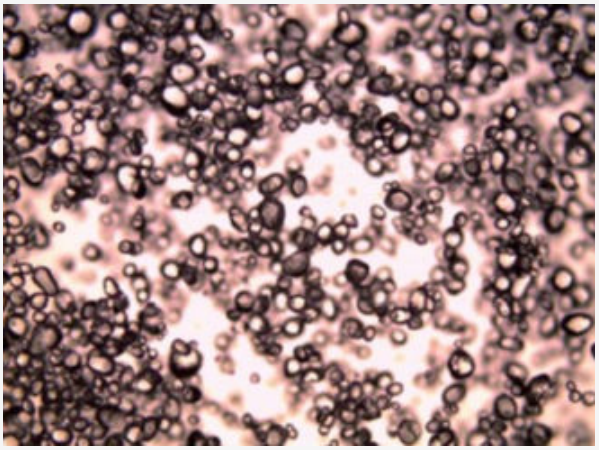
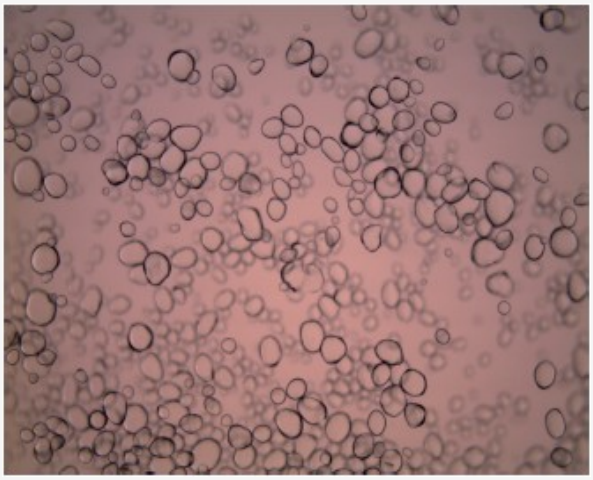
Motivation



Dry starch (100x)

The most important process on earth, photosynthesis, takes place in the chloroplasts of the cell. The energy-rich glucose and oxygen are formed from the energy-poor substances carbon dioxide and water. The energy comes from the sun. Glucose is converted into starch by the plant for storage.

Tasks



Wet strength (100x)

1. Microscope starch in dry and dissolved state.
2. Stain the dissolved specimen with iodine-potassium iodide solution and microscope it again.
3. Examine a potato.

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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	Knife, stainless	33476-00	1
7	Chemicals set for TESS advanced Microscopy	13290-10	1

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Procedure (1/3)

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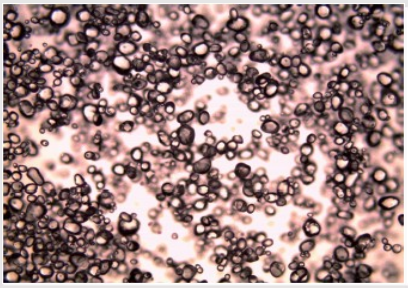
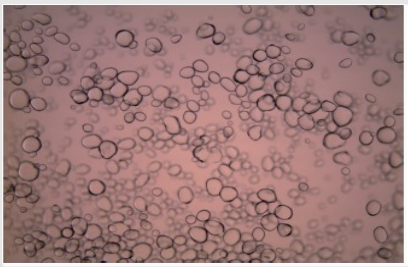
Observe starch in dry and dissolved state

- First, put some pure, dry potato starch on the slide and microscope with lowest and medium magnification (do not cover with the coverslip) (picture above).
- Now add a drop of water to the starch and cover it with the coverslip. Microscope again with the smallest and medium magnification (picture below).
- Compare the size and shape of the starch grains!
- Now look at the inside of a starch granule. At medium magnification, change the distance of the objective very slightly by turning the fine adjustment knob back and forth. If your microscope allows it, vary the light intensity to increase the contrast.





Procedure (2/3)

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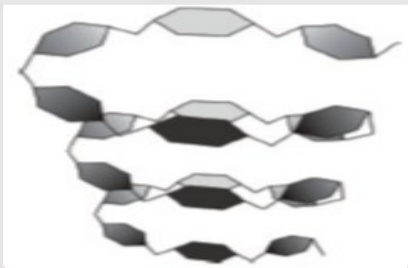
Staining with iodine-potassium iodide solution

- Note: The dyeing is particularly successful if only a little dye is applied to the grains.
- Use your ready-made starch-water preparation. Using the glass rod or pipette, place a small drop of the potassium iodide solution at the edge of the cover slip. The solution now flows independently under the glass and stains the starch grains.
- Note: If you use a blotting paper or paper towel on the opposite side to suck up liquid, you can speed up the process.
- Information: the structure of a starch molecule is shown on the right.



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Procedure (3/3)

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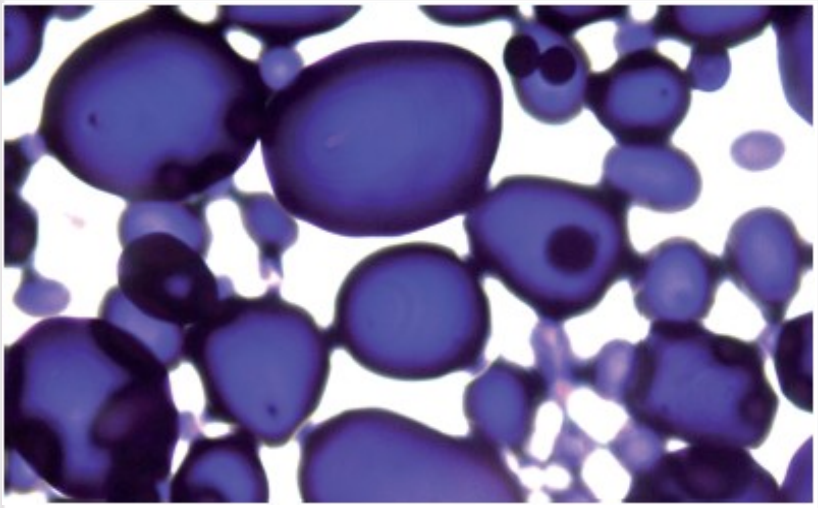
Examination of a potato

- Cut a raw potato in half.
- Drop some Lugol's solution on the cut surface.



Starch stained with Lugol's solution (400x)

Report

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Task 1

Choose the correct statements.

- [ ] Glucose is converted into starch by the plant for storage.
- [ ] In the aqueous preparation, the starch granules are shell-shaped.
- [ ] In the aqueous preparation, the starch grains are perfectly round.
- [ ] Starch can also be made by yourself.

Check

Task 2

Starch is completely unimportant for the plant. It is only used so that animals eat the plants better and thus distribute the seeds.

○ True ○ Incorrect

Check

When stained with potassium iodide solution, the starch turns reddish-yellow and blisters.

○ True ○ Incorrect

Check

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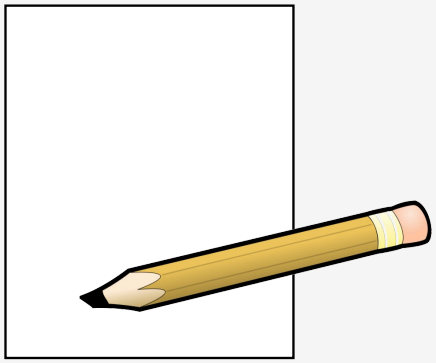
Task 3

Draw starch when dry and when wet and compare the two.



Slide	Score / Total
Slide 16: Starch	0/3
Slide 17: Multiple tasks	0/2
Total	**0/5**

Solutions Repeat

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