

## IN BRIEF

# SHAT1, A New Player in Seed Shattering of Rice

A major event in domestication of crops was the elimination of seed shattering, so that instead of falling to the ground, seeds stayed on the stalk until farmers could harvest them (Doebley, 2006). The *SH4* (for *grain shattering quantitative trait locus on chromosome4*) and *qSH1* (for *quantitative trait locus of seed shattering on chromosome1*) transcription factor genes are known to play key roles in the reduced shattering phenotype of cultivated rice (*Oryza sativa*). Zhou et al. (2012) identify an APETALA2 (AP2)-type transcription factor as also being important for seed shatter in rice through affecting seed abscission zone development.

To study the regulation of seed shatter in cultivated rice, Zhou et al. introgressed a wild-type chromosome 4 to create a now easily shattering line, called SL4. (Chromo-

some 4 carries the *SH4* locus that is active in the wild type and confers easy shattering.) They then mutagenized this line and screened for suppression of shattering, identifying two nonshattering mutants (see figure). Neither *shattering abortion1* (*shat1*) nor *shat2* formed normal abscission zones, and higher levels of force were needed to separate the seeds from the pedicel in both.

SHAT1 was identified as an AP2 transcription factor, the likely ortholog of *Arabidopsis thaliana* AP2, and was shown to be highly expressed in the abscission zone. *shat2* was found to be an allele of *SH4* and is now referred to as *sh4-2*. Whereas the *sh4-1* allele of domesticated rice has a base substitution mutation that results in a reduced shattering phenotype, *sh4-2* is a frameshift mutation that is apparently a null allele with

a much stronger, nonshattering phenotype. Based on the *SH4* expression pattern in the *shat1* mutant, *SHAT1* serves to maintain *SH4* expression in the abscission zone. Furthermore, *qSH1* appears to promote shattering by maintaining *SHAT1* and *SH4* expression in the abscission zone.

Thus, the authors have made use of a clever approach to discover a new factor involved in specification of the abscission zone of rice seeds, in the process elucidating the roles of previously known factors. The fact that the Q shattering gene of wheat (*Triticum turgidum*), like *SHAT1*, encodes an AP2-type transcription factor (Simons et al., 2006) suggests that the mechanisms of abscission zone development might be similar in seeds of these two important cereal crops.

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Panicles from the wild type (WT; SL4), the *shat1* mutant, and the *shat2* mutant. Right corner in the wild type shows the automatically shattering seeds. Bars = 1 cm. (Reprinted from Zhou et al. [2012].)

## REFERENCES

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