CTHB

Tree Protection News

tpcp

Newsletter of the Tree Protection Co-operative Programme and the DST/NRF Centre of Excellence in Tree Health Biotechnology.

VOL: 22 December 2011

FROM THE DIRECTOR'S DESK

It is said that the only thing certain in life is CHANGE. And this is certainly true from the tree health perspective. I am constantly amazed at the new pest and pathogen problems that emerge in forest ecosystems, often times most unexpected. Sadly sometimes they could have been predicted but even then, it might not have been possible to avoid them. The latter situation is patently evident in the case of *Eucalyptus* rust caused by the pathogen *Puccinia psidii*. For years, we have been predicting that it would move out of the America's where it evolved on native Myrtaceae and began to infect Eucalyptus when these trees were exposed to it in Brazil many years ago. And indeed the "march of *P. psidii*" has now clearly begun. There can be little question that it will reach South Africa. Those of us in the TPCP research team interested in this disease feel that its arrival will be sooner rather than later.

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You might think that I am returning to the "prophet of doom" mantra when I suggest that Eucalyptus rust is close. But consider a few facts. Some years back the rust moved from South/ Central America to the south eastern United States. Then it appeared in the south western part of that country. More recently it invaded Hawaii where it is causing the most amazing devastation of non-native rose-apple *(Syzigium jambos)* that I have ever seen. Three years back it reached Japan and just over a year ago its invasion of the incredible diversity of Myrtaceae in Australia begun. This progressively rapid increase in new reports of a major pathogen from new areas is typical for tree infecting/ infesting fungi and insects. It is what I refer to as the "bridgehead effect". This is a rather nice term emerging from human conflicts where enemies are overcome by establishing increasingly robust bases from which subsequent battles can be fought. This is precisely what we see with eucalyptus rust and Africa is now virtually surrounded by areas that have been invaded. The spores of the pathogen are powdery, light and they can be blown great distances. The spore load that I observed in Hawaii recently was so vast that rivers were yellow with spores floating on the surface. Then people and products will carry spores easily from one location to another. I don't see how we can escape. We should thus prepare for the imminent invasion and at least determine the relative susceptibility of our most important breeding stock and clones. As I mentioned at the start of this note, we live in a rapidly changing tree-growing environment and we must, wherever possible be ready to deal with this.

The Tree Protection Co-operative Programme (TPCP) and the DST/NRF Centre of Excellence in Tree Health Biology (CTHB) are prospering and pursuing solutions to a great number of important tree health issues. The core leadership team of 11 research leaders and about 50 M.Sc., Ph.D. students and post-doctoral fellows make up an amazing group and one that is a great pleasure for me to lead. I am constantly amazed at the passion and the accomplishments of various team members. Just a few weeks ago, I was informed that the team had been nominated by the Department of Trade and Industry for the THRIP award for excellence in post graduate education. Last week we heard that we had won this award. This is a great achievement for the team. But it is equally important to recognise that the award would not have been there without the South African Forestry Industry's commitment to supporting the TPCP. It is easily forgotten that while the core focus of the programme lies in supporting TPCP member companies to deal with pests and diseases, the programme includes a huge contribution to human capacity development in South Africa. The numbers are not at my fingertips but through the TPCP, the South African Forestry Industry has contributed amazingly to the education of scientists in South Africa. Today, many of these past students hold important positions in Science and Industry and many contribute strongly to forestry in the country.

Thinking of awards, I am reminded of a few that have come to TPCP/CTHB team members in just the very recent past. The news has been shared with our stakeholders previously but I cannot help but share this again. Jolanda Roux won the coveted Department of Science and Technology award for outstanding achievement by a young woman scientist. Bernard Slippers has been responsible for leading South Africa to establish the first "Young Academy of Sciences" and won the Third World Academy of Science award for a young scientist. And back to Jolanda who heard recently that she will receive the Queen's award from the Commonwealth Forestry Association. This award will be presented by HM Queen Elizabeth at Buckingham Palace on the thirteenth of December. This is something very special not only for Jolanda and South Africa but also for forestry in this country. Jolanda might consider seeking advice from Australian premier Julia Gillard who caused an international stir when she recently welcomed Her Majesty to Australia!!

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As I write this introductory note, I am looking out over Pretoria from the roof garden of the new Plant Sciences Complex build alongside FABI and providing substantial additional space for the TPCP and CTHB. It is the peak of the Jacaranda season and the city is blanketed in purple. This certainly is my favourite time of the year and my collection of Jacaranda photographs is gigabytes in size. I often wonder how long it will be before a dreadful pest or pathogen finds a home on these trees. This is a depressing thought but one that is not unrealistic. Ganoderma root rot is already taking out a good number of trees each year, but a pest or pathogen much more virulent will eventually catch up with these trees that have been isolated from their natural enemies. But for now, we enjoy the beauty and are reminded of the fact that the year is racing to a close. Classes are almost over and student projects are being finalised. But our TPCP/CTHB work really never stops. The Sirex flight season has started, pitch canker infections increase at this time of the year and we push ahead as hard as we can to find solutions to these and other problems that we must deal with. But it is also the time of year where we thank our many friends and colleagues, the stakeholders of the TPCP/CTHB for wonderful support, help in the field and friendship that makes the programme truly remarkable.
From all of the TPCP/CTHB research team, we wish you a very happy holiday season.

Mike Wingfield
Director, TPCP and CTHB

"Gonipterus scutellatus"

Old pest, recurring problem

Gonipterus scutellatus, the *Eucalyptus* snout beetle, was first noted into South Africa in 1916 in Cape Town and by 1929 it had spread throughout eucalypt growing areas in South Africa. When initially reported it was causing severe damage, especially on *E. globulus* and *E. viminalis* species but has since been recorded on the majority of Eucalyptus species growing in South Africa. Originating from Australia, this pest has spread throughout the world to all continents except Antarctica.

The Gonipterus beetle is a red brown colour, between 8 – 9 mm in size, with a characteristic 'X' marking on the back. The larvae are yellow to yellow-green with black spots and two black lateral stripes. When feeding they produce a characteristic thin black thread of excrement. Egg capsules are dark brown in colour and contain, on average, about 10 eggs.

Adult Beetle

Egg capsules

Larvae

Continue

Between 1926 and 1929, an egg parasitoid wasp, *Anaphes nitens* (also from Australia) was released as a biocontrol agent for *G. scutellatus*. Through these release events and the ability of the parasitoid to spread on its own, it too spread throughout areas where *G. scutellatus* was present. Parasitism levels greater than 60% were reported from most areas with levels in some areas reaching 80 – 100%. Although largely effective, sporadic outbreaks still occurred and the parasitoid was not as effective in the higher altitude colder areas. Despite this, the program was and is one of the most successful biocontrol programs worldwide.

In recent years, however, the frequency and severity of outbreaks have increased. Severe outbreaks have occurred in areas where this pest was considered in control in the past. Possible reasons may include a decrease in efficacy or absence of the parasitoid in these areas. However, no current data on the spread and parasitism efficacy of *A. nitens* is available.

To address this, a monitoring project was initiated in May 2010. Monitoring sites were established where G. scutellatus egg capsules were collected once a month and A. nitens emergence recorded. Sites were located in the KwaZulu-Natal and distributed along an elevational gradient to incorporate different climate conditions in South Africa. *Eucalyptus dunnii*, *Eucalyptus smithii* as well as *E. grandis x E. camaldulensis* and *E. grandis x E. urophylla* hybrids were sampled. Egg capsules were collected and placed in plastic tubes for emergence, whereafter percentage parasitism was determined. The project will be ongoing for at least the next 2 years to gain as much long term data as possible.

During May 2010 – August 2011, 16526 egg capsules were collected. Parasitism levels varied across sites with average parasitism levels much lower than historically recorded by Tooke.

Despite low parasitism levels, damage due to *G. scutellatus* feeding is sporadic and less severe in the higher elevation cooler sites compared to extensive damage noted in the low elevation subtropical sites. This would indicate that higher temperatures at the lower sites may have an effect on parasitism success although this needs further investigation.

Adult feeding damage on leaves

Larval feeding damage on leaves

Severe defoliation caused by *G. scutellatus*

We would like to thank Sappi and Mondi for the use of their sites and assistance in collecting samples.

FUN WITH FUNGI and FUN WITH KIDS

This year the UPwithScience project conducted at FABI was again a great success. The general aim was to introduce the world of Fungi to Grade11 learners through studying the diversity of mushrooms in the National Botanical Gardens. At the end, several species of beautiful mushrooms were identified in the gardens, and strong interest was sparked in the Grade 11 students for biology as a career.

Two students, Christina Panayotakis and Nadia Gordon transferring fungal isolates to new plates containing growth media in the sterile cabinet called a laminar flow.

The 2011 project started with a captivating presentation by Markus Wilken. The six enthusiastic and energetic Grade 11 learners then joined Tracy Hall and Melissa Simpson, both CTHB postgraduates, at the Gardens. Bernice Porter, FABI's in-house mushroom expert provided the learners with a whirlwind "fungal field training" session, after which they set out at a fast pace to collect a variety of fungal samples. The young fungal detectives then headed back to the lab to process their samples.

Over the course of six Saturdays, each of the learners gained experience in isolating DNA from their samples. The DNA was then subjected to molecular techniques to identify the collected samples.

Despite a few pipetting mishaps, contamination hiccups and reagent mix-ups, they were able to identify all of the mushrooms they collected. Finally, during the first week of the winter holidays, the learners presented their projects, which were received well by their peers.

Marinus Ferreira and Marko Scicevic prepare for a DNA extraction.

Marko Scicevic and Nadia Gordon assist each other with pipetting for a PCR reaction

Nadia Gordon, Gina Wilkins and Christina Panayotakis adding the reagents for a PCR reaction

Overall, this project again highlighted the importance of interactions with the youth, to ensure that interest in Biology remains strong. Some of the fun thoughts shared by the group included their amazement at the "smallness" of DNA and the clever methods with which it is possible to access and utilize it. Valuable understanding of the scientific method and the significance of "RE" in RE-SEARCH was also strongly noted by the students. However, this was also an interesting challenge and valuable learning experience for the postgraduate students, with the joy of seeing "Ah-ha" moments and the enthusiasm for Biology making it extra special.

THE YOUNG ACADEMY MOVEMENT

CTHB MEMBER PLAYS A LEADING ROLE IN THE GLOBAL YOUNG ACADEMY AND THE SOUTH AFRICAN YOUNG ACADEMY OF SCIENCE (SAYAS)

In tracing the development and establishment of the Global Young Academy (GYA) and South African Young Academy of Science (SAYAS), it is necessary to sketch some background leading to the launching of these bodies in 2010 and 2011, respectively.

In 2000 a new type of organization of scientists, Die Junge Akademie (the Young Academy) was created as a joint venture by two German academies. This Young Academy was described as "an organization intended to harness the resources of both academies in ways that would fertilize research fields with new ideas and bolster career pathways, as well as invigorate older academies by involving the young scientific community in critical policy-related work".

Bruce Alberts in his Editorial in Science (Vol 332, 15 April 2011) says that "I saw this empowerment of young scientists as the next step in the process that began in 1993 when the national academies of sciences from more than 60 nations came together in New Delhi to develop a coherent scientific position on world population issues in preparation for the major 1994 United Nations International Conference on Population and Development in Cairo. This soon created the Inter-Academy Panel (IAP) now a vibrant global network of more than 100 member academies. The IAP functions as a mutual support organization for the existing science academies around the world.

Founding members of the Global Young Academy

In 2005 a similar Young Academy was established in the Netherlands. The success of these two experiments recently inspired six other nations to create their own Young Academies: Egypt, Nigeria, Pakistan, Sudan, Thailand and Uganda, all nations where the tolerance and rationality inherent to science will be invaluable.

The Global Young Academy (GYA) was created in 2010, which seeks to provide a voice to young scientists on international issues that interface with science.

But the empowerment of national science academies with distinguished, well-established members can leave a gap between these influential organizations and the young, dynamic scientists who represent the future in each nation. This is precisely the gap that has been filled by the Young Academies: each a group of fewer than 200 scientists, typically selected by their national science academies to serve in 4-year leadership roles. Through its connection to a prestigious national science academy, each Young Academy is empowered to exert national leadership in advancing science through projects that the young scientist themselves determine.

These young scientists can often be more effective than their older peers in interactions with society and with politicians. They also bring new energy to these interactions with a better gender balance due to the advances that women scientists have made in recent decades".

In 2010 Prof Bernard Slippers represented the young scientists of South Africa at the inaugural meeting in Berlin of the new international Global Young Academy. He was elected as and executive committee member at this meeting, and subsequently in 2011 as co-chair of the GYA. The GYA is described as "an organisation intended to harness the resources in ways that will fertilize research fields with new ideas and bolster career pathways, as well as invigorate older academies by involving the young scientific community in critical policy-related work".

South African scientists had been represented by the Academy of Science of South Africa (ASSAf), which was inaugurated in May 1996 and formed in response to the need for an Academy of Science consonant with the dawn of democracy in South Africa. Its mission is to use science for the benefit of society, with a mandate encompassing all fields of scientific enquiry in a seamless way, and including in its ranks the full diversity of South Africa's distinguished scientists.

An act of parliament (Act 67 of 2001), which came into operation on 15 May 2002, made ASSAf the official Academy of Science of South Africa, recognised by government and representing South Africa in the international community of science academies.

With support from GYA members and a group of South African young scientists, ASSAf also started working on the establishment of a Young Academy of Science for South Africa in 2010. On 27 September 2011 a group of 20 founding members of the South African Young Academy of Science (SAYAS) were inaugurated by the Deputy Minister of Science and Technology, Mr Derek Hanekom during the launch of SAYAS. Prof Bernard Slippers of FABI is to be congratulated on being one of the young scientists chosen to be one of the 20 founding members of this new Academy. He serves as an ad-hoc member of the executive committee of SAYAS. Bernard is also a Young Affiliate of TWAS (Academy of Science of the Developing World) and was awarded the inaugural AU-TWAS Young Scientist's National Award by ASSAf in 2011.

Founding members of the South African Young Academy of Science (SAYAS).

TPCP/CTHB Stakeholder Meeting 2012

The venue is at FABI, Pretoria, and will take place on 8 and 9 May 2012.

Please contact your TPCP Board Member re. attendance.

FABI @ THE 2011 NATIONAL SCIENCE WEEK

The annual flagship event, the National Science Week (NSW), of the Department of Science and Technology (DST) took place in all nine provinces from 1 – 6 August 2011. However, the Mondi Science Centre in Piet Retief (Mpumalanga) was definitely the place to be, if learner attendance, enthusiasm, excitement and shear passion was the barometer to go by. In this regard the Forestry and Agricultural Biotechnology Institute (FABI) through its DST/NRF Centre of Excellence in Tree Health Biotechnology (CTHB) programme spared no effort in its endeavour to further the NSW objective of "attracting learners to Science, Engineering & Technology (SET) careers".

The FABI representatives for this year's NSW in Piet Retief were Markus Wilken (PhD student), Amy Wooding (MSc student), Mmatshepho Phasha (MSc student), Johan van der Linde (MSc Student) and Osmond Mlonyeni (PhD student). These "FABIans" had no less than 30 exciting experiments in their arsenal for the wide range of learners (Grades 1 – 12) expected for the duration of the NSW. For the three days and a morning stay, the group presented to at least 31 schools and members of the Piet Retief community - a total of approximately 2508 people. The FABI presentations were anchored by the interlinked nature of science, fun and problem solving.

Most of the experiments conducted required active participation from learners, as a group and/or assistants in performing the experiments. The learners were more than eager to share in this. The initial step of any experiment started with the radical transformation of our assistants from learners to "Professors" upon wearing the oh-so-famous FABI laboratory coat. Thereafter, the "Magnificent" Markus, "Amazing" Johan aka "THE SANGOMA", "Big strong" Mmatshepho, "Super" Amys and "The Oz" Osmond took the learners on a voyage of discovery, magic and science.

In this voyage, some of the favourite experiments included: The "Amazing Eggs-periment", which entailed trying to insert a boiled egg into a flask whose diameter is smaller than the egg without touching or breaking the egg once placed on the mouth of the flask. "Burning handkerchief: - setting a handkerchief on fire after being soaked in a colourless (ethanol and water) liquid solution. "Killing the can" - crushing a can in less than a second. "Mood ring" - determining the mood of our assistants using the rare tears of our "sangoma" captured every half a decade.

The underlying principles of these experiments were to show learners that much of what they initially thought to be MAGIC was actually SCIENCE, and thus in unison after every session the concluding remarks were that it is not magic but SCIENCE!

In addition to these interactive presentations, the FABI team also had an exhibition table containing University of Pretoria brochures, Understanding Biotechnology posters and a sample of insect pests responsible for causing damage to the commercial forests in South Africa. This feature sought to highlight some of the research focus areas in FABI, and specifically the CTHB.

The collective effort of FABI to proactively participate in ensuring that young people are encouraged to pursue science as an indispensable career pathway remains an integral part of the work we do at FABI. The role of science in addressing the socio-economic challenges of our time and beyond is unquestionable. We believe that the road to improving science in South Africa is well-paved with a foundation such as the National Science Week!

The CTHB team conducting experiments to the amazement of learners during the National Science Week.

Amy Wooding, Mmatshepho Phasha, Markus Wilken, Johan van der Linde, Osmond Mlonyeni and very enthusiastic learners in the FABI tent

One of the "Professors" channelling their omniscient powers for the Amazing Eggs-periment.

LARGE SCALE DIE-OFF OF AN ICONIC SOUTH AFRICAN TREE - *EUPHORBIA INGENS*

Unexplained die-off of *Euphorbia ingens* (Candelabra, Naboom or Mokgoto) in the Limpopo Province (Fig. 1) has captured the attention of researchers associated with the CTHB. Results from research on this phenomenon suggest that it is the product of a complex interaction between various biotic and abiotic factors. Discoveries made by Johan van der Linde for his M.Sc. dissertation laid a solid foundation towards a better understanding of the large-scale deaths of these iconic trees. His research also led to the description of two previously unknown fungal species and an increase in our knowledge of the fungal biodiversity of South Africa.

During the last 10 years it has been observed that *E. ingens* trees in the Limpopo Province are becoming diseased and dying without direct evidence of a causal agent.

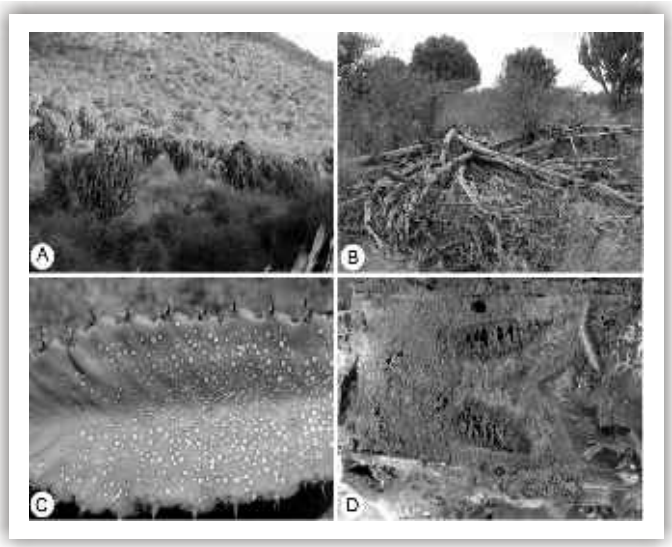


Figure 1: Mortality of *E. inges* in the Limpopo Province and symptoms found on diseased and dying trees.

A) Large-scale mortality of *E. ingens* trees at Mokopane, (B) Dead *E. ingens* trees near Louis Trichard, (C) Spotting on the external area of the succulent branches, (D) Internal rotting and feeding damage caused by *Megasis sp.*

A survey conducted in 2006 by Mrs. Rentia Malan at the National Zoological Gardens Biodiversity Conservation Centre (NZG) in Mokopane (Potgietersrus) revealed that all *E. ingens* trees in this centre were diseased, and many had died over a short period of time. A pilot study conducted in 2007 by Jolanda Roux (Professor in TPCP/CTHB), aimed at characterizing disease on *E. ingens* at the Game Breeding Centre in Mokopane, identified several fungi and insects associated with dying trees. A gray discoloration of tree stems and branches, as reported previously by Malan (2006), was also found. Additionally, rotting and browning of the succulent branches, white and yellow spots on succulent branches, blue stain of the wood in the main stems and numerous insects infesting the stems and branches were found (Fig. 1).

Studies conducted during 2009 and 2010 at multiple sites in the Limpopo Province considered both abiotic and biotic factors in the death of *E. ingens* trees. Three main areas showing trees suffering from die-off were studied: The National Game Breeding Centre in Mokopane, a domestic farm in the vicinity of the Capricorn Toll plaza and a private game farm close to Louis Trichardt. These areas were compared with two healthier sites located in the North West Province. As a first step the disease symptoms on the trees were characterized. Various spots and scars on the external areas of the succulent branches, internal rotting of the succulent branches and gray discoloration of the healthy succulent branches were observed (Fig. 1).

A high diversity of fungi was isolated from diseased *E. ingens* and a number of insects belonging to different genera were collected. The most commonly isolated fungi resided in the *Botryosphaeriaceae, Cordycipitaceae, Microascales, Nectriaceae, Ophiostomataceae* and the *Teratosphaeriaceae*. In the *Botryosphaeriaceae, Lasiodiplodia mahajangana* and *Lasiodiplodia theobromae* were identified. The *Microascales* included a previously unknown species, which was decribed as *Gondwanamyces serotectus*. Insects included *Cyrtogenius africus (Coleoptera: Curculionidae, Scolytinae), Cossonus* sp., *Stenoscelis* sp. *(Coleoptera: Curculionidae, Cossoninae)* and a *Megasis* sp. *(Lepidoptera: Pyralidae)*.

Temperature and rainfall studies showed an increase in temperature with reduced rainfall in areas where *E. ingens* displayed severe die-off. Temperature and precipitation data were analysed over a 40-year period at four sites in the Limpopo Province and two sites (areas of less severe die-off) in the North West Province. Compared to the Limpopo Province, the sites in the North West province were cooler with higher rainfall levels over the 40-year period. Furthermore, evapotranspiration and water balance levels were investigated and results showed that trees were under more stress in the Limpopo Province. This finding might explain the more severe die-offs in the Limpopo Province since the trees will be more vulnerable to pathogen and insect attack due to their state of increased stress.

The death of *E. ingens* appears to be caused by a combination of biotic and abiotic factors acting in concert. Further studies are needed to consider the unexpected die-off of different species of *Euphorbia* residing in different provinces. These studies must also include more in depth evaluation of land management and fire regimes as well as climate data for each province in order to better understand the possible involvement of fungi, insects and the various abiotic factors in the decline of native trees in South Africa.

FEATURED RESEARCH PUBLICATION

Genome sequence of *Pantoea ananatis* – a *Eucalyptus* pathogen

Pieter De Maayer, Wai Yin Chan, Stephanus N. Venter, Ian K. Toth, Paul R. J. Birch, Fourie Joubert, Teresa A. Coutinho. 2010.

Genome sequence of *Pantoea ananatis* LMG20103, the causative agent of Eucalyptus blight and dieback. Journal of Bacteriology 192: 2936-2937

Pantoea ananatis is a Gram-negative bacterium belonging to the family *Enterobacteriaceae* which causes diseases on a broad range of agronomically important crops including maize, rice, onion and pineapple fruits. It has also been associated with human disease. In South Africa, *P. ananatis* poses a serious threat to the forestry industry, causing blight and dieback of commercial hybrids and clones of *Eucalyptus grandis* (Fig. 1). There are no effective means of control for this pathogen and infected material needs to be removed. Little is known about the mechanisms by which *Pantoea ananatis* causes disease on its plant hosts.

Figure 1: *P. ananatis* blight on *Eucalyptus*

In this paper, the whole genome of the Eucalyptus-pathogenic *Pantoea ananatis* strain LMG20103 was sequenced using the newly available 454 pyrosequencing technology. Subsequently, the genome was assembled and annotated (Fig. 2). This constitutes the first genome of a phytopathogenic bacterium to be sequenced in Africa. The genome consists of a single chromosome, 4.69 million nucleotides in size and with a G+C content of 53.69%. A total of 4,237 protein coding genes are encoded on the chromosome. This genome sequence will provide an extensive resource which can be used to analyse various aspects of *P. ananatis* biology, including how it causes disease. Further analysis has revealed the presence of 433 protein coding genes on the genome which have been experimentally shown to play a role in disease in other bacteria. Interestingly, two secretion systems, the Type II and III systems, are absent from *P. ananatis* LMG20103. These two systems play a major role in disease in both plant- and animal-pathogenic bacteria, raising questions on how *P. ananatis* can cause disease in the absence of these factors. However, three copies of the Type VI secretion, a recently described pathogenicity factor, are present. Interestingly, the putative effector proteins which are secreted via these secretion systems appear to be recently acquired through horizontal gene transfer. These effector proteins may have a role in *P. ananatis* infection of both plant and animal hosts.

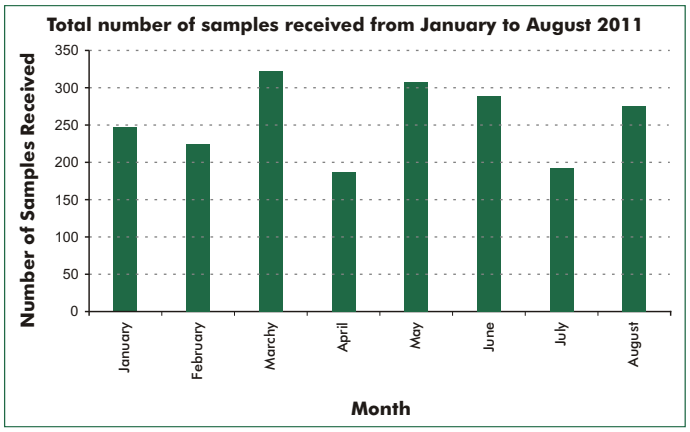
Another putative pathogenicity determinant identified from the genome, the exopolysaccharide ananatan, was experimentally demonstrated to play a role in disease on both onion seedlings and pineapple fruits. This was done through the production of a library of mutants which encompasses all the genes on the *P. ananatis* genome. This library can be further used to elucidate the functions of other putative pathogenicity factors on the genome. The information gained from the genome and from the mutant library will allow a better understanding of how *P. ananatis* causes disease on its plant hosts and can be utilised to develop and implement directed and effective control measures against this important plant pathogen.

Figure 2: The genome sequence of *P. ananatis* LMG20103.

DIAGNOSTIC CLINIC AND EXTENSION SERVICES

TPCP/CTHB Diagnostic Clinic 2011

During 2011 the Diagnostic Clinic underwent a number of changes. The most significant of these was the selection of Darryl Herron as the new Diagnostic Clinic manager. Darryl, who served on the clinic for a number of years, has been charged with the clinic's responsibilities, taking over from the long-time manager Izette Greyling. Izette will now focus primarily on her duties as a Field Extension officer for the TPCP. Both Izette and Jolanda Roux will, however, continue assisting Darryl with the clinic and the training of new student members.



The past year has been a very busy one for the clinic, especially as a result of the large amounts of material received for Fusarium screening. The clinic received a total number of 2058 samples between January and August for this year. Pine samples comprised 71% of the total number of samples received, with the majority of these samples received for Fusarium screening. *Eucalyptus* samples made up 10% and Acacia mearnsii (Wattle) samples only comprised about 0.3% of the total amount of samples. Soil samples received comprised 1% of all samples received. Petri dish samples for *Fusarium circinatum* confirmation comprised 12% of the total number of samples. Seed samples, received for Fusarium screening comprised 5.5% while samples from non-forestry and indigenous trees as well as water samples, categorized as "other", comprised 0.2% of received samples.

If you have any questions on pests or diseases, need us to come and look at problems in field or want to send samples to the clinic, we encourage you to contact Izette Greyling (izette.greyling@fabi.up.ac.za), Darryl Herron (darryl.herron@fabi.up.ac.za) or Jolanda Roux (jolanda.roux@fabi.up.ac.za).

Field extension Services

Communication with foresters, farmers, conservation agencies and other stakeholders is an important component of the services that the TPCP and CTHB programmes provide in our effort to ensure the long term health of trees in Southern Africa. This is achieved through various means including our newsletters, website, listserver (Treehealthnet), publications in forestry and agricultural magazines, field trips and attendance of, and presentations at industry field days. There is seldom a week that someone from the TPCP/CTHB is not in the field somewhere in South Africa. We average more than 40 field visits per year and well over 500 person days in the field in this time.

Jolanda and Brett in discussion with some of NCT's outgrowers near Richardsbay.

Martin Kemler and Alain Misse inspecting a eucalypt tree during a consultancy visit.

Researchers of SANPARKS and the CTHB during a visit to the Garden Route National Park to discuss tree health issues of native trees.

GRADUATIONS & CONGRATULATIONS

GRADUATIONS

More detail on the research projects, as well as references to the publications resulting from these studies, can be found on the FABI website.

Gilbert Kamgan Nkuekam – PhD
"Ophiostomatoid fungi and their insect associates on *Eucalyptus* trees in Australia and South Africa" The thesis included the description of 8 previously unknown *Ceratocystis* and *Ophiostoma* species and the expansion of the known geographic distribution of several species. Gilbert's research included the first study of nitidulid and other possible insect vectors of *Ceratocystis* species on Eucalypts in Australia.

Johan van der Linde – MSc *(Cum Laude)*
"Factors associated with the decline of *Euphorbia ingens* in the Limpopo Province of South Africa". Johan considered both biotic and abiotic factors in the mass die-off of *E. ingens* trees in Limpopo. His results included the description of two previously unknown fungal species and suggests that increasing temperatures and changes in rainfall patterns may be playing a substantial role in the death of these iconic trees.

Osmond Xolile Mnyamezeli Mlonyeni – MSc *(Cum Laude)*
"High throughput development of population genetic markers for the *Sirex noctilio* woodwasp and it nematode parasite, *Deladenus siricidicola*"

Lisa-Danélle De Wet – MSc
"Monitoring of *Fusarium circinatum* spore loads in South African forest seedling nurseries"

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CONGRATULATIONS

AWARDS – TPCP/CTHB STAFF EXCELL

Prof Jolanda Roux

Department of Science and Technology (DST) Women in Science Award in the category for young women (under 40 years of age).

Commonwealth Forestry Association (CFA) – Queens Award

Prof. Bernard Slippers

African Union's Third World Academy of Sciences (TWAS) young scientist award. Bernard was also recently elected as co-chair of Global Young Academy (GYA), an international, independent, science-based institution that aims for excellence and impact.

He is also one of three staff members of the University to be elected as Founding Members of the South African Young Academy of Science (SAYAS).

INTERNATIONAL AWARDS TO TPCP AND CTHB MEMBERS

African Union – Academy of Sciences for the Developing World Award

FABI's Prof. Bernard Slippers has been shining for the group and South Africa in 2011. He received the first AU-TWAS Young Scientists' National Award in South Africa and was elected to several leadership positions, nationally and internationally.

The AU-TWAS award recognises and award talented young scientists in Africa. The award is managed by the Academy of Science of South Africa (ASSAf), on behalf of its partners, the African Union Commission (AUC), the Academy of Sciences for the Developing World (TWAS) and the Department of Science and Technology.

Bernard was also elected as a member of the Executive Committee of the Global Young Academy established in February 2010 in Germany and the newly established South African Academy of young scientists.

Department of Science and Technology Awards

Prof. Jolanda Roux was awarded the 2011 Distinguished Young Women in Science Award from the DST (Department of Science and Technology). This award is made annually to young women scientists, under the age of 40, recognising their contribution to science in South Africa. The award was presented to Jolanda by Dr. Naledi Pandor at a formal ceremony held at the Presidential guest house in Pretoria.

Jolanda will also receive the Commonwealth Forestry Association (CFA) Queens award for forestry. She will be travelling to London in December to receive the award from Her Majesty the Queen herself! Jolanda has since also been elected to the executive committee of the CFA, representing Africa. "The Commonwealth Forestry Association (CFA) is the world's longest established international forestry association, tracing its history back to 1921. It unites foresters, scientists, students, NGOs and policy makers throughout the world in a unique international network that provides professional support to its members and forms a key element of civil society."

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IUFRO Division 7 Joint meeting of Forest Pathology and Entomology Research Groups Colonia del Sacramento, Uruguay - 8th to the 11th November 2011

Six members of the Tree Protection Cooperative Programme (TPCP) and DST/NRF Centre of Excellence in Tree Health Biotechnology (CTHB) visited South America for a week to attend the first joint meeting between the IUFRO (International Union of Forestry Research Organizations) Division 7 research groups on forest entomology and forest pathology. This historic meeting, the first ever IUFRO meeting to be held in Uruguay, was attended by more than 100 researchers from 25 countries.

A number of very important issues were discussed during the meeting in Colonia. These included tree health management, the movement of pests and pathogens around the globe, climate change, surveillance and monitoring, and the opportunities and challenges arising from the genomics era. The meeting also included a day in the field, looking at forestry pests and diseases in the south of Uruguay. The CTHB and TPCP research programmes were very visible in the contributions to the meeting, with five oral presentations and 10 posters. Prof. Bernard Slippers presented a keynote lecture on genomics and tree health, while Profs. Jolanda Roux and Mike Wingfield chaired two of the sessions.

Participants learning more about Eucalypt forestry and its pests and pathogens.

Three of the FABI delegates who attended the meeting, Dr. Brett Hurley, Dr. Shuaifei Chen and Prof. Mike Wingfield.

Two of the points that stood out at the meeting were the importance of strong teams and collaboration, and the threat of the continued trade in plants. IUFRO research meetings are fantastic opportunities to strengthen existing collaborations and to establish new ones. Prof. Mike Wingfield (Director of the CTHB/TPCP and deputy director of IUFRO) summarised the importance of building and maintaining strong linkages worldwide in his closing remarks for the meeting in reminding all present that forest health scientists and foresters deeply depend on each other and should build each other up as much as possible. This can also be summarised in an explanation for the word "TEAM": T=together; E=everybody; A=achieves; M=more! Healthy competition is good, BUT, working as a team, we all achieve more!

The second issue discussed at the meeting in Uruguay which received significant attention was the trade in plants and plant products such as seed and timber. The increase in global trade has resulted in an exponential increase of pests and pathogens moving to new areas and subsequently threatening tree health. A number of these introductions of pests and pathogens have resulted in what is called "new encounter" diseases, often with devastating effect.

Two Eucalypt problems often encountered in Uruguay: Mycosphaerella leaf blotch disease caused by a species of *Teratosphaeria* (left) and an adult left beetle of the genus *Gonipterus* (right).

The lack of understanding of the threats of the trade in plant material has led to the establishment and invasion of non-native organisms that threaten key ecosystems around the world and put additional pressure on managed resources. Concern regarding this issue has led to the drafting of a resolution now called the "Montesclaros Declaration" (www.iufro.org). This declaration by scientists from more than 17 countries aim to put pressure on forest policy makers around the globe to phase out international trade in live plants and plant products that put forest health at risk while offering limited economic benefit.

DISEASE WARNING – *PUCCINIA PSIDII*

The *Eucalyptus* rust pathogen: Australia in 2010; South Africa next?

Foresters in South Africa have been made contious about *Eucalyptus* rust since the 1990's, and the pathogen *Puccinia psidii* has been feared in Australia ever since it first started causing disease on Eucalypts in South America in the 1970s. This concern for Australia became a reality early in 2010 when *P. psidii* was detected in the state of New South Wales. The appearance of the pathogen in that country has been described, amongst other things as an "ecological holocaust". Recently, despite quarantine efforts, the disease has been reported from north of Brisbane, rapidly spreading along the east coast of Australia. Native Australian *Melaleuca* species are especially susceptible and it is already predicted that this genus may be wiped out completely.

Typical *P. psidii* fruiting bodies on native Australian host.

The appearance of *P. psidii* in Australia should be of significant concern to forestry companies in South Africa. However, it is not just Eucalypt species that are threatened. During collaborative studies between the TPCP programme of FABI, Australia and Brazil, tests of native *Heteropyxis natalensis* in Brazil showed that this South African endemic is one of the most susceptible species tested with *P. psidii* (Image). Recent studies in Australia showed that Australian species of Eugenia, *Metrosideros* and *Syzygium* are also susceptible. In fact, more than 110 plant species in the family Myrtaceae has already been shown to be susceptible to this pathogen.

***Heteropyxis natalensis* dying from *P. psidii* infection during greenhouse trials in Brazil (Alfenas et al. 2009)**

The rust pathogen, *P. psidii*, can be spread in wind currents, infected plant material and even on humans (on their clothes etc.). Foresters, botanists and anyone visiting forest areas/parks in Australia, Brazil, Hawaii or other countries where this pathogen occurs are encouraged not to bring any plant material back with them. Upon returning to South Africa it is strongly advised that you wash your clothes and shoes before entering gardens, forests, farms and plantations in South Africa. Forestry companies and conservation agencies should also, as a matter of urgency, implement management strategies and prepare for the imminent arrival of this pathogen in South Africa.

Eucalypt leaves infected by *P. psidii*. Susceptible Eucalypts include *E. cloeziana*, *E. globulus*, *C. citriodora*, *C. henryii*, *E. grandis*,*E. nitens* and a number of other species that are planted/occurs in South Africa.

For more information contact the TPCP/CTHB.