**Activity: Investigating apple attributes**

In this activity, students use industry methods to test and analyse some attributes of a variety of different apples. They use the findings to create an apple attributes chart to highlight key differences between apple varieties. The activity forms part of the unit plan [Developing future apple varieties](https://www.sciencelearn.org.nz/resources/882-developing-future-apple-varieties-unit-plan).

By the end of this activity, students should be able to:

* describe a variety of apple attributes
* explain how apple attributes contribute to consumer acceptance and distinctiveness of an apple variety
* effectively conduct sensory tests to measure crispness, firmness and juiciness of a range of apple varieties
* analyse and report the findings of a range of tests to define some key sensory attributes of a range of apple varieties.

**Introduction**

The apple is an important fruit crop worldwide and contributes significantly to New Zealand’s export income. Plant & Food Research is continually researching and developing new apple varieties with differing attributes such as juiciness, crispness, colour and texture to compete in global markets and meet ever-changing consumer demands.

Get articles:

* [Commercialising a new apple variety](https://www.sciencelearn.org.nz/resources/854-commercialising-a-new-apple-variety)
* [Breeding a new apple cultivar](https://www.sciencelearn.org.nz/resources/844-breeding-a-new-apple-cultivar)

Breeding a new apple variety requires scientists to identify and define the unique attributes or traits they want in the new variety and to select cultivars with the desired traits as breeding parents. Plant & Food Research in Hawke’s Bay has a well established germplasm collection, which is vital for providing and maintaining a wide variety of traits to select from.

Get article: [The germplasm collection: a library of apples](https://www.sciencelearn.org.nz/resources/842-the-germplasm-collection-a-library-of-apples)

When fruit is harvested from the first crossing of 2 cultivars, testing of the desired attributes in the fruit is essential for selecting the best cultivars for the next round of breeding.

**What you need**

* 5–6 different apple varieties (examples include Granny Smith, Braeburn, Pink Lady, New Zealand Rose, Royal Gala, Jazz)
* Knives and cutting boards for each station
* Refractometer (if accessible from a local industry or university)
* Requirements for the [instrumental firmness test](https://www.sciencelearn.org.nz/resources/885-instrumental-firmness-test)
* Interactive: [Assessing apple attributes](https://www.sciencelearn.org.nz/image_maps/38-assessing-apple-attributes)
* Copies of [Variety availability and fruit varieties (courtesy of ENZA – A Turners & Growers Group Company](https://www.sciencelearn.org.nz/resources/883-investigating-apple-attributes))
* Digital camera

**What to do**

1. Form small groups of about 4 students (match the number of groups with the number of apple varieties) and view the interactive to understand the purpose and methods used for testing and recording apple characteristics. This could be viewed as a whole class or in their groups.
2. Discuss how sensory testing results could vary between individuals. How does Plant & Food Research ensure consistency? What steps would help achieve consistency in the class? (Refer to the interactive: [Assessing apple attributes](https://www.sciencelearn.org.nz/image_maps/38-assessing-apple-attributes).)
3. Start with a whole class activity where each student assesses the texture of the same apple variety using the sensory method and scale explained in the interactive. Discuss the results and the variability to help prepare students for achieving consistent results in their testing. An instrumental firmness test could be used to verify the sensory test for firmness.
4. Allocate each group an apple variety, including the brand name.
5. Each group should test and record results for the following apple attributes and present findings on a computer-generated attributes chart, including a digital image of the apple:

* Sensory tests for firmness, crispness and juiciness.
* Instrumental test for firmness. (Have 1 member of each group form a separate group to test and compare the firmness of each apple variety, then contribute this result to their original group – see [Instrumental firmness test](https://www.sciencelearn.org.nz/resources/885-instrumental-firmness-test).)
* Instrumental test for sweetness if it’s possible to borrow a refractometer from a local industry. Alternatively, a sensory test for sweetness could be devised by creating a correlation scale to define the degree of sweetness, along the lines of the other sensory tests. For a fair result, students record the average of 3 tests for each attribute.
* Describe appearance attributes: skin colour, flesh colour and shape. (For consistency, pre-prepare a chart with descriptions or names to match images of different coloured apples, as well as line drawings of possible different shapes with descriptions.)
* Research and record the time of year the variety is mature or available in the market.

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| **Title (name of apple)**  **Image of whole apple**  **Attributes**  Size  Shape  Colour  Flesh firmness  Flavour (balance of sweetness and acidity)  Texture (description of firmness, crispness and juiciness)  Time of harvest |

**Useful links**

**Testing apple sweetness**

Visit the Botany of Desire website for a downloadable lesson plan for testing apple sweetness.

[www.pbs.org/thebotanyofdesire/lesson-plan-sweetness.php#](http://www.pbs.org/thebotanyofdesire/lesson-plan-sweetness.php#)