

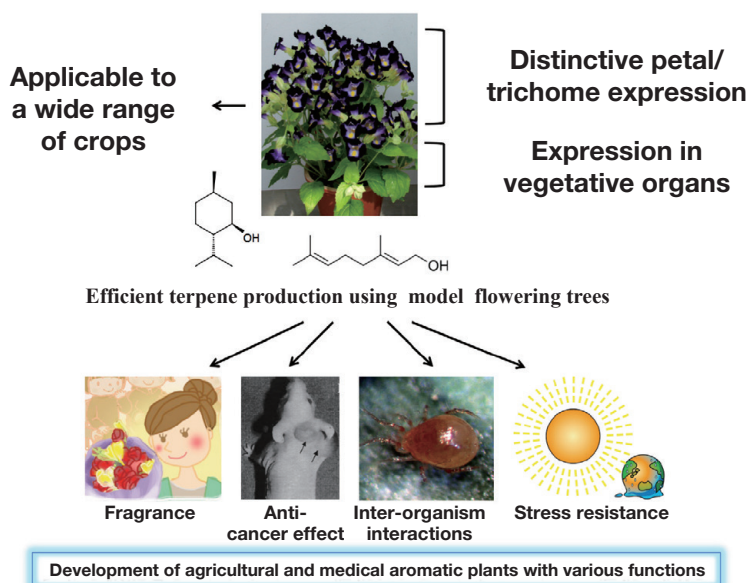
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## Purpose of Research

In the present study, we used gene recombinant flowering plants that regularly emit volatile terpenes, which are a large class of natural organic compounds produced by plants, to elucidate the pharmaceutical (anti-cancer aromatherapeutic), anti-stress, and other advantageous effects of terpenes and to establish the basis for applications of such “medical aromatic plants.” These recombinant plants also can be used as “agricultural aromatic plants” that can promote attraction of natural enemies of harmful insects and promote inter-plant communication.

## Summary of Research

Among aromatic chemicals produced by plants, terpenes have anti-inflammation, anti-cancer, relaxation (anti-stress), and many other health-promoting effects and are therefore attracting worldwide attention from researchers and physicians. In recent years, development of terpene production systems using plant factories and microorganisms such as yeast, and basic research to incorporate inter-organism communication via volatile terpenes as agribio technology in production systems have progressed rapidly. We are developing agricultural aromatic plants which regulate communications between plants and pest natural enemies and between plants, and medical aromatic plants which are expected to have health-promoting and anti-cancer effects, using the flowering plants torenia and tobacco as models.



## Comparison with Conventional or Competitive Technology

Conventionally, one terpene compound is isolated and used as the active ingredient in a drug compound. Because our product is a live plant, the active ingredients of the plant are all utilized, and multiple functions are realized.

## Expected Applications

- Agricultural aromatic plants can protect co-cultivated crops from pests.
- Medical aromatic plants can promote human health when incorporated in daily life, reducing medical care expenditure.

## Challenges in Implementation

- Identification of genes that produce and regulate effective aromatic components.
- Creation/production of functional plants.
- Genome editing (using CRISPR/Cas9).

## What We Expect from Companies

Testing and commercialization of the agricultural and medical aromatic plants generated by the present study.

## Points

- **Novel applications of aroma-based plant communication**
- **Use of anti-pest and health-promoting effects of volatile terpenes**
- **Creation/production of agricultural and medical aromatic plants with novel functions**

- Publication: Arimura G., Yazaki K., Takabayashi J., Kawakita A. (2014) *Frontiers in Plant Aromascience: Why do plants emit various scents?* published by Fragrance Journal Ltd.
- Reference: Shimoda T., Nishihara M., Ozawa R., Takabayashi J., Arimura G. (2012) The effect of genetically enriched (E)-beta-ocimene and the role of floral scent in the attraction of the predatory mite *Phytoseiulus persimilis* to spider mite-induced volatile blends of torenia. *New Phytologist* 193:1009-1021