

Plant Defences and Deficiencies Notes

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Plants just like animals are constantly responding to attack from pathogens and pests. Plants have chemical, mechanical and physical defences to protect them against pathogens, pests and damage from grazers.

Physical defences

Defence	What it does
Waxy leaf cuticle	Leaves are covered with waxy cuticle which <u>acts as a physical barrier</u> to prevent their cells from becoming infected. It can be quite thin, such as those of aquatic plants or quite thick such as those on cacti.
Cellulose cell wall	Each plant cell has a cellulose cell wall which acts as another physical barrier against infection. It also contains a variety of chemical defences.
Bark	Just like skin in humans, bark is an external dead layer which prevents pathogens from entering.

Mechanical defences

Defence	What it does
Thorns and hairs	Thorns and hairs protect the plant by discouraging animals from eating them as they can physically damage or injure the animal.
Droopy leaves	Leaves that droop when touched. This is useful as if an insect lands on the plant a droopy leaf may cause the insect to fall off preventing it from damaging the plant.
Mimicry	Some plants have evolved to look like another plant that is dangerous or off putting. This causes animals to avoid the plant.

Chemical defences

Defence	What it does
Poisons and toxins	Some plants are capable of producing poisons to prevent animals from eating them. Bamboo, for example, produces cyanide, a deadly poison.
Antibacterial chemicals	These kill bacterial cells and help to prevent a bacterial infection.
Antifungal chemicals	These kill fungal cells and help to prevent a fungal infection.

Exam note: Some of the antibacterial and antifungal chemicals can also be used by humans to treat human diseases or to relieve symptoms.

How are Plant Diseases Detected?

Plants, just like animals can have their disease identified by:

1. Scientists in a laboratory, who may use test kits containing monoclonal antibodies.
2. By experienced individuals who can recognise certain physical changes in the plant such as growths, spots on leaves. They may use a gardening guide to give more details.
3. By farmers, who are by and large experts on the plants that they cultivate.

Plant Ion Deficiencies

If a plant is looking a bit sad and unhealthy, a pathogen isn't always to blame! Sometimes, the plant is simply suffering from a lack of essential mineral ions in the soil.

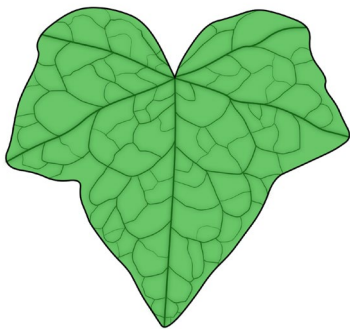
There are plenty of ion deficiencies in plants but for GCSE we only need to know about **two** of them. Let's look at each.

Ion: Magnesium.

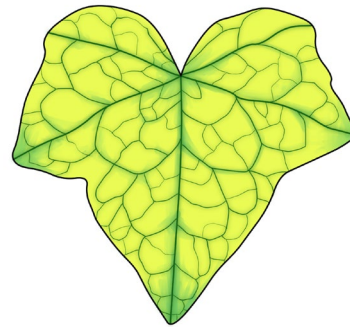
Used to: make chlorophyll which absorbs light in photosynthesis.

Deficiency effect: it causes the leaves to look yellow. This reduces the plant's ability to photosynthesise. This can reduce overall growth and yield of the plant.

The name for plant having a magnesium deficiency is Chlorosis.



Normal healthy leaf



Leaf showing a magnesium deficiency

Why do the leaf veins still look green when the plant has a magnesium deficiency?

The veins often have better access to the limited magnesium still available, since they're closer to transport tissues (like xylem and phloem). That means that chlorophyll lasts longer near the veins so they stay green while the rest of the leaf tissue goes yellow.

Ion: Nitrate.

Used to: make amino acids which are used to make proteins.

Deficiency effect: the plant can appear stunted/ smaller as the plant needs proteins for growth and repair.



Healthy plant with plenty nitrate ions



Plant showing a nitrate deficiency

Colour note: we notice here that the plant with a shortage of nitrate ions is smaller than the healthy plant. We also notice that it is a little yellow in colour. Plants with a nitrate deficiency can look a bit yellow as without enough nitrate ions plants can't produce chlorophyll fast enough. They can still make it of course but the rate at which they can make chlorophyll slows down.