DEPARTMENT OF

PLANT SCIENCES

FACULTY OF NATURAL AND AGRICULTURAL SCIENCES

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OVERVIEW OF 2023

The Department of Plant Sciences is a dynamic department contributing towards research, teaching and learning, community service, and entrepreneurial development. The Department has three divisions – Botany (both Bloemfontein and Qwaqwa Campuses), Plant Breeding, and Plant Pathology. The Department underwent a departmental review in 2023. Some of the commendations received from the external review panel, include: (1) Partnership between all departmental stakeholders is commendable and is attested with a joint effort portrayed in the well-written self-evaluation review. This is evidence of a proper work ethic and co-ordination of duties among staff members; (2) all staff members on both campuses are focusing properly on the prescribed teaching and learning goals despite some challenges that they face, particularly frequent community protests as well as electricity and water outage at the Qwaqwa Campus; (3) researchers are specific in their research foci and keep intensifying on one or very few plant species, which is one of the recommendations to become National Research Foundation (NRF)-rated; (4) the NRF-rating of several staff members on both campuses is a good achievement for the Department and the entire University; (5) there are excellent partnerships between the Department and the international institutions; and (6) community engaged scholarship is incorporated in the Department at both campuses, which ensures the relevance of the Department to different community stakeholders.

Postgraduate students in the Department excelled during the year with various students receiving first-, second- or third-prizes for oral or poster presentations. Two students were invited to attend specialised national conferences, four students attended international conferences, and one student received a three-month international internship. Postgraduate students also contributed towards engaged scholarship by presenting talks at community groups and farmers' days.

Academic staff members excelled through various involvements in teaching and learning activities, engaged scholarship activities as well as national and international collaborations. Staff published a total of 55 scientific papers in accredited journals, contributed towards six books/book chapters, and delivered 57 lectures at national and international symposia, research days, and student symposia. Many of these publications were co-authored with national and international collaborators. The Department hosted six Postdoctoral Fellows during the year. A total of 110 postgraduate students were registered in the Department, of which 14 were international students. During 2023, 10 honours, 15 Master's, and 6 Doctoral students obtained their degrees.

ACHIEVEMENTS

Staff Achievements

Prof Sandy-Lynn Steenhuisen received a C2 National Research Foundation (NRF)-rating.

Dr Kwame Shamuyarira

Dr Kwame Shamuyarira obtained his PhD degree in Plant Breeding and Dipuo Mosea obtained her MSc degree in Botany.

Dipuo Mosea (right) with her supervisor, Dr Rudo Ngara

Prof Maryke Labuschagne received a short stay research fellowship from Ghent University in Belgium and spent two months at the Department of Food Technology, Safety and Health.

Dr Ntombi Mbuma was appointed as Associated Editor to the *Crop Science* Editorial Board for three-years, starting on 1 January 2023.

Dr Ntombokulunga Mbuma is an award recipient of 2022 Editor's Citation for Excellence as Reviewer. She received an outstanding reviewer award from the *Crop Science Society of America Journal* in April 2023.

Dr Mpho Mafa was promoted from the Emerging Scholars Accelerator Project (ESAP) to be a member of the Transformation Future Professoriate Programme (FPP) of the University of the Free State (UFS). He was awarded a Performance Excellence Award in the Transformation FPP during the UFS Research Awards and 2023 UFS Book Prize function, hosted by the Deputy Vice Chancellor for Research and Internationalisation, Prof Vasu Reddy. He was nominated by the UFS for the Thamsanqa Kambule-National Science and Technology Forum (TW Kambule-NSTF) Emerging Researcher Awards, for contribution through research and outputs over a period of up to six years of research work since the commencement of the research career, predominantly in South Africa.

Dr Arun Gokul was voted as the Chairperson of the Advisory Committee for the Department of Agriculture at the University of Zululand.

Dr Rudo Ngara was invited to serve a Review Editor for 'Plant Abiotic Stress', a specialty section of the journal *Frontiers in Plant Science*.

Prof Liezel Herselman was appointed as the Vice-Dean: Teaching and Learning of the Faculty of Natural and Agricultural Sciences.

Dr Lisa Rothmann was awarded the Scholarship of Teaching and Learning Fellowship and is part of the second cohort of this initiative under Deputy Vice-Chancellor: Academic. Dr Rothmann's research will focus on 'Assessing the Plant Sciences honours research syllabus for graduate preparedness and researcher development'.

Student Achievements

In Plant Pathology, Thabiso Masisi was presented with the runner-up oral presentation award at the Annual Business Meeting of the American Phytopathology Society - African Division, hosted online in September 2023. Neo Hlongwane was selected to attend the International Seed Federation: World Seed Congress 2023 in Cape Town (June 2023) and he was sponsored by the South African National Seed Organisation for his participation at the congress.

Thabiso Masisi rating sorghum leaf diseases during the sorghum disease survey

Winners of the 2023 Postgraduate Student Symposium at the University of Johannesburg. From the left Karabo Pule (third prize BSc Honours), Sellwane Moloi (third prize PhD), and Faith Kobedi (first prize MSc)

Also in Plant Pathology, Wessel Strydom received the second-year incentive prize, Amy Coetzer received the award for the best third-year student, and Estie Coetzee for the best final-year student. Dr Marlese Meiring was recognised for an exceptional PhD in Plant Pathology.

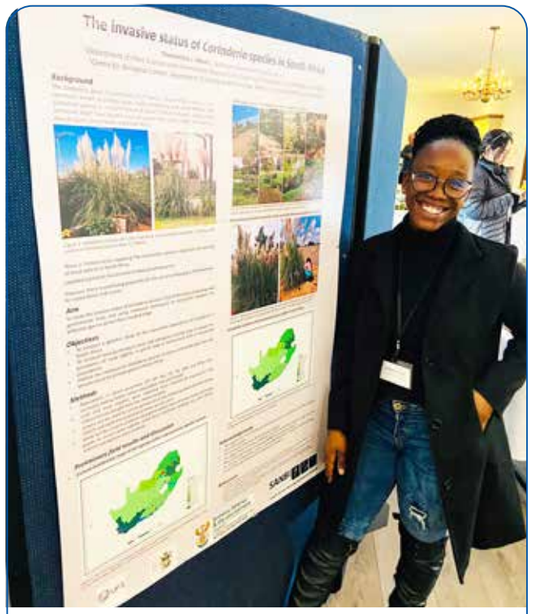
Eight postgraduate students from the Department of Plant Sciences attended the 2023 Postgraduate Student Symposium at the Department of Botany and Plant Biotechnology, University of Johannesburg. Faith Kobedi won the first prize in the MSc category, Sellwane Moloi third prize in the PhD category, and Karabo Pule third prize in the BSc Honours category.

Jeremiah Hlahla and Ninikoe Lebusa were awarded Plant Sciences, Botany Division best MSc and best BSc Honours students for 2022, respectively. Ninikoe Lebusa and Tshililo Gumani received certificates as finalists of the best assignment library competition. In addition, Tshililo Gumani received the Bronze Medal for presenting his practical report for BTNY6884.

Botany MSc student Nomcebo Mngomezulu was one of 20 postgraduate students who were selected to attend a highly competitive platform to present her work at the 15th South African Environmental Observation Network (SAEON) Graduate Student Network (GSN) Indibano from 22 to 27 October 2023. This year's Indibano themed 'Mountain meet Seas: Exploring environmental interactions', presented workshops on bridging the transdisciplinary gap, artificial intelligence, carbon flux, and spatial machine learning.

Kelvin Hlatshwayo was awarded a Plant Breeding internship from Bayer (Field Testing) in Germany.
In Plant Breeding, Estiaan Coetzee received the prize for the best second-year student, Franco Botha for the best third-year student, Moshieng Ntswane for the best MSc student, and Dr Nakai Matongera for the best PhD student.

Botany (Qwaqwa Campus) Master's student, Thembelihle Mbele, was awarded the best poster presentation prize at the National Symposium on Biological Invasions (4 to 6 July 2023, Houw Hoek, Western Cape) as well as at the Biodiversity Research Symposium (27 September 2023, Sol Plaatje University, Kimberley). Thembelihle is investigating the invasive status of Pampas grass *(Cortaderia sp.)* in South Africa for her MSc.



Thembelihle Mbele was awarded the best poster presentation at the National Symposium on Biological Invasions (4 to 6 July 2023)

Doctoral student Karabo Moloi was awarded second place for her speed talk at the 12th Oppenheimer Research Conference (4 to 6 October 2023, Randjesfontein Cricket Pavilion, Midrand), while Doctoral student, Lehlohonolo Donald Adams, was awarded the best poster presentation prize at the 16th International Conference on Ecology and Management of Alien Plant Invasions (EMAPI 2023, 23 to 25 October 2023, Pucón, Chile). Honours student, Zinhle Sithole, received an Academic Excellence Award from the UFS Faculty of Natural and Agricultural Sciences on the Qwaqwa Campus for academic excellence as Honours student.

TEACHING AND LEARNING

During the annual second-year Botany excursion that took place from 29 September to 2 October, 28 students were exposed to the new plant ecophysiological techniques that are used in the field, including capturing and processing of data. The excursion took place at the Amanzi Game Reserve, 42 km outside Bloemfontein. Dr Dimitri Veldkornet and Dr Makoena (Boke) Moloi facilitated the excursion, and they were both delighted by the enthusiasm and effort made by students. The aim of the field excursion was to determine the ecophysiological response of two species, *Tarchonanthus minor* Less. (small-leaf camphor bush) and *Olea africana subs. africana* (wild olive), to variation in daily temperature and across an elevation gradient, in terms of stomatal numbers/ adaptations, transpiration capacity, photosynthetic rate, leaf area, and diameter at breast height. After two days of fieldwork, groups presented their findings to the lecturers and demonstrators. Students indicated that the excursion on the physiological adaptations of plants in their natural environment was valuable for their learning and increased their understanding of plant-environment interactions. It is comforting to know that the future of ecophysiological research at the UFS is in good hands.

Second-year Botany students patiently waiting for the Chlorophyll Fluorometer to become dark-adapted to take readings of the Small-leaf Camphor Bush

The annual third-year Botany excursion took place from 9 to 17 February at Hogsback in the Eastern

Third-year Botany excursion to Hogsback. An excursion of extremes – sunny days and wet days

Cape. This year 11 students participated and learned various fieldwork techniques in Ecology and Taxonomy in challenging weather conditions. The students however did enjoy the time in the field and learned a great deal.

The final-year Botany students on the Qwaqwa Campus studying ecology and phytomedicine, undertook several fieldtrips to learn various field survey techniques and be exposed to our natural heritage at Witsieshoek Mountain Lodge, the Basotho Cultural Village, Mopeli Historic Statue at Namahadi, Wetsi's cave in Monontsha, and the yellowwood forests of Royal Natal National Park. In addition, a successful weekend fieldtrip was undertaken to the Golden Gate Highlands National Park with students spanning majors in Life Sciences, Botany, and Zoology. The field trip was jointly run by the Department of Plant Sciences and the Department of Zoology and Entomology, led by Prof Steenhuisen and Prof Aliza le Roux.

Third-year Vegetation Ecology students from the Qwaqwa Campus on a field excursion to Witsieshoek, to learn about different vegetation survey techniques

Prof Sandy Steenhuisen teamed up with Naquita Fernandes and Dr Tatenda Marange from the UFS Faculty of Economic and Management Sciences to present on the topic 'From silos to synergy: Fostering skills development through interdisciplinary collaboration' at the Annual UFS Learning and Teaching Conference (11 to 15 September 2023). The study involved assessing the development of creative and presentation skills of first-year Marketing students on the Bloemfontein Campus as they participated in assignments, and a competition to create a logo for Prof Steenhuisen's plant ecology lab in Qwaqwa. The new name of the research group has been revealed as the 'Q-PAIR' lab, standing for Qwaqwa Plant-Animal Interactions Research. The logo design is currently being refined and will be used as the group's branding from 2024.

RESEARCH AND INNOVATION

SARChI Chair in Disease Resistance and Quality of Field Crops

The NRF South African Research Chairs Initiative (SARChI) Chair in Disease Resistance and Quality of Field Crops, held by Prof Maryke Labuschagne, was in its eighth year in 2023 and again had several highlights. In a collaborative project with the University of Ghent in Belgium, research was done on the influence of maturity period on wheat quality and gluten characteristics. The cowpea research progressed significantly with one PhD project on genetic variation in an international germplasm collection and another on the genetic basis of nutritional value in cowpea ending. One project on sorghum nutritional value in Ethiopia was completed and another on South African sorghum is underway. On the disease resistance side, MARPLE technology was applied to genotype 48 *Puccinia triticina* isolates and four fungicide sensitive genes were sequenced to detect genetic variants that could indicate increased fungicide insensitivity in South Africa. A project on genetic diversity of *Puccinia coronata* from grasses and cultivated oat in South Africa was also completed. Herbarium specimens were used to study the development of the oat leaf rust population in South Africa. A study on functional analysis of *AvrSr35* and *AvrSr50* avirulence genes in South African *Puccinia graminis* f. sp. *tritici* isolates has been completed. Another project on the molecular and biochemical characterisation of the adult plant disease resistance response of two different wheat varieties against *Puccinia graminis* f. sp. tritici (*Pgt*, wheat stem rust) infection has also been completed.

Prof Maryke Labuschagne (left) working with two Postdoctoral Fellows, Dr Tesfay Mekonnen (middle) and Dr Neila Abdi (right)

Breeding for resistance against the mycotoxins associated with Fusarium head blight (FHB) causal species formed part of the SARChI Chair. Several *Fusarium* species associated with FHB were identified, but *F. graminearum* was identified as the predominant causal species in South Africa. The mycotoxins involved pose a threat to both human and animal health. These mycotoxins also impact food security negatively, therefore resistance breeding against these toxins should receive priority. Knowledge gained from analyses will assist with the development of effective control strategies, i.e. resistance breeding against FHB and the mycotoxins associated. This will assist with improving wheat production in South Africa.

Dr Shamuyarira worked with Prof Labuschagne, Prof Hussein Shimelis, Elize Botha, and Petru Fourie on a sorghum breeding project that aims to evaluate exotic germplasm as a precursor to sorghum pre-breeding. As part of the project, Dr Shamuyarira has developed a report on sorghum breeding that is done in South Africa. This project is funded by the Department of Science and Innovation (DSI).

Botany

Plant physiology/biochemistry and molecular biology

Dr Moloi specialises in plant ecophysiology. Her research focus is on the investigation of the effects of abiotic stress factors such as drought, elevated temperature, and the combination of both stressors on the physiological, biochemical, and morphological responses of crop plants. Furthermore, she oversees a project that utilises natural bio-stimulants, biodegradable inorganic compounds, and micronutrients to mitigate the adverse impacts of these stressors in agricultural crops. This research is of considerable importance because it provides valuable solutions to enhance crop production in the face of changing climatic conditions.

Dr Lintle Mohase and her research team investigate plant defence mechanisms in wheat infested by the Russian wheat aphid (RWA) *(Duiraphis noxia).* She collaborates internally with a biochemist (Dr Mafa), and externally with entomologists at the Agricultural Research Council – Small Grain (ARC-SG), Bethlehem (Dr Astrid Jankielsohn), and the Lesotho Agricultural Research Unit (wheat germplasm). Her research concentrates on wheat defence mechanisms to aphids, exploring tolerance mechanisms in various wheat germplasm, including landraces from Lesotho. The influence of environmental factors such as drought on the resistance response to aphids, is also investigated. In addition, the team explores plant protection strategies by investigating the role of inorganic nutrients, such as selenium and silicon, signalling molecules (salicylic acid) and leaf rust isolates in mitigating drought and aphid stress on wheat.

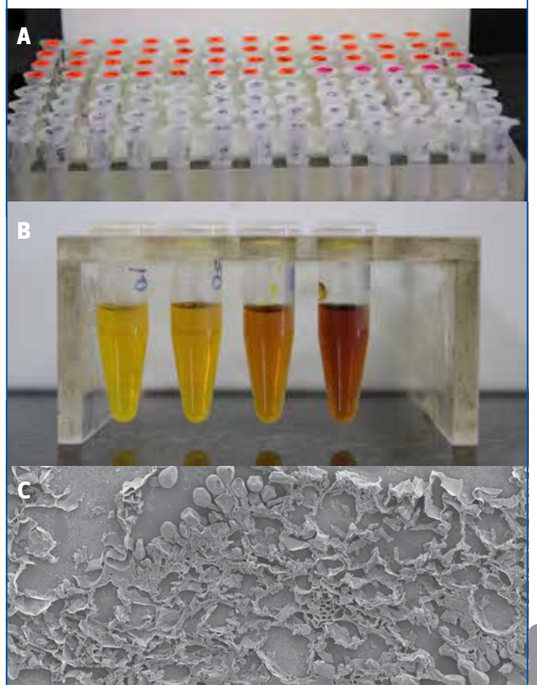
PhD student, Jesumayowa Ajidahun, working in the greenhouse

Prof Botma Visser and his students completed three genetic studies on rust pathogens of crops. In the first, the two alleles of the *AvrSr35* and *AvrSr50* genes from several wheat stem rust isolates were sequenced. Analysis indicated no potential virulence

alleles against *Sr35* and *Sr50* in these isolates. In the second study, genetic analysis of field isolates of maize rust confirmed little genetic variation between the tested individuals, suggesting the presence of a single genetic lineage within the country. This project was done with the financial support of the Maize Trust. In the third study, genetic analysis of oat crown rust using herbarium specimens suggested that the current population developed from at least one recent exotic introduction and one possible herbarium lineage. Two other herbarium lineages disappeared from the field, leaving the two current lineages. All three projects were done as part of MSc studies.

Dr Mpho Mafa's research group is named the Carbohydrates and Enzymology Laboratory (CHEM-LAB) and includes research on plant carbohydrate metabolism, CAZymes' physiological functions during plant-pathogen/pest interaction, and the application of CAZymes in the synthesis of value-added products for circular economy.

The total soluble carbohydrates extract from wheat samples (A) and determination of the total reducing carbohydrates using DNS-reagent (B). In (C), the scanning electron microscopy image shows that wheat leaf-rust disease-causing fungus (Puccinia triticina) degrades the plant cell wall's structural carbohydrates in the susceptible cultivars



Dr Arun Gokul's research continued on previously identified candidate microbial biocontrol agents. These biocontrol agents were tested both *in vitro* and *in vivo*. Experiments showed no adverse effects on the growth and health of commodity crops treated; however, a marked reduction in disease incidence was observed. The potential control mechanism was different for each putative biocontrol isolate, with some affecting the nutrient solubilisation within plants and others producing volatile organic compounds to deter colonisation and growth of the phytopathogen. Proteomic profiling was also conducted and showed certain proteins that were unique to the plants treated with the putative biocontrol agents and could play a critical role in suppressing phytopathogen infection and increasing phytopathogen tolerance in these commodity crops.

Phytomedicine and ethnobotany

Prof Tom Ashafa's research group conducted various ethnobotanical surveys. An ethnomedicinal survey of plants used in the management of skin infections in Mothabothe District of Lesotho was conducted. Furthermore, the use of medicinal plants to manage cancer and cancer-related diseases in the Thabo Mofutsanyana District Municipality of the Free State was done. Lastly, an ethnobotanical survey of plants used in the treatment of diarrhoeal disease in the Abakulusi Municipality of KwaZulu-Natal (KZN) was undertaken. The overall aim of these surveys is to document plants used in the management (curative or ameliorative) of different diseases to have a pool of plants to investigate scientifically to confirm their potency and use the outcome to advise the community. Prof Ashafa formed part of the group that visited the Appalachian State University for the Mountain-to-Mountain research collaborations in September 2023.

Dr Pheello Mojau's research focuses on bioprospecting cheap, affordable, and readily accessible herbal remedies for both *Diabetes mellitus* and cancer in order to reduce dependence of victims of these diseases on orthodox medicines that come with deleterious side effects.

Plant taxonomy and molecular systematics

Dr Lize Joubert collaborated with Pieter Bester from the South African National Biodiversity Institute (SANBI) on the taxonomic revision of the genus Nemesia, which are indigenous snapdragons. This project has progressed for the past five years, and Dr Mariëtte Jackson oversaw the DNA sequencing and phylogenetic analyses for the project. Two Master's students submitted their dissertations and one BSc Hons project was completed. Orateng Sedimo worked on the systematics and morphometrics of Nemesia and received the award for the best poster presentation at the 48th South African Association of Botanists (SAAB) Annual Conference held in Polokwane in January 2023. Dr Jackson is heading the Molecular Systematics Research group in which phylogenetic analysis of some genera in the family Asteraceae is continuing. Dr Jackson was also involved in a Plant Pathology MSc project with Dr Rothmann, in which fungi within sorghum kernels and in soybean cultivars are being identified using molecular techniques.

Orateng Sedimo (centre) receiving his poster award during the 48th South African Association of Botanists (SAAB) Annual Conference held in Polokwane in January 2023

Palaeoecology and Ecology

Dr Andri van Aardt continued her research on pollen cores from Colbyn and Rietvlei Dam from the Gauteng region, supplied by Dr Piet-Louis Grundling and co-workers and dated by Stephan Woodborne at iThemba Laboratories for Accelerator Based Sciences (LABS). She also collaborates with researchers from Spain, Germany, and the USA on the PalaeoEcology and OPen-LandscapE (PEOPLE) project. In terms of modern ecology, she is working on mapping of various vegetation types in the Free State in collaboration with Anisha Dayaram at SANBI. She is also investigating soil-plant relationships with Prof Johan van Tol from the UFS Department of Crop, Soil and Climate Sciences.

Together with collaborators, Prof Louis Scott is currently working on the palynodebris in offshore Cainozoic marine borehole cores and the palynology of Holocene swamp deposits from KZN.

Dr Lloyd Rossouw from the Bloemfontein National Museum contributed to the Methods in Palaeoecology course (BTNE6804) and provided access for students to study archaeological and palaeontological contexts at the Florisbad Quaternary Research Station near Soutpan.

Dr Dimitri Veldkornet's research focuses on the diversity and distribution of saline plants. In collaboration with Prof Anusha Rajkaran (University of the Western Cape) and Dr Nasreen Peer (Stellenbosch University), MSc student Nomcebo Mngomezulu has found that uncontrolled boating activity and strong winds, often resulting in high-intensity waves, have led to erosion of large areas of intertidal salt marshes at the Berg River Estuary. Her results suggest that immediate ameliorating actions are needed to prevent the loss of biodiversity in one of South Africa's most productive estuarine systems.

Under the guidance of Prof Steenhuisen, Postdoctoral Fellow Dr Stephanie Payne-Smith, Doctoral student Karabo Moloi, and Master's student Lesego Malekana, joined the Third BioBlitz at Witsieshoek Mountain Lodge, led by Prof Peter Taylor (Department of Zoology and Entomology and Afromontane Research Unit [ARU]). Biodiversity records were collected for nine different taxa.

Dr Stephanie Payne-Smith (left) and Lesego Malekana identifying and cataloguing plant species during the 3rd BioBlitz at Witsieshoek Mountain Lodge

Karabo Moloi received training from Prof Taylor on the correct and ethical procedures to trap rodents and other small mammals for her PhD research. Lesego Malekana and Dr Payne collected flowering plant specimens at two different sites at different elevations, to document the plant biodiversity in the Qwaqwa Maloti-Drakensberg Mountains. Over the course of the last three BioBlitz's, over 240 different plant species have been recorded and collected, with more species continuing to be added to the list from other datasets, such as Global Biodiversity Information Facility (GBIF) and PhD projects in the area.

Karabo Moloi (left) and Muzikayifani Ndimande (Zoology) received training from Prof Peter Taylor (Zoology, not pictured) on how to ethically and safely process small mammals for research

The RangeX team funded by the DSI through a BiodiverSA call (Horizon 2020) and led by South African principal investigator (PI) Prof Ralph Clark (UFS ARU Director) and Swiss PI Prof Jake Alexander (ETH-Zürich), continued to fly high this year with several helicopter-aided research fieldtrips to their Alpine Research Station on the plateau of the Amphitheatre at 3 100 meters above sea level in the Maloti-Drakensberg. South African co-PI, Prof Steenhuisen, Postdoctoral Fellow Dr Payne-Smith, Master's student Lesogo Malekana, and several team members from the ARU and Centre for Biological Control at Rhodes University, conducted their second full cycle of plant trait measurements and camera trap observations to assess the effects of elevation and warming on range expanding plant species. A new experimental set-up with flowering indigenous plant species having been transplanted recently to the lower and upper alpine sites for the third summer season of data collection on pollinator networks, was done. This work yielded a publication in *Global Change Biology* (IF= 11.6) on using machine learning to assess weather patterns with camera trap photos taken at reciprocal experimental setups in South Africa, Switzerland, and Norway. The team also gathered for a productive writing retreat in Glengarriff, Ireland, to discuss data management, publication ideas, and progress. Funding opportunities for a further team effort into expanding their expertise to assess biodiversity along elevation gradients in several other mountain ranges globally, using acoustic and photographic recorders, eDNA and environmental variables, was also discussed.

Members of the RangeX project in Glengarriff Nature Reserve, Ireland – including researchers from the UFS (Plant Sciences and Geography) , University of Gothenburg, ETH Zürich, Swedish University of Agricultural Sciences, University of Bergen, Aarhus University, and Martin Luther University Helle-Wittenberg

In October 2023, Prof Steenhuisen was invited to serve on the steering committee of the Mountain Invasion Research Network (MIREN), that encourages research avenues using standard field protocols for understanding global changes in the distribution of invasive plants along elevational gradients. This builds on the relationships established with the network by Prof Clark of the ARU, and the introduction of MIREN survey sites in South Africa and Lesotho, with plans to find funding for introducing further sites in Zimbabwe, Angola, and Madagascar.

The high elevation weeds group led by Prof Steenhuisen and members of Rhodes University's Centre for Biological Control – Dr Grant Martin (affiliate of UFS Zoology and Entomology) and Dr Kim Canavan (affiliate of UFS Plant Sciences) – had a productive year with the completion of projects by MSc student Nthambeleni Bologo, a project coordinator at the Department of Environmental Affairs, NRF-funded MSc student Patricia Masole, and Honours student Zinhle Sithole. Nthambeleni investigated the perceptions of employees and landowners of the Working for Water Programme, and the impact of clearing invasive alien plants on the native plant diversity in the Northern Drakensberg (Blyde River catchment and surrounds), pioneering work by our lab group in Mpumalanga. Patricia and Zinhle worked on various aspects of the invasive sweet briar rose, a conflict species that has both negative and positive impacts on our montane grasslands and human communities living within them. Thembelihle Mbele, funded by SANBI, commenced a Master's project on the genetic diversity and distribution of pampas grass this year, finding that local trade of the inflorescences containing viable seed may be adding to the potential spread of these grasses.

Thembelihle Mbele sampling Pampas grass (Cortaderia species) for her MSc research

Prof Steenhuisen attended several engagements with the Department of Higher Education and Training (DHET) FPP, such as writing retreats in the Eastern Cape and Kruger National Park, seminars and workshops with Nobel Prize winners and FPP fellows at the Stellenbosch Institute for Advanced Study (STIAS), personal sessions that assisted with her development and promotion to a C2-rated Associate Professorship, and funding opportunities for bringing international researchers from Cornell University and University of Arizona to South Africa in 2024. This follows a successful grant award from the USA National Science Foundation (NSF) for a joint project with Dr Nora Mitchell from the University of Wisconsin-Eau Claire, and fieldwork in the Western Cape and KZN aiming to refine the phylogeny of the *Protea* genus.

Plant Breeding

Molecular plant breeding

Prof Rouxléne van der Merwe is involved in breeding for resistance to pod shattering in vegetable-type soybean (in collaboration with the Northeast Institute of Geography and Agroecology, Chinese Academy of Sciences). This research continued to make progress towards the development of an improved South African vegetable type soybean cultivar that shows resistance to pod shattering. This project is done in collaboration with both Prof Adré Minnaar-Ontong and Dr Ansori Maré who assist with marker-assisted selection of progenies grown in field trials. One MSc student (Kelvin Hlatshwayo) has submitted his MSc dissertation for examination on this project.

Dr Maré worked with Prof Liezel Herselman and Prof Willem Boshoff (Plant Pathology division) to identify new rust resistance sources in wheat using molecular markers and phenotypic evaluations to screen mapping populations. Selected wheat cultivars/ lines from two different breeding backgrounds have been identified with unknown rust resistance. The two breeding backgrounds include the International Maize and Wheat Improvement Center (CIMMYT) rust resistant nursery and Sensako. This research is funded by the South African Winter Cereal Industry Trust (SAWCIT). Further progress has been made with cross-breeding using molecular markers to combine additional rust and FHB resistance genes into wheat lines to ensure durable disease resistance in wheat. This project is funded by the UFS Central Research Fund (CRF).

Breeding for resistance against fungal diseases

across multiple economically important crops, which include resistance breeding against Sclerotinia stem rot in soybean, soybean sudden death syndrome (SDS) and associated phytotoxins, as well as resistance to mycotoxins produced by FHB causal pathogens, to promote the improvement of disease control strategies, is the central point of Prof Minnaar-Ontong's research.

The Sclerotinia resistance research forms part of the South African Sclerotinia Research Network (SASRN) founded in 2017. Due to this collaboration, the *Sclerotinia sclerotiorum* culture collection was established containing more than 1 000 isolates from multiple crops from eight of the nine South African provinces.

A pre-breeding programme for SDS resistance was initiated using marker-assisted breeding approaches after the evaluation of the South African commercial soy-bean as well as edamame germplasm for potential resistance to this destructive disease. Furthermore, a population diversity study was initiated to determine the causal pathogen of SDS as well as the distribution of the fungal species involved. The outcome of the research on soybean diseases will contribute signficantly to soybean production of South Africa.

Conventional breeding

Prof Rouxléne van der Merwe's focus on breeding for tolerance to drought and heat stress in vegetable-type soybean continued to make progress towards the characterisation of vegetable-type soybean cultivars in terms of drought and heat stress tolerance. This project is done in collaboration with Drs Van Biljon and Moloi, who assisted with physiological response analyses. The project is funded by the NRF - Competitive Support for Unrated Researchers. One MSc student (Drikus Coertzen) has submitted his MSc dissertation for examination on this project.

Edamame field trials planted to investigate the drought-tolerance responses of cultivars as part of the pre-breeding programme

Research on the impact of water-limited-stress on the morphology, physiology, and nutritional quality of dry beans is making progress. This project, which aims to characterise dry bean cultivars in terms of drought stress tolerance and nutritional quality, is done by Dr Angeline van Biljon, who assisted with nutritional quality analysis, Dr Moloi, who assisted with physiological response analyses, and Dr Diedré Fourie (Dry Bean Producers' Organisation) who co-supervise students. One MSc student (Lesole Sefume) is enrolled for his degree on this project.

Wheat-quality and crop-nutritional value research

Dr Van Biljon continued with research on the nutritional profile and quality of various crops such as wheat, maize, vegetable-type soybeans, dry beans, and sorghum. Nutritional screening includes the study of storage protein through size exclusion- and reverse-phase high-performance liquid chromatography, as well as the determination of total starch, amylose, sugars, tryptophan, mineral content (especially iron and zinc), and the bioavailability of these minerals. Dr Van Biljon collaborated with Prof Maryna de Wit from the UFS Department of Sustainable Food Systems and Development on a successful Master's student's study on the study of protein in *Opuntia* genotype mucilage.

Plant Pathology

Cereal rust diseases

Prof Willem Boshoff continued with wheat cultivar and breeding line assessment for resistance to rust pathogens. This research involves annual greenhouse and field screening with selected races of the three rust pathogens of wheat. During 2023 field trials were carried out near Napier in the Western Cape and Greytown, KwaZulu-Natal. Results from this industry-funded project are annually shared with wheat breeders and published in the National Wheat Production Guidelines of the ARC-SG. A study to characterise isolates of the maize rust pathogen, *Puccinia sorghi,* continued with financial support of the Maize Trust. Race typing of rust isolates was carried out in collaboration with Dr Tarekegn Terefe from the ARC-SG. Field phenotyping of wheat and barley research populations to map rust resistance sources was successfully carried out in collaboration with Dr Renée Prins from CenGen.

Amy Coetzer, BSc Honours student in Plant Pathology, assisting with rust inoculation in a wheat trial

Mycology

The Pecan Health Research Group at the UFS has been supporting the pecan industry regarding pecan diseases and their management since 2017. During the 2023 growing season, six field trips were undertaken, covering all the pecan producing areas in South Africa. These include areas such as the Orange River from Luckhoff to Upington, Vaalharts, Jacobsdal, as well as various other areas in Limpopo, Mpumalanga, Gauteng, Eastern Cape, Western Cape, and KwaZulu-Natal. Farmers' days were organised during these trips where information regarding the newest findings on student projects was shared with pecan producers and interested parties.

Students from the Pecan Health Research Group on a trip to Upington for field work. From the left, Gilbert Meyer, Pieter van der Walt, Estie Coetzee, and Wilmarie Kruger

Currently, a three-year project is being undertaken with the South African Pecan Nut Producers Association (SAPPA), focusing on the cause of overall decline in pecans. Studies focus on the transfer of potential pathogens through the flowers of pecans, eventually affecting seedlings and grafted nursery plants. Studies are also ongoing on the effect of fungal pathogens such as *Neofusicoccum parvum, Alternaria alternata, Cladosporium species* and bacteria on pecan health in South Africa. To support future pecan research at the UFS, a one-hectare pecan orchard was established on the UFS Paradys Experimental Farm in Bloemfontein, which has now entered its fourth season.

Dr Gert Marais standing at a dead pecan tree (+/- 60 years old) with a fruiting structure of the bracket fungus, Phellinus rimosus, a pathogen and likely the cause of the death of the tree

Epidemiology

Dr Lisa Rothmann leads the McLab Field Pathology and Epidemiology Research Group, which focuses on diseases associated with summer grain crops, i.e. dry bean, sorghum, soy-bean, and sunflower. The project for Thabiso Masisi's PhD study on 'Incidence,

management and producer perceptions of fungal diseases in sorghum cropping systems' was successful in obtaining NRF-Thuthuka Funding and is co-funded by the Sorghum Trust. The research is done in collaboration with Dr Jackson (Botany) and Dr Lindy Rose (Stellenbosch University). An exciting component of this research is done in conjunction with the UFS Department of Sociology, who assist in investigating socio-economic factors associated with sorghum disease management decision-making. The preliminary results of Thabiso Masisi's research were presented at the American Phytopathology Society – African Division Annual Business Meeting, in September 2023. Nomvula Moloi completed her BSc Agric Plant Pathology research component, 'Occurrence and distribution of fungal grain pathogens associated with sorghum production', with samples collected during the 2023 surveying season. The sorghum disease surveys commenced again in the 2023/2024 growing season, surveying producers' fields in the Eastern Cape, Free State, KZN, Limpopo, Mpumalanga and North West. Additionally, the research group as a team has been working on 'Seeds of knowledge: exploring fungi associated with uChokwane (tepary bean), a climate-smart landrace'. Soybean and sunflower cultivar evaluations, done in collaboration with Annelie de Beer and Dr Safiah Ma'ali from the ARC-SG in Potchefstroom, were successful in the 2022/2023 season. This study was supported by the DSI, the Oil and Protein Seeds Development Trust (OPDT), Oilseeds Advisory Committee (OAC), and Grain SA. The project aims to evaluate soybean and sunflower cultivars for tolerance towards *Sclerotinia sclerotiorum* and will be ongoing for the 2023/2024 season, with Dr Derick van Staden and Koos Strydom. A new research project supported by OPDT and the OAC was initiated at the start of 2023, with Kwanele Sabela, MSc Agric researcher, conducting research on 'Premature desiccation of sunflower to preserve at-risk crops from sclerotinia head rot'. The field work was initiated at the end of 2023 during the sunflower planting season. The project on 'Identifying and assessing soybean seedborne diseases, towards improving seed health through reducing prevalent fungal pathogens' was carried out by Neo Hlongwane as part of his MSc Agric study.

Healthy sorghum grain

Thabiso Masisi (right) and Kwanele Sabela (middle) interviewing a farmer during the sorghum disease survey

Michelle Rossi enrolled for the MSc Agric Plant Pathology programme in February 2023. Her research, supported by Plantovita and the Dry Bean Organisation, is on 'Race identification of *Colletotrichum lindemuthianum* isolated from South African production areas'. Dr Rothmann is supervising Michelle along with Dr Deidre Fourie from the Dry Bean Organisation. During the 2023 season Marais Cloete initiated his MSc Agric Plant Pathology research on sunflower head rot, led by Dr Belinda Janse Van Rensburg from ARC-GC and with funding from the ARC-GC and OPDT/OAC.

ACADEMIC CITIZENSHIP AND COMMUNITY ENGAGEMENT

Dr Moloi reviewed manuscripts for *Agronomy* (Q1) and *South African Journal of Botany* (Q2). She was an external examiner for MSc dissertations from the University of the Witwatersrand and the University of Zululand and is an external moderator for North-West University. She delivered a lecture for the postgraduate students at the University of Debrecen in June 2023.

Dr Joubert, Dr Van Aardt, and Prof Van der Merwe were guest speakers on two programmes of *Pretoria FM's* Nature and Science programme, 'Ek wil weet', during which they answered listener's questions on plants and nature.

Dr Lintle Mohase

Dr Mohase featured in an interview for the *Plaas/Farm TV* (The danger of RWASA biotype 5, 19 October) and participated as a panel member in the United Kingdom Research and Innovation (UKRI) Future Leadership fellowship Round 7 Panel Interview Meeting (13 and 14 September). She also participated as an expert in the SA / Flanders (FWO) Joint Research Programme Joint Review Panel.

Dr Rothmann has continued in her role as President of the American Phytopathology Society: African Division, which hosted a successful online meeting in September on the theme 'Translating Plant Health Knowledge to Practice'. The National Grain Research Programme hosted at Stellenbosch University was held in April 2023, at which Dr Rothmann was invited to contribute on the panel on climate change and grain production in South Africa. Discussions were translated into a popular article for the *SA Grain Magazine*, titled 'Researchers discuss the effect of climate change on grain production'. Dr Rothmann was also invited to deliver a guest lecture at the Plant Pathology Department of Stellenbosch University in April; her presentation was aimed at encouraging postgraduates to see plant pathology as a service to society, a vocation, and not just a career.

Dr Rothmann contributed to the Grain SA Research Roadshow, sponsored by John Deere Financial and ABSA. The focus was on discussing Sclerotinia diseases with industry partners under the auspices of the SASRN, supported by Grain SA. The purpose of interacting with producers is to develop and communicate practical management strategies for diseases caused by Sclerotinia for local producers.

Scientific communication and popular articles were produced and distributed through the *SA Grain Magazine*, *Oilseed Focus Magazine*, and *Pula Imvula Magazine*. Contributions were made by Dr Rothmann, Nomvula Moloi, and Kwanele Sabela from the McLab research group. Topics that were covered included *Sclerotinia sclerotiorum* taxonomy and life of an ascospore, and two articles on the agronomic, biological and chemical control of Sclerotinia head and stem rot. The article 'Tactics to disrupt *Sclerotinia*', co-authored by Dr Rothmann, Dr Godfrey Kgatle, and Dr Miekie Human (from Grain SA) won the article of the year for 2022/2023 at the Grain SA Awards.

Dr Lisa Rothmann, Diana Mngomezulu, Thabiso Masisi, and Neo Hlongwane represented the SASRN

From the left, Dr Lisa Rothmann, Diana Mngomezulu, Thabiso Masisi, and Neo Hlongwane at the International Congress for Plant Pathology

at the International Congress for Plant Pathology in Lyon, France (August 2023)

Dr Rothmann was invited to join the scientific committee for the *Botrytis, Monilinia* and *Sclerotinia* symposium (MoBoSclero2025), hosted by Aristotle University of Thessaloniki, in Greece. She also presented a guest lecture at the Peritum Agri Institute on 'Introductory plant pathology and crop protection'. This is the third year she has been invited as a guest lecturer.

Dr Van Aardt's postgraduate student, Marius Muller, gave a talk about alien invasive plants in the Bloemfontein area to the Kiepersol Tuinbouklub at the Kiepersol Tuinbouklub in Bloemfontein. Another postgraduate student, Linde de Jager, presented two talks to the community – 'Ken jou gras / Know your grasses' for the Botanical Society of South Africa's Free State branch at the Free State National Botanical Garden, and 'Invasive alien plants in the Bloemfontein area' for the Bainsvlei Tuinbouklub at Monte Bello Estate in Bloemfontein.

Prof Maryke Labuschagne

Prof Labuschagne continued to serve as Speciality Chief Editor for *Frontiers in Sustainable Food Systems*, as editorial board member of *Cereal Chemistry* and *Journal of Cereal Science*, and as a member of the subcommittee to the advisory committee for Genetically Modified Organisms for the Department of Agriculture, Land Reform and Rural Development. She also served on a task team that evaluated the Centres of Excellence funded by the DSI/NRF.

Dr Mbuma is an external moderator of the Biometry IV: Advanced Diploma module for Mangosuthu University of Technology and an external assessor of the University of Limpopo for the Faculty of Science and Agriculture.

Dr Angeline van Biljon and Prof Willem Boshoff presented invited lectures titled 'Nutritional improvement through biofortification' and 'Stem rust in wheat – the Southern African perspective', respectively, as part of the spring online seminar to MSc students taking the Plant Breeding and Protection for Sustainable Production course in the Department of Plant Protection Biology at the Swedish University of Agricultural Sciences, Alnarp, Sweden.

Prof Boshoff contributed at a pre-plant wheat farmers' day held at Bothaville during February 2023. He presented a talk on 'The control of Fusarium head blight under irrigation'. He also presented a talk on 'The control of rust diseases following outbreaks in the warmer irrigation areas' to representatives from African Explosives and Chemical Industries (AECI) Plant Health at a training meeting in March in Bloemfontein. The rust research group contributed to two popular papers – 'Stripe rust on wheat – new race detected' and 'Fungicide sensitivity among isolates of the stem rust fungus on small grains – both published in *SA Grain.*

Dr Mafa is an active reviewer of articles submitted to the following journals: *Journal of Chemical Ecology, Biomass Conversion and Biorefinery, European Food Research and Technology, Plant Physiology and Biochemistry, Basic and Applied Ecology, Biotech, Genes, Agronomy, World Journal of Microbiology and Biotechnology*, and *Biofuels, Bioproducts & Biorefining.*

Prof Minnaar-Ontong reviewed articles for international journals such as *Agronomy, Discover Agriculture*, and *BMC Plant Biology*. She is the coordinator of the Crop Research Platform, a board member of the National Grain Research Programme (University of Pretoria) and an Agriculture ambassador where roadshows with Food for Mzanzi were held to engage with schools on careers in agriculture.

Prof Steenhuisen continued in 2023 as a Council member and Honorary Treasure for the Council of the South African Association of Botanists, a Review Board Editor for the *South African Journal of Botany*, Associate Editor for the *American Journal of Botany*, and scientific member of the Free State Wetlands Forum. She joined the steering committee of MIREN during 2023.

NATIONAL AND INTERNATIONAL COLLABORATION

Dr Van Biljon collaborated with Prof Erik Alexandersson and Sajeevan Radha Sivarajan from the Department of Plant Protection Biology at the Swedish University of Agricultural Sciences in Alnarp, Sweden.

Dr Moloi collaborated with Prof Ned Bowden from University of Iowa, USA, on a project involving the use of biodegradable dithiophosphates for the improvement of drought tolerance in edamame. They co-supervised an MSc student who graduated in 2023 and are also co-supervising a PhD project. Dr Moloi also has an ongoing collaboration with Prof Brigitta Tóth (University of Debrecen, Hungary), which commenced in 2019. During 2023 their work produced one publication in a peer reviewed journal. Dr Moloi visited the University of Debrecen in Hungary on the Erasmus teaching mobility programme. She also hosted Prof Brigitta Tóth in May 2023 through the same programme.

Drs Joubert and Jackson continued their collaboration with Pieter Bester from SANBI on the systematics of *Nemesia*, a genus of indigenous snapdragons.

Dr Mohase collaborated with Dr Astrid Jankielsohn, an entomologist with specialised expertise on RWA biodiversity, at ARC-SG. Dr Mohase also belongs to a newly formed consortium of RWA researchers in South Africa.

Dr Rothmann was involved in the official Memorandum of Understanding (MOU) between Grain SA and the Department, which was re-signed for the sixth term to administer the SASRN. The Network provides a platform for South African researchers, industry, and producers to work together towards a management solution for Sclerotinia diseases in South Africa. Dr Rothmann collaborates with AgriSeed/Agronomy Info Services in Delmas where soybean and sunflower field trials on the experimental farm are aimed at cultivar and fungicide evaluations.

Diana Mngomezulu, Thabiso Masisi and Dr Lisa Rothmann during the national sorghum disease survey in the Free State, that forms part of the South African Sclerotinia Research Network

Dr Rothmann is co-supervising Mariana van Deventer's MSc Agric (Plant Pathology) research titled 'Modelling the effect of environmental conditions and inoculum load on the development of sclerotinia stem rot of canola in the Western Cape' led by Dr Diane Mostert (Stellenbosch University), and Dr Gert van Coller and Lizette Nowers (Western Cape Department of Agriculture), co-funded by OPDT/OAC.

Prof Scott collaborated with Christopher Moore of the University of South Carolina on a project about a global platinum spike at the Younger Dryas, with Abraham Dabenwa from the University of the Witwatersrand on a project on Tswaing Crater fire history, and with Dr Frank Neumann and Eugene Bergh (North-West University), Andrea Sandersen (previous postdoctoral fellow), and Angela Effiom (University of the Witwatersrand student) on different projects.

Prof Scott and Dr Van Aardt collaborated with Paloma de la Peña (Universidad de Granada, Spain) on a project on Marshill Rock Shelter in the Eastern Cape, with Yolanda Fernandez-Jalvo (Museo Nacional de Ciencias Naturales, Spain) on a project on paleobiodiversity and climatic fluctuations in the Northern and Southern Hemispheres, and with Piet Louis Grundling and Althea Grundling (affiliated with the UFS Centre for Environmental Management) on the reconstruction of past environments at Colbyn wetland in Gauteng.

Dr Andri van Aardt

Dr Van Aardt collaborated with SANBI on the refining of the vegetation map of the Free State and with Prof

VanTol from the UFS Department of Soil, Crop and Climate Science on various soil-plant interactions in National Parks across South Africa.

Dr Van Aardt and Dr Rossouw collaborated with Dr Michael Toffolo from the Spanish National Research Center for Human Evolution (CENIEH) in Spain on the PEOPLE adaptations of Pleistocene humans in South Africa project, exploring the role of changing environments in the adaptation strategies of *Homo sapiens* in the Middle and Late Pleistocene in the central interior of the country. This project also includes other researchers from Germany and the USA.

Dr Rossouw is currently collaborating with Dr Michaela Ecker from Kiel University in Germany on the Kgalagadi Human Origins project, and with Dr Tyler Faith from the University of Utah, USA, on the population dynamics of the extinct blue antelope *(Hippotragus leucophaeus)*.

Prof Labuschagne spent two months at Ghent University in Belgium working on a collaborative wheat quality project with Corteva in South Africa. Her collaboration with the University of Córdoba in Spain on wheat quality also continued, as well as research on the application metabolomics in legume breeding with the Institute for Sustainable Agriculture, Córdoba. Collaboration with the International Institute for Tropical Agriculture (Nigeria and Zambia) on cassava and cowpea, respectively, continued this year. Maize research on biofortification continued with the CIMMYT in Harare and Zamseeds in Zambia. A new collaborative project on mutation breeding in legume crops was initiated in 2023 with the University of Namibia. National collaborative projects with the ARC on cowpea, sorghum, and maize continued in 2023.

Prof Van der Merwe continued her research collaboration with TransfOrmus to evaluate the effect of enOrmus and Soil Life Combo on plant biomass and yield of vegetable-type soybean and maize cultivars under field and glasshouse conditions. The aim of this collaboration is to evaluate the effectiveness of using the different plant bio-stimulants on crop biomass and yield and to determine possible phytotoxic effects on plants. The report developed by Prof Van der Merwe will assist with the registration of the newly developed bio-stimulants as group 3 fertilisers with the Department of Agriculture, Forestry and Fisheries. This project is also done in collaboration with Dr Elmarie van der Watt at Agronomy (UFS). One BSc Hons student (Brandon da Paixao) is enrolled for his degree on this project.

Brandon da Paixao busy with biostimulant foliar application on soybean plants

Prof Van der Merwe continued her collaboration with Prof Qiuying Zhang from the Northeast Institute of Geography and Agroecology, Chinese Academy of Sciences. The project focuses on breeding for resistance to pod shattering in vegetable-type soybean. Prof Van der Merwe initiated research collaboration with Dr Armand Smit, the KZN Agricultural Technical Manager at Green Farms Nut Company. The project, funded by Macadamias South Africa, focuses on establishing a correlation between thrip insect levels on macadamias to nitrogen and calcium in the macadamia leaf.

From international collaboration between the UFS rust group of Profs Visser and Boshoff, and Prof Melania Figueroa at Commonwealth Scientific and Industrial Research Organisation (CSIRO) in Australia, a paper titled 'Genome-enabled analysis of population dynamics and virulence associated loci in the oat crown rust fungus *Puccinia coronata* f. sp. *Avenae*' was accepted for publication in *Molecular Plant Microbe Interactions*. A novel wheat leaf rust resistance gene from Thinopyrum intermedium chromosome $7J^s$ has been identified and introgressed into wheat through collaborative research between Prof Boshoff and Dr Qi Zheng and colleagues at State Key Laboratory of Plant Cell and Chromosome Engineering, Institute of Genetics and Developmental Biology, Chinese Academy of Sciences, Beijing, China. Prof Boshoff also collaborated with Prof Brande Wulf from the King Abdullah University of Science and Technology (KAUST), Kingdom of Saudi Arabia. This included training of Dr Renjie Chen in rust phenotyping at the UFS from 23 April to 19 May 2023.

Profs Boshoff and Visser collaborated with Drs Sam Markell and Upinder Gill of North Dakota State University on the sunflower rust project. They provided DNA of their prevalent sunflower rust races for a Genotype by Sequencing (GBS) project to determine the genetic relationships of the global sunflower rust population.

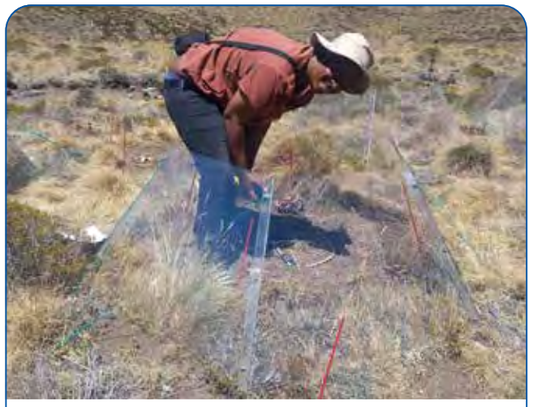
Dr Mafa collaborated with Dr Malgas (University of Pretoria, Department of Biochemistry, Genetics and Microbiology) and Prof Pletschke (Rhodes University Department of Biochemistry and Microbiology) on the application of Carbohydrates or CAZymes in the biorefinery sector for the production of value-added products. Dr Mafa hosted an RWA-consortium research meeting, which was attended by researchers specialising in the fields of Biochemistry, Genetics, Entomology, Plant Physiology, and Molecular Biology from the University of Johannesburg, Stellenbosch University, ARC-SG, and the UFS. The purpose of the meeting was to foster collaborations and develop a memorandum of understanding between the research groups in attendance.

Participants in the RWA-consortium meeting. Front row, from the left, Jesumayowa Ajidahun, Dr Mpho Mafa, and Dr Nicolis Vic; Middle row, from the left, Dr Lintle Mohase, Siphephelo Zondo, Prof Eduard Venter, Nokulunga Mzimela, Prof Anna-Maria Botha-Oberholster, and Dr Marlon le Roux; Back row, from the left, Dr Huzaifa Bilal, Dr Francois Burger and Dr Astrid Jankielsohn

Prof Minnaar-Ontong collaborated with South African breeding companies and researchers from the University of Manitoba, Canada, the University of Nebraska and the United States Department of Agriculture.

Dr Gokul continued his collaboration with the University of the Western Cape (running for the fourth year) and the University of Zululand. The collaboration has resulted in four peer-reviewed articles in high impact factor journals. The International Centre for Medical Research, Franceville also signed an MOU with the UFS.

Prof Steenhuisen is part of the RangeX project, a collaborative reciprocal experimental venture with a consortium of international ecologists from over eight countries. The South African component is managed by the ARU on the Qwaqwa Campus. This project supports Master's student Lesego Malekana, who is involved in collecting data along MIREN



Lesego Malekana measuring plant traits of transplanted plants in an Open Top Chamber on the Maloti-Drakensberg, as part of the RangeX project

transects with Dr Onalenna Gwate (Postdoctoral Fellow in Geography). MIREN transects have been actively surveyed in Lesotho and South Africa by the team.

Prof Steenhuisen conducted fieldwork in the Western Cape with collaborators from the University of Wisconsin-Eau-Claire, USA, in the winter of 2023. Her largest national collaboration is with Dr Grant Martin and Dr Kim Canavan from the Centre for Biological Control, Rhodes University, with whom she collectively supervises seven postgraduate projects. She also externally supervises two Doctoral and two Master's students from the University of KwaZulu-Natal (with Dr Michelle Tedder) and University of Witwatersrand (with Prof Glynis Goodman). Postgraduate students are funded by SAEON (with Prof Dave Thompson) in conjunction with the NRF, SANBI, and the Centre for Biological Control. In December 2023, she hosted members of the 7th International Plant Functional Traits Course (led by University of Pretoria and international researchers from Universities of British Columbia, Buffalo, and Bergen) at the Qwaqwa Campus, sharing research discoveries through seminars and discussion, and assisting with equipment needs.

POSTGRADUATE STUDENTS

At the 2023 graduations, eight students graduated with BSc Hons majoring in Botany (three on the Bloemfontein Campus and five on the Qwaqwa Campus), one student graduated with BSc Hons majoring in Plant Pathology, and one student graduated with BSc Hons majoring in Plant Breeding.

Twelve students from the Department of Plant Sciences graduated with an MSc in 2023. They were:

- Bologo, N (Botany, Qwaqwa Campus)
- Botha, CJ (Botany, Bloemfontein Campus - with distinction)
- Du Toit, I (Botany, Bloemfontein Campus - with distinction)
- Khiba, KF (Plant Breeding)
- Khoza, BM (Botany, Bloemfontein Campus - with distinction)
- Letaoana, TM (Botany, Qwaqwa Campus)
- Moloi, L (Botany, Qwaqwa Campus)
- Mosea, D (Botany, Qwaqwa Campus)
- Muthego, D (Botany, Qwaqwa Campus)
- Nienaber, K (Botany, Bloemfontein Campus)
- Sekhurwane, M (Botany, Bloemfontein Campus)
- Tsotetsi, ME (Botany, Bloemfontein Campus - with distinction)

Three students from the Department of Plant Sciences graduated with the MSc Agriculture:

- Khajoane, TJ (Plant Breeding)
- Ntswane, M (Plant Breeding)
- Omenoba-Nee Ubah, CG (Plant Breeding - with distinction)

Six candidates from the Department of Plant Sciences graduated with a PhD in 2023:

Adams, Zanele (Botany)
Thesis: Pharmacological screening and isolation of bioactive compounds from plants used against elephantiasis in the Eastern Cape, South Africa
Supervisor: Dr P Mojau

Bilal, Huzaifa Bilal (Botany)
Thesis: Priming effect of leaf rust and salicylic acid in Russian wheat aphid resistance
Supervisor: Dr L Mohase

Chiuraise, Nyashadzashe (Plant Pathology)
Thesis: Pathogen variation and genetic control of Puccinia triticina in Zimbabwe
Supervisor: Prof WHP Boshoff

Mapaura, Anthony (Botany)
Thesis: Determining the trajectory of graminoid invasions in Southern Africa's mountains: the case of Nassella
Supervisor: Prof S Steenhuisen

Olckers, Schae-Lee (Food Science)
Thesis: The influence of abiotic stress on gluten in wheat and its effect on bread baking quality
Supervisor: Dr A van Biljon

Simelane, Victor Bongumusa (Plant Breeding)
Thesis: Genetic diversity, agronomic performance and nutritional status of maize (Zea mays) landraces from Eswatini
Supervisor: Dr A van Biljon

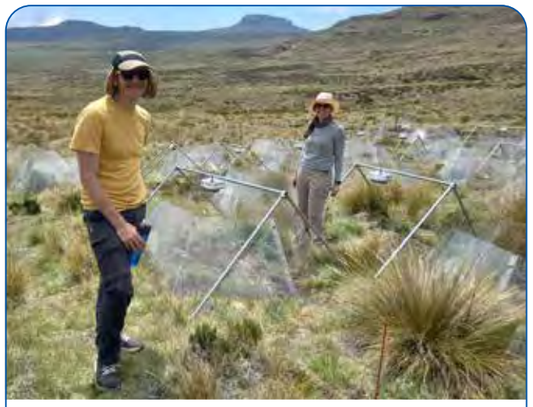
POSTDOCTORAL RESEARCH FELLOWS

Dr Conrad Achilonu (from Nigeria) was appointed in November 2022 and continued to contribute to the Pecan diseases in South Africa programme.

Three Postdoctoral Fellows were active on research conducted under the SARChI Chair, namely Neila Abdi (from Tunisia), Tesfaye Mekonnen (from Ethiopia,) and Isaac Amegbor (from Ghana).

Dr Laetitia Otomo (from Gabon), a Postdoctoral Fellow in Botany on the Qwaqwa Campus, undertook a research trip from the 13 November 2023 to 13 January 2024 to Gabon to engage with the International Centre for Medical Research Franceville. The trip included testing of synthesised therapeutic nanoparticles and endosymbionts on tissues infected with tropical diseases.

Dr Stephanie Payne-Smith (from South Africa), hosted by Prof Steenhuisen, co-taught BIOL6834: Advanced Biostatistics in 2023, presented at an international conference in Chile, leads the pollination aspects of the international RangeX project in affiliation with the ARU, and is co-supervising three Master's and one Doctoral candidate in the Department. In November 2023, she participated in a RangeX writing retreat, hosted by the Swiss collaborators of the RangeX project in Glengarriff, Ireland. Dr Payne-Smith was selected to represent the Qwaqwa Department of Plant Sciences in the postdoctoral category of the Flash Fact competition in Bloemfontein in 2023. In addition, she co-authored a technical advances paper, recently accepted in *Global Change Biology*, emanating from the RangeX project, which uses machine learning techniques and remote cameras to assess weather conditions at the top of the Maloti-Drakensberg.



Dr Radim Šarlej (University of Gothenburg) and Dr Stephanie Payne-Smith (right) conducting research on carbon flux at the South African RangeX site at the top of the Maloti-Drakensberg

STAFF MATTERS

Sandy-Lynn Steenhuisen, Adré Minnaar-Ontong and Rouxléne van der Merwe were promoted to Associate Professors.

Five new appointments were made in the Department during 2023. Dr Kwame Shamuyarira was appointed as Lecturer in Plant Breeding (SARChI Chair contract appointment), Dr Norman Muzhinji as Senior Lecturer in Plant Pathology, Johnica Vlotman as Senior Assistant Officer, Grace Mochologi as Officer: Professional Services in Botany on the Qwaqwa Campus, and Sellwane Moloi as Academic Facilitator in Botany on the Qwaqwa Campus.

Associate Professor Sandy-Lynn Steenhuisen

Associate Professor Adré Minnaar-Ontong

Orpah Taylor (Senior Assistant Officer at Plant Breeding) and Ngaka Mzizi (Officer: Professional Services,

Associate Professor Rouxléne van der Merwe

Botany, Qwaqwa Campus) resigned, while Prof Wijnand Swart, Professor in Plant Pathology, retired during 2023.

Dr Mafa was appointed as a writing consultant by the UFS Centre for Graduate Support (CGS) to teach the postgraduate students to write scientific academic reports, conceptualise new theories or link new theories to existing theoretical frameworks, and to ask students questions that help them improve their aims and objectives, read, and give feedback on their reports.

RESEARCH OUTPUTS

Research Articles

Abdi, N., VanBiljon, A., Steyn, C. & Labuschagne, M. 2023. Zn fertilizer and mycorrhizal inoculation effect on bread wheat cultivars grown under water deficit. *Life* 13: 1078. doi.org/10.3390/life13051078.

Achilonu, C.C., Gryzenhout, M., Ghosh, S. & Marais, G.J. 2023. In vitro evaluation of azoxystrobin, boscalid, fentin-hydroxide, propiconazole, pyraclostrobin fungicides against *Alternaria alternata* pathogen isolated from *Carya illinoinensis* in South Africa. *Microorganisms* 11: 1691-1704.

Achilonu, C.C., Gryzenhout, M., Marais, G.J. & Ghosh, S. 2023. Differential detection of *Alternaria alternata* haplotypes isolated from *Carya illinoinensis* using PCR-RFLP analysis of *Alt a1* gene region. *Genes* 14: 1115-1129.

Achilonu, C.C., Gryzenhout, M., Marais, G.J., Madisha, T.T. & Ghosh, S. 2023. Random amplified microsatellites (RAMS) analysis ascertains genetic variation of *Alternaria alternata* causing black spot disease on *Carya illinoinensis* in South Africa. *Frontiers in Genetics* 14: 1-11.

Achilonu, C.C., Marais, G.J., Ghosh, S. & Gryzenhout, M. 2023. Multigene phylogeny and pathogenicity trials revealed *Alternaria alternata* as the causal agent of black spot disease and seedling wilt of pecan *(Carya illinoinensis)* in South Africa. *Pathogens* 12: 672-691.

Adams, L.D., Giovannoni, D., Clark, V.R., Steenhuisen. S-L. & Martin, G.D. 2023. Reproductive ecology of the invasive alien shrub *Pyracantha angustifolia* in the grassland biome, South Africa. *Plants* 12(6): 1308. doi.org/10.3390/plants12061308.

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Payne, S., Steenhuisen, S., Moloi, K.T., Masole, P., Carvalho, G., Sithole, Z., Chikowore, G., Westwood, T., Rahlao, M., Chatanga, P., Seleteng-Kose, L. & Martin, G.D. 2023. *Review of the invasive, yet economically beneficial, Rosa rubiginosa L. (Rosaceae) within southern Africa.* Paper delivered at the 16th International Conference on Ecology and Management of Alien Plant Invasions (EMAPI), Pucón, Chile. 23-25 October 2023.

Payne, S.L., Alison, J., Steenhuisen, S. & Høye, T. 2023. *Ain't no sunshine when it snows: microclimate by-catch of wildlife cameras.* Paper delivered at the Faculty of Natural and Agricultural Sciences Annual Flash Fact competition, Bloemfontein, South Africa. 11-12 July 2023.

Pule, K., Boshoff, W.H.P. & Maré, A. 2023. *Phenotypic and genotypic evaluation of wheat plants developed for combined rust and Fusarium head blight resistance.* Paper delivered at the Annual post-graduate symposium of the Department of Botany and Plant Biotechnology at University of Johannesburg, South Africa. 23-25 October 2023.

Sedimo, G., Bester, S.P., Jackson, M. & Joubert, L. 2023. *Morphometric analysis in Nemesia (Scrophulariaceae).* Paper delivered at the South African Association of Botanists (SAAB) Postgraduate Symposium (online). 28 September 2023.

Sedimo, G., Joubert, L., Jackson, M. & Bester, S.P. 2023. *Systematics and morphometrics in Nemesia (Scrophulariaceae).* Paper delivered at the 48th South African Association of Botanists (SAAB) Annual Conference, Polokwane, South Africa. 17-20 January 2023.

Shamuyarira, K. W., Shimelis, H., Figlan, S. & Chaplot, V. 2023. *Combining ability analysis of yield and biomass allocation related traits in newly developed wheat populations.* Paper delivered at the 2023 Combined Congress, Pretoria, South Africa. 23-26 January 2023.

Sithole, Z., Moloi, K.T., Steenhuisen, S. & Martin, G.D. 2023. *Role of mammals in the seed dispersal of the invasive plant species, Rosa rubiginosa, in the Free State rangelands.* Paper delivered at the Annual post-graduate symposium of the Department of Botany and Plant Biotechnology at University of Johannesburg, South Africa. 23-25 October 2023.

Sivhada, R., Labuschagne, M.T. & Van Biljon, A. 2023. *Going back to the wild for better bread.* Paper delivered at the Annual post-graduate symposium of the Department of Botany and Plant Biotechnology at University of Johannesburg, South Africa. 23-25 October 2023.

Steenhuisen, S., Martin, G., Moloi, K., Adams, L.D., Gwate, O., Payne, S., Masole, P., Malekana, L., Downs, C. & Clark, V.R. 2023. *Expanding ranges of invasive Rosaceae.* Paper delivered at the 5th National Global Change Conference, Bloemfontein. 30 January–2 February 2023.

Steenhuisen, S., Martin, G.D., Moloi, K.T., Adams, L.D., Payne, S., Gwate, O., Masole, P., Malekana, L., Downs, C. & Clark, V.R. 2023. *When roses go rogue: Expanding ranges of invasive Rosaceae in South Africa.* Paper delivered at the 16th International Conference on Ecology and Management of Alien Plant Invasions (EMAPI), Pucón, Chile. 23-25 October 2023.

Steyn, C., Meyer, C., Minnaar-Ontong, A. 2023. *Characterisation of the Sclerotinia sclerotiorum population on soybean and sunflower in South Africa to improve resistance breeding strategies.* Paper delivered at the International Congress on Oil and Protein Crops, Antalya, Turkey. 2-4 November 2023.

Tóth, B., Grusak, M., Labuschagne, M., Guzman, C., Szoke, L., Kaczur, D., Harangi, R., Radocz, L., Makhsatova, S., Danter, M., Nagy, J. & Moloi, M.J. 2023. *Evaluation of the impacts of stressors on crops in the context of climate change.* Paper delivered at the International Summit on Renewable Energy (INSORE2023), Dubrovnik, Croatia. 11-13 February 2023.

Van Aardt, A.C., De Jager, J.C.L., Giddy, J.N. & Dayaram. A. 2023. *Karroid Islands in a sea of grasses, Free State Province, South Africa.* Paper delivered at the 65th Annual Symposium of the International Association of Vegetation Science, Coffs Harbour, Australia. 3–8 September 2023.

Van Biljon, A., Olckers, S-L., Osthoff, G. & Labuschagne, M.T. 2023. *Size exclusion and reverse-phase high-performance liquid chromatography as complementary tools to study wheat gluten protein.* Paper delivered at the 44th South African Chemical Institute (SACI) National Convention, Chemistry for Sustainable Development in Africa, Stellenbosch, South Africa. 8-13 January 2023.

Van der Merwe, R., Hlatshwayo, K.K., Maré, A., Minnaar-Ontong, A. & Zhang, Q. 2023. *Development of South African soybean lines with resistance to sudden death syndrome.* Paper delivered at the International Congress on Oil and Protein Crops, Antalya, Turkey. 2-4 November 2023.

Van der Merwe, R., Hlatshwayo, K.K., Minnaar-Ontong, A., Maré, A. & Zhang, Q. 2023. *Breeding for pod-shattering resistance in vegetable-type soybean.* Paper delivered at the International Congress on Oil and Protein Crops, Antalya, Turkey. 2-4 November 2023.

Veldkornet, D.A. 2023. *The influence of macroclimatic drivers on the macrophyte phylogenetic diversity in South African estuaries.* Paper delivered at the Southern African Society for Aquatic Scientists Annual Congress (SASAqS), Somerset West, South Africa, 21-25 June 2023.

Venter, K., Marè, A., Herselman, L., Pretorius, Z.A. & Boshoff, W.H.P. 2023. *Exploiting wheat landraces to boost food security and sustainable agriculture.* Paper delivered online through LOGYTalks. 12th April 2023

Venter, K., Swart, W.J., Visser, B. & Rothmann, L. 2023. *A quantitative and qualitative analysis of rhizosphere populations of maize and soybean as influenced by soil and plant genotype.* Paper delivered at the 12th International Congress of Plant Pathology, Lyon, France. 20-25 August 2023.

Zondo, S., Mohase, L., Tolmay, V. & Mafa, M. 2023. *Characterisation of the cell wall reinforcing peroxidase and β-1,3-glucanase induced upon wheat infestation by Diuraphis noxia.* Paper delivered at the 10th International Plant Protection Symposium (online) in Debrecen, Hungary. 24-26 October 2023.

Zondo, S.N., Mohase, L., Tolmay, V. & Mafa, M.S. 2023. *Consolidating the cell wall modification roles of Peroxidase and β-1,3-Glucanase during Diuraphis noxia-wheat interaction.* Paper delivered at the South African Association of Botanists (SAAB) Postgraduate Symposium (online). 28 September 2023.

Conference Posters

Adams, L.D., Steenhuisen, S., Martin, G.D. & Downs, C. 2023. *The role of mammals in seed dispersal of fleshy-fruited invasive alien plants in the Grassland Biome of South Africa.* Poster presented at the 16th International Conference on Ecology and Management of Alien Plant Invasions (EMAPI), Pucón, Chile. 23-25 October 2023.

Ajidahun, J., Mafa, M. & Mohase, L. 2023. *Effect of drought and Russian wheat aphid infestation on wheat yield and quality traits.* Poster presented at the Combined Congress, University of Pretoria, Future Africa campus. 23-26 January 2023.

Delport, B., Castillo-Hernandez, J., Marais, G.J., McCarlie, S.J. & Bragg, R.R. 2023. *Metagenomic evaluation of the bacterial diversity in pecan nut trees with overall decline symptoms.* Poster presented at the 22nd Biennial Congress of the South African Society for Microbiology (SASM2023), Protea Hotel Technopark, Stellenbosch, South Africa. 17-20 September 2023.

Hlakotsa, N.M.M.S. & Ngara, R. 2023. *Physiological responses of sorghum seedlings exposed to mild drought stress.* Poster presented at the 48th South African Association of Botanists conference, Polokwane, South Africa. 17-20 January 2023.

Hlongwane, N.V., Rothmann, L.A. & Swart, W.J. 2023. *Exploring soybean and sunflower microbiomes for beneficial bacterial microorganisms.* Poster presented at the 12th International Congress of Plant Pathology, Lyon, France. 20-25 August 2023.

Malekana, L., Clark, V.R., Steenhuisen, S., Martin, G.D. & Alexander, J. 2023. *Impact and management of range expanding Rosaceae species along elevational gradients in the Maloti Drakensberg.* Poster presented at the 16th International Conference on Ecology and Management of Alien Plant Invasions (EMAPI), Pucón, Chile. 23-25 October 2023.

Masisi, T.V., Mclaren, N.W., Jackson, M. & Rothmann, L.A. 2023. *Identifying sorghum grain fungal colonisers, quantification of mycotoxins and development of weather-based predictive models for Fusarium graminearum.* Poster presented at the 12th International Congress of Plant Pathology, Lyon, France. 20-25 August 2023.

Mbele, T., Steenhuisen, S. & Canavan, K. 2023. *Invasive status of Cortaderia species in South Africa.* Poster presented at the 18th Biodiversity Research Symposium, Kimberley, South Africa. 27 September 2023.

Mbele, T., Steenhuisen, S. & Canavan, K. 2023. *Invasive status of Cortaderia species in South Africa.* Poster presented at the National Symposium on Biological Invasions, Grabouw, South Africa. 4-6 July 2023.

Mboyi, L., Clark, V.R., Mapaura, A., Steenhuisen, S. & Canavan, K. 2023. *Invasion patterns and impacts of the grass Nassella tenuissima in the Eastern Cape Drakensberg, South Africa.* Poster presented at the 58th Grassland Society of Southern Africa (GSSA) Annual Conference, Rustenburg, South Africa. 24-28 July 2023.

Meiring, M., McLaren, N.W. & Rothmann, L.A. 2023. *The viability of Sclerotinia sclerotiorum sclerotia exposed to dry heat temperatures and the rumen of cattle.* Poster presented at the 12th International Congress of Plant Pathology, Lyon, France. 20-25 August 2023.

Mngomezulu, D.N., Rothmann, L.A., and Minnaar-Ontong, A. 2023. *Resistance to Fusarium head blight in wheat: influence of the fungal mycotoxin profile.* Poster presented at the 12th International Congress of Plant Pathology, Lyon, France. 20-25 August 2023.

Mngomezulu, N.T., Veldkornet, D.A., Rajkaran, A. & Nasreen, P. 2023. *The influence of physiochemical variables on the distribution of aquatic invertebrates (snails and crab abundance) in salt marsh creeks.* Poster presented at the Southern African Society for Aquatic Scientists Annual Congress (SASAqS), Somerset West, South Africa. 21-25 June 2023.

Mohotloane, M.M. & Mafa, M.S. 2023. *HRP pretreatment modifies structural and chemical properties of rooibos biomass, improving its saccharification by enzyme cocktails.* Poster presented at the 4th International Conference for Bioresource Technology for Bioenergy, Bioproducts & Environmental Sustainability (BIORESTEC2023). Lake Garda, Italy. 14-17 May 2023.

Moloi, K.T., Martin, G.D. & Steenhuisen, S. 2023. *Seed dispersal and germination of Cotoneaster pannosus on Afromontane grasslands of eastern Free State, South Africa.* Poster presented at the 16th International Conference on Ecology and Management of Alien Plant Invasions (EMAPI), Pucón, Chile. 23-25 October 2023.

Moshieng, N., Labuschagne, M., Shandu, S.F., Rantso, P. & Mbuma, N.W. 2023. *Variation in seed protein, selected minerals, phytic acid and potential mineral bioavailability of cowpea [Vigna unguiculata (L.) Walp] mutants and accessions.* Poster presented at the African Plant Breeders Association Conference, Mohammed VI Polytechnic University (UM6P), Benguerir, Morocco. 23-27 October 2023

Ngara, R. 2023. *Comparative morpho-physiological and molecular studies of sorghum under drought stress.* Poster presented at the VIB Conference: Translational Research in Crops, Ghent, Belgium. 22-23 June 2023.

Payne, S., Steenhuisen, S., Moloi, K.T., Masole, P., Carvalho, G., Sithole, Z., Chikowore, G., Westwood, T., Rahlao, M., Chatanga, P., Seleteng-Kose, L. & Martin, G.D. 2023. *Review of the invasive, yet economically beneficial, Rosa rubiginosa L. (Rosaceae) within southern Africa.* Poster presented at the 16th International Conference on Ecology and Management of Alien Plant Invasions (EMAPI), Pucón, Chile. 23-25 October 2023.

Sekhurwane, M. & Moloi, M.J. 2023. *Influence of different selenium application methods on physiology and biochemistry of drought stressed edamame.* Poster presented at the 48th Annual conference of the South African Association of Botanists (SAAB), Polokwane, South Africa. 17-20 January 2023.

Research Reports

Amegbor, I.K., Darkwa, K., Nelimor, C., Manigben, K.A., Adu, G.B., Aboyadana, P.A., Kusi, F., Keteku, A.K., Owusu, E.Y., Ackah, H. & Labuschagne M.T. 2023. *Yield performance and genetic analysis of drought tolerant provitamin A maize under drought and rainfed conditions.* Report delivered to Forum for Agricultural Research in Africa (FARA).

Boshoff, W.H.P. 2023. *Evaluation of wheat cultivars and lines for genetic resistance to rust diseases.* Report delivered the Wheat Trust, Pretoria, South Africa.

Coetzee, E. 2023. *Fungi associated with overall decline in pecan orchards in the Northern Cape.* Progress report delivered to Annual General Meeting of the South African Pecan Nut Producers Association (SAPPA).

Delport, B. 2023. *Metagenomic evaluation of the bacterial diversity in pecan nut trees with overall decline symptoms.* Progress report delivered to Annual General Meeting of the South African Pecan Nut Producers Association (SAPPA).

Figuero, M., Lewis, D.C., Henningsen, E.C., Hewitt, T., McElroy,

K., Dillon, S., Webers, C., Nguyen, T.D., Mago, R., Nazareno, E., Hartwig, E., Visser, B., Pretorius, Z.A., Boshoff, W.H.P., Pereira, D., Stuckenbrock, E., Lubega, J., Kanyuka, K., Huang, Y.-F., Hickey, L., Milgate, A., Stone, E., Steffenson, B.J., Kianian, S.F., Sperschneider, J. & Dodds, P. 2023. *Rust's biggest secret tactic to kill a crop.* Report delivered to Grains Research Development Corporation (GRDC).

Marais, G.J. 2023. *Fungal diseases of pecans in South Africa: What do we know?* Progress report delivered to Annual General Meeting of the South African Pecan Nut Producers Association (SAPPA).

McDonald, S. 2023. *Disease resistance of selected pecan cultivars based on their chemical composition and bioactivity*. Progress report delivered to Annual General Meeting of the South African Pecan Nut Producers Association (SAPPA).

Van Biljon, A. 2023. *Annual wheat purity tests of new breeding lines by SDS-PAGE*. Report delivered to the Southern African Grain Laboratory.

Yilmaz, N., Visagie, C.M., Visser, B. & Boshoff W.H.P. 2023. *Survey of fungal pathogens affecting maize production in the Eastern Cape.* Report delivered to the Maize Trust.

Industry Papers

Du Toit, I., Boshoff, W.H.P., Rothmann L. & Visser B. 2023. *Fungicide sensitivity among isolates of the stem rust fungus on small grains* (in Afrikaans). SA Grain 50 (71): 38-39.

Terefe, T., Boshoff, W.H.P. & Coetzer, A. 2023. *Stripe rust on wheat – new race detected.* Lead article. SA Grain 50 (5): 8-11.

STAFF (2023)

Head of Department:
Prof L Herselman

BLOEMFONTEIN CAMPUS:

Professors:	Prof L Herselman and Prof MT Labuschagne
Associate Professors:	Prof WHP Boshoff, Prof A Minnaar-Ontong, Prof R van der Merwe and Prof B Visser
Senior Lecturers:	Dr L Joubert, Dr GJ Marais, Dr L Mohase, Dr MJ Moloi, Dr N Muzhinji, Dr AC van Aardt and Dr A van Biljon
Lecturers:	Dr M Jackson, Dr MS Mafa, Dr A Maré, Dr L Rothmann, Dr KW Shamuyarira and Dr DA Veldkornet
Mentor:	Prof L Scott
Research Fellows:	Dr NW Mbuma, Dr GP Potgieter, Prof ZA Pretorius, Dr S Ramburan, Dr L Roussow, Prof WJ Swart, Dr AM Venter and Prof HJT Venter
Programme Director:	Prof B Visser
Subject Coordinators:	Prof WHP Boshoff, Prof A Minnaar-Ontong and Dr L Joubert
Chief Officer – Professional Services:	Dr CM Bender
Officer – Professional Services:	Dr C Steyn
Senior Officers:	M Frylinck and HP Pretorius
Senior Assistant Officers:	LP Mbingeleli and JM Vlotman
Assistant Officer:	K Mbatha
Technical Assistant:	PR Chakane
Cleaners:	NH Dlamini, NS Macwili and LHA Maile
Gardener:	MI Mojampa
Labourer:	TP Motlhacwi

QWAQWA CAMPUS:

Subject Head:	**Prof S-L Steenhuisen**
Associate Professors:	Prof AOT Ashafa and Prof S-L Steenhuisen
Senior Lecturers:	Dr A Gokul and Dr R Ngara
Lecturers:	Dr PJ Mojau and TR Pitso
Research Fellows:	Dr K Canavan, Dr RJ McKenzie and Prof RO Moffet
Academic Facilitator:	SJ Moloi
Officer:	D Mosea
Officer – Professional Services:	NG Mochologi