

Photosynthesis Olympics: Can the best wheat varieties be even better?

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CoETP/Centre researchers working in the field to find the best wheat varieties.
Credit: ARC Centre of Excellence for Translational Photosynthesis

Scientists have put elite wheat varieties through a sort of "Photosynthesis Olympics" to find which varieties have the best performing

photosynthesis. This could ultimately help grain growers to get more yield for less inputs in the farm.

"In this study we surveyed diverse high-performing wheat varieties to see if their differences in photosynthetic performance were due to their genetic makeup or to the [different environments](#) where they were grown," said lead researcher Dr. Viridiana Silva-Perez from the ARC Centre of Excellence for Translational Photosynthesis (CoETP).

The scientists found that the best performing varieties were more than 30 percent better than the worst performing ones and up to 90 percent of the differences were due to their genes and not to the environment they grew in.

"We focused on traits related to photosynthesis and found that some traits behaved similarly in different environments. This is useful for breeders, because it is evidence of the huge potential that photosynthesis improvement could have on yield, a potential that hasn't been exploited until now."

During the study, published recently in the *Journal of Experimental Botany*, the scientists worked in Australia and Mexico, taking painstaking measurements in the field and inside glasshouses.

"The results that we obtained from our "Photosynthesis Olympics", as we like to call them, are very exciting because we have demonstrated that there is scope to make plants more efficient, even for varieties working in the best conditions possible, such as with limited water and fertilizer restrictions. This means for example, that breeders have the potential to get more yield from a plant with the same amount of nitrogen applied," says CoETP Director Professor Robert Furbank, one of the authors of this study.

Photosynthesis—the process by which [plants](#) convert sunlight, water and CO₂ into [organic matter](#)—is a very complex process involving traits at different levels, from the [molecular level](#), such as content of the main photosynthetic enzyme Rubisco, to the leaf, such as nitrogen content in the leaf and then to the whole canopy.

"This work is an important result for the CoETP, which aims to improve the process of [photosynthesis](#) to increase the production of major food crops such as wheat, rice and sorghum. There is a huge amount of collaboration, both institutional and interdisciplinary, that needs to take place to achieve this type of research. Without the invaluable cooperation between statisticians, plant breeders, molecular scientists and plant physiologists, we would have never achieved these results," says co-author Tony Condon from CSIRO and the CoETP.

More information: Viridiana Silva-Pérez et al. Genetic variation for photosynthetic capacity and efficiency in spring wheat, *Journal of Experimental Botany* (2019). [DOI: 10.1093/jxb/erz439](https://doi.org/10.1093/jxb/erz439)

Provided by ARC Centre of Excellence for Translational Photosynthesis

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