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Pectinase

More juice thanks to microbes



If you let an apple or a pear lie around for too long, it will get mouldy. Many fungi that live on fruit, such as *Aspergillus niger*, produce a substance called pectinase. This substance enables the fungi to break down the fruit more quickly. We use this same substance to make fruit juices, such as apple juice.

How does pectinase work? To find out, you are going to make your own apple juice. Note that the apple juice you will make in this experiment is not suitable for drinking!

What do you need?

- half an apple (preferably a juicy apple, such as a Jonagold)
- a cutting board and a knife
- 2 beakers (400 mL - wide enough for all the apple pieces to be submerged)
- 1 small measuring cylinder (10 mL)
- 2 large measuring cylinders (50 mL)
- 2 small funnels
- plastic film
- a waterproof marker
- water bath (at 40 °C)¹
- water
- pectinase (available at www.vanderkooyjubbega.nl/pectinase-100-mL.html, among others)
- stopwatch

Getting started!

1. Fill the water bath with water and adjust the temperature to 40°C.
2. Cut half of the apple into small cubes.
3. Distribute the cubes over the two beakers (put the same amount in both beakers).
4. Use the waterproof marker to write a **P** (for pectinase) on one of the beakers and a **W** (for water) on the other.

¹ Instead of a water bath, you can also use a pan filled with warm water. You can check the water temperature with a thermometer. Keep the lid on the pan as much as possible so that the water stays warm.

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5. Add 3 mL of pectinase and 27 ml of water to **beaker P**. Be careful not to spill any pectinase. If you spill some by accident, wipe it up quickly and clean off the table and wash your hands with water.
6. Add 30 mL of water to **beaker W**.
7. Cover both beakers with plastic film.
8. Place the beakers in the water bath and use the stopwatch to keep track of time.
9. After 15 minutes, remove the beakers from the water bath.
10. Place the funnels in the measuring cylinders.
11. First pour the contents of **beaker W** in the funnel in the measuring cylinder and check how much apple juice is in the tube.
12. Then pour the contents of **beaker P** in the funnel in the other measuring cylinder and check how much apple juice is in the tube.

Questions

Question 1: Which measuring cylinder contains more juice?

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Question 2: What do you think caused the difference in the amount of juice?

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There should have been more juice in the measuring cylinder to which you added the contents of beaker P. But why is that exactly?

You added pectinase to beaker P. Pectinase is an enzyme. Enzymes are proteins which speed up chemical reactions that take place inside or outside of cells. The pectinase enzyme speeds up the breakdown of pectin. Pectin is a substance found in the cell walls of fruit. Due to the breakdown of the cell wall, the cell contents, the juice, are released more quickly and easily. That is why more juice was produced by the pieces of apple to which you added the pectinase than the pieces to which you only added water.

Go to www.micropia.nl/ -> Microbiology from A to Z and read more about enzymes. Then answer the questions below.

Question 3: Why did you first have to cut the apple into small pieces?

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Question 4: Why were the beakers placed in a water bath at a temperature of 40°C?

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Question 5: Why would fungi want to break down fruit?

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Would you like to find out more about biotechnology? Or would you like to do additional experiments? Then go to micropia.nl.