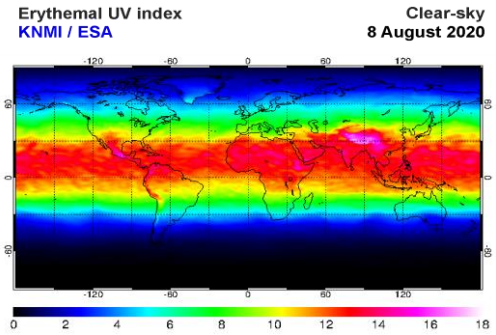
SUN PROTECTION FOR PLANTS

Not only humans and animals suffer from sunburn, plants also endure sunburn if the concentration of sunlight is too high. Plants protect themselves by stopping processes such as photosynthesis and withdrawing energy from the leaves and fruit. This causes damage at an early stage. For example, because no new leaves are produced, there is no recovery. Damage to the cell walls cannot be repaired by the plant.

UV radiation from the sun is capable of damaging the leaves and fruit of almost any plant. UV can be divided into: UVA- (320-400nm), UVB- (290-320nm), and UVC- (<290nm) The longer the wavelength, the better the radiation penetrates, but the less damaging due to its lower energy. Of all the UV radiation passing through the atmosphere, about 5% is UVB radiation and 95% is UVA radiation.



Sunscreen as we know it includes inorganic filters such as titanium dioxide (TiO2) and zinc oxide (ZnO). These work mainly by reflecting and scattering UV light on their surface. These materials are incorporated into sunscreens in the form of microparticles, and as they efficiently scatter and reflect UV light, a white appearance on the skin is avoided.

TiO2 and ZnO microparticles are non-toxic in human application as they do not penetrate the skin barrier. Even if they do penetrate, they disappear again through desquamation of the skin's outer layer. However, they can be toxic through oral ingestion or inhalation.

Like people and animals, plants are also sensitive to high concentrations of UV in the air. The effects on plants can be very different, depending on both the duration of exposure and the plant species. The effects on plants range from slight reversible disturbances of physiological processes to total destruction of almost all cells in a plant. The total destruction of a plant usually takes place when there is suddenly an extremely high UV concentration in a place that this is normally not the case. The plants are not used to it and cannot recover.

In the event of long-term exposure, the chlorophyll content of a plant may decrease; fading of the leaves and brown dots appearing on the leaves are the visible consequences. When the chlorophyll content in a plant decreases, photosynthesis is stalled, resulting in loss of production.

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Some plants that are sensitive to UV radiation than others:

Flowers:	Petunia, Carnation, Chrysanthemum
Trees and shrubs:	Poplar, Pine, Oak, Grape, Apple

In contrast to tropospheric ozone, where we prefer to keep concentrations as low as possible, the presence of stratospheric ozone is very important for all life on Earth. The ozone layer absorbs most of the harmful UV radiation; it is a protective shield around our Earth. Because the ozone layer is getting thinner, more and more harmful UV radiation reaches the earth. The increase of UV-radiation is not only harmful for humans and animals but also for all plants. Plant cells are damaged by increased UV radiation and as a result, photosynthesis and plant growth are reduced. And more so, the actual chemical composition of a plant can change due to continuous UV radiation exposure. The concentration of certain chemical substances, such as phenols, will increase after long-term exposure to UV radiation; this chemical adaptation gives the plant increased protection against UV radiation.

For a number of years, there has been a trend on golf courses to protect the grass from harmful radiation with products based on both titanium dioxide and zinc oxide.

Aqua Aid Europe has done its own research and has developed a new sun protection; **SOLAR**. This product is based solely on titanium dioxide and plant nutrients. After many tests, this combination proved to be very effective in protecting plants. Because no zinc oxide is used, this product is very future proof with regard to the future EU regulations.

Recent research has also shown that the use of zinc oxide in high concentrations or with regular use can cause damage to the plant.

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The most important advantages of **SOLAR**:

- **SOLAR** will protect the plant by filtering harmful UV and infrared light, protecting the plant from cell wall destruction, which can occur at high UV radiation levels.
- Because **SOLAR** contains plant nutrients, the plant will be stimulated to grow. The plant has energy to grow because **SOLAR** allows the required useful light through to the plant, while blocking the harmful radiation.
- **SOLAR** helps to improve the moisture balance within the plant. As the outer cells are protected against harmful UV radiation, the plant suffers less from transpiration in hot conditions. Allowing enough moisture to remain available in the plant so that less needs to be added - in tests this has led to water savings of more than 30%.

SOLAR is a liquid product which, in solution, can easily be sprayed onto the leaves of the plant. It is particularly necessary to protect trees and plants against UV radiation in the first growing phase. **SOLAR** leaves no residue in the environment and is 100% safe. In protecting plants by using a product such as **SOLAR**, an enormous contribution to sustainability is made. It often happens that young plants do not survive because we have had very sunny (dry) summers. **SOLAR** gives the chances of survival of (young) plants an enormous boost.

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