Microbes rule the agriculture
–Controlling microbes for plant health–

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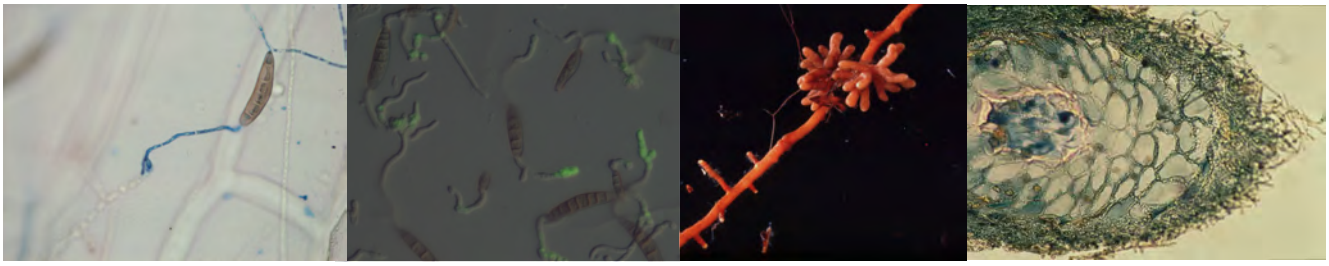
A huge number of microbes live in the agricultural and forest ecosystems, and are interacting with plants. Some microbes are parasitic to the plants bringing severe damages to them, and some other microbes are mutualistic bringing great benefits to the plants. We are studying on the nature of interactions between microbes and their biotic and abiotic environments at molecular, cellular, organism and community levels to develop new approaches for plant protection and plant health.

Molecular studies of plant pathogens and symbionts

Our goals are to further the understanding of the biology of microbes and their host plants. We emphasise those aspects of biology that might be useful in agricultual and forest disease management and plant protections. The organisms on which we have worked most are graminicolous fungi, gray mold, ectomycorrhizal mushrooms and pine wood nematode. Our current and future efforts include genetics (conventional, molecular, population), developmental biology (including microbe-host interactions), ecology, and disease management (including pesticide science).



A plant pathogenoc fungus develops an apparatus “appresorium” for infections. It penetrates into a host cell and finally extends hyphae in the cells and organ (left). The gfp-tagged gene is expressed and its pruducts are localised only in appresoria (centre right). This gene is essential for penetrations of this fungus. Ectomycorrhizae of Japanese red pine (centre left), and its section, showing penetrated hyphae between cortex cells and a mantle of hyphae around the outside of root (right).

Studies on epidemic forest diseases and their ecological effects

The two epidemic forest diseases, “Pine wilt” and “Japanese Oak wilt”, have affected ecosystems in Japanese forests. These diseases have complicated causal mechanisms, involving the pathogens, the vector insects and the host plants. We are conducting studies to reveal their interactions in the disease developments and infection cycles, to develop environmental-friendly control methods of those epidemic diseases.

Emergence of adult pine sawyer beetle carrying the pinewood nematode from a dead pine tree (left). The beetle larvae infected and killed by the insect-pathogenic nematodes, Steinernema (centre). A stroma of *Hypocrea cornu-damae* often associates with a Japanese Oak wilt victim (right).

Keywords

Fungi, Nematode, Genetics, Genomics, Biochemistry, Physiology, Ecology, Taxonomy, Plant protection, Host-Symbiont Interaction, Mode of action, Fungicides, Biocontrol

Reacent Publications

Rapid and simple preparation of mushroom DNA directly from colonies and fruiting bodies for PCR. Izumitsu, K., Hatoh, K., Sumita, T., Kitade, Y., Morita, A., Gafur, A., Ohta, A., Kawai, M., Yamanaka, T., Neda, H., Ota, Y., Tanaka, C. (2012) Mycoscience doi: 10.1007/s10267-012-0182-3

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Pine wood nematode, *Bursaphelenchus xylophilus*. Futai, K. (2012) Annual Review of Phytopathology 50 (in press)

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