

WHY THE SECRET OF BLUE BEGONIAS CAN IMPROVE ENERGY EFFICIENCY

Adapted from an article by Dr. Tim Sandle

Considering why blue begonias survive at the ground level of a rainforest, where there is little sunlight, has helped to unlock a process that could lead to improved energy efficiency on an industrial scale. The discovery was made from a research collaboration between the Universities of Bristol and Essex.

Begonias, which are also common houseplants, work at the nano-level through the use of photonics. This process enables the plant to create structures in their leaves that help them to harvest light for photosynthesis. One reason begonias are popular as houseplants is because the plants do not require direct sunlight.

Begonia is a genus of perennial flowering plants in the family Begoniaceae, and there are almost 2,000 species worldwide. Most species come from tropical regions. Within the variety, it is the blue begonia that has sparked interest among physicists and biologists.

The lead researcher, biologist Dr. Heather Whitney of the University of Bristol, found the leaves of the blue begonia only develop their characteristic blue sheen once the plant is placed in near-dark conditions. Once the plant is placed back in bright light, the sheen slowly disappears.

Looking into this further, the researchers discovered that individual chloroplasts in these leaves reflect blue light brightly, much like a mirror. It was found there was a significant difference between the blue chloroplasts found in the begonias (termed “iridoplasts”) compared with chloroplasts present in other plants. While normal chloroplasts absorb blue light and reflect green light, the iridoplasts in blue begonias reflect most of the blue light from sunlight and absorb the residual green light that filters through to the forest floor.

Using electron microscopy, the researchers found that the structure of iridoplasts resembled the artificial structures used to manufacture miniature lasers and other photonic structures that control the flow of light. Applying knowledge of these lasers led to the further discovery that the differences between iridoplasts and normal chloroplasts related to the arrangement of the inner structure and thickness at the nano-level.

The final piece in the jigsaw came when researchers at the University of Essex studied the rate of photosynthesis in these iridoplasts compared with normal chloroplasts and found that in very low light levels, the iridoplasts performed more efficiently.

The way blue begonias work can offer clues for improving artificial photonic structures by more efficiently harvesting parts of the electromagnetic spectrum that are not absorbed. The discovery marks the start of a new realm of energy research and could one day lead to more efficient electronics.

The research has been published in the journal *Nature Plants*, and it is titled “Photonic multilayer structure of Begonia chloroplasts enhances photosynthetic efficiency.”

Sources

Jacobs, M., Lopez-Garcia, M., Phrathep, O.P. et al. (2016). Photonic multilayer structure of Begonia chloroplasts enhances photosynthetic efficiency. *Nature Plants* 2, 16162. <https://doi.org/10.1038/nplants.2016.162>

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