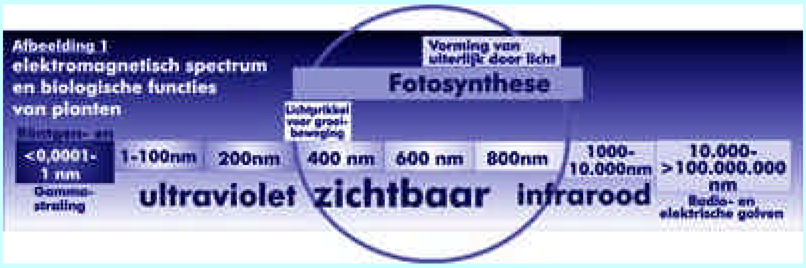
Light: Data carrier and switch

Plants need light to grow and bloom. A short review. Light is the motor of photosynthesis. The leaf green catches the light and leads it to the center. Here light is transformed into chemical energy, and water is used as a fuel. Finally the energy is preserved as matter (sugar composed from carbon dioxide).

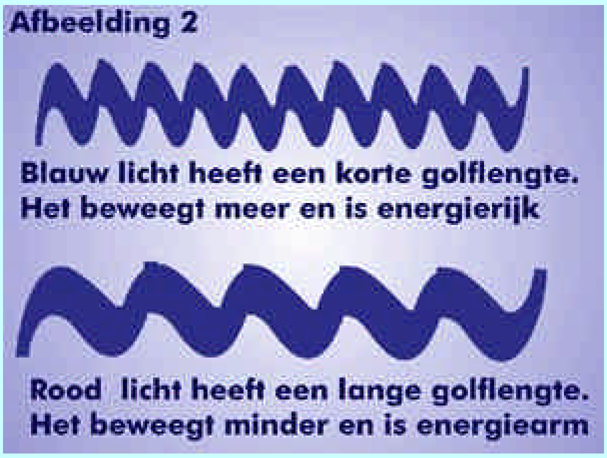


When it gets dark, photosynthesis stops. Then the plant closes it pores as much as possible and the juice stream inside the stem almost stops. When it becomes light again, the first pores will open, to admit CO2 and pass perspiration water. CO2 is the raw material for sugar, the final product of photosynthesis and by evaporation, the juice stream from the roots up will start.

In nature, light comes from the sun. The sun contains a whole spectrum of light and other radiation we cannot see. But we can feel the non-visible radiation (infrared = heat) and we can see the influences of radiation (sunburn and pigments of UV-light). The plants are completely adapted to the sunlight. A plant mainly uses the light elements of the visible light spectrum from blue to red (see picture 1). Now we know that plants need light outside the visible spectrum. That is light we cannot see. The last thirty years a lot of research is done. Some reactions to light of the plant are accurately described and photo-active matters are discovered. Probable the biggest part of 'the secret of light' hasn't been discovered yet. If you use artificial light for plants (assimilation bulbs), they try to copy the beaming of the sun as good as possible.

Light has a big influence on the plants:

- The direction of the incoming light gives the direction of growth of the plant,
- the composition of the light (the spectrum) influences the metabolism,
- the intensity of the light determines the height of the plant
- the duration and order of the periods of light can trigger a new cycle of life.



The quality of light

The visible range of light is from blue to red. Visible blue light has a wavelength of 400 nanometer. Visible red light has a wavelength of +700 nanometer.

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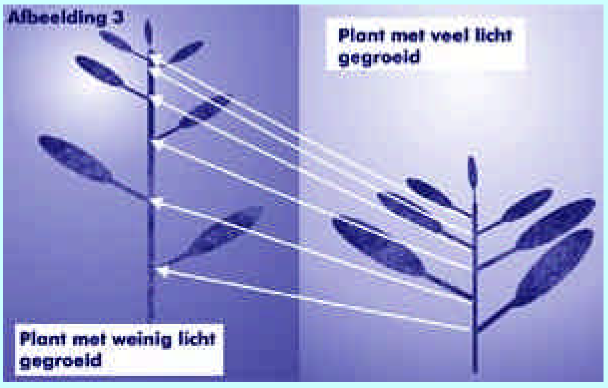
A little more explanation:
Light moves in waves and the distance between the two highest tops of the waves is the wavelength. Every color has a special wavelength. When the waves change, for instance by reflection, the color of the light changes too. The distance is measured in nanometers (nm).
One meter is the same as 1.000.000.000 (1 billion) nanometer). Or: 1 nanometer is one-billionth part of a meter.

Blue light makes more waves then red light in the same distance. It moves more often and quicker and so it has more energy. Blue light has a lot of energy and red light has little.

Radiation with more energy then blue light is UV (ultraviolet) light. After this are roentgen and gamma radiation.
At the other side of the spectrum red is followed by the IR (infrared), sensed by us as heat, followed by long-wave radio radiation.

In spite of photosynthesis only taking place with light from the visible spectrum, they detected that plants that are only attended with light of 400-700 nanometer get more diseases and don't groom and bloom well. Even when you use a lot more Watt's this will not get better. In the meantime we know that plants need also blue and red parts of light. We cannot see these. The growing plant (especially a mother plant) needs extra blue light parts. Extra red light parts stimulates the plants in blooming. They bloom more often and have more and bigger flowers.

Blue parts of light will get the plants thick and packed. Especially for mother plants, light with a lot of blue is ideal (growing bulbs), because they stay low and have a lot of side branches what will turn into healthy, quickly growing cuttings.
If we only use a short period of growing for the blooming period (1-2 weeks), we don't need to use a special growing bulb, a blooming bulb will do.



Light stream, lumen and lux

Just as important as the structure of light is the light flux or luminosity. The light flux is measured in lumen. The light flux of a bulb depends on the electric power of the bulb (in Watt). Specifications of the producer of assimilation bulbs often use lumen (=lm) for the light flux. A bulb of 400 Watt can produce between 30,000 and 60,000 lumen, 600 Watt bulbs about 90,000 or more.

The light flux that shines on one square meter is luminosity and is measured in Lux with a Lux meter.
Examples of values in Lux are:
Cloudless day: 100,000 Lux
Closed gray layer of clouds: 10,000 - 18,000 Lux
Well-illuminated living room: 500 Lux
Candle on a distance of one meter: 1 Lux
At night, full moon: 0.25 Lux

The luminosity depends not only on the capacity of the bulb (how many Watts) but also on the distance of the place you measure. The luminosity decreases if the distance to the light is getting

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bigger. The luminosity gives the plant information about the length and the distance between the side branches.

A young plant that consequently gets too less light will turn long and skinny and the distances between the side branches will get big.

Why? It would be logical for a plant with too less light to stop photosynthesis. So little energy is stored that it will grow slow and be small. But on the contrary. In nature a plant only knows the light of the sun, and when it is dark it means that something gives shadow. A plant 'knows' that it only has to grow a lot to come out of the shadow to get more light. So this needs a lot of energy and if the light conditions don't get better, the plant let die some of its parts or even tip over. The plant uses the extra energy and time to care for all it's parts because the transportation is a lot longer. A plant that is grown under good light conditions has much more energy and is healthier and more resistant against diseases.
In the next Highlife more about the light, lux and the light as a switch for the plant.

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