

## Plant CSI – Learn how to be a plant detective

Plant CSI		
<b>Group:</b> Year 9 pupils		<b>Duration:</b> 45 minutes
<p><b>Learning Objectives:</b> <i>Students will be introduced to:</i></p> <ul style="list-style-type: none"> <li>• The meaning of the word ‘pathogen’</li> <li>• The world of plant diseases</li> <li>• Identify some plant diseases</li> <li>• How to create a key</li> </ul> <p>Through participating in the practical element of this activity pupils will develop their own diagnostic skills.</p> <p><b>English National curriculum:</b>            Key stage 3/4 : <i>Science</i> - Develop experimental skills by working scientifically            Key stage 3: <i>Biology</i> - Genetics and evolution            Key stage 4: <i>Biology</i> - Health disease and the development of medicines (bacteria, viruses and fungi as pathogens in animals and plants, reducing and preventing the spread of infectious diseases in plants)</p>		
Stage	Topic/Teaching Method/Activity	Resources Required
Introduction	<p>An unhealthy plant may not look like much of a crime scene - but plant diseases and pests can lead to loss of crops, damage to the environment and unhappy gardeners. The aim of the session will be:</p> <ul style="list-style-type: none"> <li>• For students to become detectives and examine a selection of plant samples to try to work out which organism is the culprit of a garden ‘crime scene’</li> <li>• For students to produce a list of visual symptoms and then identify the disease or disorder causing the problem.</li> <li>• Create a key</li> </ul>	Infected box plant and a healthy box plant
Pair or small group discussion	<p><b>Challenge students with the question:</b> What is meant by the word <i>pathogen</i></p> <p><b>Things to consider:</b> Can you think of any <i>pathogens</i> which infect humans?</p> <p><b>Viral</b></p>	<p><b>Information on:</b>  <b>Viral:</b> chicken pox, flu, HIV AIDS.  <b>Bacterial:</b> Salmonella, E Coli, staphylococcus – pneumonia,</p>

	<p><b>Bacterial</b> <b>Fungal</b></p>	<p>streptococcal bacteria – meningitis, strep throat. <b>Fungal:</b> Athletes foot, Thrush</p>
Mini plenary	<p>Have students discussed/considered the following points:</p> <ul style="list-style-type: none"> <li>❖ How do pathogens spread?</li> <li>❖ How do we control the spread of pathogens in humans?</li> <li>❖ How can this relate to plants?</li> </ul>	
Revise knowledge	Structure of bacteria, fungus, virus	Images of bacteria, virus and yeast cell structure
Whole group practical	<p>Just like humans, plants can be infected by bacteria, fungi, viruses and protoctista</p> <p>Method:</p> <ul style="list-style-type: none"> <li>• Work in teams to examine a selection of box plant (<i>Buxus</i> spp.) samples.</li> <li>• Produce a list of visual symptoms for each sample</li> <li>• Identify the disease or disorder causing the problem.</li> <li>• Use the names and descriptions of symptoms to create a key to box plant problems.</li> </ul>	<p>Infected box plant material in petri dishes plus a healthy box plant Hand magnifiers The following sheets:</p> <ul style="list-style-type: none"> <li>○ 'Creating a key to box plant problems'</li> <li>○ Identifying pests, diseases and disorders of box plants</li> <li>○ Box plant symptoms</li> </ul>
Health and safety	<b><u>Do not open petri dishes of plant samples</u></b>	
Working in pairs	Students swap keys and use to identify what is effecting an unlabelled box plant sample.	
Whole group discussion	<p>How might gardeners overcome the problem of box plant in the garden? There are alternatives that can be grown in place of the box plant.</p>	Images of alternatives to Box: eg. Privet, holly, euonymus, boxwood honeysuckle



Feedback discussion	<p>Not all bacteria and fungi are bad - some are beneficial or asymptomatic.</p> <p>Beneficial bacteria or fungi to <b>plants</b>: <i>Beneficial bacteria</i> in nodules, soil symbiosis, <i>beneficial fungi</i> - mycorrhizal</p> <p>Beneficial bacteria or fungi to <b>humans</b>:</p> <p>Harmless and beneficial bacteria outnumber harmful varieties. Thousands of bacterial species live in humans, and many provide health benefits:</p> <p><i>Bacteria</i> in the intestinal tract help the body to digest food (health benefits). For soil enrichment with leguminous crops (see nitrogen cycle) For decomposition of organic wastes (in septic tanks, in some sewage disposal plants, and in agriculture for soil enrichment) and toxic wastes.</p> <p><i>Fungi</i> - specific fungi are a major source of antibiotic, in food - yeast enables bread to rise.</p>	<p>Examples of beneficial bacteria or fungi to <b>plants</b></p> <p>Examples of beneficial bacteria or fungi to <b>humans</b></p>
Health and safety	Wash hands thoroughly	
Follow up	<p>You may wish to repeat the activity with the plant diseases named in the particular GCSE Biology specification you are teaching. Different GCSE Biology specifications require students to describe different plant diseases.</p> <ul style="list-style-type: none"><li>• <b>AQA:</b> tobacco mosaic virus, rose black spot</li><li>• <b>OCR Twenty First Century Science:</b> tobacco mosaic virus, ash dieback, crown gall disease (<i>Agrobacterium tumefaciens</i>)</li><li>• <b>OCR Gateway:</b> tobacco mosaic virus, barley powdery mildew, crown gall disease (<i>Agrobacterium tumefaciens</i>)</li><li>• <b>Edexcel:</b> ash dieback</li></ul>	<p>For further information go to the RHS website <a href="#">Diseases and disorders</a></p>



Additional activities	<p>Other useful plant science teaching resources:</p> <p>Key Stage 1 and 2 - RHS Campaign for school gardening <a href="https://schoolgardening.rhs.org.uk/home">https://schoolgardening.rhs.org.uk/home</a></p> <p>Key Stage 1 to 4 - Science and Plants for Schools <a href="http://www.saps.org.uk/">http://www.saps.org.uk/</a></p> <p>Key Stage 4 - Field Studies Council Holly leaf miner practical: <a href="http://www.field-studies-council.org/media/356105/HollyLM_WHOLE.pdf">http://www.field-studies-council.org/media/356105/HollyLM_WHOLE.pdf</a></p>	
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