

Why do cut apples turn brown?

In a nutshell

In this lesson learners are encouraged to investigate why some fruit and vegetables turn brown once the skin is cut. They will learn that this is the result of a chemical reaction, which can be slowed down by using a variety of simple methods. Learners will identify more effective ways of storing cut fruit that will help them to reduce unnecessary food waste.

Core Learning

We are learning that some fruit and vegetables turn brown when their skin is cut and we are investigating how to prevent this. We are learning how to store food correctly to prevent food waste.

Preparation

Students will work in groups to test methods for preventing apples going brown.

Equipment needed:

- Powerpoint
- Worksheet
- 1 apple per group
- 1 knife per group

- 4 saucers or small plates per group
- Labels
- Marker Pen
- Camera

Optional resources:

- 1 lemon per group or alternatively lemon juice in a bottle
- Clingfilm/tinfoil/beeswax wrap
- Fridge

Starter

Show learners the following video

bit.ly/LFHW-4-timelapse

In this video, someone has taken a bite out of an apple.

Ask learners:

Have you ever taken a bite out of an apple and then left it to go brown?

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Why do you think the apple turns brown once a bite has been taken?

Explain to learners that they will be investigating why an apple turns brown when its skin is broken/cut and the flesh is exposed.

Ask learners if they would eat the apple once it had turned brown? If some answer no, ask them why not?

Ask learners if they can think of other fruit and vegetables that turn brown in the same way once their skins have been cut? Some examples include bananas, pears, potatoes and aubergines.

Explain that cut fruit turns brown when it is exposed to air. An enzyme in the fruit reacts with the oxygen in the air and turns the fruit brown. This is called enzymatic browning.

Note: an enzyme is a substance produced by all living organisms that speeds up a chemical reaction (i.e. speeding up the browning of fruit.)
The chemical reaction can be simplified to: Polyphenol Oxidase + O₂
→ Melanin (brown colour)

Once a fruit is cut, nothing can completely stop the fruit from turning brown, but there are several techniques that people use to slow down the browning.

Main

Tell learners that they are going to conduct an investigation into different methods that might stop an apple turning brown.

Explain to learners that they can slow down the chemical reaction that causes browning to take place by doing any of the following:

1. Reducing the apple's exposure to oxygen in the air - e.g. wrapping the apple in clingfilm or covering it in water.
2. Making the surface of the apple more acidic and reducing the pH to less than 3 by covering it in something that is acidic e.g. lemon juice or vinegar.

Note: Vinegar is acidic and is used as a pickling method to preserve fruit and vegetables.
3. Storing the apple in a cold temperature (below 7°C) slows down the chemical reaction - e.g. in a fridge or freezer.

At the end of the experiment they will present their findings on which method they think is most effective and why.

Explain to learners that they will cut their apple into quarters. One of the quarters is the control - nothing will be done to this apple so we can compare it with the other methods.

Ask the learners to choose three other methods they want to test.

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Options could include:

- Wrapping the apple in clingfilm
- Submerging the apple in water
- Squirting lemon juice over the apple
- Squirting water over the apple
- Storing the apple in a fridge

Note: learners may also come up with other ideas e.g. wrapping in tinfoil, wrapping in beeswax wraps.

Either print off or display the 'Why do cut apples go brown?' worksheet.

Remind learners that they will need to work quickly once the apple is cut so they should set up and prepare the experiment before they cut each apple. Make a label for each saucer explaining the method being tested.

Decide with the class how long they want to run the experiment for and how often they want to check to see if they can observe changes. Every time the apple pieces are checked a photo should be taken of each segment.

Note: a suggested length of time would be two days with observations at the beginning, middle and end of each day.

At the end of the experiment ask the class to write up a review of their experiment and their conclusions. Ask them to compare the degree of browning in the apples .

Note: they could also investigate whether the texture of the apple changed as well i.e. is the apple firmer or softer. The report could include some before and after photos or comparison photos of the different methods.

After the experiment review the findings with the class.

Ask learners, what advice would you now give to someone who wanted to preserve cut fruit for a day?

Note: A recycling service for clingfilm is offered to schools free of charge via the GLAD Food Storage Brigade.

bit.ly/LFHW-4-GLADbrigade

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Extra helping

Love Food Hate Waste also did research to find out the best way to store vegetables.

bit.ly/LFHW-4-storage

Read the advice on how to store food on the LFHW website then go home and check to see which of these methods your family uses. Are they similar or different?

Or create a poster with before and after photos showing people how to store cut fruit.

Why do cut apples turn brown? Worksheet

BROWNING

TIME				
METHOD 1 Control				
METHOD 2				
METHOD 3				
METHOD 4				

Rate the appearance of the apple on a scale of 1 to 5

- 1 Not acceptable - Extensive browning
- 2 Just acceptable - Advanced browning
- 3 Acceptable - Discolouration present
- 4 Acceptable - Minor discolouration
- 5 Acceptable - Perfect condition, close to original state.

Which method showed the **most** browning?

Which method showed the **least** browning?

Are there any other changes you noticed to the apple?
E.g. texture, firmness

Which storage method is the most effective? Why?