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By Michael Barker

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Coloured lights 'boost plant control'

Breakthrough research indicates optogenetics could be a major new tool in improving crop yields and performance



Photo: Ben Miller

Scientists have found a way to control different plant processes – such as when they grow – using nothing but coloured light.

The development, published this week in the journal *Nature Methods*, reveals how coloured light can be used to control biological processes in plants by switching different genes on and off.

The researchers hope that their findings could lead to advances in how plants grow, flower, and adapt to their environment, ultimately allowing increases in crop yields.

The research was led by Heinrich Heine University and the Cluster of Excellence on Plant Sciences (CEPLAS) in Düsseldorf, in collaboration with colleagues at the University of Freiburg and the University

of Freiburg, who have been working on optogenetics – using light to precisely control biological processes – in plants.

“Using optogenetics in plants hadn’t been possible before because plants naturally respond to light as they grow. Any genetic switches controlled by light would therefore be constantly active.

“But we have developed a special system which overcomes this problem and allows us to control different cellular processes in plants using light. We can now use a red light to cause gene expression at a precise moment, while an ambient white light can be used as an ‘off switch’ to reverse the process. This can be repeated any number of times.

“We can use this system to manipulate

The project bridges two hot topics in biology – optogenetics and synthetic biology. The new tool called PULSE (Plant Usable Light-Switch Elements) is suitable for plants growing under normal day and night cycles.

Miller continued: “In the future, this research might mean that we can modulate how plants grow, and respond and adapt to their environment, with light cues.

“For example, we have shown that plant immune responses can be switched on and off using our light-controlled system. If this system was used in crops, we could potentially improve plant defences to pathogens and have an impact by improving yields.

“Using light to control biological processes

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of East Anglia (UEA).

Dr Ben Miller, from UEA's School of Biological Sciences, said: "Our team have

physiological responses in plants, for example their immune response, and perhaps their development, growth, hormone signalling and stress responses."

is far less invasive and more reversible than using chemicals or drugs, so this new system in plants is a really exciting new tool for us to answer fundamental questions in plant biology."

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