

Plant defences and plant disease

Revision notes · Triple only: how plants defend themselves with physical barriers and chemicals, and how plant diseases are detected and identified.

For Edexcel GCSE Biology 1BI0 and Combined Science 1SC0. **Triple only** is not in Combined Science. **Higher tier** is only on the Higher paper.

Plant defences and plant disease **Spec 5.9B-5.11B** **Triple only**

Physical barriers in plants **Spec 5.9B**

Plants can be attacked by pests (such as insects) and by pathogens. Some plants defend themselves with **physical barriers** that stop these entering.

- The **leaf cuticle** is a waxy layer on the surface of leaves. It forms a barrier that pathogens and pests find hard to get through.
- The **cell wall** is made of cellulose around every plant cell. It is a strong barrier that pathogens must get past before they can enter the cell.

Exam tip: Name the barrier and say what it does. 'The waxy cuticle stops pathogens entering the leaf' earns the mark; just 'the cuticle' does not.

Chemical defences in plants **Spec 5.10B**

Some plants produce **chemicals** that defend them against attack. Some of these chemicals kill or slow the growth of microorganisms. Others are poisons that make the plant harmful or unpleasant for pests to eat.

Some of these plant chemicals can be used by humans to treat disease or relieve symptoms. Common examples are:

- willow bark contains a chemical that the painkiller aspirin was developed from
- foxgloves contain digitalis, a chemical used to treat some heart conditions
- the bark of the cinchona tree contains quinine, which was used to treat malaria

Exam tip: The spec does not require named examples. One example, such as aspirin from willow, is enough to illustrate the point.

This is also why plant extracts are tested for antimicrobial properties, as in the core practical later in this topic.

Detecting and identifying plant diseases **Spec 5.11B**

Plant diseases can be detected and identified in the field and in the laboratory. There are four approaches you need to be able to describe.

Ways of detecting and identifying plant diseases

Method	What is done	What it tells you
Eliminating environmental causes	Check conditions such as soil nutrients, water supply, temperature and pollution	Whether the symptoms could be caused by something other than a pathogen, such as a mineral deficiency or drought
Distribution analysis	Record where affected plants are, for example on a map	Whether the pattern points to spread of a pathogen (clusters around a source) or to an environmental cause (an area with poor soil)
Observing visible symptoms	Look for spots, discolouration, lesions, wilting, growths or leaf loss	Which disease it is likely to be, by comparing with known examples
Diagnostic testing	Test samples in the laboratory, or use testing kits in the field, for example kits that use antibodies to detect a pathogen's antigens, or tests that identify its DNA	Which pathogen is present

Visible symptoms alone may not be enough, because different problems can look similar. For example, yellow leaves can be caused by a mineral deficiency or by a pathogen. That is why environmental causes are eliminated first and laboratory tests are used to confirm the pathogen.

Exam tip: In a 'suggest how' question, combine two methods: use distribution analysis to see if the disease is spreading, then diagnostic testing to identify the pathogen.

Quick check

1. Name two physical barriers that protect plants from pathogens.
2. Give one way plant chemicals can be useful to humans.
3. Why do scientists eliminate environmental causes when investigating a plant disease?
4. What is distribution analysis?

Quick check answers

Plant defences and plant disease

- 1 . The leaf cuticle and the cell wall.
- 2 . Some can be used as medicines to treat disease or relieve symptoms, for example aspirin from willow.
- 3 . To check that the symptoms are not caused by something such as a mineral deficiency, rather than a pathogen.
- 4 . Recording where the affected plants are to look for a pattern that suggests the cause.