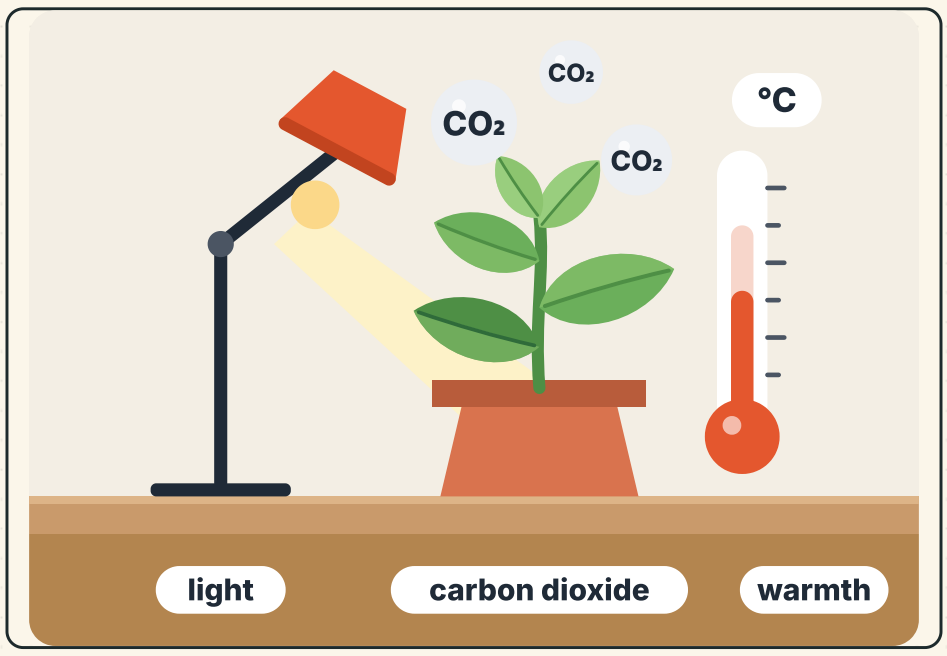
PHOTOSYNTHESIS · PART 3 OF 9 · AGES 11–16

What Limits Photosynthesis

A plant can only photosynthesise as fast as its scarcest ingredient allows. These are the factors that set the speed.



Light intensity

More light gives a faster rate, until the graph levels off because something else runs short. In the dark, photosynthesis stops.

Carbon dioxide concentration

Air is only about 0.04% carbon dioxide, so CO_2 often limits the rate on bright, warm days. More CO_2 speeds it up until the rate levels off.

Temperature

Warmth speeds up the enzymes, so the rate rises to an optimum. Too hot, and the enzymes are denatured and the rate falls quickly.

Amount of chlorophyll

Less green pigment catches less light. Chlorophyll contains magnesium, so plants short of it turn yellow and photosynthesise less.

Water supply

Water is a reactant, but a thirsty plant slows first because it closes its stomata to save water, which also shuts out carbon dioxide.

The slowest factor wins

At any moment, the factor in shortest supply sets the rate. Raising the others makes no difference until that one increases.

Distance from the light

Light intensity ∝ 1 / distance². Move a lamp twice as far from a plant and the light reaching it falls to a quarter.

Reading the graph

Where a rate graph rises, the factor on the x-axis is limiting. Where it levels off, something else has become the limiting factor.

NEXT IN THE SERIES
4. Photosynthesis vs Respiration: Key Differences

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