**Plant disease detectives**



Plant diseases can be found everywhere.

Can you find any prime suspects lurking around your school?

**To do as a group**

Use the equipment provided by your teacher to investigate plants near your school.

Look for plants that show symptoms of disease.

Collect evidence!

Write notes from your investigation, below.

INVESTIGATION NOTES



SUSPECT 1

DISEASE NAME: Powdery mildew

WHAT TO LOOK OUT FOR: White, powdery patches of fungus on both sides of the leaves.

KNOWN HANGOUTS: Rose bushes, hawthorn bushes, barley, oak trees, birch trees, willow trees, apple trees, cherry trees.



SUSPECT 2

DISEASE NAME: Violet bramble rust

WHAT TO LOOK OUT FOR: Dark brown or violet-coloured spots on both sides of the leaves. Furry fungus on the bottom side of the leaves, which is orange in summer and black in winter.

KNOWN HANGOUTS: Bramble (blackberry) bushes.



SUSPECT 3

DISEASE NAME: Apple brown rot

WHAT TO LOOK OUT FOR: Furry rings of light brown or cream-coloured fungus on the surface of the apples.

KNOWN HANGOUTS: The fruit of apple trees.



*Biology > Big idea BHD: Health and disease > Topic BHD1: What are health and disease? > Key concept BHD1.2: Disease*

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| **Response activity** |
| **Plant disease detectives** |

**Overview**

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| Learning focus: | The good health of organisms can be compromised by infectious and non-infectious diseases, which can be caused by germs, lifestyle, environment, or information in the genome. |
| Observable learning outcome: | Recall that the good health of all organisms can be compromised by diseases. |
| Activity type: | Fieldwork |
| Key words: | Health, disease |

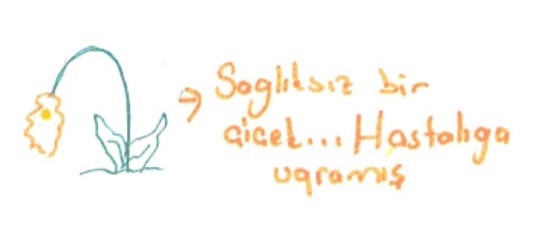
This activity can help develop students’ confidence with the idea that plants can get diseases, by investigating the local area for signs of common plant diseases. It can be used in response to the following diagnostic questions:

* Diagnostic question: Only humans?
* Diagnostic question: Plant diseases

**What does the research say?**

Learning about plant diseases is important due to the interdependence of organisms; for example, plant disease has a significant impact on human food security. It has been estimated that plant pests and pathogens are responsible for approximately 12.5% of global crop losses (Oerke, 2006), and for losses of up to 42% of the annual production of the six most important food crops (Guest, 2012).

When children aged 14-15 in Turkey were asked to draw and write about disease, only one student out of 81 drew anything related to plant disease (a “faded flower” that was said to be “sick”); all other answers pertained to humans (Isik, Çetin and Özarslan, 2017).



“A faded flower. It is sick.” *(from Isik, Çetin and Özarslan, 2017)*

In England, the current National Curriculum programme of study for science does not explicitly require students to learn about plant diseases until age 14, a requirement that was introduced for the first time in 2014 (Department for Education, 2013b; 2013a; 2014).

Curriculum development work undertaken by the Royal Society of Biology in the UK (McLeod, 2018) and the American Association for the Advancement of Science (AAAS Project 2061, 2009) advocates learning about the causes of both infectious and non-infectious diseases in science lessons from age 5. A focus only on disease in humans would provide an undesirably restricted view, and could lead to (or reinforce) the misunderstanding that only humans get diseases.

**Ways to use this activity**

Ideally, this activity should involve fieldwork in which students investigate plants growing in local habitats. Students could be encouraged to collect evidence of plant disease; this could comprise taking photographs of any infected plants they find, where symptoms of disease are apparent on the leaves, fruit or stems; or they could be instructed to collect samples of infected leaves into sealable, clear plastic food bags to take back to the classroom for closer examination. The bags should remain sealed at all times after collection.

As an alternative to fieldwork, infected plant material could be collected in advance of the lesson and examined inside sealed, clear plastic food bags in the classroom.

The student worksheet describes three plant diseases (powdery mildew, violet bramble rust and apple brown rot) that are widespread in the UK and are relatively easy to find. Students could, of course, be told about alternative diseases known to be present in local habitats.

An extension activity, in which leaves infected with violet bramble rust are examined under a light microscope is described in the activity ‘Violet bramble rust’ on the SAPS website (see References section). That activity is aimed at 14-16 year old students, but could be adapted for use with younger students.

**Further guidance on locating infected plant material in Britain:**

*Powdery mildew*

Susceptible species grow in all parts of the British Isles, and powdery mildew infection is widespread all year round. Powdery mildew is most likely to be found in damp locations that are sheltered from the wind. It is commonly found on roses, aquilegia, geraniums, hawthorn, oak, birch, willow, acers and fruit trees such as apple and cherry. It can also be found on blackcurrants, gooseberries, grapes, courgettes, marrows, cucumbers, peas, honeysuckle, rhododendrons and azaleas.

*Violet bramble rust*

Bramble/blackberry bushes grow in all parts of the British Isles and retain their leaves all year round.

*Brown rot*

Suitable fruit trees, such as apple trees, grow in most parts of the British Isles. Fruit infected with brown rot fungi can be found from mid-summer onwards. Infected fruit can remain on the tree in a mummified state, but infected fallen fruit are commonly found on the ground in autumn. Look out for the cream/buff coloured pustules (2-5 mm) on the skin, often forming concentric rings.

**Equipment**

For each pair/group:

* hand lens or magnifying glass
* access to hand sanitiser gel/foam
* scissors and clear, sealable plastic food bags (for taking samples of infected leaves) (optional)

**Health and safety**

Powdery mildew, violet bramble rust and brown rot are all caused by fungi. Fungal spores are usually present in normal air, so the risk of adverse reactions to the spores is minimal. Students with a known allergy to fungal spores should avoid handling the infected plant material. It is not necessary to wear gloves when handling the infected plant material, but hands must be cleaned immediately after doing so.

If samples are removed from infected plants, transporting the infected material in sealed bags will eliminate most of the safety concerns and prevent infection of other plants. The bags should remain sealed during handling. Sealed bags should be disposed of after use. Infected plant material could be composted, as the composting process will sterilise the spores produced by the fungus.

Fieldwork should be carried out in accordance with local health and safety requirements.

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Images: plant illustration – pixabay.com/Clker-Free-Vector-Images (34592); detective – pixabay.com/OpenClipart-Vectors (160143); powdery mildew – University of Reading/Oliver Ellingham; violet bramble rust x3 – BioImages.org/Malcolm Storey; apple brown rot – WikimediaCommons/Cwmhiraeth

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