NPL

Measurement At Home

Osmosis

(Incredible edible expanding vegetables)

How much can vegetables ‘grow’ in 90 minutes?

- Do all vegetables change size by the same amount through osmosis?
- How does water salinity affect change in vegetable size?

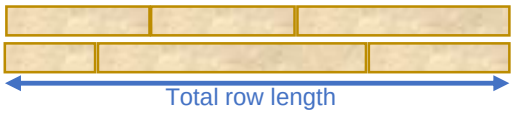
Estimated time: 30 minutes + 90 minute wait between measurements. No prior knowledge needed.

Instructions

Watch the video (**YouTube: pCVQ8KNdDUw**)

1. Put 200 ml of water in each bowl. Add 10 g of salt (about two level teaspoons) to one bowl. You can label bowls, though taste can probably identify which is which! If you have many samples you may need more bowls.

2. Peel vegetables. Cut each into pieces of 1 cm square cross section and as long as possible. Cut the ends squarely. Assemble pieces in two rows identical in length and number (as in the image below). It helps to make the length an exact number of centimetres. Record total row length.



3. Put one set of pieces in each bowl. Pieces of different vegetables can be in the same bowl as long as they are easy to identify and none are touching.

4. Leave for 90 minutes.

5. Remove pieces from the bowl a set at a time. Reassemble into a row and record its new length.

6. Convert the change in length to a percentage:
   % change = 100% x (start length – end length) / start length.

7. Enter results below or into NPL webpage:
   npl.co.uk/measurement-at-home/osmosis-expanding-vegetables

Vegetable/fruit type			
Total row length at start			
Total row length from tap water after 90 minutes			
% change in length (tap water)			
Total row length from salty water after 90 minutes			
% change in length (salty water)			

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Equipment required

- a range of vegetables and fruit: carrot, potato, melon, apple, etc..
- Peeler and knife (with responsible user)
- Ruler
- Small bowls
- Water
- Table salt
- Measuring jug
- Weighing scales (or teaspoon)
- Timer (or clock)
- Paper and pencil for results.

Risks

- Ensure adult uses knife.
- Don’t eat the samples.

SI measurement units

- metre (m) for length
- second (s) for time

Challenge Topics

- Measurement Science, Maths, Biology.

Thoughts, tips and information

- It’s important to have the same number of total surfaces (edges and ends) and ensure they are all exposed to the water.
- If left for longer, do the length changes continue?
- How does salt amount and time effect the result?
- Osmosis enables plant roots to draw water from soil and kidneys to function.

Adult direction or supervision is required. All experiments are carried out at your own risk.
For more experiments, visit NPL Measurement at Home.