DESCRIPTION FOR THE GENERAL PUBLIC

Exploring the Novel Vacuolar Transporters of Glucosinolates for Supporting Plant Defense System against Herbivores and Pests in *Arabidopsis thaliana*

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Plants are exposed to a crisis from herbivores and pests at all times. To overcome this problem, there are likely at least several hundred chemicals potentially related with chemical defense within vascular plants, for example, flavonoids, phenolics, glucosinolates, terpenoids and alkaloids. In Brassicaceae plants, mustard oil bomb (Glucosinolate-myrosinase) defense system is a unique chemical defense against herbivores and pests.

Glucosinolate is one of the secondary metabolites in plants, that does not seem to be toxic to them. When leaves are damaged by insect or herbivore chewing/eating, glucosinolates are rapidly hydrolyzed to toxic isothiocyanates and nitriles by a myrosinase. The isothiocyanates are toxic for animals, bacteria and fungi. In *Arabidopsis thaliana*, myrosinase and glucosinolate are stored in two different specialized cells, myrosin cells and glucosinolate-accumulating cells (S-cells), respectively. In previous studies, glucosinolates have been shown to be mainly accumulated in the midvein and periphery of rosette leaves. The glucosinolate synthetase genes were basically expressed in stems of leaves, and then glucosinolates are stored in vacuoles of S-cells in *Arabidopsis*. GTR proteins are only known transporters able to transport glucosinolates across the plasma membrane into mesophyll and phloem companion cells. However, the mechanism of glucosinolate transport into vacuoles is still unclear, and we do not know how glucosinolates accumulate into vacuoles in S-cells.

To understand how glucosinolates accumulate in S-cells in leaves, I am planning to identify the novel vacuolar transporters of glucosinolates in *Arabidopsis*. We have already found some candidate genes coding for transporters of glucosinolates during our preliminary research.
In this project, we are planning to investigate these aspects by:
(1) Tissue and subcellular localization of novel glucosinolate transporters
(2) *in vivo* and *in vitro* transport assay for glucosinolate by heterologous expression system
(3) Functional analysis of candidate transporters *in planta*

The functional analysis of novel vacuolar transporter of glucosinolates contributes to understanding the distribution and accumulation mechanism of glucosinolate in each plant organ. This proposed project will help to reveal how plants have developed a sophisticated defense system that is conserved in most of the plant tissues, and its results may be used in the future to improve crop resistance in agriculture.