

SYNTHETIC GENES FOR EXPRESSION ENHANCEMENT IN TRANSGENIC PLANTS

Fields of Application

- Large-scale heterologous protein production in plants through molecular farming
- Development of plants that are resistant to diseases, pests and stress
- Production of plants that possess healthy fats and oils or have increased nutritive value
- Prolonging freshness of vegetables
- Metabolic production of new substances in plants

The Problem

Genetic engineering of plants promises to create new opportunities in agriculture, environmental biology, production of chemicals, and medicine. Due to high yields and functional maintenance at low expenses, biopharming and the spectrum of pharmaceuticals produced in plants is a rapidly expanding technology.

However, expressing foreign genes in plants presents many technical challenges that are not encountered at this extent with other heterologous expression systems. It involves many aspects which have to be taken into account, some of which have been properly addressed in the past.

Accordingly, cis-acting elements such as promoter, enhancer or terminator sequences have been



studied carefully in order to optimize transgenic expression in plants and are readily available in convenient cloning cassettes. However, designing the actual coding region for each heterologous gene is very distinct and equally critical to achieve successful expression.

The Technical Solution/Our Service

Parameters such as codon usage, GC content, cryptic splice sites, premature poly(A) sites, AT rich killer sequences, RNA secondary structures, and host sequence identities (RNA interference), frequently limit heterologous and autologous gene expression in plants down to undetectable levels of the gene product. This dilemma often makes it necessary to adapt and optimize the gene of interest towards the genetic requirements of the host organism. Apparently, an optimized sequence does not occur in nature and has to be designed on a rational basis followed by in vitro synthesis. GENEART offers both steps: state-of-the-art gene optimization plus fast and reliable de novo gene synthesis.



Contact

E-mail support@geneart.com
Internet www.geneart.com

phone +49 (0) 941 - 942 76-100
fax +49 (0) 941 - 942 76-780

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Your Success

GENEART helps you to fully control every feature of your gene:

- Adapt codon usage and GC content for optimal translation efficiency.
- Eliminate premature poly(A) sites, cryptic splice sites, killer sequences and RNA secondary structures to increase the level of full length mRNA.
- Avoid homologies to host genes to prevent gene silencing through RNA interference .
- Increase genetic stability in transfer organisms such as *E. coli* and *A. tumefaciens* .
- Include and exclude restriction sites.

GENEART's proprietary, patent-pending gene optimizing software GeneOptimizer™ allows for the simultaneous adaptation of all these parameters, together with additional requirements defined by the scientist. It identifies the single best sequence among an infinite number of possible combinations coding for a given protein.

Highly automated de novo gene synthesis at GENEART ensures the most cost-effective, fast and accurate production of virtually

any DNA sequence with very short delivery times .

Taken together, this makes GENEART the ideal partner for heterologous gene expression in transgenic plants.



References

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