Amplification of plant resistance to diseases by the rare sugar D-psicose
(Keywords: D-Psicose, Plants, Resistance to diseases)

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Outline of technology
The control of crop damage due to disease by spraying of agricultural chemicals, which is commonly practiced, has many safety problems such as the retention of agricultural chemicals in the products and environmental contamination. Furthermore, agricultural chemicals can no longer exert bactericidal effect once the pathogen has entered the plant. This technology aims to amplify the resistance of plants to diseases and harmful insects by inducing the expression of resistant genes possessed by the plants themselves by spraying D-psicose over plants.

When the expression of genes related to resistance was examined after spraying 0.5 mM D-psicose over the leaves of the citrus rough lemon, the expression of various genes related to resistance was induced 2 hours after the treatment (Figure). The lipoygenase (LOX) gene, allene oxide synthase (AOS) gene, and hydroperoxide lyase (HPL) gene expressed by this treatment are known to be involved in the synthesis of signal transmitters such as salicylic acid and jasmonic acid and to activate defense functions. D-Psicose also induced the expression of the gene of protease inhibitor protein (MLP2) involved in the plant defense mechanisms and epoxide hydrolase (EH). All genes related to resistance the expression of which was induced by D-psicose are related to a common defense system in a wide variety of plant species, so that D-psicose is considered to exert similar effects on other plants.

Sales points
The use of agricultural chemicals can be markedly reduced by amplifying plants’ intrinsic resistance to diseases and harmful insects.

Expected application fields and products
(1) Agricultural chemicals that induce resistance of plants to diseases
(2) Environmental stress reducing agents
(3) Additives for hydroculture fluids (fertilizer solutions)
(4) Plant growth controlling agents (plant stimulators)
(5) Cut flower preserving agents

Comparison with existing products

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<tr>
<th></th>
<th>Advantages</th>
<th>Disadvantages</th>
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<tr>
<td></td>
<td>Safety</td>
<td>Environmental load</td>
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<tr>
<td>D-Psicose</td>
<td>Very high</td>
<td>Very low</td>
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<tr>
<td>Propenezol (product name: Orizemate)</td>
<td>High</td>
<td>Low</td>
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References, patents, etc.
Related industrial property rights: Patent number 4009720

Other matters to note
(Developer’s comment)
For further progression of specific testing for the clarification of the mechanisms of effects of rare sugars on plants and their practical use, this theme has been adopted by the "Basic Research Promotion Project for the Creation of New Technologies and Fields” of the Bio-oriented Technology Research Advancement Institution, National Agriculture and Food Research Organization and is still being investigated.
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