Forestry and Agricultural Biotechnology Institute
"Future Forests and Food"

# Tree Protection News

Newsletter of the Tree Protection Co-operative Programme (TPCP) and DST-NRF Centre of Excellence in Tree Health Biotechnology (CTHB)

Volume 51 June 2015

## FROM THE DIRECTOR'S DESK

The shortest day of the year has just passed and I believe that yesterday marked the day with the lowest Pretoria temperature this winter. For our new students from warmer parts of South Africa and those who hail from countries in the tropics, this time of the year always comes as a bit of a surprise. From the pest and disease standpoint, winter usually means smaller numbers of samples for the diagnostic clinic and a time when we need to move plants into greenhouses to protect important resources, including insect colonies, from frost damage. This is also a time of the year when we need to consolidate cultures and prepare material such as biological control agents for deployment as soon as temperatures begin to rise. So the quieter period linked to fewer samples and lower insect/disease pressure in the field never means a time for rest at the laboratory level.

Just a few weeks back in May, we held our 27th Annual meeting of the Tree Protection Co-operative Programme (TPCP). It is hard to believe that this amazing cooperative venture between the forestry industry and the University of Pretoria (for the past 16.5 years) has come to be so successful. It remains uncontested as the largest single programme dealing with tree health issues anywhere in the world. Yet, as emerged from the many presentations at the annual TPCP and CTHB meeting, there are many and growing challenges relating to tree health and the sustainability of plantation forestry, not only in South Africa, but globally. All available evidence shows that this is a trend that is set to continue. We feel optimistic that with adequate focus and ongoing commitment, it will be possible to deal with the problems that challenge us. Looking backwards

## INSIDE THIS ISSUE



Compiled by Jolanda Roux with contributions from the TPCP and CTHB research team.
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International tree health experts discussing *Leptocybe invasa* damage with Dr Brett Hurley

typically provides us with perspective and the ability to better understand our challenges. When we consider our current and substantially improved position with diseases such as pitch canker on pines, Cryphonectria and Coniothyrium canker of *Eucalyptus*, and insect pests such as the Sirex wood wasp, I believe that it is fair to look forward with some level of optimism.

Insect pests of *Eucalyptus* have risen substantially in importance during the course of the last few years. There has been approximately one new insect pest to deal with in each of the past five years and this has clearly raised concern. But again, when we consider how rapidly the first biological control agents for *Leptocybe invasa* and *Thaumastocoris peregrinus* were established, it is fair to say that, despite substantial challenges, the TPCP team has set a positive example in the global context in dealing with these problems. Clearly, there is much that needs to be done and we must build capacity to manage our screening and biological control programmes. But, the will is there to succeed and I must pay special tribute to the amazing members of the TPCP team whose determination and hard work has given rise to the accomplishments noted above.

During the latter part of 2014, the TPCP received a substantial gift from Sappi as a contribution towards the expansion of the FABI Biological Control Facilities on the University of Pretoria "research 'farm". This funding, together with a new 'injection" of support from the Department of Science and Technology Sector Innovation Fund (SIF) will make it possible to expand the TPCP biological control programme. More specifically, this will make it possible to undertake new biological control projects including, for example, the introduction of new biological control insects for *Gonipterus* (*Eucalyptus* snout beetle).

Two new rust diseases, Myrtle rust caused by *Puccinia psidii* and *Acacia mearnsii* rust, caused by *Uromycladium acaciae* have emerged

*Gonipterus* sp., causing significant damage to *Eucalyptus* clones in Zululand.

as new challenges during the past few years. Studies to understand the genetics and biology of these pathogens are underway and rapid screening protocols are now being considered. Importantly, the critical mass of researchers connected to the TPCP has made it possible for the team to rapidly launch new initiatives to deal with problems such as these. And as new problems arise, I feel confident that we will be able to deal with these in a similar way.

The TPCP Team based at FABI relies strongly on a very positive relationship with forest managers, foresters and contractors linked to our member companies. Thus, while substantial work continues in the laboratories and greenhouses at FABI, there is substantial field-based research as well as integrated disease management activities being pursued in plantations throughout South Africa. We must again express our gratitude to our many collaborators and friends linked to the South African forestry industry that provide us with great support in our efforts at 'Keeping Trees Healthy"

Warm regards, Mike Wingfield

# THE MYRTLE RUST PATHOGEN SPREADING IN SOUTH AFRICA

***Puccinia psidii***, which causes the disease known as Myrtle rust (guava/eucalyptus rust), continues to spread in South Africa. The pathogen was first detected in the country in May 2013, on a single tree in KwaZulu-Natal. Despite surveillance of the area for the past two years, no other trees with the disease have been found near the site of the original report.

Unexpectedly, in late winter 2014, two native ***Eugenia natalitia*** plants infected with ***P. psidii*** were found in the Wolkberg Wilderness area, near Haenertsburg in the Limpopo province. Subsequent surveys in the area have led to the detection of several other infected ***Eugenia*** plants along streams in that region. This discovery is strange given how distant the Wolkberg is from KZN. Even more recently, in February 2015, Myrtle rust was detected on non-native ***Backhousia citriodora*** (lemon myrtle) in a garden in Irene, near Pretoria, in Gauteng. Subsequent surveys in Gauteng have commonly found infected ***Myrtus communis*** (Myrtle) trees in commercial nurseries in the province.

In 2015 the Myrtle rust pathogen has been found in new regions in KZN and Limpopo. These include at Port Edward in KZN where several infected native myrtaceae were found in a nursery. Infected plants included species of ***Eugenia*** and ***Heteropyxis natalensis***. It was also found on a ***Myrtus communis*** plant in a garden in Melmoth and in the Soutpansberg on native ***E. natalitia***.

Typical signs and symptoms of Myrtle rust include the presence of bright yellow (sometimes white), powdery spore masses of the fungus on affected plant parts. ***Puccinia psidii*** infects young, succulent, actively growing plant parts such as new shoots, flower buds and fruits. Infection is initially characterised by the formation of reddish spots which can enlarge and become covered in yellow spore masses. On susceptible plants, infected leaves and shoots will die, resulting in leaf drop and die-back.

To date, no infections of ***P. psidii*** have been found on Eucalypts in South Africa. However, ***E. grandis*** and other Eucalypts planted in South Africa are known to be susceptible to the pathogen. We urge all foresters, farmers, botanists and conservation scientists to keep their eyes open for the disease and to report it to the TPCP/CTHB.

Yellow masses of powdery urediniospores on young leaves

Developing leaf spots caused by ***P. psidii*** on the upper surface of an infected leaf.

Myrtle rust resulting in shoot and leaf death on a South African myrtaceae plant

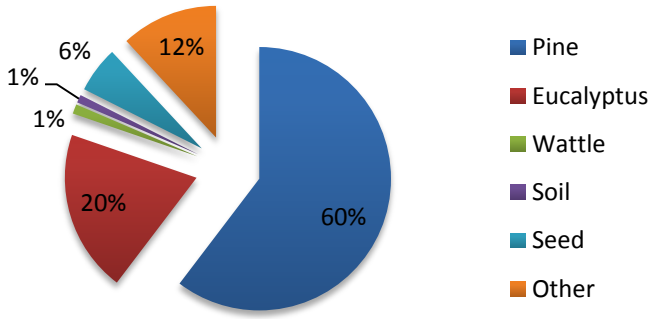
# DIAGNOSTIC CLINIC

The Diagnostic Clinic of the TPCP and CTHB presents a free service to members of the two programmes. The clinic is managed by PhD student Darryl Herron, with the assistance of Izette Greyling and Prof. Jolanda Roux. Apart from providing a service to industry and other stakeholders the clinic is important for the monitoring of pests and diseases in the country. It also serves an important role in the training of post-graduate students. Darryl, therefore, employs MSc and PhD students to process samples submitted to the clinic.

For the first six months of the year the clinic processed a total of 512 samples. Of the samples received, *Pinus* species comprised the majority, with requests for the screening of material for the pitch canker fungus, *Fusarium circinatum*, being the most common.

We encourage all members to contact us if you see anything new/different in your plantations and forests, or if you have any queries regarding diseased or dying trees.

The 2015 Diagnostic Clinic team: Redzuan Rauf, Ginna Granados, Angel Maduke, Tanay Bose and Darryl Herron




Tanay Bose analysing samples during the annual Diagnostic Clinic field trip

## RESEARCH HIGHLIGHTS IN TREE HEALTH

**Although it has been recognised for a number of years that the killer of Pretoria's famous Jacaranda trees is a fungal root rot pathogen, it had not been given a name until recently. In a research paper published in the journal IMA Fungus, researchers at the TPCP/CTHB described two species of the genus *Ganoderma* from these trees in Pretoria. These fungi have been given the names *Ganoderma destructans* and *G. enigmaticum*.**

**Coetzee MPA, Marincowitz S, Muthelo VG, Wingfield MJ (2015). *Ganoderma* species, including new taxa associated with root rot of the iconic *Jacaranda mimosifolia* in Pretoria, South Africa. *IMA Fungus* 6(1):249-256. 10.5598/imafungus.2015.06.01.16**

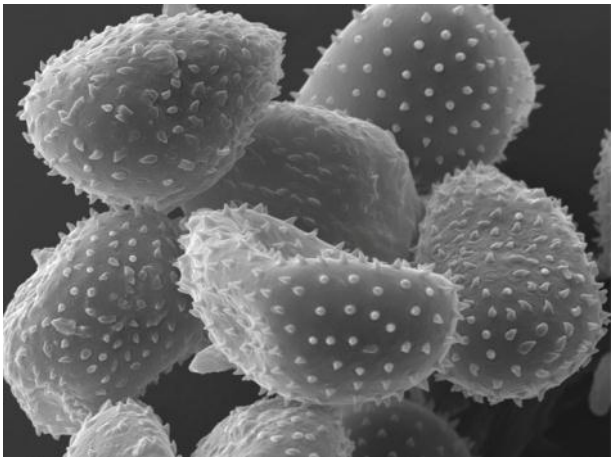
**Basidiocarps of *Ganoderma* at the base of a dying Jacaranda tree.**

**A typical dying Jacaranda tree in Pretoria.**

**A previously unknown rust fungus has been detected on *Eucalyptus* species in South Africa, Mozambique and Kenya. It has been named *Phakopsora myrtacearum* and it is not related to the Myrtle rust pathogen, *Puccinia psidii*. No serious disease has to date been found associated with it. Foresters are encouraged to keep their eyes open for the rust fungi and to report any serious symptoms found associated with it.**

**Maier W, McTaggart AR, Roux J, Wingfield MJ (2015). *Phakopsora myrtacearum* sp. nov., a newly described rust (Pucciniales) on eucalypts in eastern and southern Africa. *Plant Pathology* 10.1111/ppa.12406**

**Discrete spore pustules on the surface of *Eucalyptus* leaf caused by *Phakopsora myrtacearum*.**



**Urediniospores of *Phakopsora myrtacearum* seen through a Scanning Electron Microscope.**

## MANY VISITORS TO FABI FACILITIES

The facilities and activities of the TPCP and CTHB research programmes at FABI, University of Pretoria have been described by many visitors as being state of the art. Word on this industry-University collaborative programme has spread far and wide, resulting in many people wanting to visit the group to learn more about what happens here.

The first half of 2015 has already seen multiple visitors, both national and international, to FABI. This has included the CEO of York Timbers, Piet van Zyl, the Group Scientific Adviser, Eric Droomer, and Chief Financial Officer, Pieter van Buuren and a group of foresters from Sappi. Each year, Duncan Ballantyne, the Silviculture Development Manager for Sappi Forests, brings a group of Sappi foresters to see what happens behind the scenes.

Other visitors to the TPCP and CTHB programmes have included representatives of the DST and Thrip Programmes of the Government and several emminent international scientists.


## SIREX RESEARCH FEATURES IN MAIL & GUARDIAN

Sarah Wild, multi-award-winning science journalist, published an extensive article on the fight against the pine-killing Sirex wood wasp in the Mail & Guardian newspaper. The article by Sarah forms part of her research for a book project to be published this year by the Gordon Institute of Business Science and Pan Macmillan South Africa.

*Sirex noctilio* continues to be one of the most important constraints to the sustainable growth of pine trees in South Africa. The success achieved in the management of this pest has placed FABI firmly on the research map internationally, with scientists from various countries visiting the Institute annually to learn more from our experiences.

For more information on this pest visit the FABI website at: http://www.fabinet.up.ac.za/index.php/hosted-sites/

Mail&Guardian
AFRICA'S BEST READ

# ANNUAL CTHB AND TPCP STAKEHOLDER MEETINGS

The 26th Annual Meeting of the Tree Protection Co-operative Programme (TPCP) took place in May this year. The meeting primarily serves as a feedback session to TPCP stakeholders, with research leaders and students in the team presenting the latest results of their work. Importantly, it also serves as an opportunity to invite international forest health scientists to the country to provide an international perspective on global tree health.

Guest speakers at this year's meeting included Dr Terry Stanger, Managing Director of Sappi Forests, who highlighted a number of changes, including climate change, new pests and diseases, increases in fuel and electricity prices, and deteriorating road and rail infrastructure that Sappi and other role players in the industry have to face. International speakers included Prof. Jiri Hulcr of the University of Florida, Dr Simon Lawson of the University of the Sunshine Coast in Australia, Prof. Halvor Solheim of Skogforsk in Norway and Dr Shiroma Sathyapala of the Forestry Protection Division of the FAO.

The meeting was not all work and provided a good opportunity for all to get to know each other better and forge new collaborations, nationally and internationally. The social aspect included the annual "hands-free beer slug" competition. Mondi firmly established themselves as champions, with Dr Kitt Payne claiming the title and trophy on behalf of Mondi for the second year running.

Kitt Payne receiving the beer slug trophy from Mike Wingfield, the Director of FABI.


PhD student, Birhan Abate, talking about his work on entomopathogenic nematodes to control white grubs.

International visitors with researchers of the ICFR, visiting an *Acacia* rust trial site.

After the feedback sessions the international visitors were taken on a fieldtrip to introduce them to the South African forestry industry and some of the insect and pathogen problems in the field. The visit included time with the ICFR and researchers working on *Acacia mearnsii*, a visit to Mondi's *Eucalyptus* cutting nursery and plantations and a visit to Sappi plantations in Mpumalanga.

The TPCP/CTHB research team would like to thank all forestry partners for their continued support and time spent with us during the field trip with our international visitors.

# FABIANS MAKE AN IMPACT AT THE SASPP CONGRESS

From 18-21 January, the 49th Congress of the Southern African Society of Plant Pathology (SASPP) took place in Bloemfontein. It was one of the largest meetings in the history of the Society with more than 200 delegates representing the industry, academia, government and regulatory bodies. FABI was well represented with FABIans giving one keynote address (Prof. Mike Wingfield on tree health), 15 oral and 17 poster presentations. Apart from the congress participation, Prof. Teresa Coutinho served as President of the Society and Prof. Jolanda Roux as Vice-President for the past four years. An ex-FABIan, who worked on Cryphonectria canker, Dr Schalk van Heerden, was the treasurer.

FABI was made proud by the fact that three FABIans won major awards during the meeting. The first was Prof. Brenda Wingfield who won the top honour of the Society, namely the 18 carat gold Hendrik Persoon Medal. Then Prof. Gerhard Pietersen was selected as a Fellow of the Society, and PhD student Johan van der Linde won the Inqaba prize for best student presentation that included molecular techniques. We congratulate these FABIans on their awards!

The outgoing council of the SASPP, Jolanda Roux, Teresa Coutinho, Wilmarie Kriel, Schalk van Heerden.

Prof. Brenda Wingfield with the Persoon Medal and accompanying certificate.

The Hendrik Persoon Medal is the highest award that the SASPP can make to one of its members. The award honours the famous mycologist Christiaan Hendrik Persoon (1761-1836) who was born in the Cape Province of South Africa and who was later to be recognised as one of the 'fathers of mycology.' The Persoon Medal was first presented to the globally recognised epidemiologist and member of the SASPP, Dr J.E. van der Plank in 1979. Brenda Wingfield received the award for her outstanding contributions to plant pathology. This is only the sixth time that the award has been made in 53 years.

Johan van der Linde with the chair of the organising committee, on receipt of his award for best oral presentation by a student.

# TPCP & CTHB GRADUANDI AT THE UP AUTUMN GRADUATION

**Congratulations to the following TPCP and CTHB students on obtaining their degrees!**

## PHD

**Gudrun Dittrich-Schröder: "Molecular ecology and management of *Leptocybe invasa* (Hymenoptera: Eulophidae)".**

## MSC

**Katie Termer: "Biotic and abiotic determinants of resource quality for the larvae of the European woodwasp, *Sirex noctilio".***

**Olga Mashandule: "Population biology of *Fusarium circinatum* Nirenberg et O'Donnell associated with South African *Pinus radiata".***

**Danielle Roodt: "The mating genetics and core genome of *Ceratocystis albifundus".***

**Jon Ambler: "Genome characterisation, with special reference to gene silencing mechanisms, of *Armillaria fuscipes".***

**Tondani Kone: "Characterization of sex-pheromone receptor genes of *Fusarium* species and other Sordariomycetes".**

**Linda Ndove: "Botryosphaeriaceae associated with Podocarpaceae in South Africa".**

**Silvia Mausse Sitoe: "Diseases of Eucalypts in Mozambique with particular reference to the Cryphonectriaceae".**

## TPCP STUDENT SELECTED AS LINDAU FELLOW

A PhD student in FABI, Osmond Xolile Mlonyeni, was chosen as a 2015 Lindau Fellow to attend the 65th Lindau meeting in Germany in June 2015. The conference had an interdisciplinary focus and Osmond was joined by 650 other Fellows from around the world, as well as 70 Nobel laureates. In addition, he was selected in a smaller group of fellows who received financial support for the meeting from the Bosch Foundation. We congratulate Osmond on this major achievement and wish him all the best for flying the FABI flag high among this select group of international scientists!

To watch an interview with Osmond during the meeting see: http://www.youtube.com/watch?v=J2jiGb5seAA&sns=em

## CELEBRATING FIRST PUBLICATIONS

The TPCP-CTHB groups in FABI have a tradition of officially celebrating the first publication of a paper in an ISI-rated scientific journal by a postgraduate student from the work of either their PhD or MSc. This marks an important milestone in their professional and academic careers and is the foundation on which FABI is built: high quality research and publication output.

At the first publication party for 2015, the first publications of seven students were celebrated. The students, Arista Fourie, Darryl Herron, Donghyeon Lee, FeiFei Liu, Rofhiwa Nesamari and Stephen Taerum were congratulated on this achievement by their primary supervisors and some bottles of sparkling wine were popped! FABI wishes them success in publishing many, many more journal articles!

# FABI ACADEMICS SHINE AT THE 2015 UP ACADEMIC ACHIEVERS AWARDS

Prof. Emma Steenkamp

Every year the University of Pretoria hosts a special gala dinner rewarding academics that have shown exceptional achievement in the preceding year. At this year's ceremony several academic staff members of FABI received awards. Dr Irene Barnes was one of only two recipients of the Exceptional Young Researchers award.

The second part of the evening celebrated the 2015 NRF rated researchers. Those from FABI who received NRF ratings for 2015 included:

Prof. Bernard Slippers: B1
Dr Wilhelm de Beer: B2
Prof. Emma Steenkamp: B3
Dr Irene Barnes: Y1
Dr Brett Hurley: Y1

Prof. Bernard Slippers

Dr Irene Barnes

Dr Brett Hurley

Dr Wilhelm de Beer

# TREE PLANTING FUN AT FABI

In a joint effort, staff and students showed that many hands make light work at the year's first Tree Planting Day. Some 60 pairs of hands pitched in to replant about 1,600 *Acacia mangium* seedlings in bags, as well as do some general cleaning and housekeeping around the FABI nursery facilities at the Experimental Farm.

Everyone swapped their labcoats for shovels, secateurs, wheelbarrows, trolleys and brooms to ensure the tasks were finished by lunchtime. The seedlings were grown from seed brought in from Indonesia and will be used in various research projects in FABI under the auspices of the TPCP-CTHB.

The Tree Planting Day is a team building exercise as much as a time saving effort by the FABI staff under the watchful eye of Dr Wilhelm de Beer. Everyone was treated to sodas and snacks before tucking into pizza supplied as reward for their hard work.

# SCREENING *PINUS* GENOTYPES AGAINST *FUSARIUM CIRCINATUM*

During the past six months another round of resistance screening of pine seedlings against the pitch canker pathogen, ***Fusarium circinatum,*** was completed at FABI. This fungus is a serious pathogen that causes pitch canker on pine trees. It was first reported in South Africa in 1990 on *Pinus patula* in a nursery in the Mpumalanga province. Since then the fungus has spread throughout the country to pine nurseries and plantations causing serious root/collar rot on seedlings and pitch canker on mature trees of various pine species.

As part of its service to the South African forestry industry, the TPCP research group has, for several years, been conducting pine screening trials. These trials take place twice a year in a dedicated greenhouse at the FABI nursery on the UP experimental farm. During each trial more than 10,000 seedlings of different families and hybrids supplied by industry members are inoculated with the pitch canker fungus. This laborious task is undertaken by 8-12 FABI PhD and MSc students as part of their training. Inoculations are done by removing the meristems and placing a 10 µl spore suspension (50,000 conidia/ml) on the open wound. The lesion lengths are then measured six weeks after inoculation. The results of these experiments clearly distinguish between resistant and susceptable plants and inform the various companies on the selection and breeding of trees resistant to the disease.


Dying tops and branches (red flagging) of pine trees infected with ***F. circinatum***

Pitch/resin soaked root collar of a three-year-old ***P. patula*** tree dying from ***F. circinatum*** infection.

## FABI/IUFRO DIRECTOR SPEAKS AT UNITED NATIONS

During the week of 3 May, FABI Director Mike Wingfield attended and participated in the 11th session of the United Nations Forum on Forests (UNFF) in New York, fulfilling part of his responsibilities as current President of the International Union of Forestry Research Organizations (IUFRO). During the meeting Mike had the opportunity to meet and engage with key players in the Forum and especially to promote IUFRO's role in the Collaborative Partnership on Forests (CPF) of which IUFRO is one of the 14 members, together with for example the World Bank and the FAO.

During the meeting IUFRO was proud to be able to launch its special report "Forests, Trees and Landscapes for Food Security and Nutrition" an important product of the Global Forest Expert Panels (GFEP) co-ordinated by IUFRO. GFEP co-ordinator, Dr Christof Wildburger, led the compilation of this report along with Dr Bhaskar Vira of the University of Cambridge (UK). The report has already gained substantial media coverage. Other than chairing a side event to launch the GFEB report, Mike's role in the meetings included presenting IUFRO's statement to the Member Groups of the UNFF and to attend meetings with, for example, the student delegation linked to the International Forestry Students Association (IFSA).


Dr Christof Wilburger, IUFRO Executive Director Alexander Buck and IUFRO President Prof. Mike Wingfield at the United Nations in New York City, USA

# WELCOME TO THE TPCP AND CTHB RESEARCH PROGRAMMES

**Ginna Granados joins the TPCP team for her MSc. She has a BSc (Hons) degrees in Industrial Microbiology and Agricultural and Veterinary Microbiology, and worked in the Forest Health Protection Program of Smurfit Kappa in Colombia before joining FABI. Her MSc research is focused on two pathogens of concern in Colombia, Eucalyptus rust and Chrysoporthe stem canker.**

**Dorah Mwangola is from Kenya and joined FABI for her MSc degree. She has a BSc (Hons) degree in Microbiology and will be working on the population genetics of *Chrysoporthe* species that cause canker disease of *Eucalyptus* trees for her masters.**

**Mandy Messal obtained a bachelors degree from Germany and a MSc in Sweden where she worked on a woodrot pathogen and its fungal biological control agent on *Picea abies* stumps. For her PhD project she will look at understanding fungal community interactions in *Eucalyptus* using ecological genomics and functional transcriptome analyses.**

**Daniel Ali obtained a MSc degree from Nigeria working on a project to identify mushroom species. He has been working as an assistant lecturer in Botany at the Adamawa State University in Mubi and joined FABI to undertake research towards obtaining a PhD in plant pathology. For his PhD project he will work on fungi in the Cryphonectriaceae on native Myrtaceae in Africa.**

**Namhla Tshisela is a science journalism intern from the DST-NRF Internship Programme and will be with us for a year. She will participate in CTHB and TPCP outreach programmes in addition to writing for our website and publications. Namhla holds a BA in Media, Communication and Culture, BPhil (Journalism) and MA in Creative Writing.**

# CONTACTING THE TPCP AND CTHB RESEARCH TEAM AND DIAGNOSTIC CLINIC

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