Project Abstract

Project Title:	Genotype-independent Transformation in Barley	
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Efficient, high-throughput, and cost-effective transformation technology is key to functional analysis of genes underlying important agronomic traits. However, gene transformation has long been a bottleneck for gene cloning and gene-editing in barley. The spring variety Golden Promise has been one of few genotypes that can regenerate from immature embryo tissues mediated by *Agrobacterium tumefaciens*, but the genotype-dependence and technical challenges limit its broad-spectrum applicability for barley genomic studies. Therefore, an effective and genotype-independent transformation method is in need for barley functional genomics. Two strategies here are being proposed to improve transformation efficiency. First, with a broad host-compatibility, *A. rhizogenes*-mediated hairy root transformation is usually achieved with ease, and genotype-independent *A. rhizogenes*-mediated hairy root transformation have been widely used in both dicots and monocots, such as tobacco, maize, soybean, chickpea, and *Alstroemeria*. Moreover, transgenic plants have been obtained from *A. tumefaciens*-transformed hairy roots in some species, which provides a new perspective that using *A. tumefaciens* to overcome the hurdle of genotype-dependence in barley transformation. Second, a chimeric protein combining wheat GROWTH-REGULATING FACTOR 4 (GRF4) and its cofactor GRF-INTERACTING FACTOR 1 (GIF1) was demonstrated to significantly improve regeneration efficiency in common wheat, durum wheat, bread wheat, triticale, and citrus. The GRF-GIF chimera may be applied to barley as well.