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GCSE Biology – Transport Systems - Transcript

There's a lot going on in this plant. To keep it healthy and alive it has to get water all the way up to its leaves. And the dissolved sugars from photosynthesis back down again.

It has two transport processes called transpiration and translocation to do just that. So how do they work?

Plants can grow very large, like this giant redwood, so simple diffusion isn't enough to move substances around. Instead, they use two main systems. The xylem, which transports water and minerals, and the phloem, which transports dissolved sugars.

The movement of water upwards through the plant is called the transpiration stream. Water enters through the roots, travels up through the xylem vessels, and evaporates through tiny holes in the leaves called stomata. This flow doesn't need energy, it happens passively. Evaporation from the leaves pulls a continuous column of water up from the roots.

Xylem vessels are made of dead cells joined end to end, forming long hollow tubes, like drinking straws. Their walls are thickened with lignin to keep them strong.

The transport of dissolved sugars is called translocation. Sugars made in the leaves during photosynthesis move through the phloem to the rest of the plant where they can be used as an immediate energy source.

The sugar can also be stored as starch or converted to cellulose to build plant cell walls. Phloem tissue is made of living cells called sieve-tube elements which join together to form tubes.

They have small holes in their end wall, known as sieve plates, so the sugary solution can flow from one cell to the next.

Unlike transpiration, translocation requires energy. As sieve-tube elements have no nucleus, they are supported by companion cells. These control and carry out living processes for the elements. This includes providing energy for translocation.

So even in this plant, the transpiration system in the xylem is moving water up and the translocation system in the phloem moves dissolved sugars around. Keeping it healthy. It may look like it's just sitting there, but it's full of activity.