# Trichome mimics: sprayable plant-based adhesives for crop protection against thrips

Bierman, T.V.

# Curriculum Vitae

Thijs Victor Bierman was born on the 12th of April 1996, in Haarlem, the Netherlands. Thereafter he was raised in Driehuis, a small village located close to forest and dune areas. Because of this, Thijs was able to develop his innate interest in nature. After finishing high school, he went to Wageningen University, the Netherlands where he completed a bachelor's in biology and a master's in plant science with a focus on entomology and plant pathology. Aspiring to become an agricultural ecologist and pest control specialist, Thijs studied insect and plant ecology, taxonomy and cultivation techniques, and performed insect behavioral and pest control studies as part of his thesis projects. His second thesis project involved an internship at an agricultural pest control company, Koppert Biological Systems B.V. Driven by his desire for more sustainable agricultural systems and a greener world overall, he became part of Leiden Universities' Plant Ecology group (currently known as the Above-Belowground Interactions group) where he started his PhD under supervision of Prof. Dr. Peter G. L. Klinkhamer and Dr. Young Hae Choi as part of the NWO funded Plant Self-Defense project. During later stages of his PhD project supervision was done by Dr. Klaas Vrieling and Prof. Dr. Ir. T. Martijn Bezemer. The findings of the PhD research on the use of sprayable agricultural glues made from natural materials to control thrips and other small arthropod pests are presented in this thesis.

# List of Publications

Bierman TV, Choi YH, Bezemer TM (2025) Sticky plants and plant-based glues: potential for pest control. Front Plant Sci 16:1612368. Doi: 10.3389/fpls.2025.1612368

Bierman TV, Fernandes HP, Choi YH, Seo S, Vrieling K, Macel M, Knegt B, Kodger TE, Van Zwieten R, Klinkhamer PGL, Bezemer TM (2025) Sprayable solutions containing sticky rice oil droplets reduce western flower thrips damage and induce changes in *chrysanthemum* leaf chemistry. Front Plant Sci 16:1509126. Doi: 10.3389/fpls.2025.1509126

Wang X, Yan J, Bierman TV, Dong X, Wu Y, Wang W, Zhuang M (2025) Closing economical and sustainability gaps for China's wheat, maize, and rice production: A county level energy analysis approach. J Environ Manage, 380:125041. Doi: 10.1016/j.jenvman.2025.125041

Van Zwieten R, Bierman TV, Klinkhamer PGL, Bezemer TM, Vrieling K, Kodger TE (2024) Mimicking natural deterrent strategies in plants using adhesive spheres. Proc Natl Acad Sci U.S.A. 121:e2321565121. Doi: 10.1073/pnas.2321565121

Bierman TV, Vrieling K, van Zwieten R, Kodger TE, Macel M, Bezemer TM (2024) Adhesive droplets made from plant-derived oils for control of western flower thrips. J Pest Sci 97:2175–2186. Doi: 10.1007/s10340-024-01755-4

# Acknowledgements

The work in this PhD thesis was financially supported by the Dutch Research Council (NWO) and several companies: Van Iperen B.V., Holland Biodiversity, Holland Green machine. The research took place at the facilities of several scientific institutions, including Leiden University, Wageningen University & Research, Groningen University, and Aeres Applied University. First, I would like to express my gratitude to the NWO and the NWO advisory committee and to the involved companies and universities. Second, I would like to express my deepest gratitude to my PhD project supervisors. Prof. Dr. Peter G. L Klinkhamer, Dr. Klaas Vrieling, Prof. Dr. Ir. T. Martijn Bezemer and Dr. Young Hae Choi. Peter, thank you so much for accepting me into your group and guiding me at the start of my PhD. Klaas, I could not have wished for a better second supervisor. Your wisdom, leadership and practical mindset were key factors to move both the project and my PhD forward at a rapid pace. Martijn, as the third project leader and my final promotor, you have supported me in many ways during the last two years. I am very grateful to you for being a great and inspiring leader for our group and for your care and help during the final phase of my PhD project. Young, I am very grateful to you for being my co-promotor. Next to being a brilliant teacher, your assistance regarding writing and the chemical analyses featured in this thesis were vital for the completion and publication of several of the chapters. I hope to collaborate with you and Martijn again in the future. Third, I am grateful to my close collaborators and colleagues. In no particular order: Hocelayne, thank you for your collaboration during several experiments and for managing the GC-MS and NMR samples. Eelco, thanks for inspiring our department to be more organized. Thomas and Ralph, your brilliance in development of the sticky materials, involvement during testing and help with other aspects of my PhD was super, I am grateful to you both. Mirka and Bram, hats off and a bow to you. Not only did you two organize great meetings, but you also helped to lay the foundations of the predator-based research. Marleen and Abinaya, thank you for thinking along with product development and for exploring alternate product types. For sure I have learned a lot from both of you. Samir, thank you for your insightful comments and help with product development. Sumin, thank you also for your help with

the metabolomics analyses. Ozlem, Ria and Dr. Kim, thank you for your general chemical assistance and kindness. Conno and Jan-Willem, thank you for providing sharp comments on the research and guidance regarding the more practical aspects of the project. Sofia, thank you for all the help during my PhD research and for everything you do for our research group. Suzanne, thank you for being an exemplary teacher during the field ecology course and an inspiring researcher in other ways. Kees, Alex, Gerda, Joost, Altay, and Jan, thank you for your assistance with several practical aspects of the research. Hein, Thenisha, Sabina, Hugo, and Nikolas, thank you all for your friendliness and for the lovely chats. Christina, Sylvia, Maya, and Masa, thank you for keeping my PhD trajectory on track. Peter and Anton, thank you for the chrysanthemums and predators, both of which were essential to the experiments. Fifth, to my fellow PhDs and Postdocs: Kostas, we started on the same day, and you were truly my rival and a heroic example of a true researcher. Xiangyu, Annemiek and Miradel thanks a lot for the scientific discussions and gezelligheid in the office. Yuhui, Adam, Elke, Joes, Inge, Marieke, Farzad, Karin, Carola, Naksha, Costanza, it was a joy to work alongside all of you. Sixth, Kelly, Christiana, Maaike, Thomas, Sam, Nicky, and all other students that I have supervised, thank you. Seventh, Su, Nuri, Owyn, Federico, Manon, David, Phuong, Diana, Nad, thank you for being my friends and supporting me during my PhD trajectory. One of you was even very helpful once with planting chrysanthemum cuttings. Finally, I would like to thank my parents, Sylvia and Ted, my siblings, David, Lonneke and Bas, Diego and Dieter, my grandparents, Jeanne and Joop, and my uncle Erik for their ongoing support and everything they have done for me in my life and during my studies.