

Photosynthesis, Respiration and Transpiration

Photosynthesis is the manufacture of sugar (carbohydrate) from 2 simple raw materials - carbon dioxide and water - in the presence of chlorophyll and with light as the source of energy.

Carbon dioxide + water + light + chlorophyll → Sugar (Carbohydrate) + oxygen

The sugar made by our plants is used in:

*respiration

*conversion into other carbohydrates or fats (both necessary for growth and development)

*building blocks of protein (amino acids)

*providing surplus food in stems and roots, bulbs and other underground storage organs.

Optimal photosynthesis for houseplants requires:

*a well-lighted environment with ample amounts of carbon dioxide that the plant takes in or (fixes)

*favorable room temperatures

*functional roots

*structurally sound leaves with proper functioning stomata (pores in leaves through which gas exchange occurs)

RESPIRATION is the process of unlocking the energy in the food that is made by the plant in photosynthesis; breakdown of sugar in the presence of oxygen, releasing carbon dioxide, water and energy.

Sugar + oxygen → Carbon dioxide + Water + ENERGY

Factors affecting the rate of respiration in our houseplants are:

*temperature - increase in temperature leads to an increase in respiration

*moisture in the soil/medium

*health status of the plant

*age of the plant - young plants undergo higher respiration rates than older plants

Major differences between photosynthesis and respiration in our plants:

Photosynthesis

1. occurs only in cells containing chlorophyll

2. takes place only in the presence of light

During the day (the light period) photosynthesis under favorable conditions typically proceeds at a rate 5X - 10X that of respiration. More carbohydrate or food is available not only to be used immediately by the plant, but for storage in various cells. Food immediately available to the plant or used as reserves from storage tissue makes continued growth and development possible.

3. uses water and CO₂

4. releases oxygen

5. energy stored in sugar molecule

6. results in weight increase

Respiration

1. occurs in all living cells of plants and animals

2. takes place in both the light and dark

3. releases water and CO₂

4. uses oxygen

5. energy released from sugar molecule

6. results in weight decrease

This weight increase: weight decrease contrast should suggest to you that if respiration rate exceeds photosynthesis rate for an extended period, the plant will stop growing and slowly decline and die.

TRANSPIRATION - loss of plant water primarily out of the leaves into the atmosphere; if large amounts of plant water is lost through this process and if this water is not replenished, our plants will become stressed and may ultimately die.

Rate of transpiration affected by:

*watering practices

*temperature - the higher the temperature, the greater the rate of transpiration

*light - tends to keep stomata open while darkness results in their closure

*humidity - the higher the humidity, the slower is the rate of transpiration.

*air movement - ex. drafts of dry warm air from a heating vent can result in significant water loss through transpiration.