



Decrease in PME48 activity leads to abnormal pollen germination

Christelle Leroux, Sophie Bouton, Claudine Morvan, Françoise Fournet, Stephanie S. Guenin, Marie-Christine Kiefer-Meyer, Alain A. Mareck, Jérôme Pelloux, Azeddine A. Driouich, Patrice Lerouge, et al.

► To cite this version:

Christelle Leroux, Sophie Bouton, Claudine Morvan, Françoise Fournet, Stephanie S. Guenin, et al.. Decrease in PME48 activity leads to abnormal pollen germination. 23rd International Congress on Sexual Plant Reproduction, ICSPR, Jul 2014, Porto, Portugal. hal-02081453

HAL Id: hal-02081453

<https://normandie-univ.hal.science/hal-02081453>

Submitted on 27 Mar 2019

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.

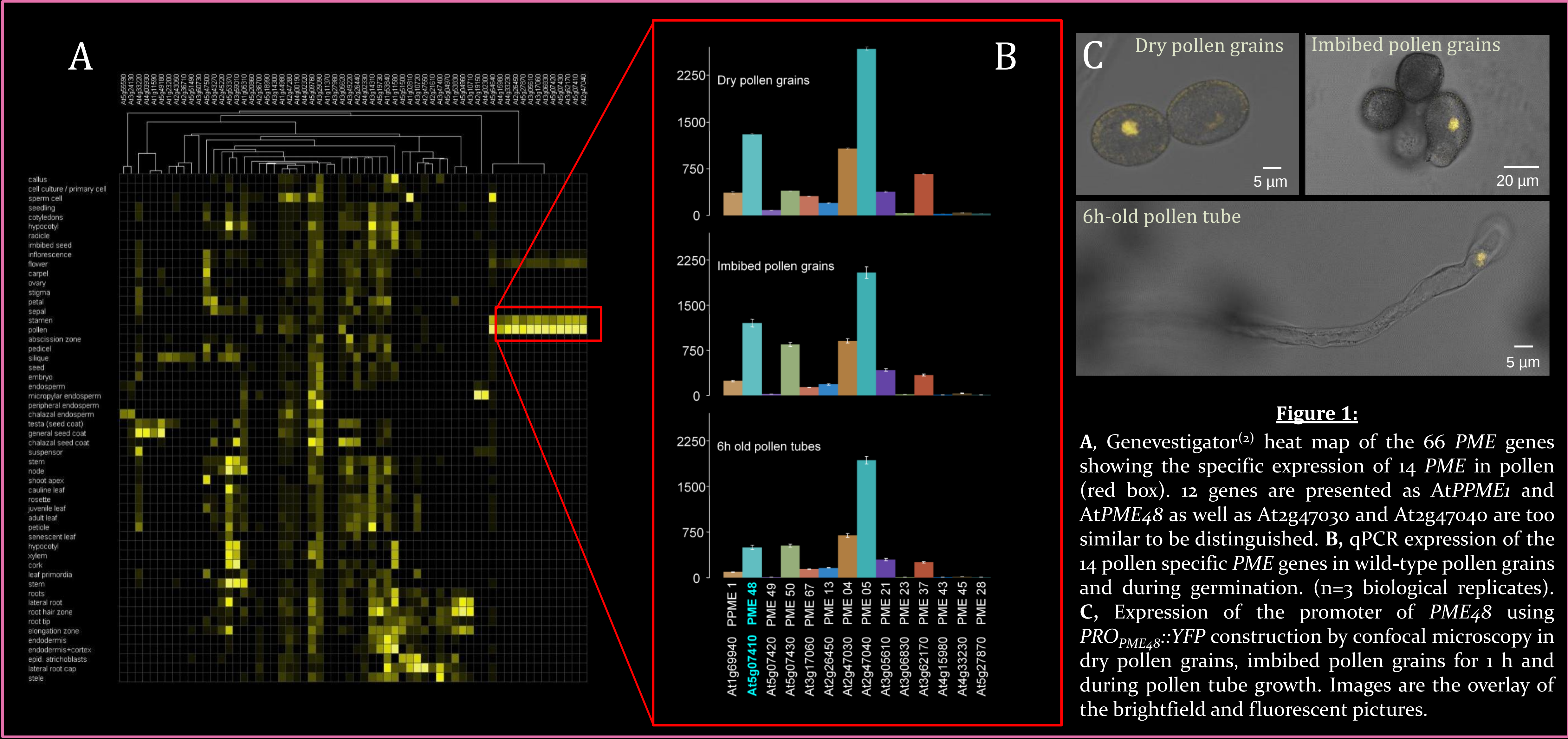
Decrease in PME48 activity leads to abnormal pollen germination

Leroux Ca, Bouton Sb, Morvan Cc, Fournet Fb, Guénin Sb, Kiefer-Meyer MCa, Mareck Aa, Pelloux Jb, Driouich Aa, Lerouge Pa, Lehner Aa & Mollet JCa.

^a Laboratoire de Glycobiologie et Matrice Extracellulaire Végétale (Glyco-MEV) EA4358, Normandy University, University of Rouen, Institut de Recherche et d'Innovation Biomédicale, 76821 Mont-Saint-Aignan, France.
^b Laboratoire Biologie des Plantes & Innovation (BIOPI) EA3900, University of Picardie Jules Verne, 80039 Amiens, France.
^c Laboratoire Polymères, Biopolymères, Surfaces (PBS) UMR6270, FR3038 CNRS, Normandy University, University of Rouen, Institut de Recherche et d'Innovation Biomédicale, 76821 Mont-Saint-Aignan, France.

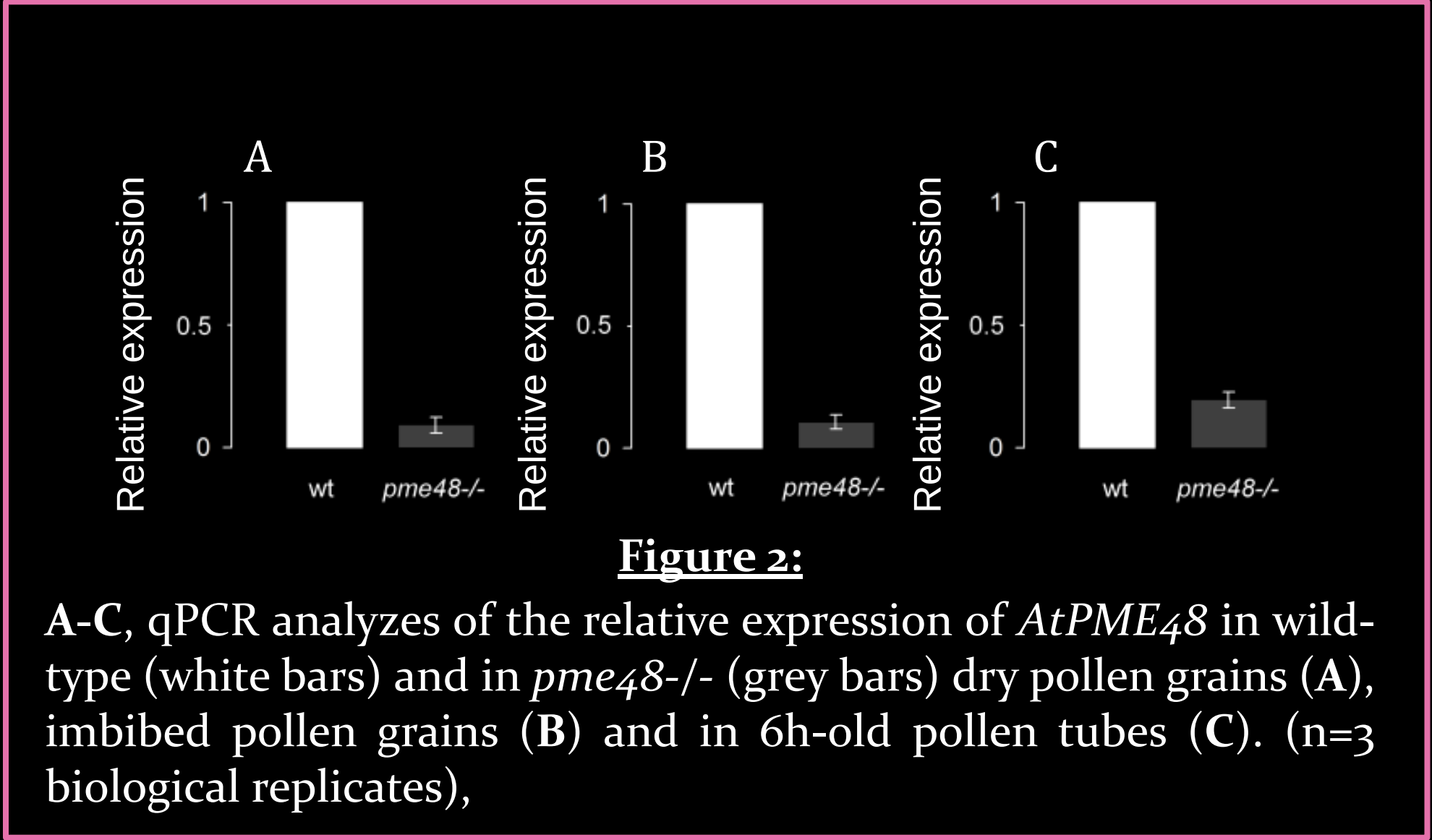
INTRODUCTION

Germination of the pollen grain on the stigma is the first step of the reproduction process. It needs a complete and rapid rehydration of the pollen that may be controlled by the variation of the degree of methylesterification of pectic homogalacturonans (HGs). Methylester groups are hydrophobic and they can be removed from the HGs by the action of pectin methylesterases (PME)⁽¹⁾. The expression of a gene coding for a pollen specific PME : *AtPME48* has been analyzed by RT-qPCR and a *PRO::PME48-sYFP* line. Moreover, we have investigated the role of reduced PME activity on the pollen grain germination using a knock-down mutant for *PME48*.



1. *AtPME48* expression profile

- 14 *PMEs* are pollen specific (Fig. 1A)
- *AtPME48* is strongly expressed in wild-type dry pollen grains, imbibed pollen grains and 6h-old pollen tubes grown *in vitro* (Fig. 1B).
- The promoter of *PME48* (*PRO::PME48*) is strongly expressed in dry pollen grains, imbibed pollen grains and in 6h-old pollen tube (Fig. 1C).



2. Effect of the loss of the PME48

- In *pme48*^{-/-}, the expression of *AtPME48* is reduced by 90% in dry and imbibed pollen grains (Fig. 2A, B) and by 80% in pollen tubes (Fig. 2C).

- PME activity corresponding to PME48 is lost in the mutant (Fig. 3A, blue circle). Note that PME28 does not appear on the zymogram as its pI is too acidic.

The total PME activity is reduced of 50% in the mutant (Fig. 3B).

- FT-IR analyzes on pectin extracts from dry pollen grains show a significant 2-fold higher level of the degree of methylesterification of the HG in *pme48*^{-/-} (Fig. 3C-D).

- The higher level of degree of methylesterification of the HG in *pme48*^{-/-} pollen grains is correlated with a strong delay in pollen germination. Only 10% of the mutant grains were germinated after 24 h (Fig. 3E).

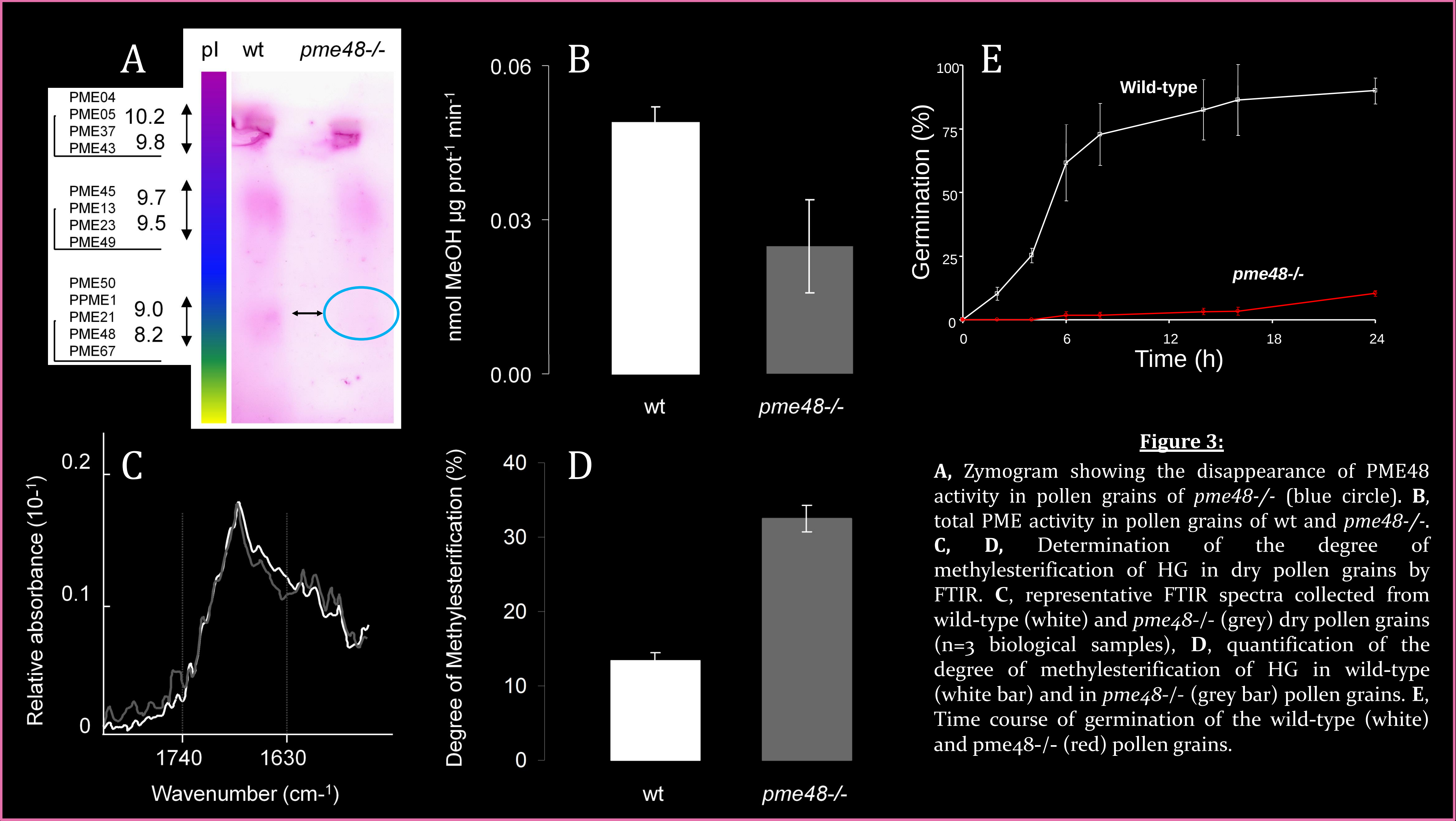


Figure 3:

A, Zymogram showing the disappearance of PME48 activity in pollen grains of *pme48*^{-/-} (blue circle). B, total PME activity in pollen grains of wt and *pme48*^{-/-}. C, D, Determination of the degree of methylesterification of HG in dry pollen grains by FTIR. C, representative FTIR spectra collected from wild-type (white) and *pme48*^{-/-} (grey) dry pollen grains (n=3 biological samples), D, quantification of the degree of methylesterification of HG in wild-type (white bar) and *pme48*^{-/-} (grey bar) pollen grains. E, Time course of germination of the wild-type (white) and *pme48*^{-/-} (red) pollen grains.

CONCLUSIONS

The loss of PME48 activity leads to a higher degree of methylesterification of the HG in the intine of the pollen grain resulting in a strong delay of pollen germination. PME48 participates in the removal of the hydrophobic methylester groups of the HG during maturation of the pollen grain promoting its proper germination.

References: 1. Micheli *et al.*, 2001; 2. Hruz *et al.*, 2008;