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# Cultivation and progresses in gene editing of *Gracilariopsis lemaneiformis* (Rhodophyta)

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## Abstract

*Gracilariopsis lemaneiformis*, an important large-scale cultured red alga ranked 2nd as for biomass output annually only after that of *Saccharina japonica* in China. Its cultivation supported the abalone breeding and agar industry. For cultivation, cultivar development is always one of the most vital goals. In recently years, gene editing technique was broadly developed from animals to plants and achieved many progresses which displayed its powerful potential in gene functional studies as well as genetic breeding. In this study, the CRISPR-mediated homologous recombination system was tried in *Gp. lemaneiformis*. The enhance blue fluorescent protein (eBFP) recombination system was transformed by microparticle bombardment to target the phycoerythrin  $\gamma$  subunit gene ( $\gamma PE$ ), and the suspected transformant traits with blue fluorescence in tetraspores were observed. In the process of further culture, the growth and development of the suspected transformant was slow, and only one transformant with stable trait change was finally regenerated into a complete individual. Due to the substitution of the upstream base of the  $\gamma PE$ , the expression of  $\gamma PE$  was affected and the content of phycoerythrin decreased, which not only affected the photosynthetic capacity of the transformants, but also affected the morphology and arrangement of the cells. This study obtained gene editing individuals in red algae for the first time, which provided an important reference for gene function research and genetic breeding of *Gp. lemaneiformis*. Other progresses as for the establishment and optimization of genetic engineering of *Gp. lemaneiformis* will be also introduced.

**Keywords:** *Gracilariopsis lemaneiformis*, gene editing, CRISPR, Cas

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