



HAL
open science

Colletotrichum higginsianum extracellular LysM proteins play dual roles in appressorial function and suppression of chitin-triggered plant immunity

Hiroyuki Takahara, Stéphane Hacquard, Anja Kombrink, Kei Hiruma, Guillaume Robin, Vivek Halder, Bleddyn Hughes, Tomonori Shinya, Ulla Neumann, Richard O'Connell

► To cite this version:

Hiroyuki Takahara, Stéphane Hacquard, Anja Kombrink, Kei Hiruma, Guillaume Robin, et al.. Colletotrichum higginsianum extracellular LysM proteins play dual roles in appressorial function and suppression of chitin-triggered plant immunity. ECFG13. European conference on fungal genetics, Apr 2016, Paris, France. p. 182, 2016. hal-02796861

HAL Id: hal-02796861

<https://hal.inrae.fr/hal-02796861>

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.

Colletotrichum higginsianum extracellular LysM proteins play dual roles in appressorial function and suppression of chitin-triggered plant immunity

Stéphane Hacquard¹, Hiroyuki Takahara², Anja Kombrink³, Bleddyn Hughes¹, Kei Hiruma⁴, Vivek Halder¹, Guillaume Robin⁵, Tomonori Shinya⁶, Ulla Neumann¹ and Richard O'Connell^{1,5}

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

²Faculty of Bioresources and Environmental Sciences, Ishikawa Prefectural University, Ishikawa, Japan

³Laboratory of Phytopathology, Wageningen University, Wageningen, Netherlands

⁴Graduate School of Biological Sciences, Nara Institute of Science and Technology, Nara, Japan

⁵UMR BIOGER, INRA, AgroParisTech, Université Paris-Saclay, 78850 Thiverval-Grignon, France

⁶Department of Life Sciences, School of Agriculture, Meiji University, Kawasaki, Japan

The genome of the hemibiotrophic fungus, *Colletotrichum higginsianum*, encodes a large repertoire of secreted effectors (10) containing LysM domains, but the role of such proteins in pathogenicity is unknown for any *Colletotrichum* species. We characterized two effectors, ChELP1 and ChELP2, that are transcriptionally activated during the early biotrophic phase of infection. Immunocytochemistry showed ChELP2 is concentrated on the surface of bulbous biotrophic hyphae at the interface with living host cells but is absent from filamentous necrotrophic hyphae. In co-localization experiments with wheatgerm agglutinin, the presence of ChELP2 was correlated with the absence of surface-accessible chitin, and *vice versa*. Recombinant ChELP1 and ChELP2 bound chitin and chitin oligomers *in vitro* with high affinity and specificity and both proteins suppress the chitin-triggered activation of two immune-related plant MAP kinases. Using RNAi-mediated gene silencing, we found *ChELP1* and *ChELP2* are essential for fungal virulence and appressorium-mediated penetration of both *Arabidopsis* epidermal cells and cellophane membranes *in vitro*. The data suggest a dual role for these LysM proteins as effectors for suppressing chitin-triggered immunity and as proteins required for appressorium function.