



**HAL**  
open science

# Identification and characterization of a large multigene family of cooperating effector genes facilitating cell-to-cell mobility conserved in Dothideomycetes and Sordariomycetes

Nacera Talbi, Mila Blekemolen, Like Fokkens, Corinne Audran, Yohann Petit-Houdenot, Cécile Pouzet, Françoise Blaise, Elise J Gay, Thierry Rouxel, Marie-hélène Balesdent, et al.

## ► To cite this version:

Nacera Talbi, Mila Blekemolen, Like Fokkens, Corinne Audran, Yohann Petit-Houdenot, et al.. Identification and characterization of a large multigene family of cooperating effector genes facilitating cell-to-cell mobility conserved in Dothideomycetes and Sordariomycetes. International Congress of Plant Pathology, Aug 2023, Lyon, France. hal-04565521

**HAL Id: hal-04565521**

**<https://hal.inrae.fr/hal-04565521>**

Submitted on 1 May 2024

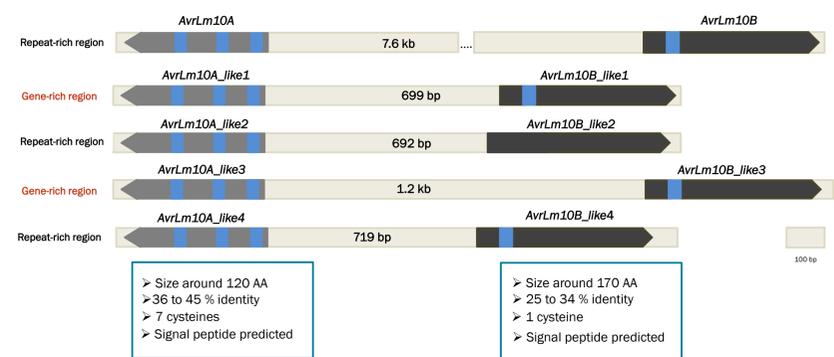
**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

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.

# Identification of a large multigene family of cooperating effector genes facilitating cell-to-cell mobility conserved in Dothideomycetes and Sordariomycetes

Nacera Talbi<sup>1</sup>, Mila Blekemolen<sup>2</sup>, Like Fokkens<sup>2</sup>, Corinne Audran<sup>3</sup>, Johann Petit-Houdenot<sup>1</sup>, Cécile Pouzet<sup>4</sup>, Françoise Blaise<sup>1</sup>, Elise J. Gay<sup>1</sup>, Thierry Rouxel<sup>1</sup>, Marie-Hélène Balesdent<sup>1</sup>, Martijn Rep<sup>2</sup>, Frank Takken<sup>2</sup> and Isabelle Fudal<sup>1</sup>

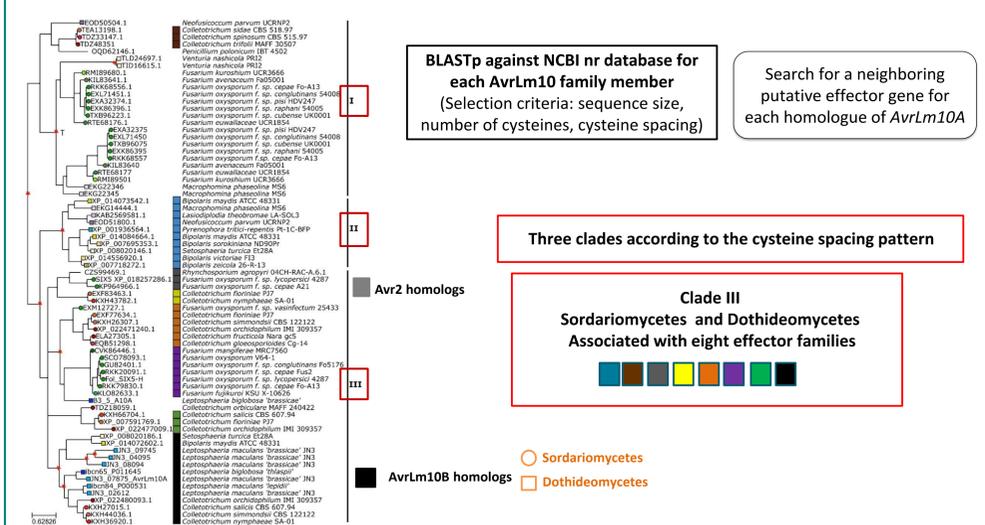
## 1. AvrLm10A and AvrLm10B avirulence effectors of *Leptosphaeria maculans* are part of a multigene family



Two avirulence effectors, *AvrLm10A* and *AvrLm10B*, of *Leptosphaeria maculans*, responsible for stem canker of oilseed rape, are members of a family of conserved effectors. *AvrLm10A* and *AvrLm10B* are neighboring genes in divergent transcriptional orientation both necessary to induce recognition by the resistance protein of *Brassica nigra* Rlm10 (Petit-Houdenot et al., 2019). *AvrLm10A* and *AvrLm10B* physically interact. Sequence searches within the *L. maculans* genome showed that *AvrLm10A/AvrLm10B* belong to a multigene family comprising five pairs of genes with similar tail-to-tail organization (Talbi et al., 2023)

**Objective:** Characterize the AvrLm10 effector family

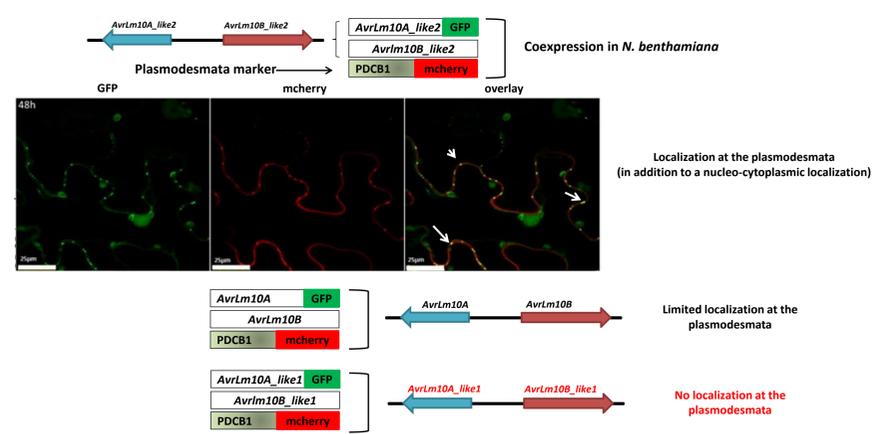
## 3. Conservation of the AvrLm10A family in phytopathogenic fungi



*AvrLm10A* homologues identified in 30 plant pathogenic fungi from the Dothideomycetes and the Sordariomycetes families. One of them, *Six5* from *Fusarium oxysporum* f.sp. *lycopersici* (*Fo*) physically interacts with the avirulence effector *Avr2* and is required for the movement of *Avr2* from cell to cell through plasmodesmata (Ma et al., 2015; Cao et al., 2018).

*AvrLm10A* / *Six5*: conserved cooperating effectors facilitating the transport of other effectors from cell to cell in plant pathogenic fungi?

## 5. Two AvrLm10A effectors localize at the plasmodesmata when expressed with their effector partner

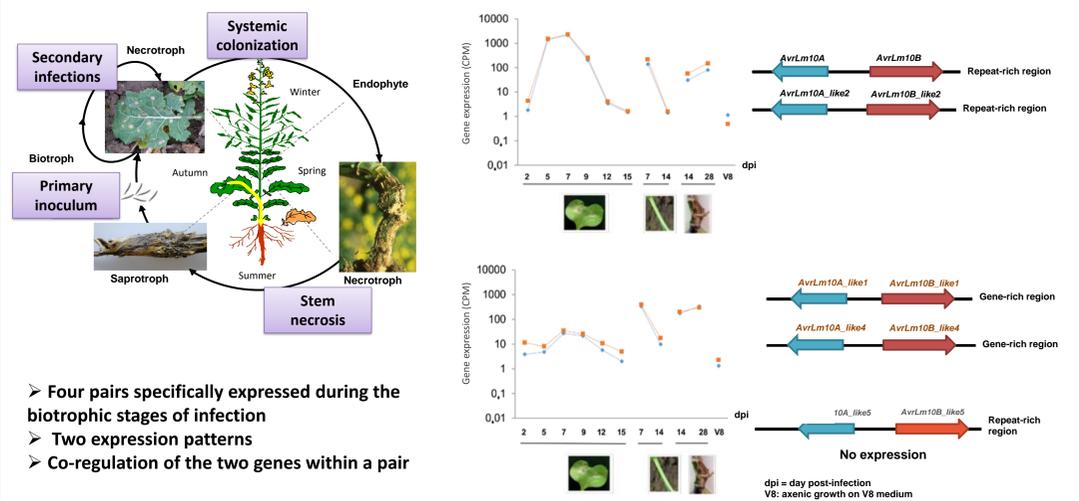


*AvrLm10A* and *AvrLm10A\_like2* localize at plasmodesmata, in addition to a nucleo-cytoplasmic localization when expressed with their effector partner.

## Conclusion

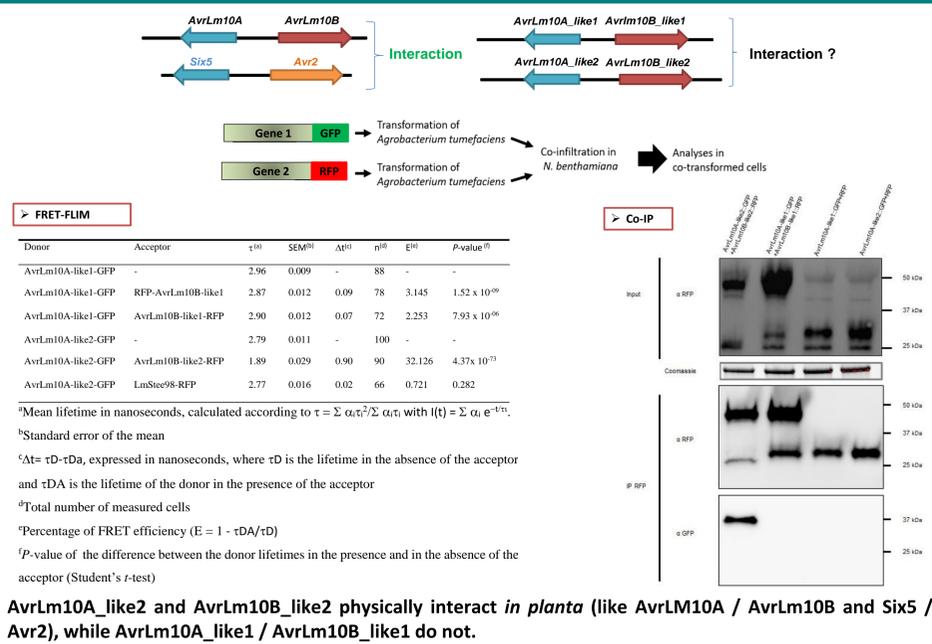
- We identified 71 *AvrLm10A* / *Six5* homologs in plant pathogenic fungi (Sordariomycetes and Dothideomycetes)
- These *AvrLm10A* / *Six5* homologs are associated with 8 different putative effector families
- At least in *F. oxysporum* and *L. maculans*, the role of cooperating *AvrLm10A* / *Six5* effectors is to facilitate the transport of their effector partner (and *Avr2*) from cell-to-cell through plasmodesmata

## 2. Expression kinetics of the AvrLm10 effector gene family

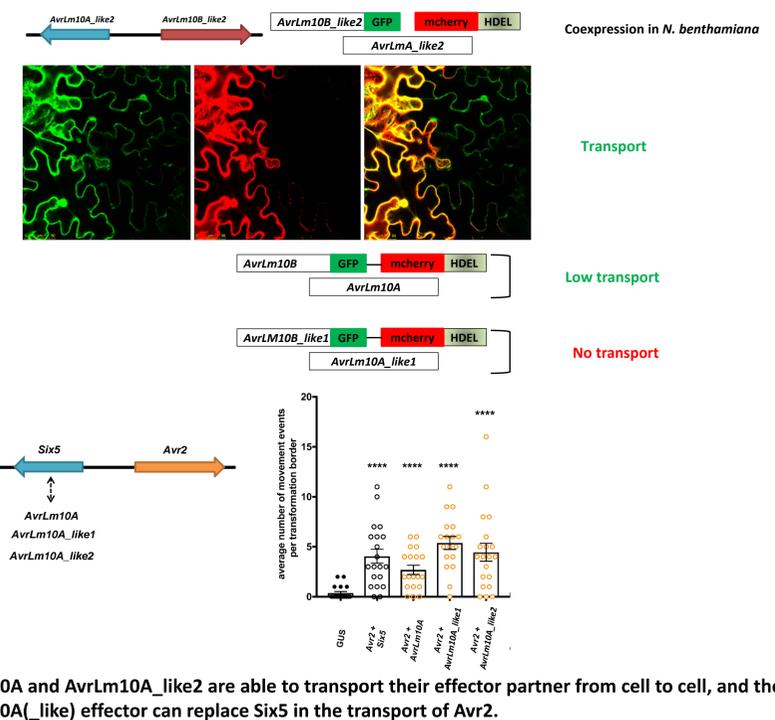


- Four pairs specifically expressed during the biotrophic stages of infection
- Two expression patterns
- Co-regulation of the two genes within a pair

## 4. Two AvrLm10 effector pairs physically interact



## 6. AvrLm10A(\_like) effectors are able to transport their effector partner and Avr2 from cell-to-cell



*AvrLm10A* and *AvrLm10A\_like2* are able to transport their effector partner from cell to cell, and the three *AvrLm10A*(\_like) effector can replace *Six5* in the transport of *Avr2*.

## Perspectives

Is the effector transport mechanism through plasmodesmata conserved in other plant pathogenic fungi?

What is the role of the transported effector? (suppression of PTI?)

## References:

Ma et al. *New Phytol.* (2015)  
Cao et al. *Mol. Plant* (2018)  
Petit-Houdenot et al. *New Phytol.* (2019)  
Talbi et al. *Mol. Plant Pathol.* (2023)

## Affiliations:

<sup>1</sup>UR BIOGER, INRAE, Université Paris-Saclay, Palaiseau, France  
<sup>2</sup>Molecular Plant Pathology, University of Amsterdam, Amsterdam, Netherlands  
<sup>3</sup>UMR LIPME, Université de Toulouse, INRAE, CNRS, Castanet-Tolosan, France  
<sup>4</sup>FRAIB-TRI, Université de Toulouse, CNRS, Castanet-Tolosan, France