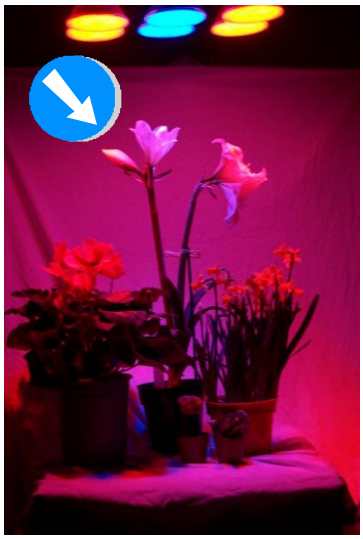
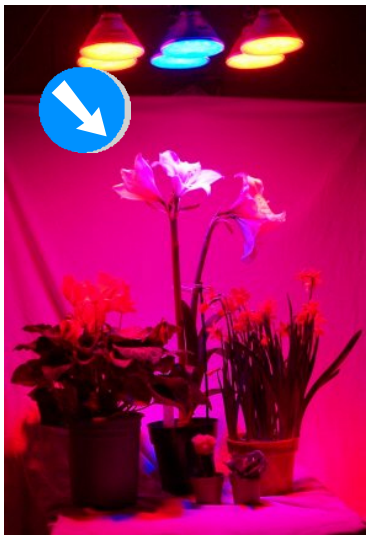
LED Sunshine in action!

Notice the Amaryllis buds on the first day under the LED's; then on following Tuesday; and finally Friday!

2 LED Sunshine Kits

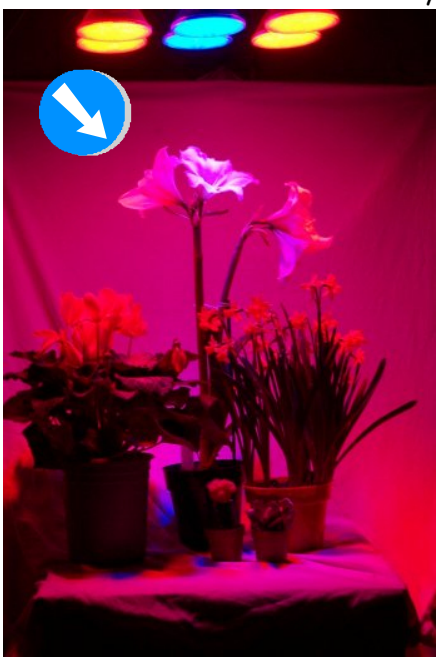


Saturday—1st day



Tuesday—4th day

The Amaryllis flowers responded amazingly after just 1 week under the 'LED Sunshine'!
The Cyclamen, Daffodil, Cactus, and Jade plants all bask in the new light and are responding as well!

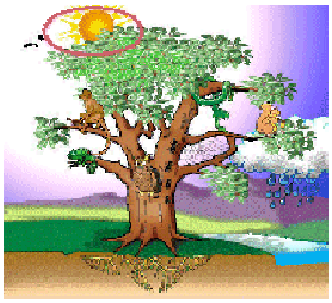


Friday—7th day

Please read the following pages to gain a better understanding of how LED grow lamps are ideally suited for the process of photosynthesis of any indoor plant or garden you may wish to grow!

Understanding Photosynthesis

The importance of the light energy



Trees and plants are able to utilize sunlight to produce food by a process called photosynthesis. Photosynthesis is the most important biological process on earth because it traps the energy of sunlight and stores it as chemical energy in energy-rich organic molecules. The photosynthetic organisms (e.g. trees and plants) build organic molecules which are not only used by themselves as building materials in their cells, but also by other organisms which feed on them. In this way, almost all the energy used by life on earth is produced from sunlight by photosynthesis and is passed though the food chain to organisms which cannot photosynthesize.

Photosynthesis

Photosynthesis (photo=light, synthesis=putting together), generally, is the synthesis of sugar from light, carbon dioxide and water, with oxygen as a waste product or by-product. It is arguably the most important biochemical pathway known; nearly all life depends on it. It is an extremely complex process, comprised of many coordinated biochemical reactions. It occurs in higher plants, algae, some bacteria, and some protists, organisms collectively referred to as photoautotrophs. Photosynthesis requires light energy which is captured by special pigments, most notably chlorophyll. As mentioned previously, this energy is used to create energy-rich carbohydrate molecules (sugar and starch) out of carbon dioxide (CO_2) and water (H_2O). During this process oxygen (O_2) is released as a by-product. All the oxygen in the Earth's atmosphere which is used by animals and plants for respiration, originates as a by-product of photosynthesis.

The process may be summed up in the following formula : $CO_2 + 2H_2O \;>>\; CH_2O + O_2 + H_2O$

The all important leaf

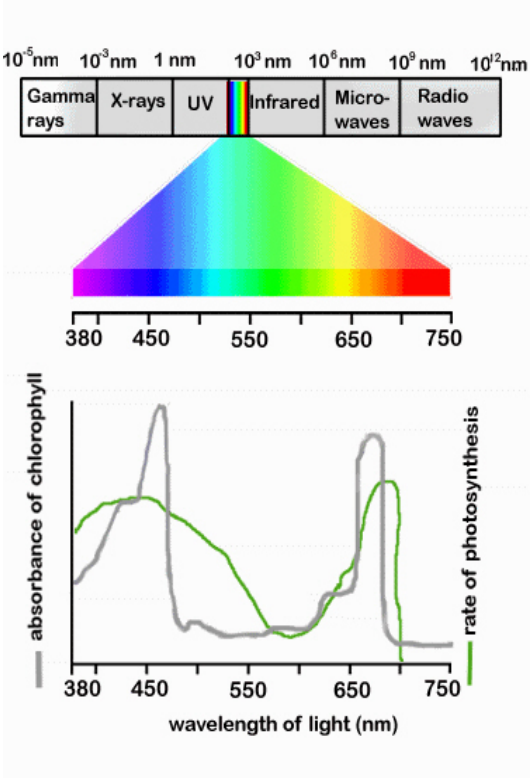
Leaves perform two major functions: a) they are where the tree or plant produces organic molecules by a complex array of chemical pathways including the most well known: **photosynthesis**; and b) they are important to the water balance of the plant. Water not used by the metabolism of the plant passes out through the leaves (through special openings called stomata) by a process called **transpiration**.

The leaves of trees and plants come in many different shapes and sizes. Their internal anatomy usually has ground tissue which contains **chloroplasts. Chlorophyll,** the light harvesting pigment of photosynthesis is green in color and occurs inside the chloroplasts giving the leaves their green appearance.

The plant's leaves provide a large surface area for the plant, this is important to the plant for : a) light absorption by chlorophyll during photosynthesis, and b) the absorption of carbon dioxide (CO_2) for the production of organic molecules.

The plant's leaves are thin and none of its cells are far away from the surface. This is important for diffusion of gases (carbon dioxide, oxygen and water vapor) between the cells of the leaf and the atmosphere.

The Light Sprectrum



The energy produced by the sun reaches the earth as electromagnetic radiation. Light and other forms of electromagnetic radiation are considered to have both a **wave nature** and a **particle nature**. Particles or packets of light (its particle nature) are known as **photons** - the smallest divisible units of light. The brightness of light depends on the number of photons absorbed per unit time. Each photon carries a fixed amount of energy which determines the amount that the photon vibrates. The distance moved by a photon during one of it vibrations is referred to as its **wavelength** and is measured in nanometres.

Electromagnetic radiation spans a broad range of wavelengths. At the one end of the spectrum of electromagnetic radiation there are gamma rays which have a wavelength of 10^{-5} nm and at the other end, radio waves which have a wavelength of 10^{12}nm. A very small part of this spectrum can be seen by the human eye i.e. between the wavelengths 380 and 750 nm. This part of the electromagnetic spectrum is called **visible light**. Almost all life depends ultimately on this part of the spectrum for its energy. Humans perceive the different wavelengths of visible light as different colors.

Within the spectrum the longer the wavelength of the radiation, the slower the vibration of the photons and the less energy each photon contains. Thus photons of ultraviolet light, at the blue end of the visible spectrum, have shorter wavelengths and contain more energy than red light and infrared radiation.

Sunlight contains 4% ultraviolet radiation, 52% infrared radiation and 44% visible light.

Light and photosynthesis

Chlorophyll does not absorb all the wavelengths of visible light equally. Chlorophyll a, the most important light-absorbing pigment in plants, does not absorb light in the green part of the spectrum. Light in this range of wavelengths is reflected. This is the reason why chlorophyll is green and also why plants (which contain a lot of chlorophyll) are also green. Note in the graph above that the absorption of light by chlorophyll a is at a maximum at two points on the graph **430** and **662** nm. The rate of photosynthesis at the different wavelengths of visible light also show two peaks which roughly correspond to the absorption peaks of chlorophyll a. Plants do not depend only on chlorophyll a in their light harvesting machinery but also have other pigments (accessory pigments) which absorb light of different wavelengths.

LED Technical specifications:

Blue: 60 LED's, 3 Watts, 470nm

RED: 180 LED's, 5.5 Watts, 630 nm