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## Optimal Management of Lighting and Irrigation

by Isabelle Lemay, agr. and Melissa Leveille | 2010-06-01

Water and light are essential to plant survival and should be the elements that receive the most focus in an indoor garden. Because these needs are periodic, lighting and irrigation systems activated at specific and well-calculated times can be helpful in satisfying your plants' needs. This is what makes the use of timers interesting: timers optimize the management of these systems, resulting in better yields, all the while reducing the gardener's work. The following article presents the importance of properly determining lighting and irrigation in the garden, and gives a glimpse of the different timers available on the market.

### A perfect amount of light

Satisfying plants' need for light involves much more than turning garden lamps on and off. For optimal growth, plants must be exposed to proper lighting, a detail that involves three factors: the quantity of light, its composition and photoperiod.

### Quantity and composition

Light is essential to the process of photosynthesis, during which the plant converts light energy into chemical energy for plant growth. To reach a maximum level of photosynthesis, the quantity of light must specifically correspond to the needs of the species being cultivated. The lack or excess of light are both detrimental, which is why it is important to find a happy medium. Too little light causes plants to wilt, and results in long and fragile stems, as well as pale, abnormally developed leaves. On the other hand, too much light slows growth: stems cease to lengthen and the already pale leaves fail to broaden.

The quantity of light is based on the intensity and the duration of the lighting. The intensity depends on the lamps used and on their position in relation to the plants. Deciding on what is appropriate in a given situation is a matter of asking a few questions when purchasing a lamp and following lamp installation instructions. For the period of lighting, the duration leading to optimal yields varies from one species to another. It may be, for example, 16 hours for tomatoes, lettuce and the majority of annual flowers, and 20 hours for cucumbers, peppers and cut roses.



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The quality, or composition, of light also has a significant impact on plant development and growth. Light is composed of electromagnetic waves. Seeing as plants only use certain wavelengths, and certain wavelengths favor growth whereas others favor flowering, the type of light available to plants has a direct influence on plant development. Before getting a lamp for the garden, it is therefore a good idea to make some inquiries at your local indoor gardening store.

### The influence of photoperiod on flowering

The term 'photoperiod' refers to the relationship between the length of the day (light phase) and the length of the night (dark phase). In nature, photoperiod is based on a 24 hour cycle and varies according to latitude and the seasons. Whether the plants grow in a natural or an artificial environment, photoperiod affects certain aspects of development, including dormancy, germination and flowering.

Ideal flowering conditions vary from species to species. Certain species acquire the ability to flower autonomously once mature, whereas others require an external stimulus. This stimulus may be temperature, relative humidity value or a specific photoperiod, or even a combination of all of these factors. Plants whose flowering is influenced by photoperiod are classed into two categories: short-day plants that only flower if the duration of the light phase is shorter than a given critical threshold; and long-day plants that flower only if the light phase is longer than a given critical threshold. In fact, it's not really the length of the light phase that's important for flowering, but rather the length of the dark phase. The number of consecutive hours

of darkness is crucial; a simple flash of light during the dark phase could prevent flowering. It's as though interrupting the 'night' simulates a longer day. The number of cycles, or rather the number of complete days (night/day), necessary to stimulate flowering varies according to the species and the age of the plant.

### Lighting control

As one of the gardener's essential tools, a timer is inexpensive and assures the regularity of lighting duration. Certain timers are programmed according to the time of day (ex. lamps turned on between 8 a.m. and 8 p.m.) whereas others are cyclical (ex. 12 hours of light followed by 12 hours of darkness). Cyclical timers are particularly interesting if one wishes to program cycles other than those based on 24 hours. Certain gardeners cultivate according to 18 hour cycles, for example, alternating 12 hours of light and six hours of darkness.

Before using a timer, it is important to check the wattage it can handle. If need be, it is possible to add an electric distribution module to obtain more power. Timers, protection devices or electric distribution modules that allow the user to program a start-

up delay in case of a power failure, are also available on the market. This kind of protection is essential if the lamps being used are not to be turned back on once hot, which is the case for high pressure sodium vapor lamps, in particular.

## Water, the spring of life

It's no secret that water is essential to plant survival. Without water, plants wither and close their stomata in order to protect themselves. This inevitably results in a decline in photosynthesis (and therefore in growth), and sometimes in death. An excess of water can be equally harmful: this lowers the quality of the yields, gives rise to a lack of oxygen at the roots and promotes the development of root diseases. The need for water varies according to several factors, including plant age, the size of the growing container, physical properties of the substrate, temperature, humidity and ventilation. The garden's irrigation system must take all of these factors into account, and the quantity of water provided must be regularly adjusted to meet the plants' changing needs.

In the specific case of hydroponic cultures, a high-performance irrigation system is an essential prerequisite. Plants cultivated on artificial supports and nourished with nutrient solutions call for more frequent irrigation than those grown in the ground, due to the smaller size of their containers, and the fact that their substrates dry up more quickly. Most irrigation systems run intermittently, meaning they irrigate frequently and for short periods of time. This is the case in aeroponics, drip irrigation and sub-irrigation (ebb and flow system). Regardless of the type of irrigation chosen, automation is necessary in hydroponic cultures, in order to avoid continuous visits to the garden.

## Automating garden irrigation

An easy and affordable way to control one's irrigation system is to connect a timer to the pump; when well regulated, the timer stabilizes and standardizes the watering without any additional work for the gardener. Stable conditions created in this way promote more abundant yields! As is the case with lighting, irrigation timers can be programmed according to the time of day or to cycles.

In hydroponics, the use of a timer based on the time of day does not always offer the flexibility necessary for the numerous irrigations required each day. These timers are often limited to a maximum number of start-ups per 24 hour period, and to a minimum running time that is longer than necessary (i.e. 15 minutes).

Cyclical timers are usually more suitable; they generally allow an undetermined number of irrigations per day, at regular intervals, for regular lengths of time. Some cyclical timers designed for irrigation also have the advantage of being able to detect the presence or absence of light. This therefore allows the gardener to program irrigation cycles which run in the presence of light only, as well as to program a different cycle altogether for periods of darkness. Some models even offer running times as short as five seconds.

## A combined timer for lighting and irrigation

What if there was a multi-timer capable of controlling both lighting and irrigation cycles right down to the very second? We will soon see this type of timer on the market. It will have numerous advantages, including perfect coordination of lighting and irrigation. And why not go a little further with a "super timer" that offers practical protection options for the plants and the facilities in case of a pump breakage, a power shortage, a low level of nutrient solution, overheating of the growing environment or any number of other things! Keep an eye out; this timer could be available sooner than you think.

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