# ABSTRACTS (MASTER THESIS)

## Functional analysis of a new sugar transporter in the nodule of *Lotus japonicus*

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Biological nitrogen fixation contributes largely to the global nitrogen cycle on the earth. In particular, symbiotic nitrogen fixation in legumes takes place in specialized organs called nodules. In infected plant cells of nodules, *Rhizobium* exists as bacteroids that are capable of reducing atmospheric $N_2$ to $NH_3$ and supplying the fixed nitrogen to the host plant. In turn, host plant provides photosynthetic metabolites as carbon source in forms of dicarboxylates. Beside, inorganic compounds that are required for the function of bacteroids are also transported across the membrane in nodule. In this process, various transporters should be involved at different membrane systems; however, little is known about the flow of carbon source from the plant cell to the symbiotic bacteria at the molecular level.

SWEET family is a sugar transporter family that was first identified in *Arabidopsis*. The fist member, AtSWEET1, is a facilitator protein involved in the excretion of monosaccharides such as glucose from plant cells [1]. Thereafter, other SWEET members have been found, which can transport sucrose in Arabidopsis and *Oryza sativa* [2, 3]. The family size of SWEET transporters is much smaller than other sugar transporter families reported previously.

In this study, we analyzed a member of SWEET transporter family of *Lotus japonicus* in order to gain an insight into the molecular mechanisms of the carbon transport from plant cells to bacteroids. In *L. japonicas* genome, thirteen members of SWEET family are found. Out of them, *LjSWEET3* was the only member that was highly expressed in the nodules. *LjSWEET3* expression was increased in accordance with the nodule development, and it reached the highest level in the mature nodule. Histochemical analysis using *L. japonicus* plants transformed with *LjSWEET3 promoter:GUS* showed the strong expression of this gene at the vascular systems in nodules. LjSWEET3-GFP fusion protein was expressed in the protoplasts of *Nicotiana banthamiana* and those of *Coptis japonica* to show its intracellular localization, demonstrating that the localization of LjSWEET3 was to be at the plasma membrane. The study is in progress by characterizing the RNAi mutants, and analyzing the relation of the gene with arbuscular mycorrhizal fungi.

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**References**

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