New modified wheat could help tackle global food shortage

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Credit: University of York

Researchers at the University of York have created a new modified wheat variety that increases grain production by up to 12%.

Wheat is one of the most important food crops in the world, providing 20% of human calories; with ever increasing global food demand, increasing crop yield is critically important.

Wheat breeders work hard to increase yield to meet global demand, but since the 'green revolution' of the 1960s, the rate of yield increase has been slowing and is currently less than 1% per year.

Most improvements have been made by breeding varieties that produce higher numbers of grain, but it should also be possible to increase yield by producing plants with bigger grains. When this has been achieved, however, it is accompanied by a decrease in grain numbers.

Researchers at the University of York have now resolved this issue by directly modifying the growth of the young developing grain by increasing the amount of a protein that controls growth rates in plants.

This resulted in plants that produced grain that are up to 12% bigger than in the conventional variety. In field experiments conducted by their collaborators in Chile, they found that there was no decrease in grain number, resulting in an increase in yield.

Professor Simon McQueen-Mason, from the University of York's Centre for Novel Agricultural Products (CNAP) at the Department of Biology, said: "Experts predict that we need to increase global food production by 50% by 2030 in order to meet demand from population growth. The negative impacts of climate change on crop yields are making this even more challenging. While researchers are working hard to meet this challenge, there remains a lot to do."

"Attempts to increase the yield of wheat have been thwarted by the apparent trade-off between grain size and grain number. We decided to side-step this complex control system by giving a boost to the natural growth system that controls the size of plant tissues.

"We did this by increasing the levels of a protein called expansin, which is a major determinant of growth in plants. We targeted this

modification so that it was confined to developing wheat grain, and are delighted by the results."

Research partners at the Universidad Austral de Chile conducted field experiments that demonstrated the effectiveness of the plants under agricultural conditions.

The team are now looking at ways to make this research accessible to farmers and the wider industry to help inform their decisions on crop production.

More information: Daniel F. Calderini et al, Overcoming the trade-off between grain weight and number in wheat by the ectopic expression of expansin in developing seeds leads to increased yield potential, *New Phytologist* (2020). DOI: 10.1111/nph.17048

Provided by University of York