

Dr. John M. Arthur, of the Boyce Thompson Institute, has also learned other new facts about light and how much of it and what kind plants need to promote their best growth.

Just Enough Daylight Can Be Blamed For August Hay Fever

Physics—Botany

IF YOU have hay-fever and started to sneeze in the last week or so, it was because the days are now 12 to 15 hours in length. This curious fact has been brought out in a radio talk given under the auspices of Science Service through a nation-wide network of the Columbia Broadcasting System by Dr. John M. Arthur, biochemist of the Boyce Thompson Institute for Plant Research at Yonkers.

Speaking on the subject of "Light and the Green Plant," Dr. Arthur described experiments of growing various plants under artificial illumination. In some experiments electric light was used entirely, and in others it was used as a supplement to daylight.

"The length of day affects flowering whether sunlight or artificial light is used as a light source for growing plants," he said. "That is, long day plants such as lettuce and radish which normally flower in the early summer, flower on day lengths greater than 12 hours. Everblooming types, represented in these experiments by buckwheat, flower on all daylengths from five hours to 24, while the height of the plant increases regularly with daylength. Short day plants which normally flower in the fall, such as salvia and ragweed, flower on short days of 12 to 15 hours or less. Many victims of hayfever have no difficulty in recalling that they normally start to sneeze on or about August 15 each year when the ragweed comes into flower. These unfortunates are indirectly attuned to daylength."

All Kinds of Light Needed

Dr. Arthur has also found that no single constituent color of sunlight is adequate for proper plant growth.

"In order to test some of the effects of light quality several species of plants were grown in a greenhouse covered with a red glass filter which transmits none of the blue region of sunlight," he stated. "These plants

very much resembled those grown in a dark basement except that the green pigment, chlorophyl, developed. The stems were very long and weak and the leaves were narrow and thin with a tendency to roll from the midrib towards the margin. Similar plants grown in another greenhouse covered with a blue glass which transmits no red were small plants, normal in appearance except considerably dwarfed. Neither the red nor the blue region of sunlight is sufficient to grow normal plants. Some light energy from both ends of the spectrum is required."

Despite the importance of the invisible, short wave ultraviolet light in the growth of animals, including man himself, his experiments reveal no improvement in the growth of plants under these rays. "We have yet to find any distinct advantage to the plant in growing it under a glass which transmits the extreme ultraviolet region of sunlight," he declared.

Inefficient Electric Lamps

"The visible region of sunlight is most important in the unique process of green plants, photosynthesis," said Dr. Arthur. "Approximately 45 per cent. of the total energy of sunlight is in the visible region. For this reason sunlight is a more efficient light source for growing plants than the ordinary Mazda lamp which has only four per cent. of its light output in the visible region. The energy of sunlight is absorbed by green leaves and used to build up carbon compounds such as starch, sugar, cellulose and wood out of carbon dioxide from the air and water from the soil. This process is not efficient. It has been estimated that less than one per cent. of the total energy of sunlight falling upon the leaf is used. Yet inefficient as it is, this process is the ultimate and sole source of energy for our food and fuel supply.

"Most of us unthinkingly regard sunlight as a more or less constant value. When we observe the brilliancy of a battery of electric flood lights the first question we ask is: 'How does this compare with sunlight?'"

More Constant Than Sunlight

"The answer is, of course, that the lamps do not compare with sunlight. Electric lamps in general are infinitely more constant. Sunlight varies in both quality and intensity from minute to minute, day to day, and season to season. Yet all these variations have limits and we realize that plants somehow manage to grow within these limits. We might conclude from this that plants are insensible to wide variations in light quality and intensity, or even that they will grow in about any quality or intensity. Only by exceeding the limits of intensity, quality and duration ranges of sunlight can one be convinced that after all, the plant not only is not indifferent to these changes, but is attuned to some of them and is easily injured whenever the natural range is greatly exceeded in any direction."

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Sun Spots Fewer

SPOTS on the sun are now declining in number, and the minimum of the present cycle will probably occur in 1934, it is indicated by records gathered by Science Service.

From November 1929 to January 1930 was a time of considerable activity, but from March to June there was a considerable decline. In July, however, the numbers increased somewhat, but this is believed to be just one of the "ups and downs" over short periods that occur inside the eleven year cycle.

Astronomy

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