



national science week 2021

DIY Science – Five Serves of Science

Fruits and vegetables are packed with nutrients and stuffed full of science! Use the chemicals in five different colourful food plants to do surprising science experiments.

Safety

An adult should carry out the steps that use sharp knives, boiling water, or a stove.

What you need

Purple: Red cabbage, other fruits or vegetables to test, vinegar, sodium bicarbonate, and kitchen tools

White: Potato and kitchen tools

Green: Fresh spinach and/or broccoli

Yellow/orange: Citrus peel, inflated balloon

Red: Hot chillies, gloves, kitchen equipment



What to do

Purple: The purple colour in some vegetables comes from pigments called ‘anthocyanins’. These chemicals change colour in acids and bases and can be used as pH indicators. To make a pH indicator from red cabbage, chop some cabbage into small pieces and place in a heat-proof jug. Cover the cabbage with boiling water and leave it for 30-minutes. Strain off the purple liquid into another container and discard the cabbage pieces.

The purple liquid can now be used to test the pH of other liquids, such as white vinegar or some sodium bicarbonate dissolved in water. Try using the same method to make pH indicator solutions from blueberries, purple sweet potato, or the skins of red apples, and record the results in the table on the next page. Can any other food plants be used to make pH indicators?



Red cabbage pH indicator

White: Make slime by extracting starch from a potato. Wash, peel, and grate a potato, place it in a bowl, and cover with cold water. Squeeze the potato mush under the water with your hands to release the starch. Pour the liquid into another bowl, using a strainer to catch the potato mush. Leave the bowl of liquid to sit and you will see white potato starch collecting at the bottom of the bowl. Pour off the liquid and play with the potato starch slime that remains. The starch can be rinsed a few more times with cold water. Allow the starch to settle, pour off the water after each rinse, and leave it to dry to form a white powder.

Green: Try storing fresh spinach and/or broccoli in the freezer and you will see that it turns mushy when it thaws out because ice crystals damage the cell structure of the plants. Freezing can preserve fruits and vegetables, but it has to be done carefully to keep the taste and texture of the food. Frozen vegetables are processed by air-blast freezing, contact freezing, immersion freezing, and other large-scale methods. In a household kitchen, try blanching green vegetables in boiling water for 2-3 minutes before freezing. This kills bacteria, wilts the vegetables, and destroys enzymes that degrade flavour and texture.



Yellow/orange: Limonene is a chemical in the skin of citrus fruits with a strong citrusy smell. If you squeeze a citrus peel near a balloon, drops of limonene will cause the balloon to pop because limonene dissolves the rubber in the balloon.

Red: The chemical 'capsaicin' is found in capsicums and gives chillies their spicy hotness. Try this activity from Harvard University to extract capsaicin from hot chillies, taking care to protect your hands with gloves! <https://youtu.be/RgvoAomnv-o>

What's happening?

Food plants have some features that evolved naturally, and others that have been enhanced through selective breeding by humans to make the food tastier and easier to grow. Eating a diverse range of fruits and vegetables provides the human body with carbohydrates for energy, fibre for a healthy digestive system, and vitamins and minerals for good health.

Results

Use the table to record the colour produced by different pH indicators. The colours can be written in words, recorded as photographs, or drawn with coloured pencils.

Plant used to make pH indicator	White vinegar	Water	Sodium bicarbonate dissolved in water
<i>Red cabbage</i>			

Did you know?

A red capsicum is the same vegetable as a green capsicum, but it has been allowed to ripen and change colour.

Find out more

- Explore the 2021 United Nations International Year of Fruits and Vegetables: <http://www.fao.org/fruits-vegetables-2021/en/>
- Check out the free National Science Week resources for schools: 'Food – Different by Design': https://www.scienceweek.net.au/wp-content/uploads/2021/03/Food_different_by_design_teacher_book.pdf
- Discover more about anthocyanins in food plants, flowers, and autumn leaves: [https://www.cell.com/current-biology/comments/S0960-9822\(12\)00022-X](https://www.cell.com/current-biology/comments/S0960-9822(12)00022-X)
- Grow Australian native fruit and vegetable plants at home: <https://www.abc.net.au/everyday/how-to-grow-native-edible-plants-and-bush-food-at-home/100004308>