

Research sheds new light on improving rice yields

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Credit: University of Nottingham

Light is essential for plant growth but getting the right amount for crops out in the field at the mercy of the climate is very difficult, now plant scientists have found a way to tackle this with the help of a protein that allows rice crops to regulate the amount of light they can safely use.

The research published in *Communications Biology* is the first to investigate high light regulation, known as photoprotection with a major food crop plant and shows that increasing amounts of a specific protein (PsbS) allows the plant to effectively regulate its intake of [light energy](#) into photosynthesis. This gives an effective way to sustainably increase grain yield and production, a discovery that could have a significant impact on global food security.

Balancing light intake

Plants need sunlight to survive and grow. However, just like humans they can receive too much light and also like humans they take steps to defend themselves. This is a problem for photosynthesis, - the process a plant uses to convert light energy into growth—which constantly needs to balance the harvesting of sunlight by chlorophyll with defensive mechanisms to prevent damage in high light.

The problem for plants that are rooted to the spot is that when light levels change they cannot move themselves in and out of sunlight so they have evolved a mechanism that senses when light is too high. They switch on a molecular valve that removes (or dissipates) energy harmlessly, they then rapidly switch this valve off when the light level falls again. This process causes energy to be lost from [plants](#) which reduces the photosynthesis rate and affects growth.

To combat this loss in energy the research team used a known regulator of photoprotection, a protein called PsbS to test how it affects crop yield in rice. They grew rice in simulated field conditions in glasshouses and also in specially designed LED light chambers and found that introducing higher levels of the protein PsbS resulted in greater photoprotection, greater [light](#) use efficiency and greater grain yield.

New targets for plant breeders

Dr. Erik Murchie is Associate Professor of Crop Science and is part of the Agriculture and Food Security research team and led the study along with Research Fellow Dr. Stella Hubbard Edwards. The team is looking for ways to enable increased production of high-quality, nutrient-rich food in a way which is sustainable and secure.

Dr. Murchie said: "Rice is hugely important for global food security, being consumed by around half the world's population on a daily basis who rely on it as an important source of calories. It has particular

significance in many developing countries and has been described as the world's most essential crop. When we improve basic plant physiology, as we show here, we will automatically provide a sustainable means to increase yield in any crop species because no further inputs of fertiliser or water are necessary.

Our work follows findings in model species to show that a substantial step change in crop yield is possible with such approaches and we provide exciting new targets for plant breeders and we are already working with globally important research institutes to achieve this."

More information: Enhanced thylakoid photoprotection can increase yield and canopy radiation use efficiency in rice. *Communications Biology*. DOI: [10.1038/s42003-018-0026-6](https://doi.org/10.1038/s42003-018-0026-6)

Provided by University of Nottingham

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