

Detection and identification of plant diseases

4.3.3.1 · Infection and response · revision notes

The plant pathogens and pests you need (TMV, rose black spot and aphids), and the effects of nitrate and magnesium deficiency. This subtopic is GCSE Biology only (not Combined Science).

Key facts

- Examples: TMV (virus), rose black spot (fungus), aphids (insects)
- Nitrate ions → protein synthesis; lack → stunted growth
- Magnesium ions → chlorophyll; lack → chlorosis
- Chlorosis = yellowing of leaves caused by a lack of chlorophyll

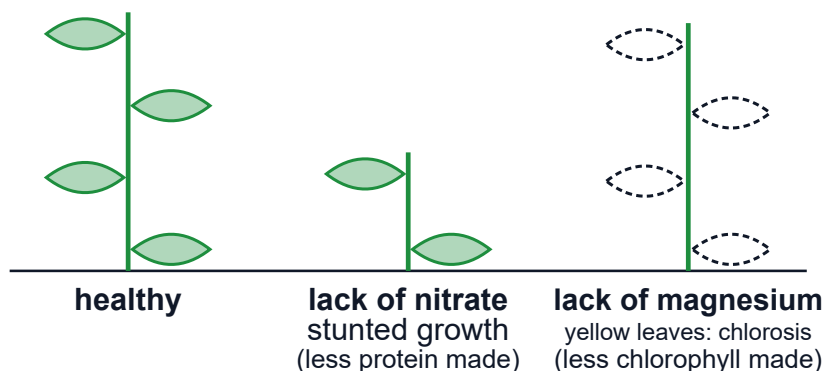
Notes

Pathogens and pests

- Plants can be infected by viral, bacterial and fungal pathogens, and damaged by insects.
- **Tobacco mosaic virus (TMV)**, a virus: a mosaic pattern of discolouration on the leaves.
- **Rose black spot**, a fungus: purple or black spots on the leaves, which turn yellow and drop early.
- **Aphids**, insects: they push their mouthparts into the phloem and feed on the sap, taking sugars the plant needs. They can also carry viruses from plant to plant.

Mineral ion deficiencies

- Plants can also be damaged by a lack of mineral ions in the soil. These **ion deficiency** conditions are not caused by pathogens.
- Nitrate** ions are needed for **protein synthesis**. A lack of nitrate causes **stunted growth**.
- Magnesium** ions are needed to make **chlorophyll**. A lack of magnesium causes **chlorosis**: the leaves turn yellow. With less chlorophyll there is less photosynthesis, so the plant grows less.



Dashed leaves are yellow (chlorosis).

- A deficiency can be put right by adding a fertiliser that contains the missing ion.

Don't lose marks

- ✗ Swapping the two ions: magnesium is for chlorophyll, nitrate is for protein synthesis.
- ✗ Writing 'the plant can't photosynthesise' for magnesium deficiency. Photosynthesis is reduced, not stopped.
- ✗ Calling an ion deficiency an infection. It is caused by a lack of mineral ions in the soil, not by a pathogen.
- ✗ Confusing chlorosis (yellowing of leaves) with chlorophyll (the green pigment) or chloroplasts (where photosynthesis happens).

More tips

Memory tricks

- Mg for green: magnesium makes chlorophyll, so a lack of it gives yellow leaves (chlorosis).
- Nitrate → protein → growth, so a lack of nitrate gives stunted plants.

Exam technique

- For deficiency questions, give the full chain: ion → what it is used for → symptom → effect on growth.
- Use the evidence in the question to decide between causes, and say which evidence supports your choice.

What each grade needs

What you need to be able to do, from the first marks up to the top grade.

Grade 5

Give examples of plant pathogens and pests

Tobacco mosaic virus (a virus), rose black spot (a fungus) and aphids (insects).

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