

PROF MARINDA VILJOEN-BLOOM

Abbreviated *Curriculum vitae*

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TERTIARY EDUCATION

1989 – BSc (Microbiology and Chemistry) *cum laude*, University of Stellenbosch

1990 – HonsBSc (Microbiology) *cum laude*, University of Stellenbosch

1992 – MSc (Microbiology) *cum laude*, University of Stellenbosch

1998 – PhD (Microbiology), University of Stellenbosch

Visiting Graduate Student at Whitehead Institute for Biomedical Research & Massachusetts Institute of Technology, USA (July 1993 – Dec. 1994)

PROFESSIONAL APPOINTMENTS

2010 – present : Associate Professor in Microbiology, University of Stellenbosch

2001 – 2009 : Senior Lecturer in Microbiology, University of Stellenbosch

1997 – 2001 : Lecturer in Microbiology, University of Stellenbosch

RESEARCH PROFILE

Micro-organisms have developed unique enzymes that drive sophisticated metabolic pathways, governed by a complex array of regulatory proteins that enable them to sense, react and adapt to its environment. This complex interaction between substrates, enzymes and gene regulation has been the cornerstone of my research career over the past 30 years. My current research focuses on yeast biotechnology and the recombinant expression of microbial enzymes for value-addition to agricultural products through microbial processing. In collaboration with Prof Emile van Zyl within the SARChI Biofuels Research Chair, several microbial enzymes have been evaluated for feedstock hydrolysis for bioethanol production. We have developed genetically modified yeast strains expressing amylolytic enzymes to hydrolyse raw starch to produce bioethanol from corn, triticale and sweet sorghum. Different strategies have been investigated to increase the expression of amylase genes through alternative promoters and terminators to ensure efficient starch hydrolysis and a high bioethanol yield. Current projects focus on the recombinant expression of a polyester hydrolase in *Saccharomyces cerevisiae* for the microbial hydrolysis of commercial polylactic acid-based bioplastics and the expression of antimicrobial peptides in *S. cerevisiae*.

RESEARCH MANAGEMENT AND GRANTS

- 2023-2025: NRF Competitive Programme for Rated Researchers (Recombinant expression of antimicrobial peptides in yeast)
- 2019-2021: NRF Competitive Programme for Rated Researchers (Transcriptional Engineering for Improved Gene Expression in Yeast)
- 2008-2012: Co-Investigator for PlantBio LEAF (Lignocellulosic Enzyme-Assisted Fermentation)
- 2007-2022: Project manager and co-investigator in SARChI Senior Chair of Energy Research: Biofuels and other clean alternative fuels
- 2003-2006: Programme Manager and Primary Investigator for BioPAD project (Microbial enzymes for Rooibos processing)
- 1998-2003: Winetech (co-funded by THRIP): Various projects on Malate metabolism, Winery effluent

BIBLIOMETRIC INDICATORS (AUGUST 2025):

Google Scholar: 3 415 citations; *h*-index = 28; i10-index = 50

Scopus: 2 090 citations, *h*-index = 24 (58 documents)

ORCID: <https://orcid.org/0000-0002-4825-2392>

RESEARCH OUTPUTS (since 2015)

Articles in international peer-reviewed journals

1. Favaro L, MJ Viktor, SH Rose, M Viljoen-Bloom, WH van Zyl M Basaglia, L Cagnin & S Casella. 2015. Consolidated bioprocessing of starchy substrates by industrial *Saccharomyces cerevisiae* strains secreting fungal amylases. *Biotechnology and Bioengineering* 112 (9): 1751-1760
2. Mhlongo SI, Den Haan R, Viljoen-Bloom M & WH van Zyl. 2015. Lignocellulosic hydrolysate inhibitors selectively inhibit/deactivate cellulase performance. *Enzyme and Microbial Technology*, 81:16-22
3. Kossatz HL, SH Rose, M Viljoen-Bloom & WH van Zyl. 2017. Production of ethanol from steam exploded triticale straw in a simultaneous saccharification and fermentation process. *Process Biochemistry*, 53:10–16.
4. Zwane, E.N., P.J. van Zyl, K.G. Duodu, S.H. Rose, K. Rumbold, W.H. van Zyl, M. Viljoen-Bloom. 2017. Enrichment of maize and triticale bran with recombinant *Aspergillus tubingensis* ferulic acid esterase. *Journal of Food Science and Technology*, 54(3):778-785.
5. Sakwa, L., R.A. Cripwell, S.H. Rose and M. Viljoen-Bloom. 2018. Consolidated bioprocessing of raw starch with *Saccharomyces cerevisiae* strains expressing fungal alpha-amylase and glucoamylase combinations. *FEMS Yeast Research*, 18.
6. Cripwell, R.A., S.H. Rose, M. Viljoen-Bloom and W.H. van Zyl. 2019. Improved raw starch amylase production by *Saccharomyces cerevisiae* using codon optimisation strategies. *FEMS Yeast Research*, 19 (2).
7. Human, C., D. de Beer, M. Aucamp, I.J. Marx, C.J. Malherbe, M. Viljoen-Bloom, M. van der Rijst and E. Joubert. 2020. Preparation of rooibos extract-chitosan microparticles: Physicochemical characterisation and stability of aspalathin during accelerated storage, *LWT - Food Science & Technology*, 117: 108653.
8. Majeke, B.M, M. García-Aparicio, O.D. Biko, M. Viljoen-Bloom, W.H. van Zyl, J.F. Görgens. 2020. Synergistic codon optimization and bioreactor cultivation towards enhanced secretion of fungal lignin peroxidase in *Pichia pastoris*: enzymatic valorization of technical (industrial) lignins. *Enzyme and Microbial Technology*, 139: 109593
9. Cripwell, R.A, L. Favaro, M. Viljoen-Bloom and W.H. van Zyl. 2020. Consolidated bioprocessing of raw starch to ethanol by *Saccharomyces cerevisiae*: achievements and challenges. *Biotechnology Advances*, 42:107579.
10. Myburgh, M.W., S.H. Rose and M. Viljoen-Bloom. 2020. Evaluating and engineering *Saccharomyces cerevisiae* promoters for increased amylase expression and bioethanol production from raw starch. *FEMS Yeast Research* 20: 1-14.
11. Biko, O.D.V., M. Viljoen-Bloom, W.H. van Zyl. 2020. Microbial lignin peroxidases: Applications, production challenges and future perspectives. *Enzyme and Microbial Technology*, 141, 109593.
12. Rocher, D.F., R.A. Cripwell, M. Viljoen-Bloom. 2021. Engineered yeast for enzymatic hydrolysis of laminarin from brown macroalgae. *Algal Research* 54:102233 .
13. Steyn, A., M. Viljoen-Bloom, W.H. van Zyl. 2021. Valorization of apple and grape wastes with malic acid-degrading yeasts. *Folia Microbiologica*, 66:341-354
14. Cripwell R.A., W.H. van Zyl and M. Viljoen-Bloom. 2021. Fungal Biotechnology: Fungal Amylases and their applications. In: Zaragoza, O. (ed) *Encyclopedia of Mycology*, 2:326-336. Oxford: Elsevier.

15. Njokweni, S., A. Steyn, M. Botes, M. Viljoen-Bloom and W.H. van Zyl. 2021. Potential valorization of organic waste streams to valuable organic acids through microbial conversion: A South African case study. *Catalysts* 11, 964.
16. Den Haan, R., S.H. Rose, R.A. Cripwell, K.M. Trollope, M.W. Myburgh, M. Viljoen-Bloom and W.H. van Zyl. 2021. Heterologous production of cellulose- and starch-degrading hydrolases to expand *Saccharomyces cerevisiae* substrate utilization: lessons learnt. *Biotechnology Advances* 53, art. 107859.
17. Biko, O.D., M. Viljoen-Bloom and W.H. van Zyl. 2023. Medium optimization for enhanced production of recombinant lignin peroxidase in *Pichia pastoris*. *Biotechnology Letters* 45:105-113.
18. Smuts, I.E., N.J. Blakeway, N.J., S.H. Rose, R. den Haan, M. Viljoen-Bloom and W.H. van Zyl. 2023. Supplementation of recombinant cellulases with LPMOs and CDHs improves consolidated bioprocessing of cellulose. *Enzyme and Microbial Technology*, 164:110171
19. Steyn, A., M. Viljoen-Bloom, W.H. van Zyl. 2023. Constructing recombinant *Saccharomyces cerevisiae* strains for malic-to-fumaric acid conversion. *FEMS Microbiology Letters*, 370, 1–9
20. Malherbe, S.J.M., R.A. Cripwell, L. Favaro, W.H. van Zyl, M. Viljoen-Bloom. 2023. Triticale and sorghum as feedstock for bioethanol production via consolidated bioprocessing. *Renewable Energy*, 206, 498-505
21. Myburgh, M.W. L. Favaro, W.H. van Zyl, M. Viljoen-Bloom. 2023. Engineered yeast for the efficient hydrolysis of polylactic acid. *Bioresource Technology*, 378, 129008
22. Cripwell, R.A., R. My, L. Treu, S. Campanaro, L. Favaro, W.H. van Zyl and M. Viljoen-Bloom. 2023. Additional glucoamylase genes increase ethanol productivity on rice and potato waste streams by a recombinant amylolytic yeast, *Bioresource Technology* 388, 129787
23. Myburgh, M.W., W.H. van Zyl, M. Modesti, M. Viljoen-Bloom and L. Favaro. 2023. Enzymatic hydrolysis of single-use bioplastic items by improved recombinant yeast strains. *Bioresource Technology* 390, 129908
24. Schwerdtfeger, K.S., M.W. Myburgh, W.H. van Zyl, M. Viljoen-Bloom. 2023. Promoter-proximal introns impact recombinant amylase expression in *Saccharomyces cerevisiae*. *FEMS Yeast Research*, 23: foad047
25. Gupte, A.P., N. Di Vita, M.W. Myburgh, R.A. Cripwell, M. Basaglia, W.H. van Zyl, M. Viljoen-Bloom, S. Casella and L. Favaro. 2024. Consolidated bioprocessing of the organic fraction of municipal solid waste into bioethanol. *Energy Conversion and Management* 302:118105
26. Rossouw, M., R.A. Cripwell, R.R. Vermeulen, A.D. van Staden, L.M.T. Dicks, W.H. van Zyl and M. Viljoen-Bloom. 2024. Heterologous expression of plantaricin 423 and mundticin ST4SA in *Saccharomyces cerevisiae*. *Probiot. Antimicrob. Pept.* 16:845-861
27. Gupte, A.P., S. Agostini, N. Gronchi, R.A. Cripwell, M. Basaglia, M. Viljoen-Bloom, W.H. van Zyl, S. Casella and L. Favaro. 2025. Integrated production of bioethanol and biomethane from rice waste using superior amylolytic recombinant yeast. *Biores. Technol.*, 418:131947
28. Nosrati-Ghods, N., A.M Petersen, C.E. Bosman, M.W. Myburgh, L. Favaro, M. Viljoen-Bloom and J.F. Görgens. 2025. Techno-economic assessment of waste poly(lactic acid) enzymatic hydrolysis and recycling for poly(lactic acid) production. *Biochemical Engineering Journal*, 215:109615
29. Rocher, D.F., M.W. Myburgh, M. Viljoen-Bloom and R.A. Cripwell. 2025. Recombinant alginate lyases and mannitol dehydrogenase enhance hydrolysis of macroalgal carbohydrates. *Enzyme and Microbial Technology*, 186:110618
30. Rossouw, M., Coetzee, G., Cripwell, R.A., van Zyl, W.H., Dicks, L.M.T., Ritter, C.L. and Viljoen-Bloom, M. Published online 2025. Expression of enterocin A in *Saccharomyces cerevisiae*. *Probiotics and Antimicrobial Peptides* [doi.org/10.1007/s12602-025-10686-0]

Book chapters

1. Cripwell R.A., W.H. van Zyl and M. Viljoen-Bloom. 2021. Fungal Biotechnology: Fungal Amylases and their applications. In: Zaragoza, O. (ed) *Encyclopedia of Mycology*, 2:326-336. Oxford: Elsevier [doi.org/10.1016/B978-0-12-809633-8.21082-0]

2. Myburgh, M.W., K.S. Schwerdtfeger, R.A. Cripwell, W.H. van Zyl and M. Viljoen-Bloom. 2023. Promoters and introns as key drivers for enhanced gene expression in *Saccharomyces cerevisiae*. In: Gadd GM, Sariaslani S (ed). *Advances in Applied Microbiology*, 124:1-29. <https://doi.org/10.1016/bs.aambs.2023.07.002>
3. Rocher, D.F., R.A. Cripwell, W.H. van Zyl, M. Viljoen-Bloom. 2024. Enzymatic hydrolysis of macroalgal biomass in *Biomass Hydrolysing Enzymes: Basics, Advancements and Applications*, edited by R.R. Singhanian, A.K. Patel, H. A. Ruiz, A. Pandey. CRC Press. ISBN 9781032370972

Patents

Stellenbosch University, Università degli Studi di Padova. Recombinant *Saccharomyces cerevisiae* strains for enzymatic hydrolysis of bioplastic polymers. UK provisional application No. 2115470.3 (filed 27 Oct. 2021); PCT application PCT/IB2022/060342 (Filed 27 Oct. 2022) National registrations (USA, Europe, Japan, RSA): April 2024

Hosting postdoctoral fellows/Senior Researchers

- Dr RA Cripwell (2017-2025)
- Dr M Rossouw (2024)
- Dr MW Myburgh (2024-2025)
- Dr ODV Biko (2025)

STUDENT SUPERVISION (since 2015)

Doctoral

1. Mr SI Mhlongo (co-promoter, 2013 – March 2017): Impact of inhibitors associated with lignocellulosic hydrolysates on the expression level and activity of recombinant cellulolytic enzymes
2. Ms A Steyn (co-promoter, 2017- March 2022): Producing organic acids from pomace wastes - a biorefinery concept
3. Mr ODV Biko (co-promoter, 2019 - March 2023)
Strategies to enhance production of a recombinant lignin peroxidase in *Pichia pastoris*
4. Mr MW Myburgh (promoter, 2020 – March 2024)
Developing recombinant *Saccharomyces cerevisiae* strains for the hydrolysis and valorisation of bioplastics
5. Ms M Rossouw (promoter, July 2021 – March 2024)
Heterologous expression of antimicrobial peptides in *Saccharomyces cerevisiae*
6. Ms DF Rocher (co-supervisor, Sept 2023 -)
Development of an enzyme cocktail for mixed bioplastic hydrolysis
7. Mr D Vezzini (co-supervisor, Feb 2024 -)
Biotechnological solutions for the end-of-life bioplastic management under industrial conditions

Masters

1. Ms. L Sakwa (co-supervisor, 2015 – March 2017): Cloning and expression of fungal alpha-amylase genes in *Saccharomyces cerevisiae* in combination with a glucoamylase gene for raw starch conversion to bioethanol
2. Mr ODV Biko (co-supervisor, 2016 – April 2019): Heterologous expression of a fungal lignin peroxidase in *Pichia pastoris*.
3. Mr JK Martin (supervisor, 2017 – April 2019): Overexpression of transcriptional activators in *Saccharomyces cerevisiae* for improved recombinant protein production

4. Mr MW Myburgh (supervisor, 2018 - April 2020): Recombinant *Saccharomyces cerevisiae* strains for improved bioethanol production from starch-based substrates
5. Ms IE Smuts (co-supervisor, 2019 – March 2022): Expression of lytic polysaccharide monooxygenases (LMPOs) in *Saccharomyces cerevisiae*
6. Ms M Rossouw (supervisor, 2020-2021); Heterologous expression of antimicrobial peptides in the yeast *Saccharomyces cerevisiae*
7. Ms DF Rocher (supervisor, 2020 - Dec 2022): Direct bioconversion of South African brown macroalgae to bioethanol by engineered *Saccharomyces cerevisiae* strains
8. Mr SJM Malherbe (supervisor, 2021 - March 2023): Evaluating triticale and sorghum as bioethanol feedstock and the impact of xylanase as an accessory enzyme
9. Ms KS Schwerdtfeger (supervisor, *cum laude*, 2021 - March 2023): Promoter-intron combinations for enhanced raw starch hydrolysis and co-production of ethanol and lactic acid by recombinant *Saccharomyces cerevisiae* strains
10. Mr D de Villiers (co-supervisor, 2021 - December 2023): Microalgae as a feedstock for ethanol production
11. Ms BJ Campbell (supervisor, 2022 - December 2023): Heterologous expression of Pediocin PA-1 in *Saccharomyces cerevisiae*
12. Ms Z Tambe (supervisor, 2022 – March 2024): Evaluation of selected natural and industrial strains of *Saccharomyces cerevisiae* for heterologous expression of a glucoamylase gene
13. Ms HL Foster (supervisor, 2022 – March 2024): Engineering and production of a cutinase-like enzyme in recombinant *Saccharomyces cerevisiae* strains for effective hydrolysis of poly(lactic acid) substrates
14. Ms CS Hendrickse (supervisor, 2024 –): Engineering approaches for improved expression of recombinant antimicrobial peptides in *Saccharomyces cerevisiae*
15. Mr JE Torppa (co-supervisor, 2024 –)
Deriving a structure-based substitution matrix from a trained neural network, with application in finding novel fungal bioplastic hydrolases
16. Ms AL Stephenson (supervisor, 2025 -)
Rational engineering of bioplastic hydrolases for improved bioplastic hydrolysis

TEACHING RESPONSIBILITIES (2015 - 2025)

Biology 144: Microbial Diversity module - Lecturer and module coordinator

Microbiology 773: Techniques in Molecular Microbiology - coordinator and lecturer on Recombinant Cloning

Microbiology 774: Selected Topics in Microbiology - coordinator and lecturer on Transcriptional Regulation

Microbiology 778: HonsBSc course coordinator