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The development of approaches to create new symbiotic systems

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Plants interact with a wide range of soil microorganisms, while interactions with symbiotic microorganisms are the most important for them. Symbiosis with nitrogen-fixing nodule bacteria provides a significant advantage in the existence of plants in nitrogen-poor soils. Since only plants from the *Fabales* and *Rosales* (a single representative *Parasponia*) enter into symbiosis with nodule bacteria, an idea about expanding the number of plants entering into such interactions became popular. To solve the problem of constructing new symbiotic systems, it is necessary to provide recognition of the symbiont (by transferring receptor genes into non-legume plants), morphogenesis of the nodule, and its infection.

We have managed to introduce the genes encoding receptors to surface components of rhizobia into the non-legume plants, and it provided increased colonization by nodule bacteria. It may improve the growth and development of non-legume plants and ensure their greater resistance to phytopathogens. Genome analysis of non-legume plant hop *Humulus lupulus* showed the existence of genes involved in symbiosis regulation, but some important regulators such as gene encoding NIN transcription factor were lost. Using genetic engineering approaches, the hop plants carrying the gene encoding NIN transcription factor were created. Analysis of these plants may provide important information about regulation of organogenesis in non-legume plants.

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