

World Congress on

PLANT PATHOLOGY & PLANT BIOTECHNOLOGY

International Conference on

&

ORGANIC FARMING, BIODYNAMICS

September 24-25, 2018 | Dallas, USA



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Establishment of plant vaccinating system by a dark septate endophytic fungus: Dark septate endophytic fungi alter the root-associated microbial communities and suppress soil-borne diseases of plant

Crop production has been dependent on chemicals to control pest organisms and supply nutrients for growth. These chemicals have caused considerable negative impacts on agricultural soils since their introduction. It is today's aim to reduce the use of chemicals and switch to a biological control method for pest control purposes, i.e., create a natural and organic agricultural system. However, the scientific basis for many biocontrol methods, which proves the validity of the organic production system, is insufficient. *Fusarium* crown and root rot (FCRR) of tomato caused by *Fusarium oxysporum* f. sp. *radicis-lycopersici* (FORL) is a common disease observed worldwide. Our Previous study showed the suppressive role of a DSE fungus, *Veonaeopsis simplex* Y34 against *Fusarium* disease of Chinese cabbage, suggesting a potential bio-control agent to suppress FCRR of tomato. The solid-substrate, incubated by combining *V. simplex* Y34 with sterilized litter compost (solid-cultures of *V. simplex* Y34), was applied in a nursery pot to assess the bio-control of the disease. Results showed that *V. simplex* Y34 decreased the disease severity of FCRR for the two cultivars. The colonization of *V. simplex* Y34 in root was determined by re-isolation and terminal-restriction fragment length polymorphism (T-RFLP) analysis targeting fungal ITS-LSU region. Moreover, the application of the endophyte increased the diversity of the fungal community in root-endosphere and decreased the colonization of FORL in the root. The T-RFs-based multivariate analysis showed that the fungal communities in root-endosphere with inoculation of *V. simplex* Y34 were clustered away from those of non-inoculation, suggesting a correlation between the root-endospheric community and disease incidence. In conclusion, this study indicates that the application of *V. simplex* Y34 altered the diversity, evenness, and structure of root-endospheric fungal community by the endosymbiosis of endophyte, and decreased pathogen colonization in the root, which opens a new way to control of tomato FCRR disease.

Biography

Kazuhiko Narisawa has a great deal of expertise in the isolation of soil fungi that can be used as a biocontrol against plant pathogens. Dark septate endophytic fungi, or DSE fungi, are not very common in the soil but are often associated with the roots of many plants, forming "symbiotic" relationships. DSE fungi may have great potential as biocontrol agents; however, their specific roles in ecosystems remain speculative. His research is unique in that it not only contributes to solving some of Japan's agricultural problems, hampered by administrative problems of effectively developing and distributing biocontrol agents against diseases of commercial plants, but also similar agricultural and environmental problems worldwide.

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