

THE MAIZE TRUST

FINAL REPORT FOR MYCOTOXIN PROJECTS

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Report due date	27 June 2025	Date range of activities reported	Full funding period
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1. Details of principal investigator

Title, initials and surname:	Dr Mariska Lilly
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2. Project title, duration and funding

Project title:	Inhibition of mycotoxin biosynthesis by mycotoxigenic fungi utilizing South African herbal teas – development of bio-control models	MTM project no. MTM 21-02
Duration:	3 years (January 2022 – December 2024)	
Keywords:	Mycotoxins, Fumonisin, Fusarium, Rooibos, Honeybush, Maize	
Location Information (Where are trial sites situated)		
Coordinates In Decimal Degrees, i.e. -27.78596, 24.12458	Latitude (e.g. -27.78596)	Longitude (e.g. 24.12458)
	-33.9425	18.8664
Area description e.g. Highveld regions, Northern Cape	The Welgevallen Experimental Farm at Stellenbosch University, Stellenbosch, Western Cape.	
Total MT funding received for project:	R 792 500 (excl. VAT) was granted. R 675 311.16 (excl. VAT) was received to date.	
All other funding received for this project (contributor and amount):	R 65 000 University Research Funding received from Cape Peninsula University of Technology	

3. Executive Summary

This project investigates the potential of South African indigenous herbal teas, specifically fermented and unfermented rooibos (*Aspalathus linearis*) and honeybush (*Cyclopia subternata* and *Cyclopia genistoides*), as biocontrol agents against mycotoxigenic *Fusarium* species in maize. The overarching goal is to develop sustainable, affordable, and eco-friendly strategies for mitigating mycotoxin contamination, particularly in rural and subsistence farming areas of South Africa, where maize is a dietary staple and regulatory control is limited.

In the initial phase, aqueous extracts of the selected herbal teas were prepared and chemically characterised. Antifungal efficacy was tested against multiple *Fusarium* strains, including *F. verticillioides*, *F. graminearum*, *F. subglutinans*, *F. proliferatum*, and *F. globosum*. The results demonstrated potent inhibition of fungal growth, particularly with fermented rooibos and honeybush extracts. These effects were validated through viability staining, conidia germination assays, and scanning electron microscopy, which revealed significant structural disruption of the fungi. Fungal ATP production was also significantly reduced, as measured using an optimized BacTiter-Glo™ assay. These findings were published in a peer-reviewed article in Microbiology Spectrum (IF: 9.043), underscoring the scientific quality and novelty of the work. Multiple oral presentations were delivered at national and international conferences, and postdoctoral fellows were trained in molecular techniques, in planta protocols, and statistical analysis.

The project further progressed into *in planta* trials, conducted at the Welgevallen Experimental Farm (Stellenbosch University). The first trial, initiated in November 2022, was compromised due to an unexpected infestation by stalk borer beetles, leading to cross-contamination of control and treated samples. Consequently, the sample analysis had to be terminated. A second, improved *in planta* trial commenced in November 2023. Following replanting due to severe summer heat damage, maize plants were successfully grown in 300 bags under greenhouse conditions. After pollination, ears were treated with fermented tea extracts followed by several *Fusarium* spp. spore inoculation. The ears were then covered and left to dry on the plant to mimic field conditions. Harvest was completed in July 2024, and the maize ears have since been processed. Genomic DNA has been extracted for fungal quantification using species-specific qPCR, and mycotoxins have been extracted for quantification via LC-MS/MS.

At present, chemical analysis has not yet been completed, as CAF (Stellenbosch University) is awaiting delivery of certified mycotoxin standards required for accurate LC-MS/MS quantification. These data will be critical for evaluating the ability of the tea extracts to reduce fumonisin production and fungal colonization in planta.

This project has already contributed significant knowledge to the development of plant-based biocontrol strategies and generated strong scientific outputs, including one high-impact publication and multiple oral conference presentations. It has also contributed to human capacity development through the training of two postdoctoral researchers. Once the final chemical analyses are completed, this study will offer robust, locally relevant evidence supporting the use of herbal tea extracts in reducing mycotoxin contamination in maize, a major step forward in food safety and sustainable agriculture.

4. Objectives of study

Aim: To develop practical, affordable and environmentally sound methods to manage toxigenic fungi in maize, with emphasis on introducing resistance in local maize cultivars.

Objectives:

1. Evaluate antimicrobial activity of fermented and unfermented rooibos and honeybush extracts against several *Fusarium* species in culture.

2. Investigate mode of action of the tea extracts against *Fusarium* growth and mycotoxin production.
3. Determine effects of the tea extracts on fumonisin production in the *Fusarium* species.
4. Evaluate antimicrobial activity of the herbal tea extracts against *Fusarium* infection *in planta*.

5. Work plan (Materials and methods)

The project was conducted in three main phases: (i) *in vitro* antifungal and mycotoxin inhibition screening; (ii) greenhouse-based *in planta* maize trials; and (iii) molecular and chemical analyses to assess fungal colonization and mycotoxin content.

1. Preparation of herbal tea extracts

Fermented and unfermented aqueous extracts of *Aspalathus linearis* (rooibos), honeybush (*Cyclopia subternata* and *Cyclopia genistoides*) and *Camellia sinensis* were prepared using standardised methods. Extracts were freeze-dried, characterised and stored under appropriate conditions for subsequent use in antifungal and mycotoxin assays.

2. *In vitro* antifungal assays

A panel of *Fusarium* strains, including *F. verticillioides*, *F. graminearum*, *F. subglutinans*, *F. proliferatum*, and *F. globosum*, was cultured. Antifungal activity of the extracts was assessed using multiple assays:

- ATP-based viability assays (BacTiter-Glo™) to quantify metabolic activity.
- Conidia germination assays to assess the impact of extracts on spore viability.
- Scanning Electron Microscopy (SEM) to visualize morphological changes induced by the extracts.
- Agar-based growth inhibition assays were also employed (see p. 9 for comments addressed).

Results from this phase were published in *Microbiology Spectrum* (Biocontrol of *Fusarium* species utilizing indigenous rooibos and honeybush extracts; Omoruyi et al., 2023), validating the inhibitory effects of especially the fermented extracts.

3. *In planta* maize trials

Two greenhouse trials were conducted at the Welgevallen Experimental Farm, Stellenbosch University:

- The **first trial (2022–2023)** involved pre- and post-inoculation treatments of maize ears with fermented extracts and *F. verticillioides*, *F. graminearum*, *F. subglutinans* and *F. globosum* spores. However, the trial was compromised due to stalk borer beetle infestation and was excluded from further analysis.
- The **second trial (2023–2024)** was successfully repeated under improved conditions. Maize was grown in 300 planting bags in the greenhouse. Ears were manually pollinated, and treatments were applied directly to the silks before and after *Fusarium* spore inoculation. Ears were covered and left to dry on the plant, simulating field conditions.

4. Sample processing and analysis

- All harvested maize ears were manually dehusked, kernels removed, and homogenised.

- Genomic DNA was extracted from the maize kernels using a commercial fungal DNA extraction kit. DNA will be used in qPCR analysis to quantify fungal colonization using species-specific primers (see p. 9 for comments addressed).
- Mycotoxins were extracted using a multi-mycotoxin protocol and sent to the Central Analytical Facility (CAF) at Stellenbosch University for LC-MS/MS analysis. However, analysis is pending due to a delay in the delivery of certified mycotoxin standards (see p. 9 for comments addressed).

5. Optimization of mycotoxin inhibition assays

Due to issues with fungal overgrowth in maize patty models, the assay system was adapted to potato dextrose agar (PDA)-based models, allowing improved control and reproducibility. These models were used to test the ability of the extracts to inhibit mycotoxin production *in vitro* under defined conditions.

6. Results, Tables, Figures

The research project aimed to evaluate the antifungal properties of indigenous South African herbal teas, namely rooibos (*Aspalathus linearis*) and honeybush (*Cyclopia* spp.), against *Fusarium* species, and to assess their potential use as biocontrol agents in maize production. The study included a series of *in vitro* and *in planta* experiments, followed by downstream molecular and chemical analyses to determine efficacy and mechanism of action.

In the *in vitro* phase, aqueous extracts were prepared from both fermented and unfermented forms of rooibos and various honeybush species (including *C. subternata* and *C. genistoides*) and green tea (*Camelia sinensis*). These extracts were tested for antifungal activity against ten *Fusarium* isolates representing key toxigenic species relevant to maize, including *F. verticillioides*, *F. proliferatum*, *F. subglutinans*, *F. graminearum*, and *F. globosum*. Antifungal activity was assessed using the BacTiter-Glo™ Microbial Cell Viability assay, which measures ATP as a proxy for viable fungal cells. Fermented rooibos and *C. subternata* extracts displayed significant reductions in ATP production, particularly against *F. verticillioides* MRC 826-E, *F. proliferatum* MRC 8549, and *F. subglutinans* MRC 8553 and MRC 8554, suggesting strong antifungal potential. These results were corroborated by minimum inhibitory concentration (MIC) calculations and compared against standard fungicides (Amphotericin B and Benomyl) used as positive controls.

Further microscopic analysis using scanning electron microscopy (SEM) at the Central Analytical Facility (CAF), Stellenbosch University, revealed notable morphological damage to fungal hyphae and spores treated with the extracts. Treated conidia displayed collapsed and fragmented structures, suggesting that the extracts not only inhibited growth but also directly disrupted fungal integrity. Germination rate analysis further supported this observation, with significantly fewer germinating conidia in extract-treated groups compared to controls.

A pilot *in planta* study was launched in November 2022 at the Welgevallen greenhouse facility, Stellenbosch University. Maize plants were grown and grouped into three treatment conditions: (1) maize ears inoculated with fungal spores suspended in tea extracts; (2) ears sprayed with fungal spores followed by extract application; and (3) control ears left untreated for post-harvest applications. Maize was successfully harvested in April–May 2023. Maize samples were scheduled for processing and analysis from June 2023 to December 2023. However, during the removal of leaves and kernels, stalk borers were discovered in the samples. The control samples were also found to be infested with stalk borers, leading to cross-contamination with fungi. As a result, the integrity of the samples was compromised, hindering further analysis.

Despite initial setbacks, the full-scale *in planta* study employing optimized biocontrol methods commenced in November 2023. A total of 300 planting bags were prepared with maize kernels, and the greenhouse irrigation system was assessed and repaired as needed. However, extreme heat between

December 2023 and January 2024 severely impacted plant development, leading to stunted growth and uneven maturation stages, rendering the crop unsuitable for experimentation. In response, the greenhouse tunnel was cleared, fresh sand and coir were procured, and replanting was carried out at the end of February 2024. Pollination was conducted at the silking stage, followed two weeks later by treatment with fermented rooibos and honeybush extracts at a concentration of 20 mg/ml. Fungal inoculation was performed by spraying 1×10^6 spores/ml onto the ears, which were then covered with brown paper bags for two weeks to facilitate infection. Watering was reduced at the time of inoculation and discontinued four weeks later to allow the ears to dry on the plant prior to harvest. The ears were harvested when dried, the kernels removed and homogenised and stored at -80 for analysis. Despite the climatic challenges encountered, the study was able to proceed with the optimised biocontrol protocol, and the forthcoming analyses are expected to yield important data on the practical efficacy of rooibos and honeybush extracts in managing *Fusarium* infection in maize.

Downstream molecular and chemical analyses are currently in progress. Genomic DNA has been extracted from maize tissue samples, and qPCR using *Fusarium* species-specific primers will be conducted to quantify fungal colonization. The selection of appropriate primers will be guided by multi-mycotoxin data, which is pending due to delays in receiving analytical standards from the Central Analytical Facility. Multi-mycotoxin analyses will quantify the impact of the treatments on FB₁, FB₂, FB₃, DON, NIV, and ZEA levels.

The objective investigating the antimicrobial activity of herbal tea extracts on *Fusarium* species and their effect on mycotoxin production has faced significant challenges, particularly when integrating the extracts into maize patties. Fungal overgrowth often masked the inhibitory effects of the extracts, complicating accurate analysis of mycotoxin levels and ergosterol as a growth indicator. To overcome this, we have shifted the experimental setup to using Potato Dextrose Agar (PDA) plates, which provide a more controlled and consistent environment for fungal growth and allow better isolation of the extracts' effects, however, it posed challenges in detecting high enough concentrations of fumonisins. *Fusarium* typically produces greater amounts of mycotoxins like fumonisins when growing on natural substrates such as maize, which better mimic the fungus's natural environment. In contrast, PDA is an artificial medium and resulted in lower toxin production, making it more difficult to detect and quantify fumonisins accurately. To address this, sensitive extraction and LC-MS methods are essential to capture even low levels of toxins, and incubation times may need to be optimised to allow sufficient toxin accumulation.

In conclusion, preliminary results strongly support the use of rooibos and honeybush extracts as environmentally sustainable biocontrol agents. Fermented extracts, in particular, demonstrate broad-spectrum antifungal activity both *in vitro* and potentially *in planta*. The ongoing analyses will provide further insights into the mechanism of action and potential for integration into existing maize pest management strategies.

7. Discussion

This study contributes to the growing body of research exploring plant-based biocontrol strategies as sustainable alternatives to synthetic fungicides in agriculture. The use of indigenous South African herbal teas, rooibos and honeybush, as antifungal agents against *Fusarium* species addresses an urgent need for locally sourced, low-cost solutions to mycotoxin contamination in maize. The findings provide early yet compelling evidence that these extracts may offer a practical intervention to reduce fungal infection and secondary metabolite production in maize cultivation systems.

One of the most significant outcomes of this project lies not only in demonstrating the antifungal activity of the extracts, but in showing that traditional, food-grade materials can be repurposed for plant protection with minimal risk and high cultural acceptability. This shifts the paradigm away from dependency on commercial fungicides, which are often inaccessible or environmentally burdensome,

particularly for smallholder farmers. Moreover, using resources already widely cultivated and consumed in the region adds an element of sustainability and circular economy to the strategy.

The work also highlights the importance of extract preparation method, with fermentation appearing to enhance antifungal potency. This suggests that the bioactivity of herbal materials can be further optimised through processing, aligning with trends in functional agriculture and bio-enhanced formulations. While the molecular mechanisms underlying the antifungal activity remain to be fully elucidated, the observed morphological damage to *Fusarium* structures supports a direct and potentially multifaceted mode of action, possibly involving oxidative stress, membrane disruption, or interference with fungal metabolism.

Importantly, this project has laid the groundwork for applying biocontrol strategies under more realistic agricultural conditions. While much of the existing literature on plant-derived antifungals remains confined to laboratory models, the initiation of *in planta* studies and the development of practical treatment methods represent a critical step forward. The next challenge will be to determine how these extracts perform under variable field conditions, across different maize cultivars and environmental stressors.

In the broader context of maize production in South Africa, this work addresses a persistent food safety concern: fumonisin contamination. The health risks posed by chronic exposure to *Fusarium*-produced mycotoxins are well documented, particularly in rural communities that rely on maize as a dietary staple. Interventions that are affordable, accessible, and environmentally sound are essential. The development of an effective biocontrol method using rooibos and honeybush extracts could reduce mycotoxin load at the source, rather than relying on downstream mitigation efforts.

Although challenges such as reagent delays and capacity limitations have impacted the timeline of downstream analyses, the overall trajectory of the project remains positive. The results already achieved justify continued investment in this line of research, with a focus on completing the multi-mycotoxin analysis and molecular quantification to strengthen mechanistic insights. In summary, this study supports the original hypothesis and provides a promising foundation for future work on indigenous plant-based biocontrol. It bridges traditional knowledge and modern agricultural biotechnology, offering a unique, locally relevant contribution to integrated pest management strategies in the South African maize industry.

8. Scientific Outputs

Scientific papers:	Omoruyi BE, Volschenk H, Gelderblom WC, Lilly M. Biocontrol of <i>Fusarium</i> Species Utilizing Indigenous Rooibos and Honeybush Extracts. <i>Microbiology Spectrum</i> . 2023 May 24: e02742-22 (Impact factor: 9.043)
Technical reports:	1st PROGRESS REPORT FOR MYCOTOXIN CONTINUATION PROJECTS 30 June 2023 2nd PROGRESS REPORT FOR MYCOTOXIN CONTINUATION PROJECTS 19 July 2024 - FINAL REPORT FOR MYCOTOXIN PROJECTS 27 June 2025

Articles in industry magazines:	None
Conference contributions:	1. <u>Omoruyi EB</u>, Gelderblom WCA, Lilly M. Biocontrol of <i>Fusarium</i> species utilising indigenous rooibos and honeybush extracts. The South African Society of Biochemistry and Molecular Biology SASBMB 2022 (<u>Virtual Oral Presentation</u>), 23-26 January 2022. 2. <u>Omoruyi EB</u>, Volschenk H, Gelderblom WCA, Lilly M. Biocontrol of <i>Fusarium</i> species utilising indigenous rooibos and honeybush extracts. 52nd Conference of the Southern African Society for Plant Pathology, Future Africa Campus, University of Pretoria (<u>Oral Presentation</u>), 1-3 August 2022. 3. Omoruyi EB, Volschenk H, Gelderblom WCA, <u>Lilly M</u>. Biocontrol of <i>Fusarium</i> species utilising indigenous rooibos and honeybush extracts. 3RD ASM JOINT MYTOX-SOUTH CONFERENCE 2022, Stellenbosch, South Africa (<u>Oral Presentation</u>) 4-7 September 2022. 4. <u>Omoruyi EB</u>, Imrie G, Volschenk H, Lilly M. Biocontrol of <i>Fusarium</i> species utilizing indigenous rooibos and honeybush extracts CPUT Biotechnology Symposium Presentations. CPUT Hotel School, Granger Bay Campus; MS Teams (<u>Virtual Oral Presentation</u>); 7 September 2022
Human capacity development:	1. Skills development of Postdoctoral fellow, Dr Etinosa Omoruyi. 2. Statistical data analysis skills development of CPUT Postdoctoral fellow, Dr Nashia Deepnarain.
Technology transfer:	There has been no technology transfer to date. However, once the <i>in-planta</i> trial data has been concluded and the data fully analyzed and if any promising outcomes are identified, the CPUT Technology Transfer Office (TTO) and the Maize Trust will be contacted for further guidance and assistance in exploring potential commercialization or application pathways.

Other outputs (Procedures, Methods, Databases, etc):	1. The BacTiter-Glo™ Microbial Cell Viability kit was optimised for the needs of the analysis and utilised for measuring the ATP production.
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9. Personnel / Management / Risk factors that influenced progress and lessons learned

The *in-planta* study on optimised biocontrol methods in maize cultivation encountered several challenges that provided valuable insights for future research. A major risk factor was the extreme heat experienced during December 2023 to January 2024, which led to severely stunted maize plants and uneven growth stages, rendering them unsuitable for the trial. This highlighted the critical need for contingency plans to manage weather-related risks and emphasised the importance of robust greenhouse climate control systems. Additionally, the late discovery of stalk borer infestations, which led to cross-contamination of fungal strains, underscored the importance of strict pest management protocols.

Key lessons learned included the value of timely intervention and adaptability, demonstrated by the decision to clear the affected greenhouse tunnel and replant using fresh sand and coir, providing a clean start. The successful pollination and subsequent treatment of maize ears with biocontrol agents further emphasised the importance of meticulous execution in biocontrol trials. Overall, the project highlighted the necessity of flexible, responsive strategies to mitigate environmental and biological risks, ensuring the integrity of agricultural biocontrol research.

However, the project also faced delays in downstream analyses. Specifically, the receipt of multi-mycotoxin standards at CAF (Central Analytical Facility) is significantly delayed, preventing the completion of multi-mycotoxin quantification to date. Additionally, the contract of the Postdoctoral Fellow involved in the project ended in February 2025, posing a challenge to the timely completion of final experiments. The genomic DNA has already been extracted, and the principal researcher will proceed with the qPCR analyses. However, these will be conducted once the multi-mycotoxin data are available, in order to determine the most appropriate primers based on confirmed mycotoxin profiles.

10. Conclusions and Comments you wish to share with the Maize Trust

We would like to express our sincere gratitude to the Maize Trust for their continued support of this important research. The funding provided has enabled significant progress toward developing a sustainable, locally applicable biocontrol strategy for *Fusarium* infections in maize, using indigenous rooibos and honeybush tea extracts.

Our findings to date demonstrate strong *in vitro* antifungal activity of fermented tea extracts against several *Fusarium* species, supported by both viability assays and morphological analyses. Initial *in planta* trials have shown promising results, and preparations for detailed molecular and mycotoxin analyses are underway. These results support the potential of this biocontrol approach to contribute meaningfully to integrated pest management strategies within the South African maize industry, particularly in resource-limited and subsistence farming contexts.

Despite unavoidable challenges, including delays in reagent delivery and postdoctoral staffing constraints, the project has maintained its momentum and achieved most of the critical milestones outlined in the original proposal. The support from the Maize Trust has also facilitated valuable scientific outputs, including a high-impact publication and multiple national conference presentations.

We look forward to completing the final phase of the study and to sharing our full findings, which we believe will have significant implications for food safety, public health, and sustainable agriculture in South Africa. Once again, we thank the Maize Trust for its investment in innovative, locally relevant research and its continued commitment to improving maize production systems.

Addressing the MRRP comments:

The Maize Trust appreciates the publication of the work.

Thank you and we greatly appreciate the continued support of the Maize Trust in enabling this research

Several results are, however, still outstanding, including agar-based growth inhibition, qPCR, mycotoxin analyses, etc.

The agar-based growth inhibition assays were conducted; however, the maize patty-based mycotoxin inhibition assays did not yield interpretable results. In these trials, fungal overgrowth occurred across all treatments, regardless of the tea extract applied, which obscured any potential inhibitory effects and prevented accurate quantification of mycotoxin levels.

To overcome this limitation, the assay format was adapted to a PDA-based model, which provided improved control over fungal growth. Nonetheless, this artificial substrate resulted in significantly lower fumonisin production compared to maize-based substrates, making detection and quantification more challenging. Sensitive extraction methods and LC-MS/MS analysis need to be employed to detect even low toxin concentrations.

As outlined in the current report, genomic DNA has been extracted from in planta samples. The qPCR analysis will be performed once the pending multi-mycotoxin LC-MS/MS data are available, as these results will guide the selection of the most appropriate species-specific primers for quantifying fungal colonization.

Please include data on the temperatures recorded during the greenhouse experiments.

The trials were conducted in an open-tunnel greenhouse, which is not environmentally controlled. As the study's objective was to assess the antifungal activity of the tea extracts against *Fusarium* species, and not to evaluate drought stress or other climate-dependent factors, continuous temperature recording was not performed. Ambient conditions reflected the natural seasonal variation during the trial period, and standard cultivation practices for open-tunnel maize growth were followed.

The MRRP emphasized that analytical standards must be ordered in advance to ensure timely initiation of the analyses.

Mycotoxin extractions from the in-planta samples were completed in February 2025. I had requested a quotation for multi-mycotoxin analysis from the Central Analytical Facility (CAF) already at the beginning of March 2025; thus, the responsibility for obtaining the certified standards lay with CAF, not with me. The MRRP emphasised that analytical standards must be ordered in advance to ensure timely initiation of the analyses. A quotation for LC-MS/MS analysis was obtained from CAF in March, and the samples were delivered to CAF at the beginning of April. On 20 May 2025, CAF confirmed that the samples had been processed; however, completion of the analyses was delayed as they were awaiting delivery of the certified mycotoxin standards, sourced via Dr Lindy Rose. Follow-up communication with CAF indicated that the standards had not yet been received, and the analysis will be finalised once they become available.

The MRRP requested that an Amended Final Report be submitted on or before 30 June 2026, incorporating all outstanding results.

I sincerely apologise for not being able to include the financials with the progress report by the submission deadline. Although the required financial information was requested on several occasions, it was not received in time and was therefore not attached to the report. Please find it attached to the updated report.

11. Signatures of Project Leader and Authorized Manager

Dr Mariska Lilly, Tygerberg, 13 August 2025



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Names, Signatures, Place and Date

Project Leader: DR M LILLY
Project Title: BIOLOGICAL CONTROL: MYCOTOXINS
Funded by: MAIZE TRUST

INCOME AND EXPENDITURE STATEMENT

Income	
Opening Balance	-54890,48
Project income	-63400,11
Total Income	<u><u>-118290,59</u></u>

Expenses	
Professional Fees	44445,4
Repairs/Maintenance Equip	9259,42
Postage & Franking	-80,67
Project Expenses	31495,34
Research Project Materials	24752,55
Laboratory Consumables	589
Membership Professional Bodies	330
Travel Claims- Parking/Toll fee	6112
Total Expenses	<u><u>116903,04</u></u>
Balance	<u><u>-1387,55</u></u>

Prepared by: La Meyer M
Marvin La Meyer
Coordinator: Research Finance

Verified by: Dr Lilly
Dr Lilly
Project Leader:

20/08/2025

Date
20 August 2025

Date

I/We hereby certify the above request was approved for reasonability, procurement policy compliance, availability of funds, bona fide expenditure and budget allocation as well as that the quotations were invited on a fair and impartial basis with regard to confidentiality, the accuracy of the information and the highest possible code of conduct with the sole object of securing the maximum possible benefit to the Institution. I/We further take responsibility for the safekeeping of all original documents for audit purposes.

Nikeziwe Ngceni
20 August 25
Nikeziwe Ngceni
Research Grants Finance Coordinator

Prof Dina Burger
Director: Directorate Research
Development

Dina Burger
Date 21 Aug 2025