

Science

Earth Science

Drink It In

Plants are living creatures that need food and water just like us. But how do plants like soybeans get food? This experiment should shed some light on the subject.

What's the Word?

nutrients, carbon dioxide, stomata, xylem, epidermis

Plants like soybeans get their nutrients through the water they take in. Nutrients from the soil get mixed up with the groundwater. The plant takes in the groundwater with the sneaky nutrients concealed inside. So how do plants take in water? Check it out with this experiment.

What You Need

Clear bottle Water
Clay Plastic drinking straw
Freshly cut soybean leaf or any other freshly cut leaf or flower

What to Do

1. Fill the bottle with water.
2. Take a freshly cut soybean leaf, wrap clay around the stem and place the stem into the bottle. Make sure the clay fits snugly around the mouth of the bottle.
3. Poke a hole in the clay and stick a straw through the hole. Make sure the clay fits tightly around the straw so that no air leaks will occur. Make sure the straw is not touching the water!
4. Stand in front of a mirror so you can see the bottle. Suck the air out of the bottle (make sure the straw is not touching the water). This experiment will not work if there are any air leaks.

What's Going On?

There are holes in the leaf called *stomata* and tiny tubes called *xylem* that run down the stem. The leaf and stem act as a straw for the plant. The *stomata* act as the straw's hole, and the *xylem* act as the straw itself. As you drew air out of the plant, more air was drawn into the bottle through the *stomata* and *xylem*. This is the same system that moves water in a plant.

More Information: Carbon dioxide enters a leaf from the air. The epidermis (outer surface) of the leaf has many tiny pores. These openings, called *stomata*, enable carbon dioxide to enter the leaf. A leaf has many *stomata*. For example, a cottonwood leaf may have 1 million *stomata*, and a sunflower leaf nearly 2 million. However, the pores are so small that they make up less than 1 percent of the leaf's surface. In most plants that grow in full sun, the majority of the *stomata* are in the shaded lower epidermis of the leaves. In many other plants, the *stomata* are about equally divided between the upper and lower epidermis.

A leaf obtains water that has been absorbed by the plant's roots. This water travels up the stem and enters the leaf through the petiole. Tiny tubes in the leaf's veins carry the water throughout the blade. These tubes make up the vein's *xylem* (water-transporting tissue).





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The Circle of Life

Everything exists together in a delicate balance. Here, we see how the Nitrogen Cycle completes the Circle of Life.

The Circle of Life, otherwise known as the Nitrogen Cycle

“Everything exists together in a delicate balance.”

What’s the Word?

nitrogen, node, decompose, ammonia, amino acids

Explanation:

All living things require nitrogen to make proteins. About 78 percent of the atmosphere is nitrogen (N_2). In the form of a gas, nitrogen is useless to plants and animals. To become useful, the nitrogen must be first converted into a nitrate (NO_3), a combination of oxygen and nitrogen. Only in nitrate form can plants absorb the nitrogen they require.

Lightning forms some nitrates. But bacteria form most nitrates in the soil. Many of these nitrogen-fixing bacteria live in little nodes on the roots of soybeans and other members of the pea (legume) family. The resulting nitrates are absorbed by the roots of plants for use in the production of proteins. The tissues of plants use the nitrogen atoms to produce amino acids, which are then built into the proteins. Animals, in turn, get the nitrogen that they need by eating plants or other animals.

“When we die, our bodies become the grass. And so we are all connected in the great Circle of Life.”

Explanation:

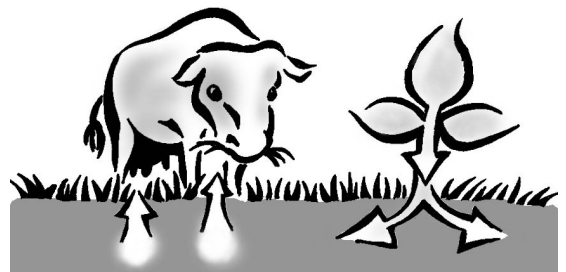
When the plant or animal dies, decomposing bacteria and fungi cause the body to decay. As they decay, the amino acids that contain nitrogen are broken down and ammonia gas (NH_3) is released. Nitrate bacteria convert this poisonous ammonia into nitrate molecules, and other nitrate bacteria add a third atom to form nitrates. Plants now have a usable form of nitrogen again. Many plants can use ammonia directly. These plants do not have to wait until ammonia has been converted into a nitrate before they absorb it.

Nitrogen can be removed from the nitrate in the soil by denitrifying bacteria. In this case, the released nitrogen is returned to the atmosphere and the Nitrogen Cycle, or the great Circle of Life, is complete.

Activity:

Label how nitrogen moves in the Circle of Life illustration above as it is explained in this lesson. This will represent the Nitrogen Cycle.

Quotes courtesy of The Lion King, Walt Disney Pictures.





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