

Photosynthesis in the dark

A Question & Answer series with Ken Bellamy

Q: Does photosynthesis stop when there is no sunlight or because of dense cloud cover?

A: Photosynthesis is the natural process of living things capturing light and storing it in special energy compounds. These special compounds – let's call them photon packs – are used for fuel when the organism converts carbon dioxide from the atmosphere into sugars.

Plants use these photon packs when they grow. But the photon pack may have been produced by the plant itself or by other organisms living nearby.

The mineral phosphorus is a key component of these photon packs, and must be available in the soil for photosynthesis to happen. Phosphorus acts as a sort of battery for the photon pack and is exchanged as the energy in the pack is used.

Photon packs are "charged up" by photons (light) and accept the charge by picking up a piece of phosphorus. When the pack is used, phosphorus is released. These packs can accept photon energy from any type of light. The light we see is only a small part of the total light spectrum, but even Ultra Violet light and Infra-Red light can be used for photosynthesis.

These two bands of light are not overly impacted by cloud cover. In fact, photon packs can even be charged at night, using reflected or re-radiated light which is not visible to the naked eye. The trick is that plants use mostly visible light while other organisms use the other bands too. So the plant itself may slow down when visible sunlight fades but some of its neighbours can help pick up the slack.

Infra Red light can penetrate soil, so photosynthesis can be active in what we think is darkness.

Provided there are enough "phototrophic" – or photosynthetic bacteria and other organisms which can accept non-visible light, photosynthesis can go on 24 hours a day.

Plants make friends with these organisms. And even trade them enzymes and other substances for photon packs when there are enough of them present. This means that plants can share in a 'second wave' of photosynthesis—outsourced to soil organisms.

Increased overall photosynthetic activity results in greater capture of CO₂ from the air, greater sugar production and better growth all around. As long as the right microbes are present around a plant, sugar production can happen day or night, light or dark...just like it does on the dark and shady floor of a rainforest or deep in the ocean! Build the microbes, share their photon packs and photosynthesis happens even in the dark.

Ken Bellamy is the director of Townsville-based biotech company Vital Resource Management (VRM), which he established in 1997 to offer sustainable and affordable improvements in water management and food production. He is also a director of Prime Carbon, set up in 2004 to help assess and register farm-based carbon offsets.

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