

How We Discovered Photosynthesis

Three centuries of experiments, from a willow in a pot to radioactive carbon, that revealed how plants make sugar.

1648



Van Helmont's willow tree

A willow grew by about 74 kg in five years while its soil lost only about 57 g. He concluded, wrongly, that the new mass came from water alone.

1771



Priestley's mint and mouse

A sprig of mint 'restored' air in a sealed jar where a candle had burned out, so a candle could burn and a mouse could live in it again.

1779



Ingenhousz: light is needed

Plants restored the air only in light, and only their green parts did it. In the dark they did not.

1782



Senebier: carbon dioxide goes in

Plants take in 'fixed air', now called carbon dioxide, and give out oxygen in the light.

1804



De Saussure: water is used too

Careful measurements showed that water is also a reactant: a plant's gain in mass comes from carbon dioxide and water together.

1882



Engelmann's bacteria

Oxygen-loving bacteria crowded beside the parts of an alga lit by red and blue light, showing which colours chlorophyll uses.

1905



Blackman's limiting factors

Experiments on pondweed under different light, temperatures and CO₂ levels showed that the factor in shortest supply limits the rate.

1941



The oxygen comes from water

Ruben, Kamen and colleagues gave algae water with a heavy oxygen isotope. It turned up in the oxygen released, not from carbon dioxide.

1948–
1954



Mapping the Calvin cycle

Calvin, Benson and Bassham traced radioactive carbon-14 to map how CO₂ is built into sugar. Calvin won the 1961 Nobel Prize in Chemistry.



Wrong answers still help

Van Helmont's conclusion was wrong, but his careful weighing proved the soil was not the source and set up the question others answered.

NEXT IN THE SERIES

7. Photosynthesis in Everyday Life: 8 Places You Meet It

