Bio

Application of Plant Aroma-Mediated Biological Interactions to Agri-System and Healthy Food Science

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Purpose of Research

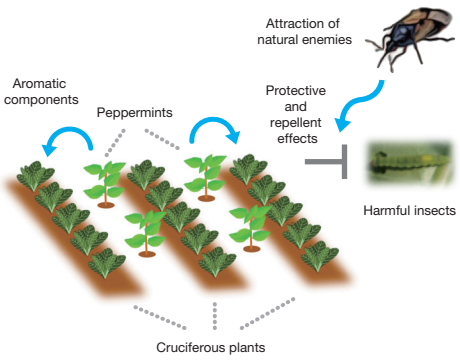
In the present study, we used transgenic plants and medicinal plants that emit volatile terpenes to elucidate the pharmaceutical (such as anti-inflammatory effects on the colon), anti-stress, and other advantageous effects of terpenes and to establish a basis for applications of such "medical aromatic plants." In addition, aromatic plants including mints can also be used as "agricultural aromatic plants" that can promote the attraction of the natural enemies of harmful insects and promote inter-plant communication.

Summary of Research

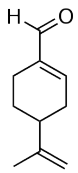
Among the aromatic chemicals produced by plants, terpenes have anti-inflammation, anti-cancer, relaxation (anti-stress), and many other health-promoting effects and are therefore attracting worldwide attention from researchers and physicians. In recent years, the development of terpene production systems using plant factories and microorganisms such as yeast, and basic research for incorporating inter-organism communication via volatile terpenes as agri-biotechnology in production systems have progressed. A patent application has been filed for some results of the research and a specific commercialization project is being considered. We focus on terpenes that have various physiological activities and are developing agricultural aromatic plants that regulate communications between plants and the natural enemies of harmful insects and between plants, and medical aromatic plants that are expected to have health-promoting effects including anti-inflammatory effects using tomatoes and other plants.

Development of production systems using mints as companion plants

Pest control technology for cruciferous vegetables using aromatic components emitted from peppermints (Japanese Patent Application No. 2017-214231)



Development of plants producing secondary metabolites that have health-promoting effects



Specific Examples

- Anti-inflammatory functions of tomatoes containing a large amount of betalain (plant pigment)
- Improvement of intestinal environment by aromatic components of Perilla frutescens

Comparison with Conventional or Competitive Technologies

Conventionally, some unique terpenes are used as the active components for foods and drugs. Because our product is a live plant, the active ingredients of the plant are of ease to be utilized and functional for multiple purposes.

Expected Applications

- Agricultural aromatic plants (including mints) can protect co-cultivated crops from pests without using agricultural chemicals.
- Medical aromatic plants can be used to provide scientifically proven health-promoting components at low costs.

Challenges in Implementation

- Identification of genes that produce and regulate effective aromatic components.
- Creation/production of functional plants.
- Genome editing (using CRISPR/Cas 9).

What we Expect from Companies

Practical applications and marketing 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**

■ Intellectual Property: Japanese Patent Application No. 2017-214231 "Methods of immune activation of cruciferous plants and production methods of immune-activated cruciferous plants"
■ Publication: Arimura G., Nishihara M. (2018) Plant Plot: Botany of Aroma and Color published by Beret Publishing Co., Ltd. (Tokyo) pp. 159
■ Reference: Uemura T., Yashiro T., Oda R., Shioya N., Nakajima T., Hachisu M., Kobayashi S., Nishiyama C., Arimura G. (2018) Intestinal anti-inflammatory activity of perillaldehyde. Journal of Agricultural and Food Chemistry 66:3443-3448
Sukegawa S., Shiojiri K., Higami T., Suzuki S., Arimura G. (2018) Pest management using mint volatiles to elicit resistance in soy: mechanism and application potential. The Plant Journal, in press

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