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Keywords

Plant-microbe interactions, Fungus, Symbiosis and Parasitism, Maize, Smut pathogen, Secreted proteins, Extracellular vesicles

Research

Background

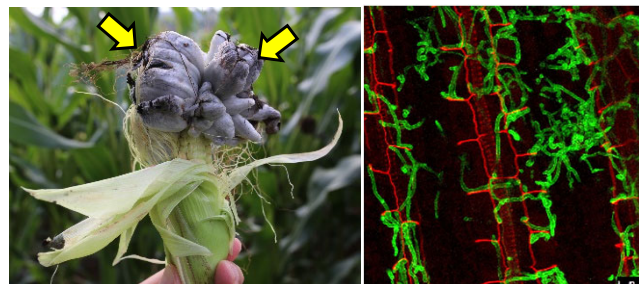
Plant growth is tightly regulated and thus it is difficult to artificially control plant growth. However, some plant-colonizing fungi can manipulate plant growth through infection. If we could reveal those abilities which such fungi have, novel technology controlling plant growth could be established.

Objectives

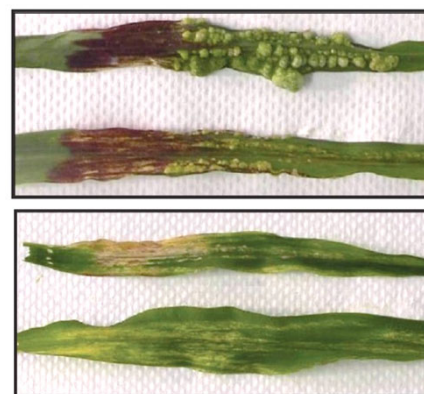
We focus on molecules and vesicles secreted from plant-colonizing fungi, and then investigate their molecular function. Based on the findings, we will develop novel technologies that control plant growth.

Achievements

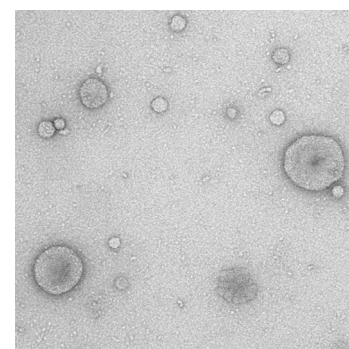
The corn smut fungus *Ustilago maydis* dramatically enlarges plant tissues through infection. We identified secreted proteins involved in enlargement of plant tissues and revealed molecular function and evolution. Furthermore, we also investigate the role of extracellular vesicles (exosome) in plant-fungal interactions.



(Left) Maize kernels swollen by the infection of smut fungus *Ustilago maydis*
(Right) Microscopic picture of fungal hyphae inside plant tissues



(Top) Infection of wild type carrying secreted proteins
(Bottom) Infection of mutant strain lacking secreted proteins



TEM picture of secreted extracellular vesicles

Prospects for collaboration

【Collaboration with pharmaceutical company】 In order to utilize the active molecules secreted by filamentous fungi found in our research to the agricultural field, we would like to work on the development of technology for formulation.

【Collaboration with farmers】 We would like to collect and study filamentous fungi that are useful to plants found in agricultural fields, and bring the results back to the field of agriculture.

【Outreach】 I would like to talk about the molecular interactions between plants and filamentous fungi in a way that is easy to understand so that non-specialists can learn about them.



We identify and analyze plant growth-promoting substances possessed by filamentous fungi. Then, we develop the technology that control plant growth and apply it to agricultural fields.