

Summary of VBL Research Project

Theme	Increase in panicle number of monocotyledon by new high-speed (super-high-speed) myosin gene introduction
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Myosin is a motor protein that moves on actin filaments using the hydrolysis energy of ATP. In animal cells, myosin plays important roles in cell movement and cell division in addition to muscle contraction. In immobile plants, myosin plays an extremely important role of "cytoplasmic streaming". In plants with large cell sizes compared to animal cells, simple diffusion alone takes a long time to distribute nutrients and minerals into cells. Thus, myosins bound to organelles move on actin filaments causing cytoplasmic streaming (Fig), thereby promoting the diffusion of nutrients and oxygen inside cells. In 2012, we made high-speed myosin genetically by replacing the myosin motor domain of *Arabidopsis thaliana* with that of *Chara corallina* (CCM), the world's fastest myosin at that time. Then, the high-speed myosin was introduced into *Arabidopsis thaliana*. In the transgenic *Arabidopsis thaliana*, the velocity of cytoplasmic streaming increased and the size of the above-ground parts increased. (Dev Cell, 2013). Since myosin is universally present in plants, this result indicates the possibility of increasing production of biomass resources, food and feed plants by speeding up myosin. However, the above results are obtained using a dicot plant *Arabidopsis thaliana*. Biomass energy, food and feed are obtained from monocot plants such as rice, corn and alfalfa, so validation and establishment of the system with monocot plants is essential for the application development to biomass and food. We genetically made "a super-high-speed myosin gene" by replacing the myosin motor domain of monocot *Brachypodium distachyon* with that of *Chara braunii* (CbM) which has four times the speed of CCM and has been newly cloned by us. *Brachypodium* strains transfected with the super-high-speed myosin increased in weight and panicle number three-fold. The purpose of this study is to establish an increase system of panicle number and seed number by introduction of the super-high-speed myosin using *Brachypodium*. The system will be applied to rice and maize to increase the number of panicles and seeds of resource plants.



