

## Plants and the cosmos

Earth is being bombarded daily with rays originating from out of the Cosmos and from the Sun in particular. These rays are not only electromagnetic because radio waves and radioactive Gamma rays also influence the daily existence of all terrestrial creatures.



Symmetrie van de plant

Whether plant, germ or animal, we are all affected by this daily shower of rays and even direct our lives to it by adapting to periodic light and dark phases. Strong electromagnetic waves such as Gamma rays are absorbed and used much more effectively by plants and bacteria than by animals. While we can get skin cancer from absorbing too many UV rays, a plant will adapt itself, for example, by producing genetically adapted seeds. Where we would be toppling over, plants produce new kinds. The enormous array of kinds of chrysanthemum was brought about using similar methods.

In my previous article, I wrote about how plants perceive their environment. We cannot find any discernible eyes on plants, not of the kind comparable to ours. A plant apparently does not need brain matter for retaining images either. Our manner of perception is necessary because we are mobile creatures who need to see in order to gather the necessities of life. A plant does not need to move about. A plant does not need to go anywhere as it can provide for all its needs while staying firmly rooted to the spot.

Plants use light to make energy. Photosynthesis has nothing to do with seeing light. The light for the photosynthesis is retained by the plant, even sustaining a loss of energy (noted by colour change) and reflected until the correct wavelength has been reached that corresponds with the leaf green. Light from photoreaction gets swallowed up as it were. The light that is used for photosynthesis is not suitable as an information carrier. We humans can observe light directly without the need for reflection, but leaf green can only absorb light if it has been reflected a while by travelling far. Leaf green does not receive light in the same real time that we do.

This is comparable to the fact that some of the stars we can see from the Earth, no longer actually exist. But the light from that star is still travelling towards us despite the non-existence of the star. So even we receive light messages that are outdated and therefore no longer reliable. All this does not make any difference to our daily lives on Earth as we continue to perceive in real time.

The real eyes of green plants are not to be found in the leaf green then. Yet, a plant will always grow in the direction of the light and a plant is always capable of making optimal use of the light to benefit all of its leaves. This means that they see light and react to it by growing towards it.

The connection that sets all this in motion is a protein by name of Flavine which can be found in all green parts of plants. Flavine sees light best at 380nm (hardly visible as blue) and is therefore called a blue light receptor. Lamps for indoor plants possess extra blue light particles that stimulate Flavine production.

The plant appears to have a complete eye system in that it is constantly measuring which direction the light is coming from so that all the leaves get a chance at the light or whether adjustments have to be made. But it are not only the green parts of plants, the roots can see too. In an earlier article I showed a drawing of a potato in a box, closed off from the outer world in a sort of labyrinth. And we were surprised to see that the potato sprout made its way directly through the labyrinth towards the light. This indicates that the sprout could still trace a trail of light.

Even a seed in the ground will not germinate in any old direction but always starts off growing in the opposite direction of the light. This allows for the green parts to start growing up while the roots start to take a firm hold. See the illustration 'Symmetry of the plant'.

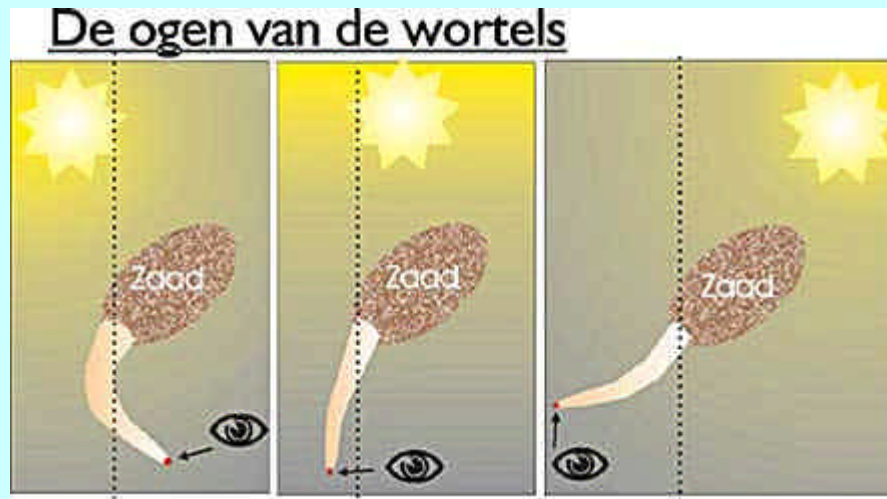
This means that the root can see where the light is coming from and which direction the green parts are going to grow in. See the illustration 'The eyes of roots'.

The tips of all the roots have eyes which are highly light sensitive at 250 micrometer (=0,25mm) but at 1mm they are already completely blind. They can catch flashes of light that manage to penetrate the ground. Because only blue and UV light contain enough speed and energy to penetrate the soil or

other growing substrate, the roots are attuned to receiving blue and UV light. Just a couple of brief light flashes is enough to let a germinating sprout know which direction to go or for the roots to know to grow in the opposite direction. It is important therefore that a growing medium is never totally closed off from the light and that the medium itself should be dark enough to ward off green algae. In order for a plant to achieve optimal balance, the roots should not be entirely covered. The correct signals increase the harmony for the whole plant.

### Messages from light cycles

Everyday, the Sun rises and sets. We are all attuned to this light rhythm. Every living being has a built in clock that relative precisely keeps to a twenty-four hour cycle. This clock is checked daily against incoming light and dark periods. It is also regularly maintained and if necessary, corrected.



The plants clock decides the growth and flowering periods of many plants. As most readers are aware that with the Cannabisplant, the clock has been genetically set to start the flowering period once the days shorten and the nights get longer. In places where they are indigenous, this change of light indicates that autumn and winter are approaching and it is getting time to be making seeds.

With hemp plants, the critical threshold to the flowering period is reached when there is 12 hours of light and 12 hours of dark. Should the plant receive more light than this, it will continue with the growth phase. To ensure that growing hemp plants do not go into the flowering period it is possible to work with artificial light and so create 18 hours of light with 6 hours of dark. This method can be justified in the cultivation of Cannabis, but in chrysanthemum cultivation where each plant is only worth a few cents, cheaper methods have been discovered.

The chrysanthemum is also directed into flowering through the length of available daylight. Just like hemp, chrysanthemums start to bloom once the days are shorter than the nights. Chrysanthemums require 15 hours of daylight in this critical period. If these plants receive less than 15 hours of daylight (or more than 9 hours of night rest, they will start to blossom.



In glasshouses where autumn and summer collections are being prepared, the springtime brings ideal but unwanted blooming conditions (long nights and short days). When cultivating these plants, it is far too expensive to use artificial light to maintain daylight for a period of 15 hours.

Because an unbroken nightrest is more important to a plant when dealing with the light available for

grow or bloom phases, disturbing the night rhythm can effectively stop the flowering phase. In chrysanthemum production, the night rest is disturbed with one hour of light. In this way, the flowering period is held back and the plant gets the chance to just grow, despite the short days. See illustration 'Using disturbance light in chrysanthemum cultivation'.

The plants will not grow so well under these conditions because photosynthesis is limited and fewer sugars are built up. A lot of growth is not necessarily always desirable.

In Cannabis cultivation, this would mean that the first plants could be placed in a warmed glasshouse in February already. In a warm country a warmed greenhouse would not even be needed, even if the days were short and the plants naturally wanting to flower. All one has to do is disturb the dark period every night. A circulation lamp of 25-75 watts, burning above the plants for one hour, preferably in the middle of the night, is sufficient to prevent the plants from going into flowering. In this way the plants will remain in the growth phase throughout the short days of February.

The actuality of the effects of disturbing the flowering phase with light within cannabis cultivation still has to be tested.