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The Sun's energy (radiant) bathes the Earth. It heats our planet, causes the winds to blow, and water to recycle in the water cycle. Wow, that is a lot but the Sun does more. The Sun's radiant energy with the help of some common molecules of carbon dioxide and water in plants can produce something everyone can use....food. This food-making process is called photosynthesis, and it keeps you, me, and everyone alive!



Plants and animals need energy to live, to grow, and to reproduce. Plants are unique and important living organisms. They grow, use the Sun's radiant energy, and reproduce. Animals and plants have a very special relationship. Plants are considered producers because one of the plants job is to produce food (carbohydrates or sugars) from raw materials. Animals depend on plants for their food source either directly or indirectly. Animals need these carbohydrates or sugars for their food. Animals cannot produce their own carbohydrates directly from the Sun. Horses only eat plants for their diet. They are considered plant eaters or herbivores. Lions eat other animals and are considered carnivores. They get their plants by eating organisms that have eaten grass. They do not eat plants directly. Humans eat both plants and animals and are considered omnivores. Plants play an important part in supplying food for the Earth. Plants also produce oxygen, which animals need. The animals produce carbon dioxide, which plants need. Isn't that interesting?



How do plants produce carbohydrates or food? Plants produce food by a process called photosynthesis. Photosynthesis takes raw materials, water and carbon dioxide through a plant's roots and leaves. Water is taken in mainly through the roots, and carbon dioxide enters through openings in the leaves. These two main ingredients, with the added boost of radiant energy from the Sun, drive the process of photosynthesis. Energy is defined as the ability to do work. The radiant energy of the Sun is required to drive the plant to do the work of producing carbohydrates. Carbohydrates or sugars are an important source of chemical energy (food). When carbohydrates or sugars are eaten directly or indirectly by organisms, the chemical energy in the sugars helps the consumer (the horse, the lion, the human, etc.) by supplying the energy needed to run the many processes that sustain that organism's life.



Water enters in the root system and travels through the stem into the leaves. Carbon dioxide enters the leaf through openings in the leaf. A leaf is made up of many different layers. The epidermis or outer layer has a waxy layer that helps to keep the leaf from drying out. The epidermis is nearly transparent. This allows the sunlight to penetrate the leaf. Sunlight is important because the plant uses the radiant energy from the Sun to do the work of making food. The Sun's radiant energy is changed to chemical energy in the process.



If you look at the epidermis of a leaf under a microscope you will see little openings called stoma (plural: stomata). These openings allow gases to enter and exit the leaf. Stomata are opened and shut by the action of two guard cells that surround one stoma. When water moves into the guard cells, they swell and open the stomata. When water leaves the guard cells, the stomata close. Water vapor, oxygen, carbon dioxide, and other gases enter and leave through the stomata. During the day, the stomata are usually open and they close at night. The production of food (carbohydrates) occurs more during the day and slows down



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at night. If the plant is losing too much water, the plant responds to this stimulus by shutting the stomata down to minimize water loss.

Below the epidermis of the leaf is the spongy layer. The spongy layer is a reservoir for carbon dioxide and water vapor. Remember that carbon dioxide and water vapor are important in the food making process.

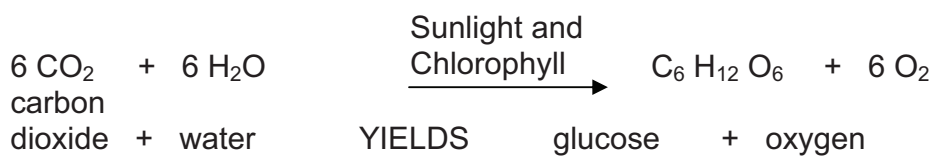
Another layer in the leaf is the palisade layer. Chloroplasts are located in the palisade layer of the leaf and are the sites of photosynthesis. The chlorophyll, a green pigment, in the chloroplast is what gives green plants their green coloring. Chlorophyll is a very important component in the production of food. It is in the green portion of the leaves (in the chloroplast filled with chlorophyll) that photosynthesis occurs.



The basic process of photosynthesis is:

Carbon dioxide, water, and radiant energy work in chlorophyll to produce glucose (a carbohydrate or sugar) and oxygen.

The process of photosynthesis can be represented by the following chemical formula:



This process of photosynthesis is amazing. Without the plants helping us, life as we know it would be very different. Plants take the radiant energy of the Sun and convert it into something we can use through chemistry!

