

Large-scale overexpression of *Brassica rapa* orphan genes (*BrOGs*) to screen useful genes related to specific traits and stress response

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Background

Orphan genes (lineage-specific genes, *LSGs*) are unique to a specific taxon, and are important for species-specific traits and stress responses. However, little is known about their functions in a given species. We identified *LSGs* in *B. rapa* (*BrOGs*) in previous study.

Methods

Here, a *BrOGs* over-expression (*BrOGsOE*) mutant library in *A. thaliana* were constructed, we have over-expressed 127 unknown function *BrOGs* from Chinese cabbage with randomly selection. Considering phenotype difference between Chinese cabbage and *Arabidopsis*, we focused on phenotypes of flowering time and leaf shape.

Results

Interestingly, a total of 61.42% mutants displayed visible phenotype variations. Observation of *BrOGsOE* mutants revealed that phenotype variations of *BrOGsOE* *Arabidopsis* lines showed Chinese cabbage specific traits, such as wavy, serrated, hairy, upward and downward curving leaves, numerous leaves. Flowering time variations are rich, especially delayed flowering, indicating that *BrOGs* caused delayed flowering time might be related to bolting tolerance of Chinese cabbage. Furthermore, *BrOG37*, caused a strong delayed flowering time phenotype, might played vital roles in bolting tolerance, and vernalization might suppress its function. Furthermore, 24 mutants with no visible phenotypes were treated with stresses, indicating that different *BrOGs* can have distinct roles in the response to pathogen and environmental stresses.

Conclusion

This work extensively elucidates the functions of *BrOGs*, and reinforces the idea that *BrOGs* are a valuable resource for identifying new genes related to species-specific traits and stress response.

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