Hello. I'm Dr Alex Lathbridge and this is Bitesize Biology.

This is the final episode in our eight-part series on homeostasis.

In this episode we're going to talk about plant hormones.

You might think plants are boring, I understand. They don't speak. They generally don't have strong views on important topics. They've never even been on holiday.

But on the inside plants are as complex as you and I, with many needs and drive to survive.

In order to survive, plants need light and water for photosynthesis. There's a whole episode about it if you want to check that out in our series on The Cell.

Of course, you know that plants don't have the ability to walk on two legs like you and me.

So, in order to give themselves the best chance of survival, plants have developed responses called tropisms which help them grow towards sources of light and water: Plants grow in response to light, which is called phototropism.

Plants also grow in response to gravity, which is called geotropism. (Or gravitropism.) When a plant grows towards a change in the environment, the stimulus, it's a positive tropism. When a plant grows away from the stimulus, it's a negative tropism.

Ok, there's some key terms, let's go over them again quickly:
Phototropism – growing in response to light.
Geotropism – growing in response to gravity.
Positive tropism – growing towards a stimulus.
Negative tropism – growing away from a stimulus.

Different parts of plants respond to light in different ways: In the plant shoot, responses to light are known as positive phototropism, because the shoot grows towards the light, so the leaves can absorb as much sunlight as possible.

In the plant root, responses to light are known as negative phototropism, because the root grows away from the light. Roots need to grow downwards into the soil, away from the light, in order to absorb water and minerals.

But plants don't have muscles or legs or anything – so how do they control where to grow? Well, it's all thanks to a hormone called auxin. Auxins are mostly made in the tips of growing shoots and roots, and these hormones can diffuse to other parts of the shoots or roots. Auxin controls the growth of

plants by promoting cell division and causing elongation of the plant cells.

Once again, different parts of plants use auxin in different ways:
High concentrations of auxins in shoots promotes more growth, and the cells become longer.
High concentrations of auxins in roots inhibits growth, so even though the concentration of auxin is high in the roots, its effect is to inhibit growth.

The key thing to remember here is that while both the shoots and the roots have high concentrations of auxins, they do different things.

This happens because of an unequal distribution of auxin in different parts of the plant.
In shoots, the shaded side, away from the sun, contains more auxin and grows longer, which makes the shoot grow towards the light.

But auxins have the opposite effect on roots. In a root, the shaded side contains more auxin and grows less, causing the root to bend away from the light and down into the soil.

Now let's look at how different parts of the plant respond to changes in gravity, geotropism. When the shoot grows upward, against the force of gravity, this is known as negative geotropism.
When the roots grow downwards, so with the direction of gravity, this is known as positive geotropism.

This is also caused by an unequal distribution of auxin in different parts of the plant: In a root placed horizontally, the bottom side of the root contains more auxin (because more of the hormone accumulates in the lower, bottom half) and so it grows less, so the root grows downwards in the direction of the force of gravity. Auxin slows the growth in the root and it curves downwards because it stops growing.

The opposite happens in a shoot. When a shot is placed horizontally, the bottom side of the shoot contains more auxin (more of it accumulates in the bottom half) but grows more, so the shoot grows upwards, against the force of gravity, this is negative geotropism. Auxin stimulates growth in the shoot and it curves upwards.

It might be useful to check out the pages on the Bitesize website, because they have pictures of these processes going on.

I know you probably want me to shut up about auxins but the most important thing to remember is that they help plants grow, stimulating their cells to elongate.

Finally, let's look at how humans use auxins are used to help plants grow. They're used in agriculture, or farming, and horticulture, as weed killers, rooting powders and for promoting growth in tissues.

Selective weedkillers are useful because they kill some plants, but not all of them. Selective weedkillers contain a growth hormone that causes the weeds to grow too quickly and die.

But selective weedkillers also kill plants that some animal species rely on for food, this can result in a reduction of biodiversity.

Rooting powder works with plant cuttings. These are little cut offs of plants that can be dipped in hormone rooting powder before they are planted. Rooting powder contains growth hormones that makes the roots of plant cuttings develop quickly.

Tissue culture is a technique used to grow whole new plants from small sections of a parent plant. Hormones are used to stimulate cell division and elongation.

I'm Dr Alex Lathbridge and this is bitesize biology.

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