

PLANT PROTECTION NEWS



In this issue

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Remembering Stefan Neser

Publication of the decadal review of research on the biological control of invasive alien plants in South Africa, 2011-2020

The Weeds Research Division of the ARC-PHP is proud to have contributed to the publication of the decadal review of research undertaken on the Biological Control of Invasive Alien Plants in South Africa (2011-2020), which has been recently published in 'African Entomology', Special Issue, Vol.2, Issue 3, December 2021. Of the 24 published papers covering 72 weed species targeted by biocontrol programmes, the ARC researchers were first authors of 11 publications and co-authors of a further 10 papers. There was a great deal of collaboration with our research partners in invasive weed biocontrol at the Centre for Biological Control at Rhodes University and with other University partners at UCT, Wits, UKZN, etc.

The publication of the decadal review follows on from the inaugural volume published in 1991 that included accounts from the inception of weed biocontrol in South Africa in 1913; the next covered research projects from 1990-1998; the third from 1999-2010, and current 4th volume covers the period from 2011-2020. The papers presented are mainly a 'stock-take' of the current status of biocontrol research and biocontrol implementation achievements within the specific project focus areas over the past decade. Developments in regulations, mass-rearing and implementation, and community engagement are also reviewed. An updated catalogue of agents released, rejected and under consideration is presented and reflects the most recent methods of quantifying success in weed biocontrol.

Due to the early colonisation and geographical situation on the trade routes around the Cape, South Africa has suffered invasions of weeds since the 1600s, with many hundreds of invasive weeds now well established and causing serious environmental and agricultural problems. Biological control as a management tool against weeds of agricultural significance was first initiated in South Africa in 1913, but then became more focussed on weeds of environmental importance in the 1960s against the Australian invasive trees that threatened the biodiversity in the unique fynbos biome of the Western Cape Province. As such, South Africa was the first country in Africa to become involved in weed biological control and South African scientists are now recognized among world leaders in this field. The ARC-PHP has been involved in weed biocontrol since the 1970s, with the research capacity ramping up during the last 20 years. The success of weed biocontrol in South Africa is mainly due to the long-term sustained financial support provided by the Natural Resource Management Programmes of the Department of Forestry, Fisheries and the Environment (DFFE: NRMP) which has



'Historical Loan' Returns Home



Plant growth promoting Streptomyces species

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enabled a strong and experienced community of weed biocontrol researchers to develop at the ARC and at partner Universities, with the outputs clearly evident in this marvellous review of the past decade.



The ARC continues to play a key role in weed biocontrol research, especially in the development of new biocontrol agents for new weeds and for some of the older weed targets that need additional biocontrol pressure to bring them under adequate levels of control. Weed biocontrol is an essential component of South Africa's strategy to reduce the negative impacts of invasive alien plants and has contributed significantly towards the protection of the country's ecosystems, indigenous biodiversity, water security, agricultural productivity, and society in general.

By documenting and publishing all the relevant data accumulated over the past decade on the target weeds, this publication will continue the stock-taking review of the projects and will become an invaluable testimony to the science of biocontrol research and integrated management of invasive alien plants locally, but also were they have a wider significance in an African context as invader species. The current review volume will become a standard reference work for posterity, and will also become the foundation benchmark of biocontrol research and implementation for the next decade to come.

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Remembering Stefan Nesar (16 April 1942 – 17 February 2021)

Dr Stefan Nesar, once described as 'one of the best field entomologists of our time', has left indelible footsteps in ARC-PHP, as well as in the lives of all those who were so privileged to have come into close contact with him.

Upon obtaining a B.Sc. from the University of Pretoria in 1961, Stefan started his career as regional entomologist at the Department of Agriculture in the then Transvaal Region. One of his research projects, a study of *Chrysodeixis acuta*, a recently-discovered pest on tomatoes, potatoes and bananas, formed the subject of his M.Sc., which he obtained with distinction in 1964.

By this time, he had caught the attention of Dr D.P. Annecke of the Plant Protection Research Institute (PPRI) (the predecessor of ARC-PHP), who was looking to create a research unit aimed at the biological control of invasive alien plants. Stefan was recruited into this team, and soon left for Australia to study potential biocontrol agents against *Hakea* species. This investigation culminated in a doctorate in insect ecology from the Australian National University, Canberra, in 1968, titled *Studies on some potentially useful insect enemies of needlebushes (Hakea spp. – Proteaceae)*. During these years, he married Otilie Kritzinger, another entomologist trained at the University of Pretoria, who assisted and supported him in his research and became his inseparable companion for life.

Having identified several promising insect species that affected seed production in *Hakea* spp., Stefan returned to South Africa in 1968 to establish laboratory and quarantine facilities at Stellenbosch to accommodate the natural enemies. As this was the first weed biocontrol project undertaken independently by South Africa, there were no existing protocols to guide him. Stefan developed the safety protocols for studying and releasing imported potential biocontrol agents, which are still followed today. He also developed the system whereby the biocontrol researchers submit the results of their host-specificity testing to the relevant Government department, thus applying for authorisation for the release of the biocontrol agents from quarantine.

Following the successful establishment of the first biocontrol agents on hakea, Stefan visited Australia repeatedly, collecting and studying additional insect species against hakea. During this period, he initiated and supervised biocontrol projects against several other invasive plant species in the Fynbos region, e.g. St John's wort (*Hypericum perforatum*), several Australian *Acacia* species (*A. longifolia*, *A. melanoxylon*, *A. mearnsii* and *A. cyclops*), the closely related stinkbean (*Paraserianthes lophantha*) and Australian myrtle (*Leptospermum laevigatum*). Besides the very promising insects, he also discovered pathogens and mites that were damaging the target species. He stayed in Stellenbosch until 1980, followed by two more years of exploration in Australia.

In 1982, Stefan was appointed as Assistant Director of the newly established Weed Research Unit in PPRI, and was therefore transferred to Pretoria. He became the leader in the field of biological weed control in this country, guiding a group of some 15 professionals, who were stationed at laboratories at Pretoria (Gauteng), Stellenbosch (Western Cape) and Uitenhage (Eastern Cape), together with an entomologist based in Argentina. He also supervised contract research at three South African universities. His pragmatic and far-sighted approach to problem solving, together with his almost legendary knowledge of insect-plant interactions, enabled him to introduce a whole new approach to biological weed control. He was the first person to advocate and implement the use of seed-attacking insects on their own in biocontrol, and has achieved some astounding successes with this approach in the Fynbos region. Whereas Australian plants invading the Western Cape were the initial research focus of the Weed Research Unit, the scope now widened to include plant species from the Americas and Europe, which invaded the Northern and Eastern parts of South Africa. Under Stefan's management, aquatic weeds in South Africa became targets for biocontrol for the first time.

Stefan was appointed to Specialist Scientist at PPRI in 1987, a position which freed him from administrative duties to concentrate on his own research. During 1993, he was made Programme Manager of all weed biocontrol projects, and was promoted to Senior Specialist Scientist in 2000.

Apart from his surveys in Australia, he also studied various candidates against silverleaf nightshade, or 'satansbos' (*Solanum elaeagnifolium*) in their native range in Texas, and agents against water hyacinth (*Eichhornia crassipes*) in Florida, USA. Later he undertook several trips to South America, where he explored Argentina, Brazil, Bolivia, Paraguay and Uruguay for natural enemies of bugweed (*Solanum mauritianum*), lantana (the *Lantana camara* complex), trifid weed (*Chromolaena odorata*), pereskia (*Pereskia odorata*), water hyacinth and wild tomato (*Solanum sisymbriifolium*). More recently he surveyed Mexico for biocontrol candidates against lantana, yellow bells (*Tecoma stans*) and Crofton weed (*Ageratina adenophora*). He was personally involved in most of the weed biocontrol projects in South Africa.

Looking back on Stefan's career, it is clear that his greatest contribution to the biological control of plant invaders has been the collection of natural enemies of weeds in their country of origin. During the years as part of a government department, when only one person per year per institute was granted permission for an overseas visit, and before funding by the *Working for Water* Programme made extended surveys possible, these visits were opportunistic and often cut short by tight budgets. It was therefore critically important to find the target plants and their closest relatives quickly, to select the most promising natural enemies, to collect suitable numbers and to deliver them to South Africa in a healthy condition. This is where Stefan's perceptivity, his amazing ability to locate the right plants and insects, and his dedication were invaluable. As colleagues can attest, he used to work very long hours collecting in the field, with no thought of meals or his own comfort. Inadequate air freight facilities in certain countries often obliged him to carry all the collected material with him throughout his visit, and he often spent most of the night taking care of the insects. His knack for rearing insects has ensured very high survival rates. He could seldom resist to look wider than the planned target species, recording or collecting natural enemies on plant species that were emerging as weed problems in South Africa if he came across them by chance, and has thus probably averted several potential invasive disasters.

During most of these exploration visits, Stefan took one or more colleagues under his wings and subtly mentored them in the science (or art?) of finding, evaluating and collecting promising natural enemies and taking care of them. The majority of biocontrol researchers in South Africa have learned the art of their trade from Stefan while exploring for biocontrol agents in some foreign country, and most of us will cherish those valuable experiences for the rest of our lives. He served as inspiration to generations of scientists, practitioners, land owners and decision-makers in South Africa.

Various international colleagues have contracted Stefan's services in surveying for suitable natural enemies against their own invasive plant species, frequently of South African origin. On behalf of Australia, he contributed to the biocontrol of doublegee (*Emex australis*), bietou bush (*Chrysanthemoides monilifera*), prickly Acacia (*Acacia nilotica*) and belly-ache bush (*Jatropha gossypifolia*), and identified suitable agents against Cape ivy (*Delairea odorata*) for the USA, and against sickle bush (*Dichrostachys cinerea*) on behalf of Cuba. Recently he identified two agents from Ghana that are currently providing highly effective control of African tulip tree (*Spathodea campanulata*) on the Cook Islands. Several of his discoveries also benefited the biocontrol of insect pests. When black scale (*Saissetia oleae*) was still a pest on citrus and olives in California, Israel and other countries, Stefan found black scale in previously unreported subterranean situations in South Africa, from which he reared numerous, previously unknown, parasitoid species that proved important in controlling black scale in overseas countries. Similarly, he located and collected parasitoids in South Africa to control the soft scale that was threatening ice plant (*Carpobrotus* sp.), a South African succulent plant, on road embankments in California.



Wherever Stefan was, he never stopped observing and learning from nature. During his official duties and as member of the Mountain Club of South Africa, his expeditions took him off the beaten track, as attested by a multitude of specimens he lodged with the National Collection of Insects. The associated observations and host records make these specimens even more valuable. He was honoured by having three parasitic wasp species named after him: the aphelinid *Prococophagus neserorum*, the pteromalid *Trichilogaster stefani* and the cynipid *Phanacis neserorum* – the latter having been “named after Stefan and Otilie Nesor, for their invaluable contribution to the study of South Africa's fauna of parasitic Hymenoptera”.

His interest was not restricted to insects either: he made valuable contributions to the National Collections of Arachnids and Nematodes too. One of his hobbies, a fascination with the organisms that cause plant growth abnormalities, led to his collection of hundreds of plant growths together with the eriophyoid mites that caused them. Numerous of these were described by his colleague, the late Dr Magdalena K. P. Meyer (Smith). His hypothesis that each plant species was host to a different eriophyoid mite species has not been disproved, and this principle has been applied successfully in weed biocontrol. In honour of Stefan's contribution to Acarology, one mite genus (*Neserella*) and three more mite species (*Tegonotus stefneseri*; *Aceria neseri* and *Tegonotus stefneseri*) have been named after him. A spider species, *Secthyra neseri* also carries his name. Stefan was the first person ever to record a wasp (*Aprostocetus* sp.) feeding on a nematode in a plant gall.

In addition to his official duties, Stefan served as committee member, vice president and president of the Entomological Society of southern Africa; as committee member of the Southern African Weed Science Society (SAWSS); as a founder member of the Australian Entomological Society; as committee member, chairman, co-ordinator of Conservation Committee of the Mountain Club of SA, and as a member of the Quarantine panel of the then Department of Agriculture, responsible for reviewing applications for the release of biocontrol agents.

He was the recipient of a number of prestigious awards: the Dave Annecke Award for Outstanding research in weed science in 1986; the Senior Captain Scott Award for his Outstanding Contribution to Science (by the SAAWK) in 1994; the NSTF award (as part of a team) for the Corporate organisation making the most significant contribution to Science and Technology over a period of 10 years in 2001; and the Peglerae Award by the Magaliesberg Section of the Mountain Club of South Africa.

Stefan retired officially from ARC-PPRI (now ARC-PHP) at the end of April 2007, after 46 years of dedicated service to this institution. This was, however, not the end of his research career. He worked as extraordinary professor at the Forestry and Agricultural Biotechnology Institute (FABI), at the University of Pretoria, where he mentored younger colleagues on the intricacies of finding and testing natural enemies of various eucalypt pests. This research unit has been exceedingly busy dealing with an unprecedented influx of new eucalypt pests, and several biocontrol agents have been released successfully.

It took an aggressive brain cancer to snatch away this incredibly productive researcher, naturalist, mentor, and warm-hearted human being, who had been regarded as indestructible by those who tried to keep up with him. He is, and will continue to be, sorely missed.

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First *Fusarium* status update in thirty years

The NRF Thutuka project awarded to Dr Adriaana Jacobs resulted in the first update on the status of *Fusarium* spp in South Africa in 30 years. The genus *Fusarium* hosts a large number of economically important phytopathogens with a global distribution. However, a limited number of studies have focused on establishing the natural distribution of members of this genus in soils with low human interference. The grassland biome (the focus of this NRF funded project) of South Africa supports a large amount of agriculture and includes the most populated urbanised metropolitan areas. Additionally, this biome is largely fragmented and critically endangered. To increase our understanding of the distribution of *Fusarium*, we combined the information obtained from this study with published reports on *Fusarium* from South Africa. Sampling sites included five nature reserves with two located far from urbanised areas. Three of the nature reserves fell within the limits of two metropolitan cities, Johannesburg and Pretoria. Analyses of the different isolates indicated that different species complexes emerge as dominant when comparing the three urbanised nature reserves with the other reserves. The *F. oxysporum* species complex was the dominant species complex in urban areas with the *F. incarnatum-equiseti* species complex dominant in the nature reserves situated in rural areas. A network analysis indicated that several isolates were unique to each of the different nature reserves. The comparison with the reference study revealed that eight new reports and thirteen confirmed reports of *Fusarium* species for South Africa were included. Additionally, fifteen previously identified reports were not observed during our study. Studies into the endemic distribution of fungi play an important role by informing conservation policies and supporting decisions on urbanisation and agricultural development.



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'Historical Loan' Returns Home

Although not officially documented, a 'historical loan' of a collection of Seed Beetles (Chrysomelidae: Bruchinae) from the 1970s was unexpectedly returned to the South African National Collection of Insects (SANC) in 2018, some thirty-eight years later! Ms Sharon Reid, the Invertebrate Collections Curator at the Food and Environment Research Agency (FERA), Plant Pests and Diseases Programme, which is an agency within the Department for Environment Food and Rural Affairs of the UK Government, first contacted Beth Grobbelaar, a researcher at Biosystematics, in July of 2016 on ResearchGate. Ms Reid had somehow made the link between a collection of Seed Beetles, the SANC, and the names of the legendary entomologist S.H. Skaife and well-known coleopterist B.J. Southgate, who had worked on this material. Seven wooden Deyrolle boxes containing said beetles, studied by these researchers in the 1970s, had found their way from the Slough Laboratory of the Ministry of Agriculture, Fisheries & Food (MAFF) to the FERA collection. Despite the apparent absence of any paperwork at either institution, labels on some of the specimens confirmed that they indeed originated from the SANC, and Ms Reid sought to repatriate these specimens. After lengthy correspondence, the seven boxes were couriered to South Africa in October 2018.



The seven Deyrolle boxes used by S.H. Skaife and B.J. Southgate.

Seed Beetles are well-known as major pests of stored crops and products, but they are also effectively employed as valuable biological control agents against a variety of alien invasive plants the world over. This invaluable collection of beetles potentially enhances our knowledge of the distribution and host plant use of this group in Africa. It has finally been meticulously curated, having waited for the availability of skilled curatorial and technical expertise, and is now housed in special boxes in the drawers of the main beetle collection at the SANC.

Curation entailed transferring many specimens to new stainless steel pins, as the original pins were badly corroded, and labelling of a large number of unlabelled specimens. Two additional labels were attached to each specimen, one indicating the collection of origin, and the other a SANC label, indicating that the material now belongs to the SANC and is part of the 'FERA donation'.

With much delight and after a lot of hard work, Johanna du Plessis and Beth Grobbelaar may stand back and survey the 1761 specimens saved from this consignment in 2022.

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Contents of a drawer before (left) and after (right) curation has been conducted

HISTORIC LOAN RETURN:
Return 2018: from Ministry of Agriculture, Fisheries & Food (MAFF) Lab., Slough, UK by Food & Environment Research Agency (FERA)

NATIONAL COLLECTION OF INSECTS (SANC) Pretoria, South Africa
MAFF LOAN - 1970's

The two additional labels attached to each of the specimens returned to the SANC

EcoRodMan project partners present at the International Conference on Rodent Biology and Management in Tanzania

The 7th International Conference on Rodent Biology and Management (ICRBM) was hosted by the Pest Management Centre of Sokoine University of Agriculture and the ICRBM committee in Arusha, Tanzania, from 5 to 8 July 2022. Arusha is in northern Tanzania and nestles in the shadow of Mount Meru, the fifth highest mountain peak in Africa. Meru is a dormant stratovolcano about 70 km west of Kilimanjaro. The conference was attended by 116 people in person, presenting 107 oral and 35 poster presentations and a further 86 online presentations, representing 44 countries.

EcoRodMan is a project funded by the European Development Fund and implemented by the African Union. The EcoRodMan project is a collaboration of researchers from Sokoine University (Tanzania), University of Greenwich (UK), University of Namibia, University of eSwatini, Mekelle University (Ethiopia), Busitema University (Uganda) and University of Venda and ARC-PHP (South Africa). The project addresses rodent pests and the damage they cause in crop production, the loss and contamination of stored food after harvest and the many health problems inflicted on people and domestic animals through the transmission of rodent-borne diseases. Training manuals, videos, and policy discussion papers on sustainable rodent management forms part of the key information provided for end users. EcoRodMan project partners contributed as presenters or co-authors to almost 22 percent of the presentations. Emil von Maltitz presented a paper "Ecologically-based rodent management: Human perceptions from South Africa".

Three EcoRodMan project partners, Professors Rhodes Makundi and Apia Massawe from Sokoine, and Steve Belmain from University of Greenwich, were awarded ICRBM Lifetime Achievement Awards for their contributions to rodent research.

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Mount Meru, Arusha, Tanzania



ICRBM Lifetime Achievement Awards. Profs. Rhodes Makundi and Steve Belmain (centre), flanked by ICRBM committee Prof. Herwig Leirs and Dr. Grant Singleton

NEW Diagnostic Test developed for Tomatoes and Peppers

Agricultural Research Council – Plant Health and Protection

ARC • LNR

NEW Diagnostic Test for Tomatoes and Peppers Available

ARC-PHP
Diagnostic seed health tests available

Pospiviroids

The family Pospiviroidae contains many viroids that can affect tomatoes (*Solanum lycopersicum*) and pepper (*Capsicum annuum*). Many of these viroids occur in various countries worldwide and are therefore a concern for countries that have not been affected by these viroids. Consequently, import and export permits of tomato and pepper seed to other countries require molecular verification that seed are free from these viroids.

The pospiviroids of concern on tomato and pepper include seven pospiviroids. These viroids are Citrus exocortis viroid (CEVd), Columnea latent viroid (CLVd), Pepper chat fruit viroid (PCFVd), Potato spindle tuber viroid (PSTVd), Tomato apical stunt viroid (TASVd), Tomato chlorotic dwarf viroid (TCDVd) and Tomato planta macho viroid (TPMVd).

The Naktuinbouw Real-time RT-PCR protocol, recommended by the International Seed Federation (ISF), was optimized for these seven viroids, and is now readily available at ARC-PHP Virology Laboratory, which is registered with DALRRD.

Samples can be submitted to ARC-PHP virology unit for identification of one or all of these pospiviroids. Test results will be available within two to three weeks after receipt of samples. Standard terms and conditions apply.

For any further enquiries and quotations
Please contact our Research Team Manager, Dr. Elna van der Linde (vdlindle@arc.agric.za), or one of our Virologists: Ms Marika van der Merwe (vdmerwema@arc.agric.za) or Ms Nicoo Robertson (robertson@arc.agric.za)

New diagnostic seed health test

The family Pospiviroidae contains many viroids that can affect tomatoes (*Solanum lycopersicum*) and pepper (*Capsicum annuum*). Many of these viroids occur in various countries worldwide and are therefore a concern for countries that have not been affected by these viroids. Consequently, import and export permits of tomato and pepper seed to other countries require molecular verification that seed are free from these viroids.

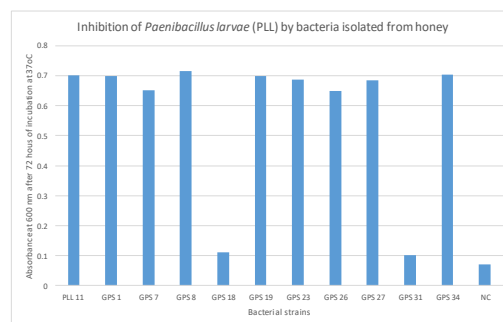
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Bacterial strains may provide possible remedy for American Foulbrood

Beekeeping contributes to the economic welfare of both commercial and emerging farmers in South Africa. Bees are important pollinators. Without bees, the production of food crops and other plants would fail. Microorganisms present in colonies play an enormous role in the health and vigor of these insects. In South Africa honey is produced by two subspecies of honeybee *Apis mellifera scutellata* and *A. m. capensis*. Honeybees are threatened by many diseases, including American foulbrood (AFB), caused by a bacterium, *Paenibacillus larvae*. AFB is deadly to the brood, resulting in the collapse of the colony. Clinical symptoms of AFB are present in the Western Cape. It is intriguing that *P. larvae* has been detected in other provinces as well but the clinical symptoms were absent. There is a high probability that such colonies are protected by the naturally occurring *P. larvae*-inhibiting bacteria in their environment. A diet of bees contains exclusively food derived from plants: nectar and pollen. Bacteria introduced to nectar by bees transform it into honey, and pollen into bee bread which provides the colony with necessary nutrients and also protects them from pathogens. Microbial diversity associated with food of honeybees and the potential impact of honeybee associated microorganisms on immunity to pathogens have not been assessed in South Africa. At ARC-PHP the Bacterial Diseases and Insect Ecology units aim to isolate and identify indigenous bacteria present in South African honey and bee bread that are able to inhibit *P. larvae*, causal agent of AFB. Since October 2021 samples were collected from apiaries in eight provinces, namely Gauteng, North West, KwaZulu Natal, Eastern Cape, Western Cape, Northern Cape, Limpopo and Mpumalanga. AFB clinical symptoms were not observed at any of the apiaries visited. Seventy-eight bacterial strains were isolated from collected materials. Fifteen randomly selected bacterial isolates were screened for anti-*P. larvae* activity. Two of those isolates inhibited two isolates of *P. larvae* in in vitro assays. More isolates will be tested to find one or a combination of strains that are able to inhibit a large number of *P. larvae* isolates. Such *P. larvae* biological inhibitors could contribute to limit the spread of AFB in South Africa.



Graph showing *in vitro* inhibition of *Paenibacillus larvae* strain PLL 11 by bacteria isolated from honey. Evaluation was done on ELISA plates. Bacteria were grown in MYPG broth added to wells in a plate. Bacterial growth was evaluated spectrophotometrically by measuring absorbance at 600 nm after 72 hours of incubation at 37°C. Two strains, GPS 18 and GPS 31 inhibited growth of PLL 11.

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Causes of Potato early dying disease identified

Diseases are a major constraint in the production of tuber crops due to the potentially serious impact on production. Recently, potato early dying (PED), has been observed in some fields in the Limpopo Province. The disease manifests as the premature senescence and ultimate death of a potato plant. When a potato field experiences early dying, diseased and stressed plants results in reduced yield, with typically smaller tuber size and visible effects on tuber quality. Surveys were conducted in the Limpopo Province potato production area. These locations were situated in the Dendron, Tom Burke and Vivo areas. Fungi and oomycetes from the genera *Alternaria* spp., *Colletotrichum* spp., *Fusarium* spp., *Macrophomina* spp., *Pythium* spp., *Rhizoctonia* spp. and *Verticillium* spp. were isolated from diseased plants.

Verticillium dahliae consistently caused symptoms of PED under glasshouse conditions and is therefore considered the primary pathogen of potato early dying. During the first season, of the plants from which *V. dahliae* was isolated, 91% was in combination with *C. coccodes* and 23% in combination with *Pectobacterium* spp. During the second season, 71% was in combination with *C. coccodes* and 38% in combination with *Pectobacterium* spp. Considering the number of isolates found of *C. coccodes* and *Pectobacterium* spp., their pathogenicity and virulence, the co-isolation percentage with *V. dahliae*, and the symptoms observed on the potato plants from which these pathogens were isolated, it can be concluded that these two pathogens, and especially *C. coccodes* play a prominent role in PED in the Limpopo Province.

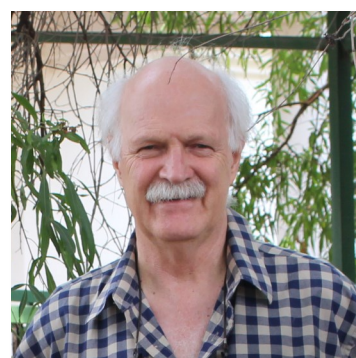


Potato early dying in the field

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Prof Eddie Ueckermann receives the James Allen McMurtry award for 2022

Eddie Ueckermann joined PHP in 1976. His major research interest for more than 40 years was the taxonomy of mites of agricultural importance, especially the family Phytoseiidae, an important worldwide group of predatory mites. Also during that time, he contributed significantly to knowledge of phytophagous, parasitic (medically and veterinary), and other predatory mite families relevant to agriculture. Until now, he has described 23 new genera and 240 new species, in more than 212 scientific papers. Eddie retired on January 31st, 2016, but continues participation in research activities in full professional capacity.



The James Allen McMurtry award was instituted by the Systematic & Applied Acarology Society in 2018 in memory of Prof James A. McMurtry—“the father of biological control of mite pests”. It was designed to recognize a living acarologist who has made outstanding contributions to acarine systematics or applied acarology or both. It is hoped that recognizing outstanding contributions to acarology is not only a tribute to giants in our science but will also inspire a new generation of young acarologists to follow their steps in advancing acarology.

The US\$5000 award is presented every 4 years to coincide with the International Congress of Acarology, to enable the recipient to attend the congress and give a presentation. All nominees are honoured with biographies published in Systematic & Applied Acarology to celebrate their achievements and contributions. The selection committee is formed from acarologists around the world including Ashley Dowling of USA, Qinghai Fan of New Zealand, Farid

Faraji of The Netherlands, Tetsuo Gotoh of Japan, Xiaoyue Hong of China, Sergey Mironov of Russia, Gil-berito José de Moraes of Brazil, Sebahat Ozman-Sullivan of Turkey, Eric Palevsky of Israel, Heather Proctor of Canada, Alireza Saboori of Iran, Owen Seeman of Australia, Marie- Stéphane Tixier of France, Eddie Ueckermann of South Africa, and Zhi-Qiang Zhang of New Zealand.

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Africa BioGenome Project (AFricaBP)

The Africa BioGenome Project (AFricaBP) is an Africa-led effort to sequence the genomes of plants, animals, fungi, and protists that are endemic to the continent of Africa. Following its pilot launch in June 2021, AfricaBP now hosts 109 African scientists and 22 African organizations, representing researchers, institutions and corporations from all five regions in the African Union. The project will build resilience in breeding, sustainable food systems, and biodiversity conservation across the continent to deliver on the goals of the post-2020 Global Biodiversity Framework of the Convention on Biodiversity (CBD). Dr Tendekai Mahlanza from the ARC-PHP is among the scientists that launched this effort and was part of the article in Nature that elaborated on the purpose and aspirations of AfricaBP.

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Setting the agenda in research

Comment



The red mangrove tree is indigenous to Africa and is being sequenced as part of the African BioGenome pilot project.

Africa: sequence 100,000 species to safeguard biodiversity

Article in Nature (2022, Vol 603)

Streptomyces: a soil biocontrol agent, biofertiliser and plant growth promoter in one

With the expected increase in world population in the coming decades, crop yield per hectare and a reduction in the use of chemicals in agriculture will both be of paramount importance. Actinobacteria or 'ray bacteria' are Gram-positive bacteria that comprise a significant percentage of soil microbial populations, the soil food web and the root microbiome (the community of micro-organisms, such as fungi, bacteria and viruses, that exists in a particular environment and colonises the root systems). Actinobacteria usually grow in warm and damp soil.

Some species promote root growth and protection against pathogens. *Streptomyces* species are the most plentiful and important actinobacteria, and comprise between 10% and 50% of soil microflora communities. Most are free-living and occur in both natural and agricultural environments, where they colonise plants' root zones and different morphological parts of the roots. They produce numerous bioactive compounds, such as antibiotics, phytohormones and cell wall-degrading enzymes. They can function as biocontrol agents or antagonists of soilborne pathogens and have plant growth-



Pure cultures of four *Streptomyces* species isolated from the root zone. DR WJ BOTHA

promoting properties. They also function as bioremediation agents; that is, they help to reverse or halt the damage caused to contaminated soil and water by targeting the contaminants. Specifically, they degrade pesticides and remove heavy metals. As a biofertiliser in the root zone, *Streptomyces* act through the formation and release of numerous bioactive compounds and enzymes that decompose complex organic substrates and convert them into soluble compounds for root absorption and root growth. In nutrient-deficient soils, some species of *Streptomyces* fix atmospheric nitrogen and convert it to ammonia and nitrate. In addition, complex forms of phosphate, potassium and zinc are converted to a soluble format for root absorption. These organisms therefore have the potential to mitigate the negative effects of climate change and accelerate the recycling and retention of atmospheric carbon. Soil carbon sequestration or capturing regulates the uptake of carbon-containing substances from the atmosphere and soil organic matter, as well as its storage in soil and microbial carbon pools. Soil microbial communities (SMCs) and actinobacteria play a major role in carbon cycling.

In order to exploit our biological diversity, approximately 150 strains of *Streptomyces* that have been collected, are maintained in the National Collection of Fungi. Strains of *Streptomyces* have been isolated from several hosts, such as macadamia, blueberry, avocado, citrus and maize soils. More strains will be characterised and curated in future and deposited in the collection to serve as a national repository and reference biobank of actinobacteria.

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Biobanks South Africa (BBSA) agreement signed between SANBI and ARC



The Biobanks South Africa (BBSA) is one of the South African Research Infrastructure Roadmap (SARIR) initiatives of the Department of Science & Innovation (DSI). It provides a co-ordinating structure across existing biodiversity biobanks, with the main aim of increasing the range and quality of samples stored and or distributed, and increasing and improving access for research and development through a single, centralised data portal, which will also allow more strategic collection of samples because gaps across biobanks can be identified.

The BBSA activities will increase cost effectiveness and efficiency for state investment and for researchers, it will improve the rate, the quality of research and postgraduate student training. As new data related to samples (e.g. sequence data) is made available in an integrated and co-ordinated way, new knowledge can be built on by others, and support innovation in a variety of disciplines.

The BBSA provides a system of repositories of biologically relevant resources, including reproductive tissues such as seeds, eggs and sperm, other tissues including blood, DNA extracts, microbial cultures (active and dormant), and environmental samples containing biological communities. These biomaterials represent species, strains, varieties and breeds present in South Africa, including domesticated crops and livestock, that can be used to support research, capacity development and the development of new or improved products and practices in the fields of agriculture, human health and wellness, environmental management and conservation biology. This aligns with the DSI's Bioeconomy Strategy (2013) and the recently released Science & Technology White Paper (2019) in terms of improved coherence and coordination, and the principle of open science "that allows people to re-use, redistribute and reproduce research and its underlying data and methods".

The ARC biobanks included in the BBSA includes holdings at Roodeplaat (PHP and VIMP); Nietvoorbij-Infruitec, TFC, OVR, Grains, small grains and animal production. As a consortium members of the BBSA, the ARC

Biobanks are members of the Global Genome Biodiversity Network (GGBN). The membership provides the ARC with the opportunity to showcase its holdings internationally and, in this way, increase their use.

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An updated (2021) catalogue of natural enemies of invasive alien plants in South Africa available on the ARC website

Two versions of the updated (2021) catalogue of natural enemies of invasive alien plants in South Africa are now available on the ARC website, on the following page:

<https://www.arc.agric.za/arc-ppri/weeds/Pages/Management-of-invasive-alien-plants-.aspx>

These include a DOI link to the paper published in *African Entomology*:

[A Catalogue of Natural Enemies of Invasive Alien Plants in South Africa: Classical Biological Control Agents Considered, Released and Established, Exotic Natural Enemies Present in the Field, and Bioherbicides](#)

and a downloadable Excel file containing the information from Tables 1-4 in the above paper:

[Natural enemies for biological control of weeds in South Africa](#)

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