



Survival trade-offs in plant roots during colonization by closely related beneficial and pathogenic fungi

Stéphane Hacquard, Kei Hiruma, Barbara Kracher, Nina Gerlach, Soledad Sacristán, Ryohei Thomas Nakano, Michael R Thon, Marcel Bucher, Richard O'Connell, Paul Schulze-Lefert

► To cite this version:

Stéphane Hacquard, Kei Hiruma, Barbara Kracher, Nina Gerlach, Soledad Sacristán, et al.. Survival trade-offs in plant roots during colonization by closely related beneficial and pathogenic fungi. ECFG13. European conference on fungal genetics, Apr 2016, PARIS LA VILLETTE, France. p.228, 2016. hal-02801397

HAL Id: hal-02801397

<https://hal.inrae.fr/hal-02801397>

Submitted on 5 Jun 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

POSTER SESSION ABSTRACTS
Session CS2 Pathogenesis and symbiosis
CS2M94

Monday 4th April
14:00 - 16:00

HACQUARD Stéphane (1), **HIRUMA Kei** (1), **KRACHER Barbara** (1), **GERLACH Nina** (2), **SACRISTÁN Soledad** (3), **NAKANO Ryohei Thomas** (1), **THON Michael R.** (4), **BUCHER Marcel** (2), **O'CONNELL Richard J.** (5), **SCHULZE-LEFERT Paul** (1)

(1) Department of Plant Microbe Interactions, Max Planck Institute for Plant Breeding Research, Cologne, Germany

(2) Botanical Institute, Cologne Biocenter, CEPLAS, University of Cologne, Cologne, Germany

(3) Centro de Biotecnología y Genómica de Plantas (UPM-INIA) and E.T.S.I. Agrónomos, Universidad Politécnica de Madrid Campus de Montegancedo, Madrid, Spain

(4) Instituto Hispano-Luso de Investigaciones Agrarias (CIALE), Departamento de Microbiología y Genética, Universidad de Salamanca, Villamayor, SPAIN

(5) BIOGER, INRA, AgroParisTech, Thiverval-Grignon, France

Survival trade-offs in plant roots during colonization by closely related beneficial and pathogenic fungi

Although most characterized species of the fungal genus *Colletotrichum* are destructive pathogens, we found recently that *C. tofieldiae* (Ct) is an endemic endophyte in natural *A. thaliana* populations in Central Spain. Colonization by Ct initiates in roots, but can also spread systemically into shoots. Ct transfers the macronutrient phosphorus to shoots, promotes plant growth and increases fertility only under phosphorus-deficient conditions, a nutrient status that might have facilitated the transition from pathogenic to beneficial lifestyles. Comparative genome and transcriptome analyses between Ct and its closely related pathogenic species *C. incanum* (Ci) identified genomic signatures reflecting this recent transition from pathogenic to beneficial lifestyles, including a narrowed repertoire of secreted effector proteins, expanded families of secondary metabolism-related proteins, and limited activation of pathogenicity-related genes *in planta*. Analysis of the *Arabidopsis* transcriptome during root colonization by Ct revealed that beneficial responses are prioritized under phosphorus-deficient conditions whereas defense responses, involving ethylene and glucosinolate pathways, were activated under phosphorus-sufficient conditions. These data, together with the analysis of *Arabidopsis* mutants that are impaired in indole glucosinolate metabolism and the phosphate starvation response (PSR), provide evidence for a specific coordination between the PSR, the plant immune system and invasive fungal growth during beneficial interaction with Ct. Importantly, *Arabidopsis* immune responses were retained in phosphate-starved roots colonized by pathogenic Ci, illustrating the extraordinary ability of plants to maximize survival in response to conflicting stresses.