

Sunlight Management[®]

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INTRODUCTION

Sunlight management is the process of manipulating the sunlight quality and quantity to which plants are exposed. A new generation of agrotextiles has been developed and tested over the last 10 years. They allow the grower to choose both the duration of light as well as the particular wavelength that will produce the desired effect from the plants at all stages of development.

Albert Einstein won his Nobel Prize for describing the photoelectric effect. He proved that beams of light are made up of particles and wavelengths. He called the particles photons. He stated that we could neither affect nor measure both at the same time. Therefore, in order to manage light, we will need materials to affect the photons (light energy/intensity) and different materials to affect the wavelength (light quality).

There are currently three fabrics that manage photons and two fabrics that affect wavelength. For photon management, use aluminized, gray, and pearl fabric and to manage wavelength, use blue and red materials.

The aluminized fabrics are constructed from high-density polyethylene (HDPE) plastic tapes that are fused with aluminum and coated with UV inhibitors. These tapes are knitted together with the tapes twisted between each row of knots. Aluminized fabric manipulates light by reflection. It acts as a collection of tiny mirrors reflecting light photons in all directions at once. They also bring sunlight down to your plants over all daylight hours, thus increasing the photoperiod.

Aluminized knitted fabric is especially effective when placed over a greenhouse glazing such as poly. The mirrors maximize the perpendicular light needed to penetrate any greenhouse glazing. This increases the volume of light to which your plants are exposed, but more importantly, it is all usable light to the plants. The aluminized agrotextile has the added advantage of reflecting away heat in the daytime and blocking infrared from the ground at night, creating a thermo-reflective barrier of protection for your plants.

As an example, let's use the most recommended 50% aluminized material. It allows in 50% direct sunlight through the openings in the fabric. It reflects down 65% redirected light; the act of reflection breaks down the UV intensity. Full spectrum light beams down upon the plants from sunup to sundown. During midday the heat and light intensity are dispersed. This creates an environment of maximized photo-synthetic light in the greenhouse, as well as temperature control.

There are four light-managing fabrics in different colors. The elements that create their abilities are imbedded in the plastic. The manufacturer mixes elements and UV inhibitors into the clear HDPE plastic. The colors we see are not dyes, but are created by the imbedded elements. This is called color by subtraction. Most of the colors we see are from absorption. Plants are green because they absorb the blue, yellow, and red visible light that they need for growth and then reflect back the green visible light they do not use. Color by subtraction is caused by refraction. The beams of light that hit the material are refracted or bent to a particular wavelength.

The tapes that are stretched between the knots of the knitted fabric become sunlight filters. At the stated net percentage of 50%, there will be a direct sunlight block of 50%, but photosynthetic light will penetrate the fabric. This adds as much as 20% more light of the targeted quality. More importantly, a 50% rating on these nets is a close shading approximation for all daylight hours. With black shade cloth a 50% rating is the shade at geographic noon; during the rest of the day the shade percentage is higher. Therefore, light managing net puts more stress-free photosynthetic light onto the plants.

The gray material diffuses the photons. It scatters light through the crystalloid structure that is inside the net. This mimics tree canopy light — the light plants receive in natural shade. The most noticeable difference in your plant will be the increase in flush. You will see more branching and more foliage, with less stretch. It also creates a thermo-reflective barrier, causing cooler days and warmer nights for the plants. The gray material moderates temperatures and increases the photoperiod for all plants.

The newest addition to the light managing nets is pearl material, which disperses photons much like the aluminized fabric, but without the thermo-reflective barrier. The element inside the pearl fabric is responsible for the reflective properties. Your plants benefit from the extended photoperiod provided by this fabric. Trials have shown that full sun vines demonstrate rapid growth under this material.

The red and blue materials are pure wavelength management. That is, they manipulate the light spectrum that the plants see. Clouds block blue light and only allow the red light to penetrate. Therefore plants see more red light on cloudy or rainy days and more blue light when there are clear skies.

The blue material refracts all the light that penetrates its filters to blue light. Blue light mimics dry days or blue skies. The blue wavelength slows the rhythm of the plant. The plants will exhibit compact growth, deep green foliage, and excellent budding. The bloom will be delayed. Growers have been able to market their annuals as growth-regulator-free and still have a 3- to 4-week window to sell their plants before they bloom. When the budded plants are exposed to full sun, they bloom within 1 day. The blue fabric is very handy for any plant that needs a dry season trigger for desired results.

The red material refracts all the light that penetrates its filters to red light. Red light mimics rainy season light conditions. The red wavelength stimulates the growth of the plant. Many plants will show increased growth rate, greater root mass, longer stems, and early flowering. Propagators have enjoyed higher rooting percentages and healthier plants with less time in the greenhouse. Tropical foliage, especially palms, responds vigorously to red light. The red fabric brings out the best in plants that crave cloudy skies.

These sunlight management fabrics allow the grower to simulate an environment that brings out the desired characteristics in their plants. They can be used in combination, one on top of the other, to control day length and spectrum specifications. They have been installed in tandem, one next to the other, over and under different glazing to provide an even distribution of light over the plants. Many propagators have used the aluminized fabric over their roofs and red in the rafters to simulate spring light year around.

This new agrotechnology reduces light variables and decreases the growers' dependence on chemicals to produce quality plant material. Growers can now choose the quality and quantity of sunlight to which the plants are exposed.