Plant Protection Research Institute

January –March 2009

No 79

PLANT PROTECTION NEWS

Newsletter of the Plant Protection Research Institute (PPRI), an institute in the Natural Resources and Engineering Division of the Agricultural Research Council (ARC)

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General inquiries

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Biocontrol of invasive cactus exceeds all expectations

A highly exciting discovery was recently made during the first post-release monitoring of a biocontrol agent released against a problematic cactus weed near Musina in Limpopo province. *Plant Protection News* No. 78 reported on the first releases of a biotype of the cochineal species, *Dactylopius tomentosus*, against this cactus, chain-fruit cholla (*Cylindropuntia fulgida* var. *fulgida*) during November 2008.

Every areole infested with cochineal

On 18 March 2009 (exactly 4 months after release), Hildegard Klein (ARC-PPRI), Dr Helmuth Zimmermann (the country's most well-known cactus biocontroller, previously of ARC-PPRI) together with five employees of the *Working for Water* Programme, visited the release site again, hoping to find some early signs that the cochineal insects had become established. To their utter amazement, the cochineal had not only become established on each of the inoculated plants, but the inoculated plants were virtually covered from top to bottom with clusters of *D. tomentosus* females. What is more, they had already started dispersing, with most of the *C. fulgida* plants within a radius of 3 m or more from the inoculated plants infested. Many small plants consisting of only a few cladodes had already died and young plants less than 1 m tall were collapsing. The side branches of large plants were beginning to droop, many of the lower cladodes had dropped off the plants, and many of these were dead.

The rate of population build-up and dispersal of the cochineal biotype, as well as its damage to the cactus, have exceeded all expectations. In the four months since its release in Musina it has achieved a level of success that is normally expected only after a year or more. It is expected to become one of South Africa's most spectacularly successful biocontrol projects.

Cochineal-infested cactus plant starting to droop

Cladodes having been killed by cochineal, dropping off a large cactus plant

A dead Woodlands Kingfisher impaled on the cactus spines

This exceptional performance by this cochineal biotype was predicted by Catherine Mathenge, currently living in Australia, but previously based at PPRI's Rietondale campus, where she carried out research into the performance of different biotypes of *Dactylopius tomentosus* on various closely related cactus species.

Biocontrol of invasive cactus (cont.)

Catherine's results indicated that the biotype of the cochineal collected from *Cylindropuntia cholla* (which is believed to be synonymous with *Cylindropuntia fulgida* var. *mamillata*) in Mexico, was more damaging to the weedy *C. fulgida* var. *fulgida* in South Africa than another biotype of the same cochineal species that had been collected from *C. fulgida* var. *fulgida* in Arizona, USA.

This might be ascribed to the fact that this is a "new association" between an insect and a plant species that did not co-evolve. Had it not been for Ms Mathenge's recommendation, this particular cochineal biotype would probably not have been imported, and biocontrol of this cactus weed in South Africa might have remained mediocre.

On a different note: the devastation that this invasive cactus can cause to biodiversity was brought home to the monitoring team by the pitiful sight of three dead Woodlands Kingfishers that had become impaled on the cactus spines on the small island in the dry bed of the Limpopo River where the biocontrol agents had been released. Cactus collectors are urged to keep the invasive potential of cacti in mind and to prevent escapes from their gardens.

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Bee Disease Threatens South African Apiculture

American foulbrood (AFB) is an extremely serious bacterial disease of honeybee brood, caused by the bacterium *Paenibacillus larvae*. It results in the death of honeybee larvae and, in serious cases, the collapse and death of the honeybee colony. AFB is found almost world-wide, but has previously not been reported in sub-Saharan Africa. AFB was recently found in South Africa for the first time during an ARC survey for AFB, funded by the Department of Agriculture. The origin of the AFB in South Africa is unknown, but is likely to be as a result of non-irradiated honey being brought into the country. Other possible avenues for entry are imported beeswax, imported bee-food, or ship-borne honeybee swarms. For many years, South Africa has insisted on the compulsory irradiation of all bee products entering the country, specifically to prevent the entry of AFB.

Since the first report in February 2009, a preliminary survey for AFB in bee colonies in the Western Cape was undertaken by the ARC-PPRI's Mike Allsopp who is the only agricultural honeybee researcher in South Africa and the only bee disease specialist. Laboratory analyses were undertaken by Dr Teresa Goszczynska, ARC-PPRI's bacteriologist at Roodeplaat.

AFB is a notifiable disease in almost all countries, including South Africa. Clinical symptoms in colonies are diseased larvae and pupae, which collapse into a mucus-like mass at the base of a cell, and then dry into a hard, black scale. The colony has a sickly, 'old boots' smell. In almost all parts of the world there are regulations controlling the spread of AFB in honeybee colonies. These controls mostly require the immediate destruction (normally by burning) of infected colonies, and prohibitions of movement of other nearby colonies for 18-24 months, until colonies are shown to be infection free.

These measures are enforced by the necessary regulations, backed up by extensive inspection and analytical services. If the disease is not contained and eradicated, it will almost certainly spread throughout South Africa, and eventually to neighbouring countries and throughout sub-Saharan Africa. The impact will be severe in the short-term, with organized beekeeping having to adapt very swiftly to the disease and the new management procedures that it requires.

The steps that the National Department of Agriculture (DoA) will take are as follows:

A. To conduct an urgent yet extensive delimiting survey of the Western Cape to determine how widespread and extensive the AFB infection is, and particularly, whether it is present in the wild honeybee population. This survey will be conducted by ARC-PPRI, assisted by DoA inspectors from the Directorate Agricultural Product Inspection Services (APIS). In addition, beekeepers may be requested to assist with the survey.

B. Once the extent and distribution of the AFB presence is known, the DoA, in consultation with organized beekeeping and other stakeholders, will decide on the appropriate course of action to be followed. This is likely to entail an attempt to quarantine and eradicate the disease.

In the interim, beekeepers are strongly urged to adopt extreme precautionary measures to prevent the disease spreading further, and to prevent their apiaries from contracting the disease. This applies to all beekeepers in South Africa, but particularly those in the Western Cape. The suggested measures are as follows:

- Beekeepers should endeavour to keep all apiaries isolated from each other; that is, do not move honeybee colonies from apiary to apiary.
- Beekeepers should not place their colonies in the near proximity of colonies belonging to other beekeepers.
- Do not move equipment (brood boxes, supers, frames) from apiary to apiary, or from colony to colony.
- Sterilize all beekeeping equipment (hive tools, gloves) with alcohol or boiling water after use, so as not to spread the infection from apiary to apiary or from colony to colony.
- Do not put out wet supers for bees to feed from.
- Do not feed colonies with anything containing honey or pollen.
- Keep robbing to an absolute minimum, and hence, keep beekeeping management to a minimum.

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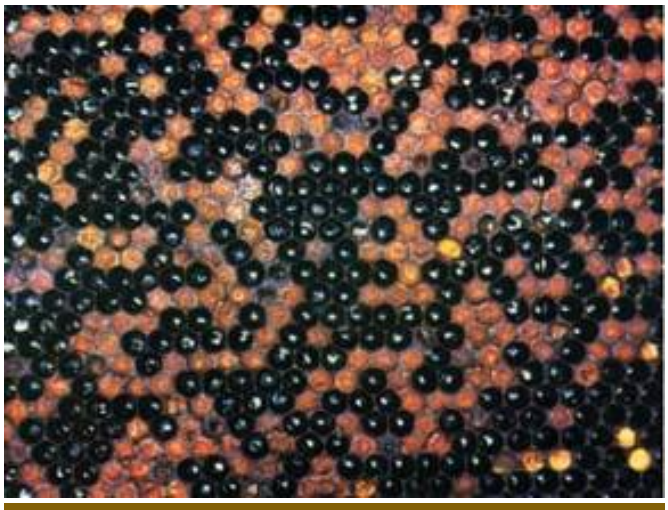

Symptoms of AFB are diseased larvae and pupae, which collapse into a mucus-like mass at the base of a cell, and then dry into a hard, black scale

Biosystematics

Productive collaboration on southern African Tortoise Beetles

The enthusiasm of independent researchers is often 'contagious' and very encouraging! This was the case when Hugh Heron, a retired school teacher and independent researcher from Escombe, Durban, spent a few days in January working on the tortoise beetle (Chrysomelidae: Cassidinae) collection with Beth Grobbelaar, beetle taxonomist at ARC-PPRI's South African National Collection of Insects (SANC).

Working about 11-hour days, beavering away over drawers full of specimens, he managed to work his way through the entire collection, identifying many species previously unnamed in the collection. The result is a vastly improved identified collection at the SANC, only one drawer containing a few specimens as yet unnamed, a diary of notes that took about two weeks to decipher upon his return to Durban, and the cherry on top - a summary that we have all but about 47 of the 120 species known to occur in southern Africa represented.

A brief afternoon of fieldwork at our Roodeplaat campus delivered some interesting finds, as well as newly recorded biological data for a few species of tortoise beetle. A morning spent working at the Transvaal Museum (TMSA, Pretoria) yielded some rewarding host plant information.

Hugh is eager to publish his findings and readily and generously collaborates. Reference specimens collected by him in KwaZulu-Natal, South Africa, are to be deposited in the SANC. His amazing knowledge of the biology and host plants of the group makes working with him both a pleasure and enlightening. A note by him and Beth, based on findings from the SANC collection, is nearing completion for publication in the newsletter *Chrysomela*. They hope to continue documenting findings based on his fieldwork and material Beth has collected with associated host plant data and immature stages.

Contact: Beth Grobbelaar at GrobbelaarB@arc.agric.za

Beth and Hugh discussing cassidines

Aspidimorpha puncticosta, one of the largest South African cassidines (13x11.2 mm). (Photo E. Grobbelaar)

Basipta stolida, endemic to South Africa and Namibia (Photo E. Grobbelaar)

ARC-PPRI and the University of KwaZulu-Natal

In January, Dr Connal Eardley was made an honorary staff member of the University of KwaZulu-Natal. Professor Steve Johnson, at the University's School of Biology, has one of the most productive pollination biology laboratories in the world and with Connal being a bee taxonomist, there is common ground between Steve's research and Connal's studies.

Because the identification of bees is paramount to understanding how both agricultural and natural ecosystems function, Connal raised funds from the South African Biosystematics Initiative (SABI) to present a bee identification course for Steve's laboratory and for SANBI, which is managing South Africa's part in the International Pollinator Initiative's pollination project.

Contact: Dr Connal Eardley at ConnalE@arc.agric.za

Biosystematics (continued)

Scientists visit South Africa to study relict bee group

The genus *Fidelia* (Hymenoptera: Megachilidae) is endemic to Africa, with 11 species recorded from southern Africa and one from Morocco. Its nearest relatives (sister group) occur in South America. Professor Bryan Danforth, from Cornell University in the U.S.A., is an expert on the molecular taxonomy of bees, and he believes that by studying the genetic phylogeny of *Fidelia* and its sister group, he can better understand the history and age of our fauna. In October last year, he and his student, Jesse Litman, made an exploratory trip to South Africa to see if they could find enough suitable material, and five species were collected. This left him and Jesse fired up with enthusiasm. Jesse returned, with a fellow student Sophie Cardale to help her, in January this year. They collected three of the remaining species, all of which do not fly in October. Connal Eardley collected one of the species, otherwise only known from Nambia, in Angola. Two elusive beasts remain at large: one is very rare and is only known from three specimens. The other flies in April. Such collaborative research enables South Africans to understand our biodiversity better, and in this case, in fields in which we do not have expertise. We now await the completion of Jesse's Ph. D. thesis on these bees.

Jesse Litman

Research Expedition to Angola

The South African National Biodiversity Institute (SANBI) organized a joint South Africa/ Angola research expedition in January 2009. The main purposes of the expedition were to provide taxonomic training for young Angolan scientists, and to help Angola document its biological diversity.

Dr Connal Eardley joined the Expedition, and was part of the team that investigated invertebrates. His main focus was on solitary and semi-social bees. Angola is entomologically poorly known, and therefore the specimens he collected have contributed greatly to the documentation of the country's biodiversity. It goes without saying that a number of species not yet recorded from Angola were collected, some of which Connal did not expect to find there. The trip was a great success and similar expeditions should be supported to foster capacity building throughout the SADC Region.

Contact: Dr Connal Eardley at ConnalE@arc.agric.za

Goodbye Thabo Phasoana

Thabo Phasoana has worked for ARC-PPRI for the past 22 months. He spent 12 months in the Mycology Division, and ten months databasing the Biosystematics' bee collection. At the end of March his contract ended, and it was with sadness that we said goodbye to him. However, on 1 April Thabo was voluntarily back at the office at 07h30, because he had not finished his work to his liking.

Thabo Phasoana

Aphids a problem on potato

Ian Millar gave a talk on aphid identification methods at the Annual Meeting of the KwaZulu-Natal Seed Potato Growers, which was held in Pietermaritzburg on 28 January.

Twelve species of aphids occur on potato plants in South Africa. Some of them are important pests, especially *Myzus persicae*, which transmits plant virus diseases that are a serious problem in seed potatoes. Growers need to constantly monitor aphid populations around their potato fields if they are to plan effective managent strategies for these insects. As aphids are difficult to identify, Ian has provided training to numerous technicians in the potato industry over the past few years, to enable them to recognize the more important species that they monitor in their field surveys.

Myzus persicae adult

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The Angola Expedition

Biosystematics (continued)

Scorpions… scorpions everywhere

Dr Lorenzo Prendini

As part of SANSA (South African National Survey of Arachnids), funds are available to invite specialists from abroad to come and assist with the identification of the arachnids of South Africa. During February–March 2009 Dr Lorenzo Prendini of the American Museum of Natural History, New York, visited the Spider Research Centre in Pretoria to assist with scorpion identifications.

All the unsorted and unidentified scorpions from the Natal Museum, Iziko Museum Cape Town, National Museum Bloemfontein, McGregor Museum Kimberley and the Transvaal Museum were couriered to Pretoria. Adding the National Collection scorpions and the newly sampled SANSA collections, a large collection of scorpions was available for Lorenzo. He spent long hours sorting and identifying the >4000 scorpion specimens.
The "scorpion team" consisting of Petro Marais, Annette van den Berg, Sma Mathebula and Connie Anderson then took over, providing each specimen with a new label and databasing the material. It was a very effective way of dealing with such large museum collections.

While in Africa, Lorenzo also undertook an extensive collecting trip to Namibia and several areas in the Northern Cape and Western Cape looking for scorpions, especially *Opistopthalmus*. He has completed a major revision of this genus. The visit was very fruitful and he found some very interesting material. The possibility of submitting a scorpion project proposal to SANBI was also discussed.

Contact: Ansie Dippenaar-Schoeman at DippenaarA@arc.agric.za

The scorpion team: (Back) Stefan Foord (collector), Lorenzo Prendini, Petro Marais. (Front): Sma Mathebula, Annette van den Berg and Connie Anderson.

A photo from the SANSA virtual Museum
Buthidae *Parabuthus raudus*

Arachnids of Nylsvley Nature Reserve

Spiders and scorpions have been collected over a period of 30 years from the Nylsvley Nature Reserve (NNR), Limpopo Province, South Africa. The reserve lies in the upper reaches of the Nyl River on the Nyl floodplain, which is the largest inland floodplain in South Africa and was recognized as a RAMSAR site in 1998.

The spider checklist contains 175 species, 132 genera from 37 families. The Thomisidae is the most diverse spider family with 33 species (18.9% of total), followed by the Salticidae with 20 species (11.4%) and Araneidae with 18 species (10.3%). The majority of species (125) are wandering spiders (71.4%) while 50 species (28.6%) build webs. The free-living ground dwelling spiders comprise 52 species, while 73 species were collected from the plant layer. A total of 159 species are new records for the reserve, and the genus *Araniella* and species *Oxyopes tuberculatus* Lessert, 1915, were newly recorded from South Africa. Three species are possibly new to science, while 7.5 % of the total known spider species of South Africa are protected in this reserve.

The scorpion fauna of NNR comprises five species in three genera and two families (5% of the scorpion species recorded in South Africa). Buthidae are more diverse in the reserve, with four species and two genera represented. The scorpion fauna of the reserve includes two fossorial species and two epigeal species, representing five ecomorphotypes: semi-psammophilous, pelophilous, lithophilous, corticolous and lapidicolous. As many as five additional scorpion species may be recorded if the reserve is sampled more intensively using appropriate techniques.

DIPPENAAR-SCHOEMAN, A.S., VAN DEN BERG, A. AND PRENDINI, L. 2009. Spiders and scorpions (Arachnida: Araneae, Scorpiones) of the Nylsvley Nature Reserve, South Africa. *Koedoe* 50: 1-9.

Silver vlei spider commonly found in wetlands

Biosystematics (continued)

Congratulations

Congratulations to Dr Eddie Ueckermann who was appointed as Extraordinary Professor at the University of North-West. Eddie also received an excellent B2 rating from the NRF

Spider study in the Steenkampsberg Grasslands

A study is being undertaken by Luciano Makaka, an M.Tech. student from Tshwane University of Technology (TUT), on the spider diversity and abundance in the Steenkampsberg Grasslands of Mpumalanga Province. These high altitude, montane, moist grasslands lie in the mist-belt escarpment of Mpumalanga between the towns of Belfast and Lydenburg. The area is popular for its fly fishing and small scenic villages, such as Dullstroom, and attracts many visitors from Gauteng.

However, these grasslands are considered vulnerable in terms of their conservation status and have been identified as a priority area for conservation by SANBI. Much of these grasslands have been transformed due to poor livestock management practices, such as frequent burning and intensive grazing. An intensive vegetation analysis by another TUT student is revealing startling data in the actual level of transformation of this vegetation type, and the changes being experienced in this vegetation community structure. Dovetailing with this work, Luciano is investigating the possible link between vegetation structure and species composition on the one hand, and changes within spider assemblages.

He has completed his field work and is presently working at the Spider Unit identifying the material.

Luciano Makaka

Virtual Museum helps with research

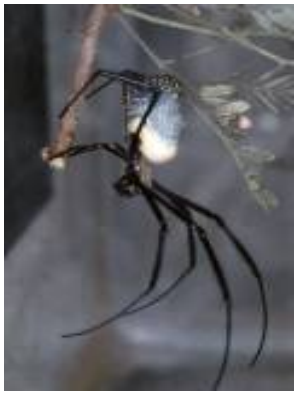
The on-line Virtual Museum of South African Arachnids has reached the 1300 mark. This represents about 2500 images received from many photographers throughout the country. During the last three months alone we have received 300 entries; this averages about 5 photographs or series of photographs received per day. Not only is it a wonderful display of photographs, but it also provides valuable information on species behaviour and prey. We also now have a database available on when and where species occur. Some interesting results were:

- Discovery of a new species of bird-dropping spider (Araneidae: *Cyrtarachne* sp.) near Clocolan, the first record from South Africa. Photographs of its very unique web-building behaviour are also available.
- A very rare scorpion was photographed and we were able to recollect it during January.
- A new species of baboon spider was photographed at Marakele National Park.
- Based on the low number of violin spider photographs, we can assure South Africans of their rarity.
- The golden orb-web spiders are very common this year and mating is taking place during FebruaryMarch.
- The common garden spider, *Argiope australis,* is the species most commonly photographed, with the rain spider,*Palystes superciliosus,* in second place.

We hope eventually to use this wealth of images in a fieldguide to South African spiders.

The Virtual Museum can be accessed at www.arc.agric.za — see Quick Link: SANSA and then Virtual Museum.

Common garden orb-web spider



Golden orb-web spider

Obituary

Marie de Jager, previously of ARC-PPRI, who worked for years with the late Dr Johann Möhr in Middelburg in the Eastern Cape, passed away in March. Marie will be remembered for her energy and knowledge of the insects and arachnids of the Karoo. She will especially be remembered for her contribution to spider research at ARC-PPRI.

Insect Ecology

Increasing status of secondary pests of cabbage in South Africa

Over the past 20 years, cabbage pests in South Africa were ranked according to their damage potential in the order: diamondback moth *Plutella xylostella*, cabbage aphid *Brevicoryne brassicae*, green peach aphid *Myzus persicae*, bagrada bug *Bagrada hilaris* and a few other minor pests. As a consequence, research into the control of cabbage pests has focused on the top three species.

Plutella xylostella is active throughout the year, with peak population density occurring in spring. It is notorious for its extreme ability to develop resistance to all insecticide classes, and as a result alternative control measures have been sought (see below). *Brevicoryne brassicae* and *M. persicae* occur mainly during the cold winter months, and are effectively controlled with aphicides. *Bagrada hilaris* is a sporadic pest, but when present it is often devastating, especially on young seedlings. It can be controlled with parathion, but the insecticide is very toxic and is broad-spectrum.

PPRI research has shown that parasitoids (particularly *Cotesia vestalis*) are an important mortality factor of *P. xylostella*. Before biological control of *P. xylostella* was initiated, infestations during peak season reached 80 larvae per plant, whereas they now stand at an average of 3 larvae per plant.

However, the effective suppression of *P. xylostella* by parasitoids during late spring and summer has led to the elevation of minor pests like onion thrips, *Thrips tabaci*, and cabbage webworm, *Hellula undalis*. The most reasonable explanation for this scenario is that the low densities of *P. xylostella* during late spring and summer have left a niche for secondary pests (e.g. *H. undalis* and *T. tabaci*), which were formerly out-competed by *P. xylostella* (*i.e.* the key-stone herbivore in the cabbage system).

Towards development of an Integrated Pest Management approach for cabbage pests, research on the identification of natural enemies for *H. undalis*, *T. tabaci* and *B. hilaris* is now being undertaken.

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Distinctive damage by diamondback moth larvae

Typical damage caused by aphids

Characteristic damage by bagrada bug

Damage characteristic of thrips

Typical damage by cabbage webworm

Pesticide Science

Rodent post-harvest and crop field impact assessment trials in Namibia

The ICART/CRAFT-funded project 'ECORAT' has the aim to develop ecologically-based rodent management for the southern African region. Following on the annual ECORAT project meeting at the Sokoine University of Agriculture in Morogoro, Tanzania in November 2008 (Plant Protection News No. 78), Emil von Maltitz and Phanuel Malebane met with their Namibian Ecorat colleagues in the Kavango Region of Namibia in January 2009 to initiate a field trial to monitor rodent damage in pre-harvest millet crop fields. Four smallholder fields of approximately 0.5 ha at millet seedling emergence stage were selected. Within each field, four $9m^2$ enclosures were constructed. The aim of the structures is to exclude rodents from damaging the crop. Impact of rodents on plant development, from emergence to yield, will be compared between the open fields and within the enclosures. Similar trials are currently being done on maize in Tanzania and in Swaziland, but such an exclusion rodent trial has not been done on millet before. Millet (*Pennisetum glaucum*) known as mahangu here, is the staple grain crop in Northern Namibia and also along the Kavango River. Of all the major cereals, millet is the one most able to tolerate extremes of heat and drought, and with global warming, might play an even more important role in the future. An agricultural student based near Andara in Kavango will be managing the trial as part of his project work.

The second part of the visit was to re-launch the post-harvest trials which had been conducted since the millet harvest in August. Animal (and also human) intervention in the trial in the non-intervention villages however caused considerable damage to the trial. The aims of the trial were again clearly discussed with the participants in a social exercise. The second challenge was to "goat-proof" the sacks of millet, but not to exclude the target rodents from feeding on the trial. The grain is open and accessible to rodents and through monthly monitoring of the sacks, grain loss due to rodent damage as well as rodent contamination is measured. This trial is conducted in four villages; in two villages (intervention) rodent control, through the use of snap traps, is conducted daily, while in the other villages (non-intervention) no traps are set out by the field staff. Initial results of the trial were promising, indicating substantially smaller loss of grain to rodents as well as less contamination in the intervention villages compared to villages where no trapping is done (Plant Protection News No. 77).

Further information about the Ecorat project can be found through the website: http://www.nri.org/ecorat

Contact: Emil von Maltitz at VMaltitzE@arc.agric.za

Enclosures in a smallholder millet field under a gathering rain storm in Kavango Region, Namibia

Millet seedlings emerging as an enclosure in a rodent exclusion pre-harvest field trial is constructed

Chickens observing "fowl-proof" sacks of millet in a post-harvest rodent assessment trial

The ECORAT post-harvest trial is 2010-ready

Plant Pathology

SASPP and AMA congress at Gordon's Bay in January 2009

The joint Southern African Society of Plant Pathologists (SASPP) and the African Mycological Associations (AMA) congress was held in Gordon's Bay in January 2009.

SASPP CONFERENCE

The main themes of the conference were disease management, disease detection, host-pathogen interaction, pathogen identification and characterisation, techniques, virology, disease resistance and resistance breeding, bacteriology and a specific African Mycological Associations session.

Keynote and international speakers included Dr David Minter (CABI-UK), Louis Palou (Spain), MA Afifi (Egypt), D Prusky (Israel), P Crous and others from CBS (The Netherlands) and S Lindow (USA). A number of delegates from Africa were, amongst others, from Egypt, South Africa, Zimbabwe, Uganda and Zambia.

Delegates in the Plant Microbiology group included S Lamprecht, IH Rong, M van der Merwe, E Jooste, V Moloto, T Goszczynska and W Sekgota. The group contributed four oral presentations and four posters. All work was well received by other delegates.

Presentations at the conference suggest that current trends in plant pathology focus on post-harvest disease, resistance breeding against rust diseases of grains, immune responses in plants, biodiversity studies and new molecular techniques for the detection and identification of plant pathogens.

During the Virology session, virus diseases of grapevine and cassava received most attention. During the Bacteriology session, research on a wide variety of diseases on various crops was presented but no specific aspects were noted as being national priorities.

AFRICAN MYCOLOGICAL ASSOCIATIONS SESSIONS

A workshop arranged by AMA and presented by David Minter addressed the evaluation of conservation status of fungi, using IUCN criteria. The workshop was attended by approximately 30 delegates who eagerly participated in evaluations. The workshop provided insight in the complexities and special requirements for conservation of micro-fungi.

The keynote address presented by David Minter, 'Fungi: the orphans of Rio', was an excellent exposé of current knowledge on fungi and introduced a magnificent and free online database to classic mycological literature dating back to 1880.

Most presentations focused on characterization and population studies of notorious fungal soil pathogens (*Fusarium* and *Rhizoctonia*) and a number of tree pathogens such as *Mycosphaerella* and *Botryosphaeria*. Presentations on biodiversity in specific biomes were evaluated for the Darwin prize, a prize awarded to the delegate with the best presentation on fungal biodiversity. The winner was CM Visagie of the University of Stellenbosch with his talk on 'Biodiversity in the genus *Penicillium* from coastal fynbos soil'.

Dr Isabel Rong, the current president of the AMA, was also the AMA liaison officer and formed part of the organizing committee. During the General Meeting a new council and president were elected since the term of office of the previous committee had expired. Isabel Rong will remain a member (without portfolio) on the committee as required by the AMA constitution.

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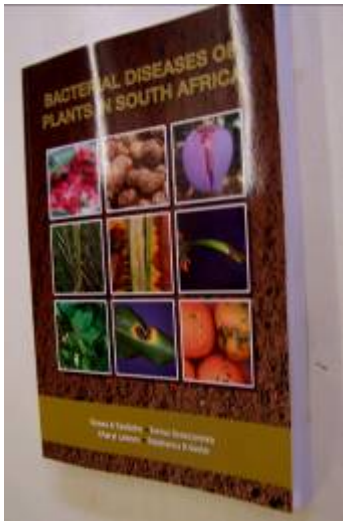
Venue of joint SASPP-AMA Congress

New book on bacterial diseases

DrTeresa Goszczynska is one of the co-editors of a new book: ***Bacterial Diseases of Plants in South Africa***. The book is distributed by Briza Publications (http://briza.co.za/bookstore).

Book information

Authors: Teresa A Coutinho, Teresa Goszczynska, Cheryl Lennox, Stephanus N Venter
ISBN: 978-1-920146-02-3
Format: A4, soft cover in full colour, 119 full colour photographs, 128 pages
Price: R 395.00



The main purpose of *Bacterial Diseases of Plants in South Africa* is to provide information on bacterial diseases of agricultural crops, ornamentals and forest tree species. Over 86 bacterial species and pathovars incur substancial economic losses to growers each year.

The book contains fact sheets on the economic importance, distribution, detection and identification, biology and management of the most important bacterial diseases of plants in South Africa. Full colour photographs depict typical symptoms. Similar information on diseases never previously recorded here (first reports) and those considered quarantine pathogens is also included.

Bacterial Diseases of Plants in South Africa will be very useful to farmers, nurseries, governmental agencies, academic institutions and industry.

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Weeds Research

Cornops aquaticum *shows promise as a biological control agent for water hyacinth*

The water hyacinth grasshopper, *Cornops aquaticum*, has been under consideration for release as a biocontrol agent for water hyacinth in South Africa since host specificity testing was completed in 2001. Before actually releasing a new agent, practitioners wanted to be sure that the grasshopper would be effective under conditions that limit the efficacy of the current biocontrol agents. The current agents do not cause sufficient damage in systems with high levels of nutrients, particularly nitrates and phosphates from eutrophication, which enhance plant growth, nor at low winter temperatures where agents fail to reach damaging population densities due to poor adaptation to the climate.

Pre-release efficacy testing, which is now considered an important component of pre-release screening of candidate agents in biocontrol programmes, was conducted over the last three years to assess the potential impact of the grasshopper on water hyacinth, should it be released in South Africa. In particular, the research addressed the requirement for *C. aquaticum* to be able to reduce the vigour and characteristics of water hyacinth related to its invasiveness in eutrophic systems which have high levels of nitrates and phosphates.

The results were encouraging. During quarantine trials under eutrophic water nutrient conditions, and at a population density at which the grasshoppers occur in their native range, herbivory by *C. aquaticum* significantly reduced water hyacinth biomass, growth and reproduction and reduced the competitive ability of plants by 50% after only 4 weeks of feeding. The grasshopper density that was used in the trials would be considered a conservative field density for South Africa, since the grasshoppers will be free of specialist natural enemies.

Under low water nutrient conditions, where plants were stressed due to nutrient deficiency, the grasshoppers had a substantial impact, in some cases causing mortality of plants after only 8 weeks of feeding.

Other findings that suggested potential for the grasshopper to be successful in high nutrient systems was their response to high levels of foliar nitrogen, associated with high levels of nitrates in the water. Female fecundity was greatest on plants grown in eutrophic nutrient conditions, and higher survival rates and female-biased sex ratios were found for nymphs reared on high nutrient plants. This suggests that under eutrophic nutrient conditions in the field, the grasshoppers may have higher survivorship and higher rates of increase from generation to generation, and therefore higher population densities.

The research provided further evidence in support of the notion that the presence of plant growth-enhancing nutrients from eutrophication exacerbates the problems caused by water hyacinth, and that water hyacinth plants can better tolerate the damage caused by herbivory when their growth rates are enhanced. Therefore a reduction in nutrient input into aquatic systems would largely reduce the problems caused by invasive aquatic weeds.

Based on efficacy, *C. aquaticum* should be released in South Africa. Nevertheless, these data are to be collated with other biological and ecological data collected in quarantine studies to make an informed decision on whether it will be a valuable addition to the South African biological control programme.

The grasshopper's thermal tolerance will be investigated to determine its potential to establish and build up good numbers throughout the range of water hyacinth in South Africa. Furthermore, its interaction with the current water hyacinth biocontrol agents will be investigated to determine whether they will be antagonistic or complementary in their impact on water hyacinth. These studies will be conducted by Anthony King and Ayanda Nongogo in the PPRI quarantine facility at Rietondale.

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Water hyacinth in flower

The water hyacinth grasshopper, *Cornops aquaticum*

Weeds Research (continued)

A promising potential biocontrol agent for Tecoma stans *(yellow bells) in South Africa*

Tecoma stans (Bignoniaceae) is believed to have originated in Mexico and southern USA. Commonly known as yellow bells, it is an invasive ornamental plant in South Africa, classified in terms of the Conservation of Agricultural Resources Act (CARA) as a category 1 invader, which implies that it has to be controlled wherever it grows. It produces thousands of pods with papery, winged seeds which are dispersed effectively by the wind and by birds.

Yellow bells is widely distributed in the Gauteng, Limpopo, Mpumalanga, KwaZulu-Natal and Eastern Cape Provinces of South Africa, as well as in neighbouring countries. It is also an invasive alien plant in Brazil and Argentina.

A promising biological control candidate, the ladybird beetle *Mada polluta* Mulsant (Coccinellidae: Epilachninae: Madaini), was collected from Mexico in 2007 and introduced into weeds quarantine at Rietondale. The culture of *M. polluta* established very well in quarantine and it was then intensively screened as a potential biocontrol agent for *T. stans*. The beetle and its larvae feed extensively on the leaves, producing closely spaced, horizontal, semi-circular to circular lines on the leaves during the feeding process.

The biology of *M.polluta* was thoroughly investigated and the results showed that it has a short life cycle, the period from egg to adult being about 35 days. *M. polluta* females lay eggs in clusters; each female lays about 22 egg clusters, each containing about 23 eggs. The average number of eggs a female produces in her lifetime is about 532, which is a high fecundity rate. The biological data of this beetle thus indicate that it could become a very successful biological control agent, provided that it is also found to be host-specific to *T. stans* and sufficiently damaging to weed growth and reproduction.

The host specificity studies on *M. polluta* are still in progress and the results will determine whether this beetle is suitable for release in South Africa.

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Yellow bells plant, showing its flowers (above) and its long seed pods (below)

Adults of the ladybird beetle *Mada polluta*

The typical feeding damage of the adults and larvae of *Mada polluta*

Weeds Research (continued)

Role of fungal endophytes in promoting invasiveness of Australian Acacia species in South Africa

An exciting research collaboration between the DST-NRF Centres of Excellence for Invasion Biology (CIB, Stellenbosch University) and Tree Health and Biotechnology (CTHB, University of Pretoria) and the ARC-PPRI was initiated in April 2008. The key role players are Prof. Dave Richardson, Deputy Director: Science Strategy and Dr Alana Den Breeÿen, Post-doctoral associate (CIB), Prof. Mike Wingfield, Director, and Prof. Brenda Wingfield, Project Manager (CTHB), and Dr Alan Wood, Weeds Pathology Unit Manager (ARC-PPRI).

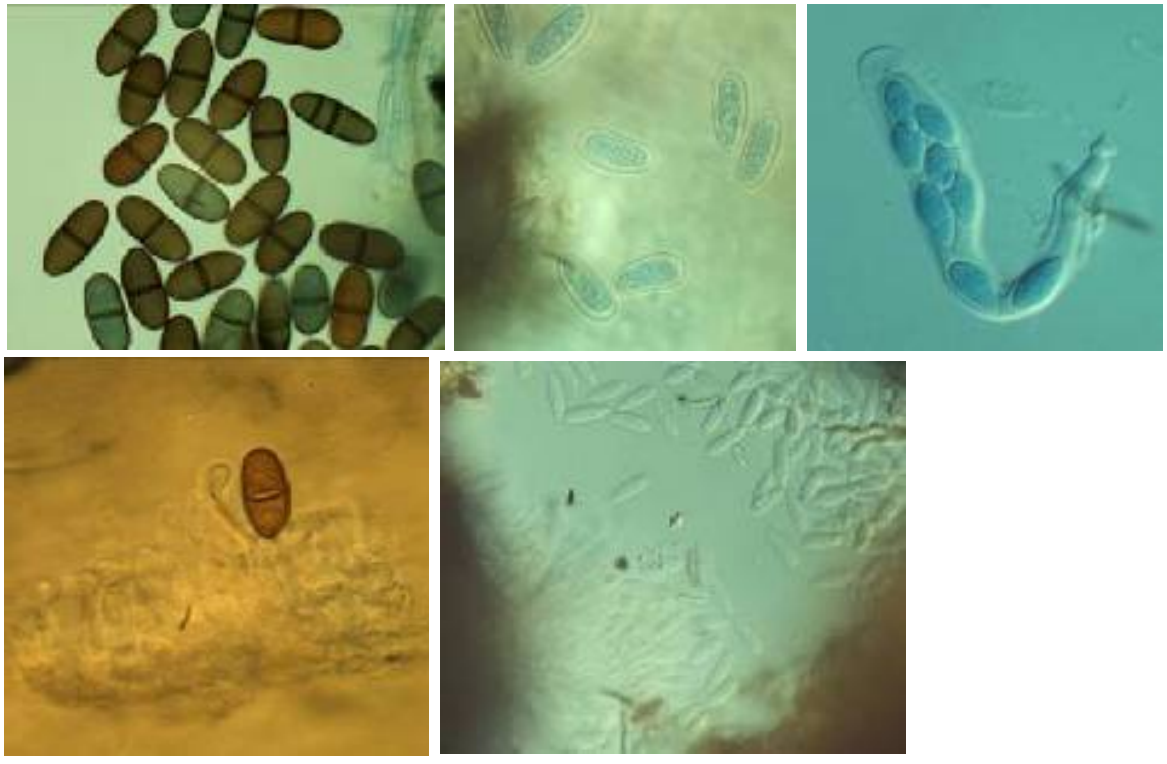
Understanding why a few plant species are highly successful when invading native communities in the new range, compared to the failure of most introduced plant species to establish, is one of the more challenging questions facing invasion biologists. To become successful in a new region, plant species have to pass through a series of ecological filters that include transportation, colonization, survival, reproduction and extensive spread. Similarly, these filters will act on the enemies, competitors and mutualists from the invader's native range. Alien plants can either colonize the invaded range with their own complement of endophytes, or they can leave their native associations behind and acquire new ones in the introduced range. Alien plants are known to be less abundant and less competitive in their native ranges than in their invaded range. Fungal endophytes, as mutualists, are thought to contribute to the overall competitiveness of alien plants in the invaded ranges.

Fungal endophytes are asymptomatic colonizers of virtually every plant species studied for all, or at least a significant part, of their life cycle. These fungi are known to be important to the structure, function, and health of plant communities. In fact, without fungal symbioses, plant communities do not survive many environmental stresses.

Mutualistic fungi have been shown to provide the host with additional defences against diseases and pests by induced resistance and/or competitive exclusion, enhanced drought-, salt- and temperature-tolerances and enhanced growth, independent of apparent biotic or abiotic stresses. The mechanisms through which invasive species alter native ecosystems may depend on association of the invaders with microbial mutualists. Current research suggests that invasive species can strongly affect ecosystem properties.

The research objectives are to determine to what extent fungal endophytes are responsible for the invasiveness of *Acacia saligna* (Port Jackson acacia) in introduced habitats. Specifically, we will test the hypothesis that alien plant species will have a less diverse endophyte community than native plant species. The research protocol, over a two year period, will be to assess the endophyte community and fungal diversity within alien *Acacia* species (*A. saligna* and *Ac. paradoxa*) compared to native *Acacia* species (*A. karroo*) in South Africa, focusing on key species within the Family Botryosphaeriaceae (Fig. 1). Cultures will be classified morphologically, using microscopic and culture characteristics. Phylogenetically relevant comparisons, using multiple genes, will be drawn between the endophyte diversity in alien and native plants.

Contact: Dr Alan Wood at WoodA@arc.agric.za or Dr Alana Den Breeÿen at alanadb@sun.ac.za



Representative fungal endophytes within the family Botryosphaeriaceae isolated from alien and native *Acacia* spp.

Technology transfer

Refereed publications

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MARAIS M., 2009. *Helicotylenchus imperialis* Rashid & Khan, 1974, a junior synonym of *H. multicinctus* (Cobb, 1893) Golden, 1956. *Nematology* 11: 309-310.

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NOFEMELA R.S. & KFIR A.R., 2008. The pest status of diamondback moth and the role of *Cotesia plutellae* in suppressing pest populations in South Africa. *In: Proceedings of the Fifth International Workshop on the Management of Diamondback Moth and other Crucifer Pests*: 239-249.

VILJOEN, B.D. & STOLTSZ, C.W. ,2008. Control of black wattle (*Acacia mearnsii* De Wild.) seedlings with Garlon herbicide applied by backpack mistblower. *South African Journal of Plant and Soil* 25: 242-244.

WILLIAMS, H.E. & MADIRE, L.G., 2008. Biology, host range and varietal preference of the leaf-feeding geometrid, *Leptostales ignifera*, a potential biocontrol agent for *Lantana camara* in South Africa, under laboratory conditions. *Bio Control* 53: 957-969.

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WOOD A.R., 2008. Host-specificity testing of *Prospodium transformans* (Uredinales: Uropyxidaceae), a biological control agent for use against *Tecoma stans* var. *stans* (Bignoniaceae). *In: Proceedings of the XII International Symposium on Biological Control of Weeds*: 345-348.

WOOD A.R., DEN BREEYEN A. & BEED F., 2009. First report of smut on *Imperata cylindrica* caused by *Sporisorium schweinfurthianum* in South Africa. *Plant Disease* 93: 322.

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FOURIE A. & WOOD A.R., 2008. Biology and host specificity of *Puccinia arechavaletae*, a potential agent for the biocontrol of *Cardiospermum grandiflorum*. p. 356.

HILL M.P., MCCONNACHIE A.J. & BYRNE M.J., 2008. *Azolla filiculoides* Lamarck (Pteridophyta: Azollaceae) control in South Africa: a 10-year review. pp. 558-560.

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MCKAY F., OLEIRO M.I., MCCONNACHIE A. & SIMELANE D.O., 2008. Natural enemies of balloon vine and pompom weed in Argentina: prospects for biological control in South Africa. p. 253.

NTUSHELO K. & WOOD A.R., 2008. Supplementary host-specificity testing of *Puccinia melampodii*, a biocontrol agent of *Parthenium hysterophorus*. p. 360.

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SIMELANE D.O., 2008. Towards predicting establishment of *Longitarsus bethae*, root-feeding flea beetle introduced into South Africa for potential release against *Lantana camara.* p. 363.

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WILSON J.R.U., RICHARDSON D.M., LOWE, A.J., HEDDERSON T.A.J., HOFFMANN J.H., SHEPPARD A.W., WITT A.B.R. & FOXCROFT L.C., 2008. Comparative invasion histories of Australians invading South Africa. p. 452.

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WOOD. A.R., 2008. Impact of the rust fungus *Uromycladium tepperianum* on the invasive tree, *Acacia saligna*, in South Africa: 15 years of monitoring. p. 645.

ZACHARIADES, C., STRATHIE, L.W., SHARP, D. & RAMBUDA, T., 2008. Success at what price? Establishment, spread and impact of *Pareuchaetes insulata* on *Chromolaena odorata* in South Africa. p. 645.

Technology transfer

Semi-scientific

CROUS P.W., GROENEWALD J.Z. & WOOD A.R., 2008. *Sporidesmium knawiae* Crous sp. nov. *Fungal Planet*: 29.

DIPPENAAR-SCHOEMAN A.S. & JONES A., 2009. First record of a bird-dropping spider genus *Cyrtarachne* from South Africa. *SANSA Newsletter* 8: 14-15.

Newsletter

DIPPENAAR-SCHOEMAN A.S. & HADDAD C.R., 2009. (Eds). SANSA Newsletter no. 9. February-March. 17 pp.

Congresses

46th Congress of the Southern African Society for Plant Pathology held at ARC-PPRI, Infruitec-Nietvoorbij.

FOURIE A., 2009. Biological control of *Hakea sericea* with the mycoherbicide *Colletotrichum acutatum*.

FOURIE A. & BESTER W., 2009. *Uromyces cestri*: A potential biological control agent of *Cestrum parqui*.

Lectures and Talks

DIPPENAAR-SCHOEMAN A.S., 2009. Mites of medical, veterinary and agricultural importance. Lecture to 2nd year students. University of Pretoria.

DIPPENAAR-SCHOEMAN A.S., 2009. Spiders and scorpions of medical, veterinary and agricultural importance. Lecture series to 2nd year students. University of Pretoria.

DIPPENAAR-SCHOEMAN A.S., 2009. Ticks of medical and veterinary importance. Lecture series to 2nd year students. University of Pretoria.

MARAIS M., 2009. Nematodes at Zeekoegat. Zeekoeigat Report-back meeting. ARC-ISCW.

MARAIS M. & SWART A., 2009. Soil Nematodes at Zeekoegat. Conservation Agriculture Information day. ARC-ISCW.

MILLAR I.M., 2009. The identification of potato aphids. Annual Meeting of the KwaZulu-Natal Seed Potato Growers. *Potatoes South Africa.*

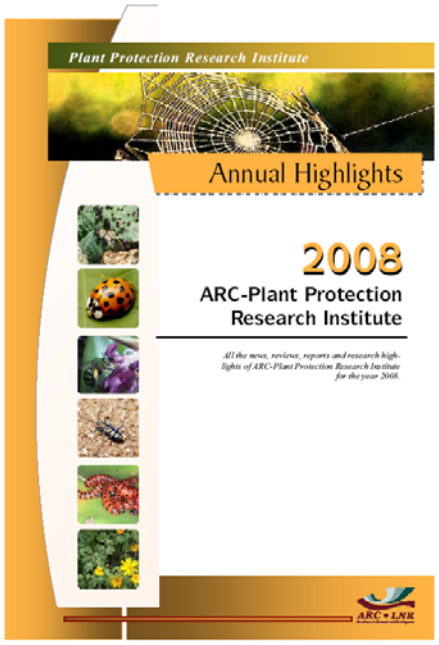
STALS R. 2008. The complete dependence of macroecology on systematics. Lecture to graduate students of the University of the Free State, at National Collection of Insects, Pretoria.

Radio

DIPPENAAR-SCHOEMAN A.S., 2009. 12 radio interviews on spiders live on Radio Laeveld during the report period.

DIPPENAAR-SCHOEMAN A.S., 2009. 4 radio interviews were broadcast on RSG “Hoe verklaar jy dit”?

ARC-PPRI Highlights of 2008



Annual reports will no longer be printed. Instead the four Plant Protection Newsletters of 2008, ring-bound and provided with a cover, designed by Elsa van Niekerk, will be available from the Graphic Artist’s Office at VNiekerkE@arc.agric.za

Two degrees for two ladies

PPRI’s aquatic weeds researcher and team leader at Cedara, **Angela Bownes**, has been awarded a PhD degree by Rhodes University for her thesis: “Evaluation of a plant-herbivore system in determining potential efficacy of a candidate biological control agent, *Cornops aquaticum* for water hyacinth, *Eichhornia crassipes*”.

Nontembeko Dube, a PDP student, also based at Cedara, has been awarded her MSc degree by the University of KZN for her thesis: “Investigation of the biology and cross-breeding of populations of *Pareuchaetes insulata* (Lepidoptera: Arctiidae) and the implications for the biological control of *Chromolaena odorata* (Asteraceae) in South Africa”.

Our heartiest congratulations go to Angela and Ntemsie on their achievement, which is the reward for years of dedicated work. Well done, ladies!