

## URLs

## PLANT GENETICS

## Tailor-made crop improvements

Tapping into natural allelic variation has always been an important means of crop enhancement. A recent study has now identified a new and powerful way of improving rice yield — by combining loci that increase grain production and plant height.

Starting from two rice varieties that were variable with respect to agronomically important traits, Ashikari and Sakakibara identified 4 QTLs for plant height (*Ph*) and 5 QTLs for grain number (*Gn*). *Ph1*, the strongest of the four height QTLs, turned out to encode gibberellin 20 oxidase. *Gn1*, on chromosome 1, accounted for 44% of the difference in grain production between the two varieties used.

*Gn1* contained two loci. Positional cloning of one of these, *Gn1a*, revealed that it encoded cytokinin oxidase/dehydrogenase (CKX). Sequence analysis of *OsCKX2* from several varieties revealed that in one variety, a small 11 bp deletion introduces a premature stop codon. Reasoning that perhaps a reduced activity of this enzyme would increase the grain yield, the authors created transgenic rice plants that express different levels of CKX. As expected, lower levels of CKX meant more grain. But how does it work?

*OsCKX2* is most abundantly expressed in inflorescence meristems and young flowers. As the *OsCKX2* relative from *Arabidopsis thaliana* reduces the number of flowers when overexpressed, the authors propose that the same mechanism operates

in rice — that low CKX levels lead to higher yield by increasing the number of flowers.

To capitalize on this valuable QTL, the authors combined it with a series of QTLs for other agriculturally desirable traits, such as plant height (a process known as QTL pyramiding). The practical application of this work is obvious — 23% of calories consumed worldwide come from rice. As the authors say, discovering and improving useful hidden plant traits and using this information in crop breeding “will pave the way for a new green revolution.”

Magdalena Skipper

### References and links

**ORIGINAL RESEARCH PAPER** Ashikari, M. & Sakakibara, H. *et al.* Cytokinin oxidase regulates rice grain production. *Science* 23 June 2005 (doi:10.1126/science.1113373)

**FURTHER READING** Zamir, D. Improving plant breeding with exotic genetic libraries. *Nature Rev. Genet.* **2**, 983–989 (2001)