Research Highlights

Plant science: New insights into infection strategy of *Rhizoctonia solani*, a causal agent for rice sheath blight, highlighted by the plant defense mechanism

Rhizoctonia solani is a soil-borne phytopathogical fungi causing sheath blight, a major disease in cultivated rice. It gives rise to serious damage in agriculture and economies in USA and East Asia including Japan.

Phytopathogens are classified in terms of their lifestyle and *R. solani* is regarded as a necrotrophic pathogen which kills its host to obtain nutrients. In contrast, biotrophic pathogens parasitize their hosts to deprive nutrients form living cells. Since all rice cultivars are not fully resistant to *R. solani*, fungicides are the only current means to deal with this pest.

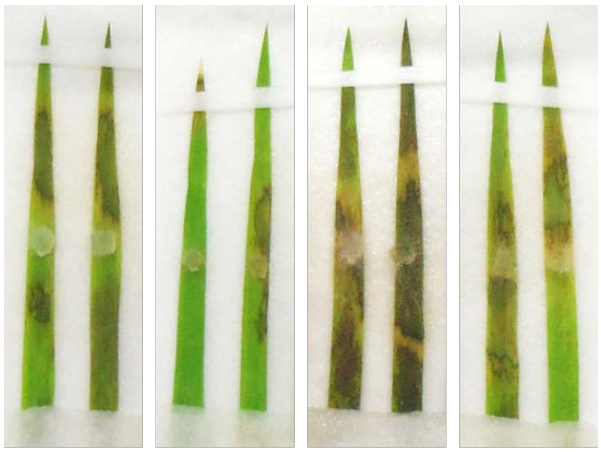

Fig.1.Effects of pretreatment of phytohormones on *R. solani* infection in *B. distachyon*

Yusuke Kouzai, Yoshiteru Noutoshi, and colleagues at Okayama University have developed a pathosystem using *R. solani* and *Brachypodium distachyon*, an emerging monocotyledonous model plant, and found that pretreatment of a phytohormone salicylic acid (SA) can induce disease resistance in both *B. distachyon* and rice against *R. solani*. Consistently, the SA-deficient transgenic rice is more susceptible to *R. solani* compared with wild-type.

Furthermore, two accessions of *B. distachyon* were found to be resistant against *R. solani*, that activate SA-dependent immunity after inoculation.

These results update the pathogenic program of *R. solani* as a hemi-biotroph which uses biotrophic phase at the initial invading step where SA-dependent plant immunity can effectively block. In addition, *B. distachyon* should deploy disease resistance proteins which work as a sensor detecting *R. solani* to activate defense response.

The researchers proposed two options to counteract this intractable disease: 1. development of *R. solani*-resistance cultivars using genetic resources of *B. distachyon*; and 2. development of plant immune-activating chemicals termed plant defense activator with SA-based functionality.

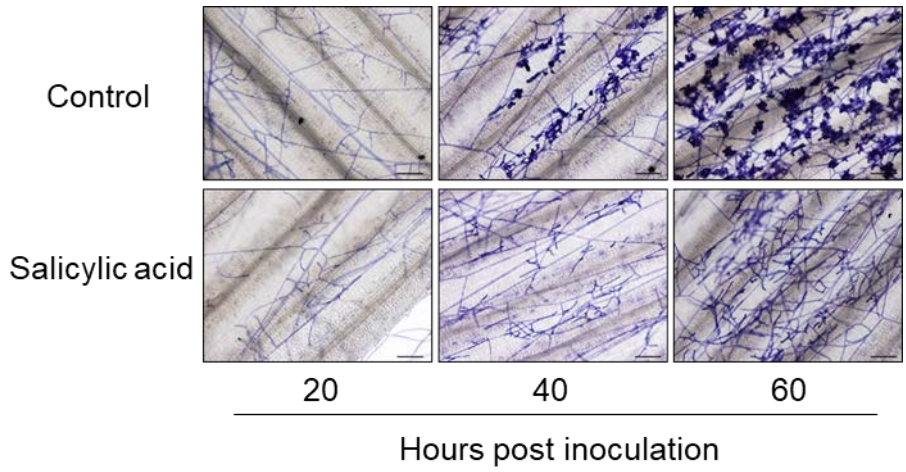

Fig.2. Effect of salicylic acid pretreatment on *R. solani* hyphal growth (purple filaments) on *B. distachyon* leaf surface. SA treatment prevents formation of structure called infection cushion (dense clots) required for the progression to its necrotrophic stage.

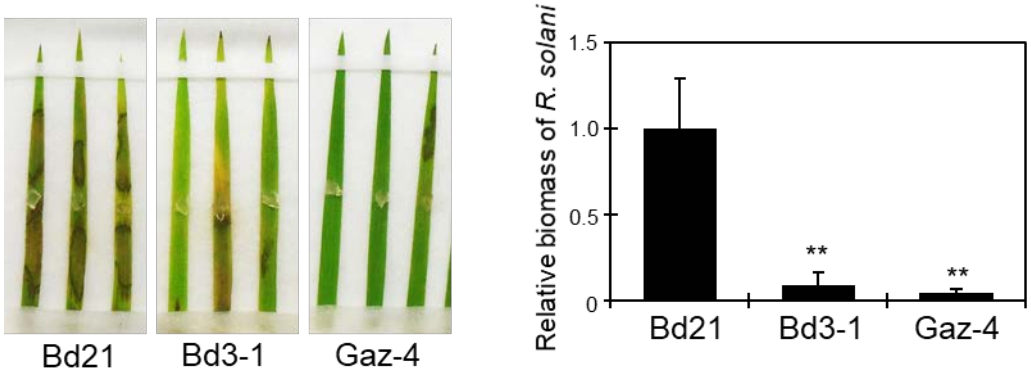

Fig.3. Disease symptom (left) and relative fungal biomass inside leaves (right) of three different accessions of *B. distachyon* Bd21, Bd3-1, and Gaz-4 inoculated with *R. solani*.

Reference:

Authors

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