



CMG GardenNotes #142

Plant Growth Factors: Light

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The quality, intensity, and duration of light directly impacts plant growth.

Light Quality

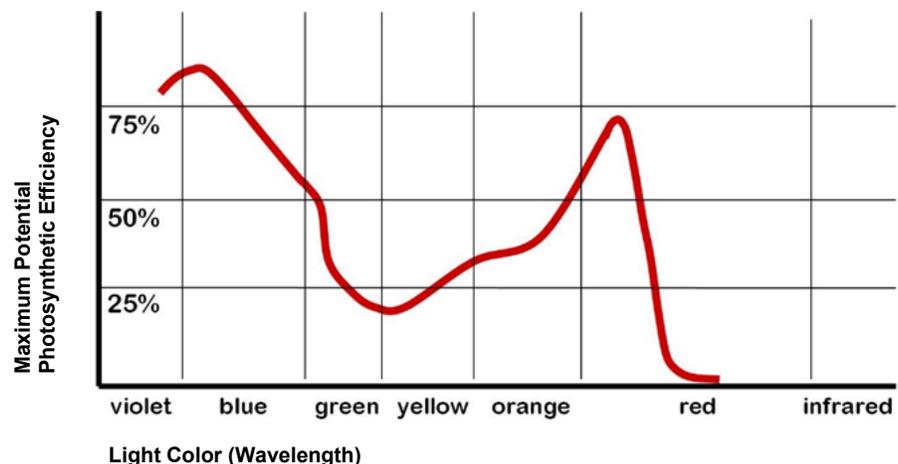
Light quality refers to the particular colors or wavelengths of light reaching the plant's surface. Visible light ("white" light) can be separated into the spectrum of colors familiar in the rainbow; each color of light is associated with particular wavelengths. [Figure 1]

Red and blue light have the greatest impact on plant growth – the particular energy of these wavelengths is what chlorophyll is able to capture best. Green light is least effective (plants appear green because the other wavelengths are more absorbed/used by the plants, leaving green to bounce back to our eyes).

Light quality is a major consideration for indoor growing.

LED lights are the most common lights available for indoor growing. For general use, bulbs that generate light in the 400-700nm wavelength range (blue to red) are effective for plant growth. Specialist and commercial growers can enhance the photosynthetically active spectra, but this is rarely needed in homes.

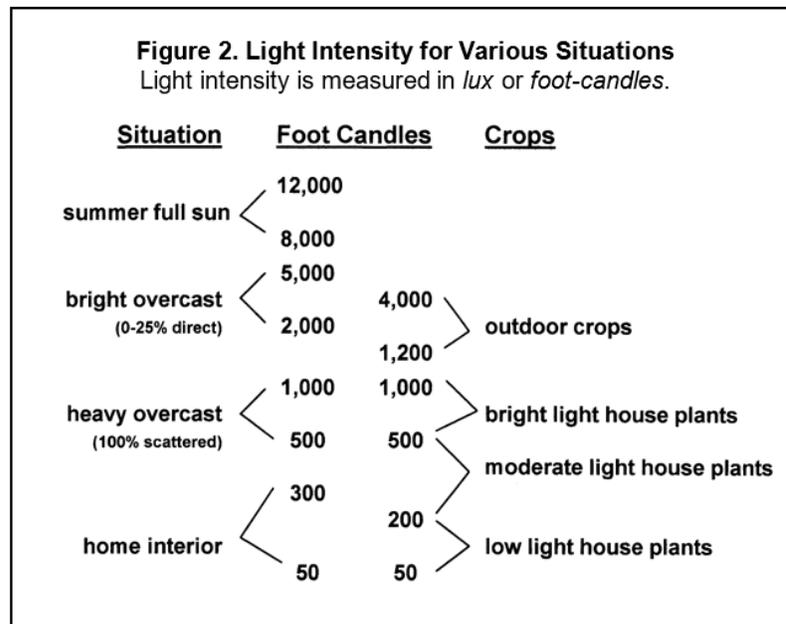
Figure 1. Relative efficiency of various light colors in photosynthesis.



Light Intensity

The more sunlight a plant receives, to a degree, the higher the photosynthetic rate will be. However, leaves of plants growing in low light readily sunburn when moved to a bright location. Over time, as the plant acclimates, it will become more sun tolerant.

As illustrated in **Figure 2**, light levels in most homes are below that required for all but low light house plants. Except for rather bright sunny rooms, most house plants can only be grown directly in front of bright windows. Inexpensive light meters are available in many garden supply stores to help the indoor gardener evaluate light levels (though importantly, do not distinguish among wavelengths, so cannot guarantee satisfactory plant growth).



Landscape plants vary in their adaptation to light intensity. Many gardening texts divide plants into sun, partial sun, and shade. However, the experienced gardener understands the various degrees of sun and shade:

Full sun – Direct sun for at least eight hours a day, including from 9 a.m. to 4 p.m.

Full sun with reflected heat – Where plants receive reflected heat from a building or other structure, temperatures can be extremely hot. This situation significantly limits the choice of plants for the site.

Morning shade with afternoon sun – This southwest and west reflected heat can be extremely hot and limiting to plant growth.

Morning sun with afternoon shade – This is an ideal site for many plants. The afternoon shade protects plants from extreme heat.

Filtered shade – Dappled shade filtered through trees can be bright shade to dark shade depending on the tree's canopy. The constantly moving shade pattern protects under-story plants from heat. In darker dappled shade, only the more shade-tolerant plants will thrive.

Open shade – Plants may be in the situation where they have open sky above, but direct sunlight is blocked during the day by buildings, fences, and other structures. Only more shade-tolerant plants will thrive here.

Closed shade – The situation where plants are under a canopy blocking sunlight, like under a deck or covered patio, is most limiting. Only the most shade-tolerant plants will survive this situation.

In hot climates, temperature is often a limiting factor related to shade. Some plants, like impatiens and begonias, may require shade as an escape from heat. These plants will tolerate full sun in cooler summer climates.

Light penetration is a primary influence on correct pruning. **[Figure 3]**. For example, dwarf apple trees are pruned to a Christmas tree shape. This gives better light penetration for the best quality fruit. Mature fruit trees are thinned each spring for better light penetration. A hedge should be pruned with a wider base and narrow top. Otherwise the bottom thins out due to the shade from above. A common mistake in pruning flowering shrubs is to shear off the top. The resulting regrowth gives a thick upper canopy that shades out the bottom foliage.

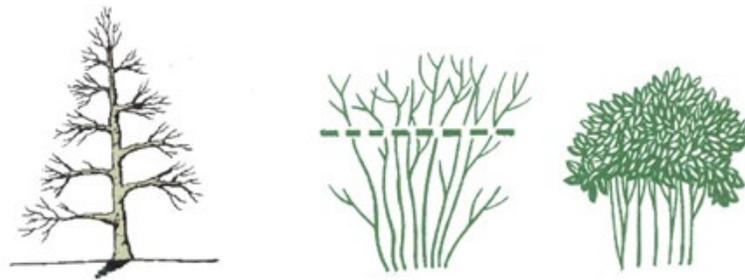


Figure 3. Light penetration is a primary influence in pruning.

Left: Dwarf apple trees pruned to a Christmas tree shape allow better light penetration for best quality fruit.

Right: Regrowth on flowering shrubs that are sheared on top creates/promotes heavy upper canopy growth. This shades out the bottom creating an unattractive “naked” base.

Light Duration

Light duration refers to the amount of time that a plant is exposed to sunlight. Travelers to Alaska often marvel at the giant vegetables and flowers that grow under the long days of the arctic sun even with cool temperatures.

Even so, plants are generally intolerant of continuous light for twenty-four hours. Many important physiological processes occur at night, including repair of photosynthetic mechanisms.

Photoperiod

The flowering response of many plants is controlled by the **photoperiod** (the length of the light period in twenty-four hours). Photoperiod response can be divided into three types. **[Figure 4]**

Short-day plants flower in response to long periods of night darkness. Examples include poinsettias, Christmas cactus, chrysanthemums, and single-crop strawberries.

Long-day plants flower in response to shorter periods of night darkness than daylight. Examples include asters, California poppies, and spinach.

Day-neutral plants flower without regard to the length of the night, but typically flower earlier and more profusely under long daylight regimes. Day neutral strawberries provide summer long harvesting (except during heat extremes).

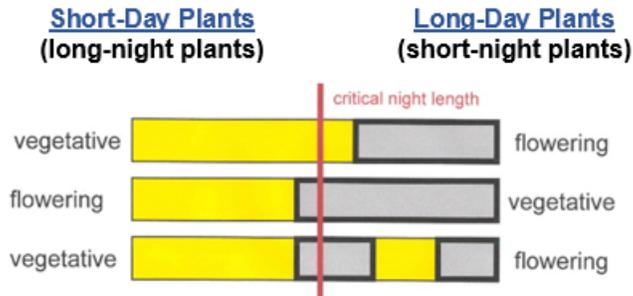


Figure 4. Photoperiod and flowering.
Left side: Short day plants flower with uninterrupted long nights.
Right side: Long-day plants flower with short nights or interrupted long nights.

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