Rubisco activase best clue for better photosynthesis in fluctuating light

February 11 2016, by Erik Toussaint

Scientists and plant breeders who are aiming to improve food production by improving photosynthesis in crop plants, would make a good choice if they chose to change the composition and concentration of the protein Rubisco activase. In conditions where light intensity changes often and strongly, Rubisco activase is an important limiting factor in boosting the photosynthesis process when light suddenly increases. Elias Kaiser, crop physiologist at Wageningen UR, publishes this new insight in his PhD thesis that he will be defending at Wageningen University on 15 February 2016.

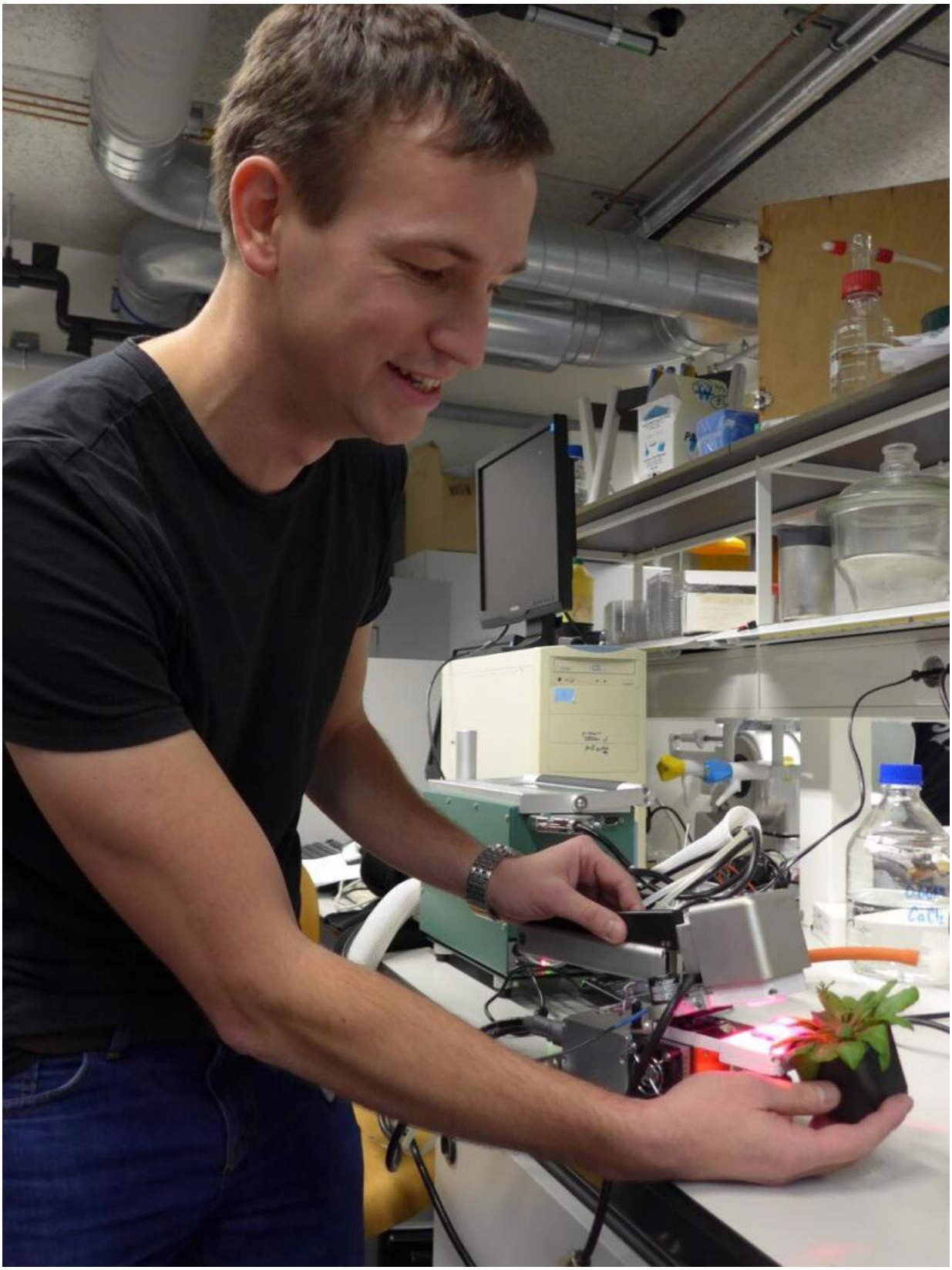
Plants and algae are the basis of life on our planet, thanks to their photosynthesis process. Plants capture sunlight and use that source of energy to produce carbohydrates. In this process the plant uses carbon dioxide and produces oxygen. The carbohydrates produced allow plants to grow, thus producing food for other organisms.

Therefore, plants are very important in feeding the world. The world population is expected to grow to some 9 billion by 2050. That is why food production and food distribution need to be very much improved.

Scientists all over the globe are now trying to further improve the photosynthesis process in order to increase food production. For that improvement finding limiting factors is a crucial step. When scientists and plant breeders will be able to eliminate one or more of these limiting factors, it may get feasible to develop crop plants that grow faster and produce more food.

Elias Kaiser studied factors that limit photosynthesis under fluctuating light conditions. In the field and in greenhouses irradiance incident on

leaves often fluctuates, due to the movement of leaves, clouds and the sun. Plants need to respond to these fluctuations by adapting biochemical processes in their leaves. These adaptations take time. Kaiser wanted to know whether it would be possible to shorten the adaptation period. That could enable plants to use the sunlight more efficiently.



Several potentially important limiting factors were chosen by Kaiser. He studied tomato and Arabdiposis thaliana plants and combined his laboratory research with the use of computer models that describe and predict photosynthesis.

Kaiser: "The concentration and composition of Rubisco activase are potentially attractive factors to improve the pace with which plants can adapt their photosynthesis during fluctuating light conditions. Differences in the Rubisco activase concentration and form, result in different capacities to quickly adapt to increased light. I expect that species with higher Rubisco activase concentrations and altered composition or three dimensional shape can be made available in crops. That makes it worthwhile to choose for this approach to further improve photosynthesis."

Provided by Wageningen University

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