

Growing Seedlings Under Lights

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Many farmers and homeowners grow their own seedlings for transplant. Doing this indoors can save the cost of buying, heating and maintaining a greenhouse. Doing it indoors, however, also requires the use of artificial lights. Knowing how to use artificial lighting to grow seedlings can be challenging. This fact sheet will address some of the questions and challenges about growing seedlings with artificial light while helping to understand light and how it is perceived and used by a plant.

First, one quick bit of science: light acts both like particles and like waves. What this means for us is that:

1. We can count the particles (called photons), and
2. We can measure the waves. We measure them by how long they are (called wavelength). We see the different visible wavelengths as different colors, and we see all the visible wavelengths mixed together as white.

Light Requirements For Plants

A plant's need for light can be thought of like a bucket being

In this analogy, different light sources (whether the sun or lamps) put out different quantities of light. A tomato seedling may have its light bucket filled for the day in just five hours in full sun, whereas the same plant may need 22 hours of a fluorescent light, just because there are so many more photons coming out of the sun every second than out of the fluorescent light.

A source can give too much light every second, too, like trying to fill the bucket in a few seconds with a fire hose; the plant can't use that much water at once and most of it is wasted, perhaps even damaging the plant. How much light the light source gives every second is called the light Intensity. We measure Intensity as the number of photons that hit a square meter every second, and we count the photons in moles.

To take our bucket analogy further, imagine that there are things coming out of the "hose" (light source) other than water, say, mud particles. The plant can only use the water and not the mud, so if the hose gives a lot of mud it needs to run longer to put out the same amount of water as one that has less mud.

Plants use some wavelengths of light very well, other wavelengths not so well, and other wavelengths not at all. If a light source has mostly wavelengths that a plant can use well, it will require less time to fill the plant's "light bucket" than a light source of the same intensity with a lot of wavelengths the plant can't use.

How much of the light in the wavelengths that is useful to plants is called the light Quality. The Intensity of a light, within the wavelengths that a plant can use, is called "Photosynthetically Active Radiation" (PAR) (also known as "Photosynthetic Photon Flux Density" or PPFD) and it's what we measure with a horticultural light meter.

For the last thing we'll add to our bucket analogy (and this one is a bit harder to imagine), imagine that the bucket could tell how long the hose was running, and use that information to determine what time of year it was. If the hose was running for 15 hours a day in New Hampshire, the bucket assumes it is in June. When the hose only runs for nine hours a day, the bucket assumes it is in December. This is completely separate concept from how long it takes to fill the bucket; it's all about what time of year it is.

A plant could have a very poor quality, low intensity lamp shining on it for 15 hours per day and still not have enough DLI, despite "thinking" that it was June. Anyone who has kept a poinsettia in a living room has seen this: running a television on a poinsettia at night in October is enough light to make the poinsettia "think" it is June and refuse to flower, even though there is not enough light coming from the television to grow a healthy poinsettia.

How long the plant is being lit between dark periods is called Daylength. Daylength is used by the plant to tell what time of year it is, and mostly relates to flowering and fruiting responses. It isn't terribly important for the production of most seedlings, except for things that need to be kept in a growing phase before they enter a flowering phase

Did You Know?

The Intensity of a light, within the wavelengths that a plant can

(like begonia, poinsettia and cannabis).

When Extension gets questions about light from people growing seedlings indoors, often the question is about Quality (“should I use a grow light instead of a shop light?”) when the focus should really be on quantity, or DLI. Most seedlings can be grown to transplant stage with high quality T8 four- bulb fluorescent “shop lights,” but the lamps need to be kept close to the tops of the seedlings (less than one foot away) and these lights need to be run for 22 hours to get the DLI ideal for seedling growth of sun-loving plants.

A fancy purple horticultural LED (which is actually a combination

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