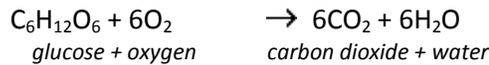


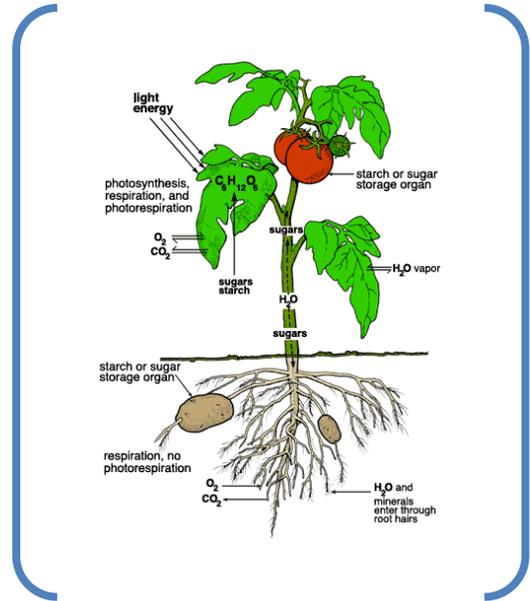
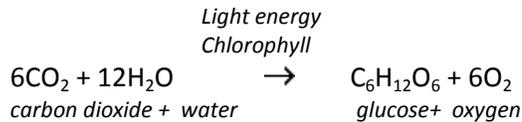
Water is essential for crop production. Water is required for the germination of seeds and as soon as growth starts water serves as a carrier in the distribution of mineral nutrients and plant food. Plant cells grow by increasing in volume and for the cells to increase in volume they must take up water. In addition, all processes of metabolism require an aqueous environment in which to function. Water fills a number of important roles in the physiology of the plant; roles which only water can play as a result of its unique physical and chemical properties:

- **Thermal properties:** water is important for temperature regulation as it does not heat or cool too quickly, and cools plants by evaporating from the leaf surface.
- **Solvent properties:** it carries nutrients and solutes required for growth.
- **Biochemical reactions:** many of the biochemical reactions that are part of growth occur in water or water itself participates in the reactions, e.g:

**Respiration - energy for life**



**Photosynthesis - storing energy for respiration**



- **Transparency :** allows sunlight to penetrate to power photosynthesis in the cells.

**Water movement in plants**

Transpiration is the process that drives water movement through the plant from the roots to the atmosphere. Transpiration is driven by the loss of water from the plant, in the form of water vapour through the stomatal pores (90%) and the cuticle (10%). Nearly all water taken up is lost by transpiration and only a tiny fraction is used within the plant. Importantly, the process of transpiration produces the energy gradient that largely controls the ascent of sap through the plant, which is beneficial because it cools the leaves and increases absorption of minerals.

Research has shown that the leaves of plants not water stressed will be about 4°C cooler than the surrounding air temperature at solar noon. The plants use the principle of **evaporative cooling** where heat energy is drawn out of the plant to convert the water molecule from a liquid to a vapour. This loss of heat results in the tissue being cooled.

If the plant gets too hot, or the flow of water from the roots cannot match that lost through the stomates, then the plant will close the stomates and “shut down” in response to the water stress.

This means photosynthesis and growth will stop. This results in a net reduction in plant yield. The application of irrigation water aims to prevent this situation.

The transpiration rate is influenced by the relative humidity of the surrounding air, air temperature and wind speed. If there is a breeze and the air is hot and dry then the transpiration rate is high.

Evaporation from the soil and transpiration from the plant occur simultaneously and there is no easy way of distinguishing between the two processes. The evaporation from soil is largely determined by the amount of solar radiation reaching the soil surface. This decreases as the crop develops and the crop canopy shades the ground area.

Sources:

Picture Available at [extension.oregonstate.edu/mg/botany/growth.html](http://extension.oregonstate.edu/mg/botany/growth.html)

<http://www.horticulture.com.au>