

 TECHNOLOGY

# Breeding vigour backwards

Hybrid vigour is a desirable property in plants. However, hybrids cannot be stably maintained owing to the recombination that occurs during meiosis; they must be reproduced by crossing inbred lines. In a recent study, Wijnker *et al.* have shown proof of concept for reverse breeding, in which stable homozygous breeding lines can be produced from heterozygous plants, allowing future production of hybrids by crossing these lines.

To achieve this, the authors first had to prevent recombination. They used transgene-induced RNAi to knock down the recombinase DMC1 in the *Arabidopsis thaliana* Columbia accession, and using cytogenetic analysis they showed that despite the lack of crossing over, random segregation of the chromosomes in meiosis did occur. The authors then crossed these transgenic Columbia accessions with Landsberg *erecta* accessions to create reverse breeding F1 hybrid lines that produced haploid gametes carrying non-recombinant chromosomes.

The next step was to go from haploid gametes to homozygous diploid adults. The authors first crossed the reverse breeding F1 lines with a line that gives rise to haploid progeny by centromere-mediated genome elimination and then converted the resultant haploids into fertile diploids

by collecting the rare seeds that are produced after self-pollination of the haploids. Genotyping showed the complete absence of recombination in these homozygous lines. Importantly, these lines included plants that could be crossed to produce the original heterozygous hybrid lines.

It may be possible to apply reverse breeding for crop improvement, as it allows the predictable generation of desirable hybrids.

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**ORIGINAL RESEARCH PAPER** Wijnker, E. *et al.*  
Reverse breeding in *Arabidopsis thaliana*  
generates homozygous parental lines from a  
heterozygous plant. *Nature Genet.* 11 Mar 2012  
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