Patrick Willems, Ph.D.

Willems533@gmail.com, +32 473 50 76 65, Department of Plant Biotechnology and Bioinformatics, Ghent University, Technologiepark 71, 9052 Ghent, BE

PERSONALIA

Date of birth	June 2nd 1990
Sex	Male
Nationality	Belgian
Residence	Liedekerke, Belgium
Civil status	Married, 3 children
ORCID number	0000-0003-4667-2294
Google Scholar	yh0bSnMAAAAJ
Researcher ID	AAD-3493-2020
Website	https://patrick-willems.github.io/

EDUCATION

2018 – Current	**Postdoctoral Researcher** in Biochemistry and Biotechnology, Ghent University
2018 – 2018	**Postdoctoral Researcher** in Biochemistry and Microbiology, Ghent University
2013 –2018	**PhD** in Biochemistry and Biotechnology, Ghent University
2011 – 2013	**Master** in Biochemistry and Biotechnology, Ghent University
2008 – 2011	**Bachelor** in Biochemistry and Biotechnology, Ghent University

RESEARCH EXPERTISE

I obtained my master degree at Ghent University after plant studying cold stress signaling in plants during six months in the Vaughan Hurry lab in Umeå (Sweden). Afterwards, I continued studying plant abiotic stress signaling during my PhD in the Oxidative Stress Signaling group of Frank Van Breusegem in collaboration with the proteomics group of Kris Gevaert. This led to multiple first author papers and several co-authorships, mostly entailing integrative –OMICS analysis of transcriptome, proteome or other datasets. As a post-doctoral researcher, I was active in the field of microbiology by annotating novel proteins in *Salmonella enterica*. More recently, I am focusing on studying post-translational modifications (PTMs) in plants. Recent published work on this topic incudes the characterization of *S*-sulfenylation at a site-specific level in Arabidopsis and the development of an integrative plant PTM database 'The Plant PTM Viewer'. The bridging theme in his research is the integration and interpretation of large -OMICS data to address specific biological research questions.

BIBLIOGRAPHY

Articles (*corresponding authorship, ¶co-first authorship)

Own work

Redox signaling in plants

1. **Willems, Patrick**¶, Valerie Van Ruyskensvelde¶, Takanori Maruta, Robin Pottie, Álvaro D. Fernández-Fernández, Jarne Pauwels, Matthew A. Hannah, Kris Gevaert, Frank Van Breusegem and Katrien Van der Kelen. 2023. "Mutation of Arabidopsis SME1 and Sm core assembly improves oxidative stress resilience." FREE RADICAL BIOLOGY AND MEDICINE *Accepted*. doi:10.1016/j.freeradbiomed.2023.02.025

2. **Willems, Patrick***, Jingjing Huang, Joris Messens, and Frank Van Breusegem. 2022. "Functionally annotating cysteine disulfides and metal binding sites in the plant kingdom using AlphaFold2 predicted structures." 2022. FREE RADICAL BIOLOGY AND MEDICINE 194: 220-229. doi:10.1016/j.freeradbiomed.2022.12.001

3. **Willems, Patrick**, Frank Van Breusegem, and Jingjing Huang. 2021. "Contemporary Proteomic Strategies for Cysteine Redoxome Profiling." PLANT PHYSIOLOGY 186 (1): 110–124. doi:10.1093/plphys/kiaa074.

4. Wei, Bo¶, **Patrick Willems¶**, Jingjing Huang, Caiping Tian, Jing Yang, Joris Messens, and Frank Van Breusegem. 2020. "Identification of Sulfenylated Cysteines in Arabidopsis Thaliana Proteins Using a Disulfide-Linked Peptide Reporter." FRONTIERS IN PLANT SCIENCE 11. doi:10.3389/fpls.2020.00777. Impact factor: 5.753, category: PLANT SCIENCES, rank: 17/235.

5. Huang, Jingjing¶, **Patrick Willems¶,** Bo Wei¶, Caiping Tian, Renan B Ferreira, Nandita Bodra, Santiago Agustín Martínez Gache, Khadija Wahni, Keke Liu, Didier Vertommen, Kris Gevaert, Kate S Carroll, Marc Van Montagu, Jing Yang, Frank Van Breusegem, and Joris Messens. 2019. "Mining for Protein S-Sulfenylation in Arabidopsis Uncovers Redox-Sensitive Sites." PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA 116 (42): 21256–21261. doi:10.1073/pnas.1906768116. Impact factor: 9.412, category: MULTIDISCIPLINARY SCIENCES, rank: 8/71.

6. **Willems, Patrick**, Amna M'Hamdi, Simon Stael, Veronique Storme, Pavel Kerchev, Graham Noctor, Kris Gevaert, and Frank Van Breusegem. 2016. "The ROS Wheel: Refining ROS Transcriptional Footprints." Plant Physiology 171 (3): 1720–1733. Impact factor: 6.456, category: PLANT SCIENCES, rank: 11/211.

Databases and technologies

7. **Willems, Patrick**, Ursula Fels, An Staes, Kris Gevaert, and Petra Van Damme. 2021. "Use of Hybrid Data-Dependent and -Independent Acquisition Spectral Libraries Empowers Dual-Proteome Profiling." JOURNAL OF PROTEOME RESEARCH 20 (2): 1165–1177. doi:10.1021/acs.jproteome.0c00350.

8. **Willems, Patrick**, Alison Horne, Thomas Van Parys, Sofie Goormachtig, Ive De Smet, Alexander Botzki, Frank Van Breusegem, and Kris Gevaert. 2019. "The Plant PTM Viewer, a Central Resource for Exploring Plant Protein Modifications." PLANT JOURNAL 99 (4): 752–762. doi:10.1111/tpj.14345. Impact factor: 6.141, category: PLANT SCIENCES, rank: 13/234.

Proteogenomics and N-terminal proteomics

9. **Willems, Patrick**, Elvis Ndah, Veronique Jonckheere, Frank Van Breusegem, and Petra Van Damme. 2021. "To new beginnings: Riboproteogenomics discovery of N-terminal proteoforms in Arabidopsis thaliana." FRONTIERS IN PLANT SCIENCE. 12: 778804. doi:10.3389/fpls.2021.778804.

10. **Willems, Patrick**, Igor Fijalkowski, and Petra Van Damme. 2020. "Lost and Found : Re-Searching and Re-Scoring Proteomics Data Aids Genome Annotation and Improves Proteome Coverage." MSYSTEMS 5 (5). doi:10.1128/mSystems.00833-20. Impact factor: 6.496, category: MICROBIOLOGY, rank: 21/137.

11. **Willems, Patrick**, Elvis Ndah, Veronique Jonckheere, Simon Stael, Adriaan Sticker, Lennart Martens, Frank Van Breusegem, Kris Gevaert, and Petra Van Damme. 2017. "N-terminal Proteomics Assisted Profiling of the Unexplored Translation Initiation Landscape in Arabidopsis Thaliana." Molecular & Cellular Proteomics 16 (6): 1064–1080. Impact factor: 5.232, category: BIOCHEMICAL RESEARCH METHODS, rank: 9/79.

Collaborations

12. Zhou, Heng, Jingjing Huang, **Patrick Willems**, Frank Van Breusegem, and Yanjie Xie, 2022. "Cysteine thiol-based post-translational modification: What do we know about transcription factors?" TRENDS IN PLANT SCIENCE. *In press*. doi: 10.1016/j.tplants.2022.11.007

13. Fijalkowski, Igor, **Willems, Patrick**, Jonckheere, Veronique, Simoens, Laure, and Petra Van Damme. 2022. "Hidden in plain sight: challenges in proteomics detection of small ORF-encoded polypeptides." MICROLIFE. 3: uqac005. doi:10.1093/femsml/uqac005.

14. He, Huaming, Jordi Denecker, Katrien Van Der Kelen, **Patrick Willems**, Robin Pottie, Su Yin Phua, Matthew A. Hannah, Didier Vertommen, Frank Van Breusegem, and Amna M'Hamdi. 2021. "The Arabidopsis Mediator Complex Subunit 8 Regulates Oxidative Stress Responses." PLANT CELL 33 (6): 2032–2057. doi:10.1093/plcell/koab079.

15. Rusaczonek, Anna, Weronika Czarnocka, **Patrick Willems**, Marzena Sujkowska-Rybkowska, Frank Van Breusegem, and Stanisław Karpiński. 2021. "Phototropin 1 and 2 Influence Photosynthesis, UV-C Induced Photooxidative Stress Responses, and Cell Death." CELLS 10 (2). doi:10.3390/cells10020200.

16. Czarnocka, Weronika, Anna Rusaczonek, **Patrick Willems**, Marzena Sujkowska-Rybkowska, Frank Van Breusegem, and Stanisław Karpiński. 2020. "Novel Role of JAC1 in Influencing Photosynthesis, Stomatal Conductance, and Photooxidative Stress Signalling Pathway in Arabidopsis Thaliana." FRONTIERS IN PLANT SCIENCE 11. doi:10.3389/fpls.2020.01124. Impact factor: 5.753, category: PLANT SCIENCES, rank: 17/235.

17. van der Meer, Tom, Arno Verlee, **Patrick Willems**, Francis Impens, Kris Gevaert, Christa Testerink, Christian Stevens, Frank Van Breusegem, and Pavel Kerchev. 2020. "Chemical Genetics Approach Identifies Abnormal Inflorescence Meristem 1 as a Putative Target of a Novel Sulfonamide That Protects Catalase2-Deficient Arabidopsis against Photorespiratory Stress." CELLS 9 (9). doi:10.3390/cells9092026. Impact factor: 6.6, category: CELL BIOLOGY, rank: 53/195.

18. Fijalkowska, Daria, Igor Fijalkowski, **Patrick Willems**, and Petra Van Damme. 2020. "Bacterial Riboproteogenomics : The Era of N-Terminal Proteoform Existence Revealed." FEMS MICROBIOLOGY REVIEWS 44 (4): 418–431. doi:10.1093/femsre/fuaa013. Impact factor: 16.408, category: MICROBIOLOGY, rank: 6/137.

19. Hander, Tim, Alvaro D Fernández Fernández, Robert Kumpf, **Patrick Willems**, Hendrik Schatowitz, Debbie Rombaut, An Staes, Jonah Nolf, Robin Pottie, Panfeng Yao, Amanda Gonçalves, Benjamin Pavie, Thomas Boller, Kris Gevaert, Frank Van Breusegem, Sebastian Bartels, and Simon Stael. 2019. "Damage on Plants Activates Ca2+-Dependent Metacaspases for Release of Immunomodulatory Peptides." SCIENCE 363 (6433). doi:10.1126/science.aar7486. Impact factor: 41.846, category: MULTIDISCIPLINARY SCIENCES, rank: 2/71.

20. Escamez, Sacha, Simon Stael, Julia P Vainonen, **Patrick Willems**, Huiting Jin, Sachie Kimura, Frank Van Breusegem, Kris Gevaert, Michael Wrzaczek, and Hannele Tuominen. 2019. "Extracellular Peptide Kratos Restricts Cell Death During Vascular Development and Stress in Arabidopsis." Journal of Experimental Botany 70 (7): 2199–2210. Impact factor: 5.908, category: PLANT SCIENCES, rank: 14/234.

21. De Smet, Barbara, **Patrick Willems**, Alvaro Daniel Fernández Fernández, Saleh Alseekh, Alisdair R Fernie, Joris Messens, and Frank Van Breusegem. 2019. "In Vivo Detection of Protein Cysteine Sulfenylation in Plastids." Plant Journal 97 (4): 765–778. Impact factor: 6.141, category: PLANT SCIENCES, rank: 13/234.

22. Huang, Jingjing, **Patrick Willems**, Frank Van Breusegem, and Joris Messens. 2018. "Pathways Crossing Mammalian and Plant Sulfenomic Landscapes." FREE RADICAL BIOLOGY AND MEDICINE 122: 193–201. doi:10.1016/j.freeradbiomed.2018.02.012. Impact factor: 5.657, category: BIOCHEMISTRY & MOLECULAR BIOLOGY, rank: 43/298.

23. Zhang, Xinhua, Aneta Ivanova, Klaas Vandepoele, Jordan Radomiljac, Jan Van de Velde, Oliver Berkowitz, **Patrick Willems**, Yue Xu, Sophia Ng, Olivier Van Aken, Owen Duncan, Botao Zhang, Veronique Storme, Kai Xun Chan, Dries Vaneechoutte, Barry James Pogson, Frank Van Breusegem, James Whelan, and Inge De Clercq. 2017. "The Transcription Factor MYB29 Is a Regulator of ALTERNATIVE OXIDASE1a." Plant Physiology 173 (3): 1824–1843. Impact factor: 5.949, category: PLANT SCIENCES, rank: 11/222.

24. Czarnocka, Weronika, Katrien Van Der Kelen, **Patrick Willems**, Magdalena Szechynska-Hebda, Sara Shahnejat-Bushehri, Salma Balazadeh, Anna Rusaczonek, Bernd Mueller-Roeber, Frank Van Breusegem, and Stanislaw Karpiński. 2017. "The Dual Role of LESION SIMULATING DISEASE 1 as a Condition-dependent Scaffold Protein and Transcription Regulator." Plant Cell and Environment 40 (11): 2644–2662. Impact factor: 5.415, category: PLANT SCIENCES, rank: 13/222.

25. Kerchev, Pavel, Cezary Waszczak, Aleksandra Lewandowska, **Patrick Willems**, Alexey Shapiguzov, Zhen Li, Saleh Alseekh, Per Mühlenbock, Frank Hoeberichts, Jingjing Huang, Katrien Van Der Kelen, Jaakko Kangasjarvi, Alisdair R Fernie, Riet De Smet, Yves Van de Peer, Joris Messens, and Frank Van Breusegem. 2016. "Lack of GLYCOLATE OXIDASE1, but Not GLYCOLATE OXIDASE2, Attenuates the Photorespiratory Phenotype of CATALASE2-Deficient Arabidopsis." PLANT PHYSIOLOGY 171 (3): 1704–1719. Impact factor: 6.456, category: PLANT SCIENCES, rank: 11/211.

26. Waszczak, Cezary, Pavel Kerchev, Per Mühlenbock, Frank Hoeberichts, Katrien Van Der Kelen, Amna Mhamdi, **Patrick Willems**, Jordi Denecker, Robert Kumpf, Graham Noctor, Joris Messens, and Frank Van Breusegem. 2016. "SHORT-ROOT Deficiency Alleviates the Cell Death Phenotype of the Arabidopsis Catalase2 Mutant Under Photorespiration-promoting Conditions." Plant Cell 28 (8): 1844–1859. Impact factor: 8.688, category: PLANT SCIENCES, rank: 6/211.

27. Verkest, Aurine, Marina Byzova, Cindy Martens, **Patrick Willems**, Tom Verwulgen, Bram Slabbinck, Debbie Rombaut, Jan Van de Velde, Klaas Vandepoele, Evi Standaert, Marrit Peeters, Maria Van Lijsebettens, Frank Van Breusegem, and Marc De Block. 2015. "Selection for Improved Energy Use Efficiency and Drought Tolerance in Canola Results in Distinct Transcriptome and Epigenome Changes." PLANT PHYSIOLOGY 168 (4): 1338–1350. doi:10.1104/pp.15.00155. Impact factor: 6.28, category: PLANT SCIENCES, rank: 8/209.

28. Jacques, Silke, Bart Ghesquière, Pieter-Jan De Bock, Hans Demol, Khadija Wahni, **Patrick Willems**, Joris Messens, Frank Van Breusegem, and Kris Gevaert. 2015. "Protein Methionine Sulfoxide Dynamics in Arabidopsis Thaliana under Oxidative Stress." MOLECULAR & CELLULAR PROTEOMICS 14 (5): 1217–1229. doi:10.1074/mcp.M114.043729. Impact factor: 5.912, category: BIOCHEMICAL RESEARCH METHODS, rank: 6/77.

29. Stael, Simon, Przemyslaw Kmiecik, **Patrick Willems**, Katrien Van Der Kelen, Nuria S Coll, Markus Teige, and Frank Van Breusegem. 2015. "Plant Innate Immunity: Sunny Side Up?" Trends in Plant Science 20 (1): 3–11. Impact factor: 10.899, category: PLANT SCIENCES, rank: 2/209.

30. Ng, Sophia, Inge De Clercq, Olivier Van Aken, Simon R Law, Aneta Ivanova, **Patrick Willems**, Estelle Giraud, Frank Van Breusegem, and James Whelan. 2014. "Anterograde and Retrograde Regulation of Nuclear Genes Encoding Mitochondrial Proteins During Growth, Development, and Stress." Molecular Plant 7 (7): 1075–1093. Impact factor: 6.337, category: PLANT SCIENCES, rank: 9/204.

Editorials and book chapters (*corresponding authorship)

1. **Willems, Patrick***, Pitter F Huesgen, Iris Finkemeier, Emmanuelle Graciet, Thierry Meinnel, Frank Van Breusegem. 2022. "Editorial: Plant protein termini: Their generation, modification and function". Frontiers In Plant Science.
2. **Willems, Patrick***. "Exploring posttranslational modifications with the Plant PTM Viewer." In Plant Proteases and Plant Cell Death, ed. Simon Stael, Marina Klemenčič and Pitter Huesgen. New York, NY, USA: Springer.
3. **Willems, Patrick***. "Analysis of ROS-triggered changes in the transcriptome." In Reactive Oxygen Species in Plants: Methods and Protocols, ed. Amna M'Hamdi. New York, NY, USA: Springer.
4. M'Hamdi, Amna, Pavel Kerchev, **Patrick Willems**, Graham Noctor, and Frank Van Breusegem. 2017. "Measurement of Transcripts Associated with Photorespiration and Related Redox Signaling." In Photorespiration : Methods and Protocols, ed. Alisdair R Fernie, Hermann Bauwe, and Andrew PM Weber, 1653:17–29. New York, NY, USA: Springer.

WEBSITES

The Plant PTM Viewer (https://www.psb.ugent.be/PlantPTMViewer)

➔ Analytics: approximately 12,000 users, 19.1% returning visitors

CONFERENCES

Selected for oral presentation:

1. Redox Biology Congress 2022, 2022 Ghent
2. PSB symposium, 2022 Ghent
3. Fall symposium, 2022 Ghent
4. HUPLANTcontrol, COST Action 16110 Control of Human Pathogenic Micro-organisms in Plant Production systems, 2018 Dubrovnik

5. 4th Plant Protease and PCD symposium, 2018 Ghent
6. Belgian Proteomic Association (BePAc) meeting, 2017 Ghent
7. Interuniversity Attraction Poles Programme (IUAP) meeting, 2016 Antwerp

Poster contributions:

1. Next-Generation Protein Analysis and Detection (4th edition), 2022 Ghent
2. Forty Years of mRNA Splicing: From Discovery to Therapeutics, 2017 Cold Spring Harbor
3. Plant Oxygen Group conference, 2015 Verona

RESEARCH FUNDING

Research grants

- Research Foundation – Flanders (FWO) junior postdoctoral grant: 'Systemic redoxome profiling in plants: catching the ROS wave' (grant 12T1722N, started October 2021)

International travel grants

- Research Foundation – Flanders (FWO) travel grant for '12th International Conference on 'Reactive Oxygen and Nitrogen Species in Plants: from model systems to field', June 2015 (grant K149115N).
- Research Foundation – Flanders (FWO) travel grant for Cold Spring Harbor meeting 'Forty Years of mRNA Splicing: From Discovery to Therapeutics', October 2017 (grant K1E2817N).

International mobility grants

- Participant in FWO-NSFC international Mobility project, "Mining the redox switches in plant oxidative stress signaling with chemoproteomics." (NSFC-n.3201101597/FWO-n.VS02521N)

SCHOLARLY ACTIVITIES

Student supervision

1. Supervision Yanni Stalmans, HOWEST University of Applied Sciences, 'Identifying and visualizing protein cleavage sites in Arabidopsis thaliana'. 2021 April-June, evaluation 18 June 2021.
2. Supervision Ricky Colman, Ghent University, Master 1 project, 'Crosslink interactomics of the Mediator compex in Arabidopsis thaliana'. 2022 March-April
3. Co-supervision Lindsey De Veirman, Ghent University, Master 1 project, 'Investigating thiol-based redox regulation using immunoprecipitation proteomics in plants'. 2022 March-April
4. Supervision Muhammad Jawad SIDDIQUE, Ghent University, PhD. 'Oxidative stress signaling event in the plant nucleus'. 2022-2026

Reviewing

- Reviewer for international scientific journals including Cell Death & Differentiation, Journal of Proteome Research, PLOS One, Plant Physiology and Biochemistry, Frontiers in Plant Science.
- 2020 – Associate Editor for Frontiers in Plant Science, hosting research topic 'Plant Protein Termini: Their Generation, Modification and Function'.
- June 2021: Reading commissioner, Master dissertation Valdes Snauwaert (Ghent University; WE10).
- June 2022: Reading commissioner, Master dissertation Laure Simoens (Ghent University; WE10).
- Oct 2022: PhD jury member Bhavesh Parmar (KU Leuven), 'Discovery of non-canonical translation products and functional annotation of a novel overlapping gene in C. elegans''.

Teaching

- Aid Practical session, D012184A – Systems Biology, Ghent University
- Assist feedback evaluations thesis Master of Science in Plant Biotechnology
- Participation Basisdocententraining 2.0 (NL), organized by the Department of Educational Policy – Educational Quality Assurance Office.