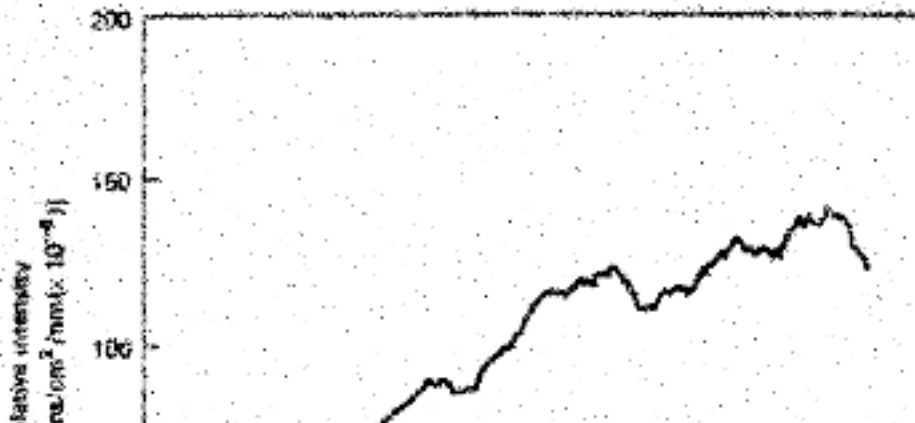


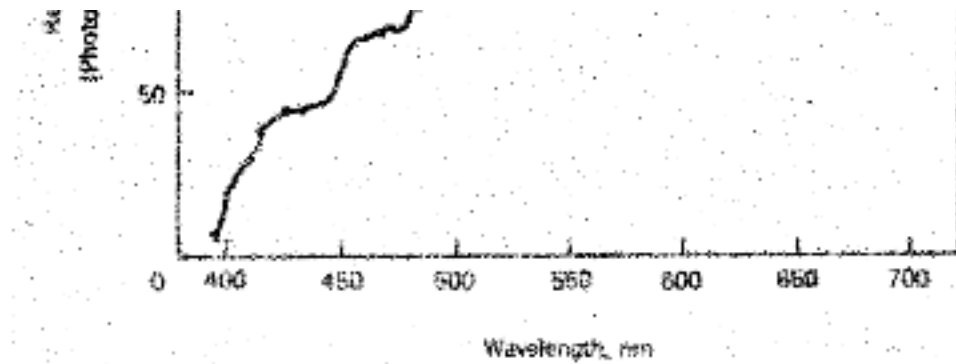
External Factors that Influence Plant Growth: Light

Effects of Moonlight and Artificial Lights on Photoperiodic Behavior

Light intensities as low as 0.1 lux (approximately 0.01 ft-candle) during the night can influence photoperiodic time measurement in many plants and animals. Yet the intensity of light from a full moon on a cloudless night may reach 0.3 lux at latitude of 50', and more than three times this value in tropical regions (Fig. 12-20). This fact led E. Bunning and his colleagues to inquire whether moonlight can disturb time measurement. Surprisingly, their investigations revealed that some plants have adaptive mechanisms that apparently prevent moonlight from interfering with photoperiodism.

You will recall that photoperiodic perception occurs in the leaves. In the leguminous plants soybean, peanut, and clover, steep movements change the position of the leaves from horizontal during the day to vertical at night. This behavior reduces the intensity of light falling on the leaf surface from an overhead lamp (an "artificial moon") by 85 % to 95 %, to an intensity below threshold for interference with time measurement. In some nyctinastic plants such as *Albizzia*, *Sainanea*, and *Cassia*, leaflets not only orient vertically at night, but also rotate on their axes so that paired leaflets fold together, with the upper surfaces shading each other, an interesting behavior in view of the fact that the upper surface is more sensitive to light breaks than is the lower surface.





The spectrum of moon light, recorded at Eniwetok, 0200 hr., August 20, 1970. The moon was 15° from zenith. Note that the spectrum peaks near 660 nm. (Adapted from Munz and McFarland, 1973, Vision Res. 13:1829-1874,).

Some short-day plants flower most prolifically when grown with low intensity light (approximately 0.5 lux) rather than complete darkness during the night. In these plants, moonlight probably increases the number of flowers produced by a short-day regime. Although it is not clear why low light intensities promote flowering more than darkness, these examples provide some rational basis for the superstition of planting particular seeds by the light of the full moon. Another full moon one lunar cycle later could have profound promotive effects on flowering. Street and house lighting, on the other hand, can disrupt important photoperiodic controls in many plants. For example, they can retard the induction of dormancy in rhododendron, dogwood and other trees and shrubs, thereby decreasing the chances for survival during harsh winters. Lamps that maintain a high P_{fr} level because they are rich in red wavelengths are particularly disruptive, a fact which should be considered when installing outdoor lighting facilities.

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