TREE PROTECTION NEWS

Newsletter of the Tree Protection Co-operative Programme University of Pretoria

NO. 5 MAY 2003

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The Director reporting .....

As I write this note, I am flying down to Richards Bay to meet with Tree Protection Co-operative Programme (TPCP) Field Services Manager, Jolanda Roux and overseas guests that attended our annual meeting this last week. What lies ahead is a few days of lectures to forestry colleagues and field days to inspect trials in the Zululand area. As one might expect from this time of the year, it is likely to be hot and muggy in the field, but on the more positive side, the disease and pest problems will be interesting and exciting to consider. In addition, having the opportunity to hear the views of overseas pathology and entomology experts regarding our various projects is a special privilege, and always much appreciated.

With the TPCP meetings now over, the research and extension team can get back to normal activities. I believe that all will agree that this years meeting was again a great success. As important as the meeting is, I have to admit that it is a relief to have it behind us for another year. This event requires a huge amount of work to organise, and some elements of the planning occur up to a year in advance. Dates are now set for our 2004 meeting (April 20, 21 and 22) and venues are already booked. Some three months before the meeting occurs, the team enters into a period of intense activity and this does not change until the meeting is over. So while we all feel elated at the outcome of the meetings, I would be untruthful to say that we are not somewhat pleased that it is over for now.

At this time, I cannot help but reflect on the overall outcome of the TPCP meeting. I will not comment on the regular events - the presentations by team researches etc- but rather on some of the special features. Here, presentations by Carl Seele (NCT), Andrew Morris (Sappi), Bruce Hulett (Mondi), Carol Rolando (ICFR) and Glen Mitchell (Fusarium Working Group) deserve special mention. All five presentations were outstanding and brought special perspective to the links between the TPCP team and our forest industry partners. In addition, we enjoyed fantastic presentations from Dr. Giles Hardy form Murdoch University in Perth, Dr. Kier Klepzig from the USDA Forest Service research station in Pineville, Louisiana and Mrs. Nora Telechea of Direction Forestal, Montevideo, Uruguay. Their perspectives on *Eucalyptus* and Pine pests and diseases were important and valuable.

The status of plantation health appears to be changing and presenting us with new and unexpected challenges. This worrying change of environment began to emerge in recent years with growing damage due to the pitch canker pathogen, *Fusarium circinatum*. During the course of the last year, the Sirex wood wasp *Sirex noctilio* with its associated fungal symbiont, *Amylostereum areolatum*, began to appear in pine plantations far north of the previously recognised northern limits. Dealing with these two problems will present us

with huge challenges in coming years. For now, a very positive sign is that all players in the industry are committed to fighting the battle. Here the Fusarium Working Group has been and will increasingly be extremely important. Likewise, during the past few weeks, an all-industry *Sirex* Action Plan (SAP) steering committee and a SAP technical committee have been constituted. Together with the TPCP, these committees will forge ahead with the management of the Sirex threat.

There can be little doubt that new pests and diseases will challenge forestry in South Africa in the future. *Sirex* and the pitch canker fungus are just two examples of what we might expect in years to come. This should not be interpreted as a gloomy and pessimistic perspective, but rather as a realistic challenge that will need to be met. From this standpoint, the pitch canker fungus problem and the *Sirex* wood wasp threat present us with positive as well as negative elements. While they are certainly serious, they enable us to learn to deal with other new and serious incursions that we will need to deal with in the future.

Before ending this introductory note, I must take this opportunity to thank all of you that attended this year's annual TPCP meeting. My commiserations to those people that had planned to attend and were prevented from doing so due to fires in plantations. This event is a special feature in the South African Forest Industry calendar and brings many positive products to our industry. Among these are open lines of communication between researchers and field foresters as well as between staff of the many groups that make up Forestry in this country today. Such communication is essential in our quest towards the goal of "KEEPING TREES HEALTHY"

Mike Wingfield.

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DO NOT .. I REPEAT ..DO NOT! cut the tree while I'm up here collecting samples!!
(The manager of field services up a tree)

FIELD SERVICES MANAGER RECEIVES COVETED AWARD

Dr. Jolanda Roux, well known to most foresters and forest managers in South Africa has received one of the coveted **"Exceptional Young Researcher Awards"** from the University of Pretoria. About four of these awards are made to young researchers each year and they recognise exceptional research achievements. For Jolanda, these achievements are many and varied. She has particularly been a pioneer in elucidating diseases of plantation trees in various countries of Africa, including South Africa. She has also conducted groundbreaking research on diseases of black wattle and especially on the serious Ceratocystis wilt pathogens of wattle and eucalypts. As a young researcher, she has also played a key role in advising post-graduate students and, in this regard, her first M.Sc. and Ph.D. students have just completed their studies. The following citation was presented with the award that comes with a certificate and monetary incentive:

"Dr. J. Roux conducts research on diseases of trees, particularly those caused by fungi. Much of her research has been on the diseases affecting commercial plantation forestry in South Africa, but she has also done research into the diseases affecting forestry in African countries such as Uganda and Ethiopia. Her research includes the identification of pathogens using morphological and molecular techniques. She also makes use of phylogenetic and population studies to better understand the pathogens and assists in the selection of disease-tolerant planting material for South African forestry companies."

L'oreal-UNESCO fellowship for young women in science awarded to TPCP researcher

Dr. Karin Jacobs is the second South African woman to become the recipient of the annual International L'oreal UNESCO fellowship for young women in science. L'oreal, in partnership with UNESCO, introduced the award programme in 1998 to recognize the contributions of exceptional female scientists and to encourage promising young women scientists from around the world. Currently, five awards are given to women representing the five geographical regions (Africa, Arab States, Europe and North America, Asia-Pacifica and Latin America) in recognition of their contribution to their scientific field. Fifteen post-doctoral fellowships are awarded to promising young women at the start of their careers. National Commissions of each country can nominate two candidates for the fellowships and an international jury makes the final selection from these nominations. The fellowships were presented to the recipients at a glamorous award ceremony at the UNESCO headquarters in Paris on the 27th of February 2003.

Karin is currently working as a post-doctoral fellow in the TPCP programme under the supervision of Prof. Brenda Wingfield. She is no stranger to the programme and completed her PhD with Prof. Mike Wingfield before spending two years with Agriculture Agrifood Canada in the laboratory of Dr. Keith Seifert. Her main research interests at the moment are to compile a multigene phylogeny for the genus *Leptographium* and to revise the monograph of *Leptographium,* published in 2000. These fungi are part of the group that causes blue-stain on lumber.

The fellowship will commence in October 2003 and will be aimed at the development of a rapid identification method for fungal pathogens based on micro-array technology. This method is based on the exploitation of short pieces of DNA (oligonucleotides) unique to a certain species, fungal pathogens in this case. Single strand copies of these unique oligonucleotides are attached to a microscope slide with the aid of a micro-array spotter. A hybridisation reaction with a sample containing unknown fungi will result in the formation of double strands where the sample DNA is complementary to the oligonucleotides on the slide. This will result in a colour reaction, indicating a positive identification. If the sample DNA contains no DNA that is complimentary to the target DNA, there will be no colour reaction. The advantage is that the technique is very rapid and accurate. A further advantage is that one can test a single sample for 500-600 species at the same time. The proposed project will be done in collaboration with Dr. C.A. Levesque and Dr. Seifert from Agriculture Agrifood Canada, who is already in the process of developing "microchips" for Canadian agriculture and forestry.

ANNUAL TPCP MEETING MARCH 2003

On the 11th and 12th of March 2003 the TPCP had its annual meeting at the University of Pretoria. Despite a few people missing the meeting at the last moment due to plantation fires, we once again had excellent attendance at the meeting. For those who were not lucky enough to attend we have decided to publish at least the executive summary of some of the activities of the TPCP in this issue of our newsletter.

EXECUTIVE SUMMARY OF TPCP ACTIVITIES

- This report marks the end of twelve years of formal existence of the TPCP. During this time, the Programme has grown considerably, both in size and stature. It has continuously changed to meet the needs of the South African forestry industry and to ensure that diseases and more recently, insect pests do not impinge on the sustainability or reduce the productivity of plantation forestry in South Africa. It is now widely accepted internationally that the TPCP is one of the strongest and most active unified programmes dealing with plantation pests and diseases.

- Diseases and pests pose one of the greatest threats to plantation forestry in South Africa and elsewhere. The prediction that losses due to these perturbations will increase has been highlighted in recent years by the appearance of an uncomfortably large number of pests and pathogens. There are clear indications that this trend will continue and great effort will be needed to ensure that losses are minimal.

- During the past year, the TPCP has continued to maintain an active programme of disease and pest monitoring. This has been achieved through field surveys, participation in monitoring activities of members, training of field foresters through field days and extension and through maintaining an active pest and disease diagnostic clinic that provides a free advisory service to members. During the past year, the team spent 635 person days in member plantations and this high level of activity in the field is more or less equal to that in past years.

- Being housed in a University implies that the TPCP has a primary responsibility to train post graduate students in the various disciplines related to tree protection. From a University standpoint, the group has experienced an exceptional year with a record number of students completing M.Sc. and Ph.D. degrees and an outstanding record of publishing high quality science in internationally reputable journals. By maintaining this exceptional record, the group is easily able to retain the strongest possible support from the University of Pretoria.

- During the past year, the University reaffirmed its support to the group by approving a R20 million grant to expand the facilities used by the TPCP. Thus, during the coming year, the "downstairs" FABI facilities will be extended by more than double its current size. The building project is well advanced and should be completed by mid 2003. This will include additional laboratories, facilities for working with genetically modified plants and the second only quarantine level greenhouses in South Africa. These new facilities will have a great impact on the work that the Programme is able to undertake.

- Many pest and disease problems were dealt with during the last year and details of the most important of these are provided in the extended report to members. However two particular problems caused the highest level of concern and these have required the greatest effort from the TPCP team. More specifically they include the damage due to the pitch canker fungus, *Fusarium circinatum* and the Sirex wood wasp, *Sirex noctilio*. Special programmes have been initiated to deal with these agents that seriously threaten forestry in South Africa.

- New diseases have been discovered for the first time in South Africa and many well-established diseases have been subjected to intensive study. Of the new pathogens discovered, we are most concerned about the appearance of the serious wilt pathogen *Ceratocystis fimbriata*. This fungus has led to the deaths of large numbers of *Eucalyptus* trees elsewhere in the world, and a special effort will need to be made to deal with this newly discovered tree pathogen in South Africa.

- During 2002, the TPCP has continued with its efforts to integrate its pathology and entomology activities. This has not been difficult to achieve because the requirements of the disciplines, especially in forestry, are so similar. Projects are already closely integrated and will continue to be more so in the coming years.

- The TPCP has continued to maintain a very active programme of international collaboration. This is most important, especially in the field of tree protection where it is necessary to maintain a clear view of problems being experienced elsewhere in the world. Pests and pathogens are moving actively and a first hand understanding and awareness of key problems must facilitate early discovery, risk abatement and reduced losses. Amongst the formal collaborations that we are proud to have continued are those partially funded by the Australian government to evaluate the risks of Eucalyptus rust, and bilateral agreements between the South African and Chinese Governments, the South African and Norwegian Governments and the South Africa and Belgium Governments.

- Members of the TPCP team have excelled in the national and international arenas, receiving a wide range of awards and invitations. We are particularly pleased with these awards and invitations in the case of students, many of whom have gained excellent funding opportunities, together with exceptional new experiences.

- As in the past, the successes of the TPCP are linked to a high level of collaboration and team effort on the part of a great number of people. The research group and support staff of about 50 represents an outstanding team of highly committed and passionate people. The group gains tremendous support from University colleagues and especially forest managers and foresters throughout South Africa. We take this opportunity to thank members of the TPCP and their staff for valued and superb support. It is only though this support and collaboration that we are able to achieve our goal of "KEEPING TREES HEALTHY".

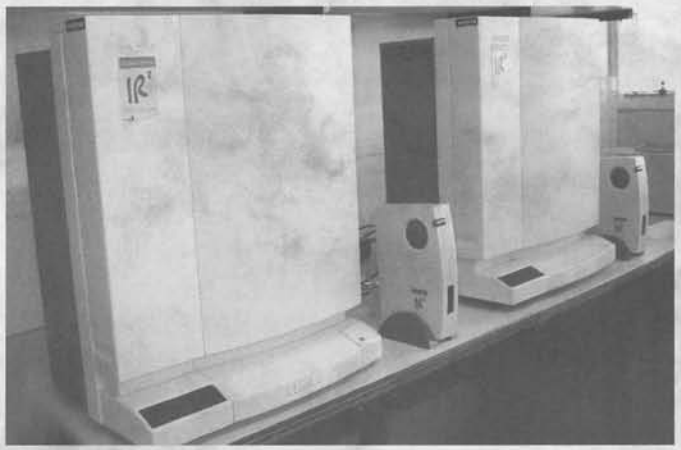
NEW FOREST MOLECULAR GENETICS PROGRAMME IN FABI STARTS WITH HELP OF SAPPI FORESTS

Two automated DNA analysers were recently installed at the University of Pretoria. These instruments were purchased from LI-COR Biosciences (Lincoln Nebraska) with a donation of R150 000 from Sappi Forestry and financial contributions from the University of Pretoria, Departments of Genetics, Microbiology and Plant Pathology and the Tree Pathology Co-operative Programme. The LI-COR instruments will be used for high-throughput, automated marker analysis of the genomes of forest trees, cereal crops, banana, fungal pathogens and bacteria. This capacity will form an important part of the new Forest Molecular Genetics programme in

Zander Myburg (right) with the first two MSc students (Martin Ranik and Minique de Castro) in the Forest Molecular Genetics programme.

FABI. The programme will be directed by Dr. Zander Myburg who joined the University of Pretoria at the end of 2001 after completing a PhD degree programme in Forest Biotechnology at North Carolina State University.

The Forest Molecular Genetics programme will have three main focus areas. The first focus will be the development of general molecular tools for forest tree breeding. This includes the use of molecular markers for fingerprinting of trees and clones, paternity analysis, pollen contamination studies, etc. The second focus will be the development of trait-linked molecular markers for marker-assisted improvement of wood and fibre properties, growth and volume, vegetative propagation and disease resistance. Association genetics approaches will be used to identify these genes in tree breeding populations. Thirdly, the programme will focus on



The two LI-COR instruments installed at the Department of Genetics at UP

the identification and functional analysis of genes that are involved in wood formation in forest trees. The sequence of the poplar genome will be completed within the next year and this important development in Forest Genomics is expected to lead to a rapid expansion of our knowledge about genes that regulate wood and fibre development, as well as important biological processes such as resistance to forest pathogens. The Forest Molecular Genetics programme at FABI will use cutting-edge technologies such as microarray analysis and AFLP transcript profiling to identify genes involved in these biological processes. The function of these genes will be studied in *Eucalyptus* trees and in the model plant *Arabidopsis thaliana*. This tiny weed, of which the complete genome sequence is known, can be induced to form wood and can therefore be used as a model system for wood and fibre development. Genes characterized in this model will eventually be used to improve plantation forests using marker-assisted breeding or direct genetic engineering.

Zander Myburg collecting differentiating xylem (wood forming tissue) from a *Eucalyptus* tree

For more information on Forest Molecular Genetics visit:
http://www.up.ac.za/academic/fabi/eucgenomics/Eucalyptus.htm

FUNGI ASSOCIATED WITH CONIFER-INFESTING BARK BEETLES IN NORWAY AND SOUTH AFRICA

A South African-Norwegian Research Cooperation

Bark beetles, particularly in the genera *Ips* and *Hylastes* are common in Europe, including Norway, and represent one of the greatest threats to conifer plantations, as they carry a guild of fungi that contribute to tree death. These insects are also important to South Africa, because several species have been accidentally introduced into the country. Much work has been done on bark beetle-associated fungi in Norway, but little is known regarding these organisms in South Africa. A new 1.5 million rand project funded by the South African – Norwegian Programme for Research Cooperation aims to improve on this situation by exchanging knowledge and researchers between the two countries. The Norwegian partner, the Norwegian Forest Research Institute (Skogforsk), has a long history of forestry research and is particularly well-known for the work that has been done in the areas of classical forest pathology and forest entomology. FABI has a strong history of research on diseases of plants and trees, with particular emphasis on molecular studies of tree pathogens.

The main objective of this collaborative project is to characterise the fungal pathogens associated with a number of important bark beetles in Norway and related species that have been accidentally introduced into South Africa. The research will contribute to an understanding of bark beetle biology, the identification of fungi associated with bark beetles, as well as the impact of bark beetles and their fungal associates on forest trees. Specific objectives are:

1. To identify fungi associated with different species of bark beetles in South Africa and Norway, using both conventional and molecular techniques such as DNA sequencing. Some of the fungi have not been characterised and poor identifications are already impacting negatively on timber trade, which is important to both Norway and South Africa.

2. To develop molecular markers for species of dominant fungi to enable comparisons of populations. Through undertaking population biology studies, we hope to discover the origins of fungi associated with introduced bark beetles in South Africa. This will aid in improving quarantine measures both in South Africa and Norway. Patterns of spread of the fungi and their insect vectors may also be elucidated.

3. To test the pathogenicity of selected fungi in South Africa using techniques developed at Skogforsk. Very little is known about the pathogenicity of fungi associated with invasive conifer bark beetles in South Africa. The pathogenicity of blue-stain fungi is studied using artificial point inoculation of fungal mycelium into host trees. Trees are either inoculated at low densities, or mass inoculated with up to 300 inoculations per tree. With a low number of inoculations the fungus is always confined by the defence responses of the tree. The mass-inoculation technique, which has been developed at Skogforsk, simulates the depletion of host defenses that takes place during a bark beetle mass-attack, and mature, healthy trees can be killed using this technique.

The two partner institutions have mutual and complimentary interest in this research domain. The Norwegian partners bring to the project the long-term experience and knowledge of bark beetle biology and the fungi associated with these important pests. Close interaction between South African students and research leaders from Norway will be achieved by students working in Norway and the Norwegian partners working in South Africa together with these students. During the course of the 3-year project (running from 01/Aug/02 to 31/Jul/05) students and staff will be exchanged between FABI and Skogforsk for a total duration of 29 months. Most of this time (23 month) will be allocated to South African PhD students and Post docs working in Norway. Through this mentorship students will come back to South Africa with experience particularly in forest entomology. This is a seriously neglected subject in South Africa and is a serious problem that needs urgent attention. We envisage that this project will contribute significantly to increasing forest entomology knowledge and capacity in South Africa.

WELCOME TO TPCP/FABI

Mohammed Abdo has started his Masters degree on the development of microsatellite markers for *Fusarium circinatum*. Mohammed is originally from Egypt where he obtained his B.Sc. degree. He, however, came to South Africa and recently completed his B.Sc. honours degree in Microbiology and the University of Pretoria.

Izette Greyling will do her Masters degree in the TPCP and will be working on the *Pantoea* spp. associated with Coniothyrium canker on *Eucalyptus*. She is a graduate of the University of Pretoria.

INTERNATIONAL VISITORS TO TPCP

Since our previous issue of Tree Protection News, the TPCP has hosted many international visitors. These visitors provide a valuable opportunity for our students and staff to increase their knowledge of the international disease situation. Many of these visits have also resulted in valuable international collaboration with regards to research projects and the exchange of students. These visits would not be possible without the help of our forestry colleagues. A special word of thanks goes to all who assisted us in entertaining these visitors and in showing them all the various aspects of our plantation health research. Thank you also for help with accommodation, meals and your precious time.

Top: Dr. Pia Barklund (right) and Leon Labuschagne (left) looking at Coniothyrium stem canker in Zululand.

Our visitors were:

Dr. Pia Barklund from the World Agroforestry Centre (ICRAF) in Nairobi, Kenya visited the TPCP in October 2002. She has spent a number of years working in Africa and before here appointment in Nairobi, she worked at the Wondo Genet Forestry College in Ethiopia for several years.

Dr. Giles Hardy from Murdoch University in Perth, Western Australia is well-known for his work on *Phytophthora cinnamomi* on *E. marginata*. More recently he has been actively involved in research into the diseases affecting the recently established plantations of *E. globulus* in Western Australia.

Bottom: Mike Wingfield and international visitors in Cryphonectria *inoculation trial. F.l.t.r: Dr. Kier Klebzig, Mike Wingfield and Dr. Giles Hardy. (Front) Mrs. Nora Telechea*

Dr. Kier Klebzig is from the USDA Forest Service research station in Pineville, Louisiana and has both entomological and forest pathology training. He has spent the last few years working especially on the management and study of bark beetles infesting pine trees in the U.S.A.

Mrs. Nora Telechea from Direction Forestal in Montevideo, Uruguay is a forest pathologist, also with a lot of experience in forest entomology. She has been very active especially in the biological control of several of Uruguay's forestry pests.

TPCP Diagnostic Clinic 2003

The structure of the Clinic was adjusted at the beginning of 2003 in order to reflect the activities of the team (Fig. 1). It now has a diagnostic and research component. The latter component focuses on research samples, specifically pine, received from the TPCP members as well as samples from the Pine Fusarium Working Group.

For the period January to 20 March, the clinic has received 79 diagnostic and 267 research samples (Fig. 2). Of the diagnostic samples, an equal number of pine and eucalypt samples were received (Fig. 3). The "other" samples refer to those of bark media, seeds, water etc.

Figure 1
Structure of TPCP Diagnostic Clinic

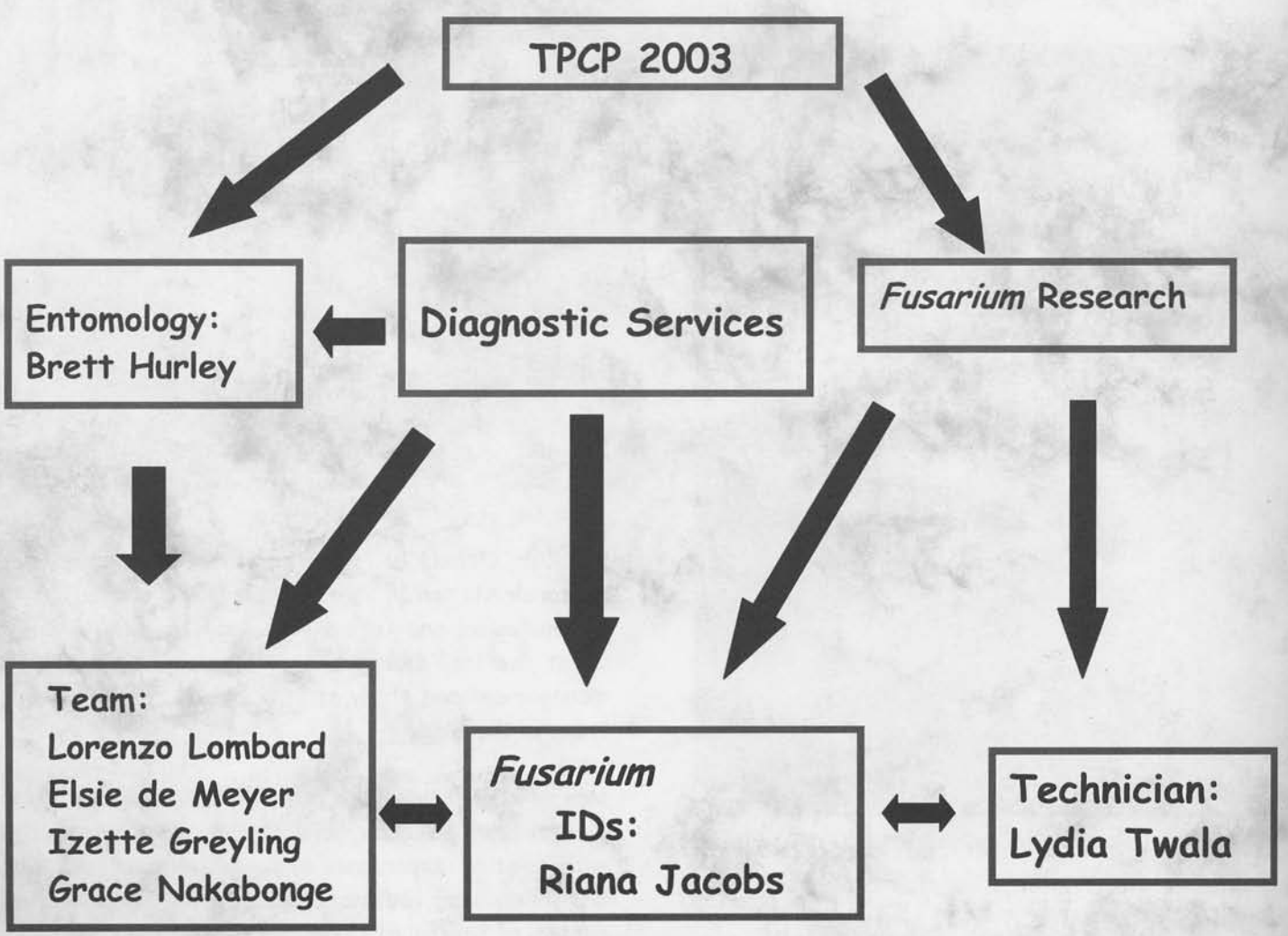


Figure 2
Number of diagnostic and research samples received (Jan to Mar 2003)

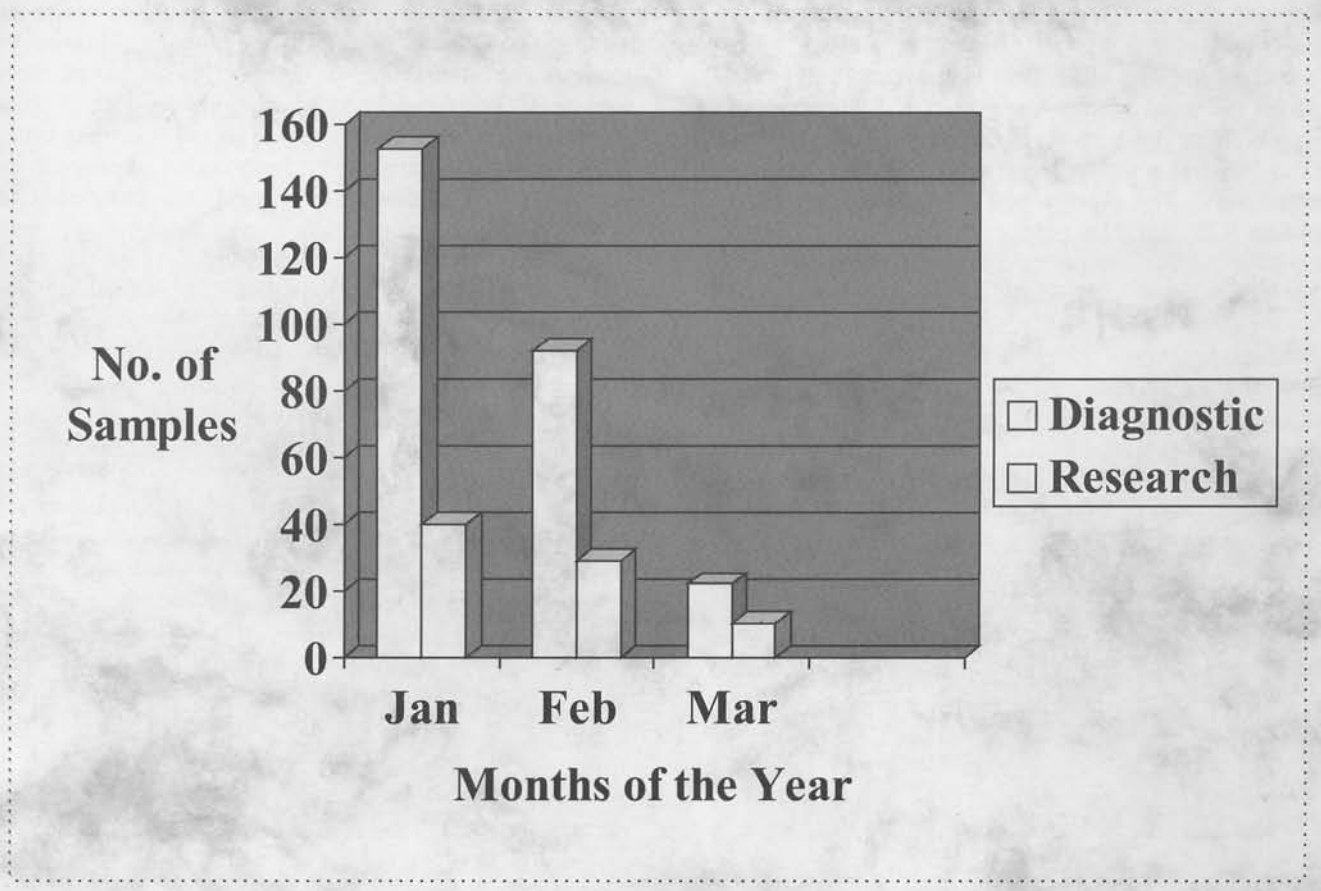
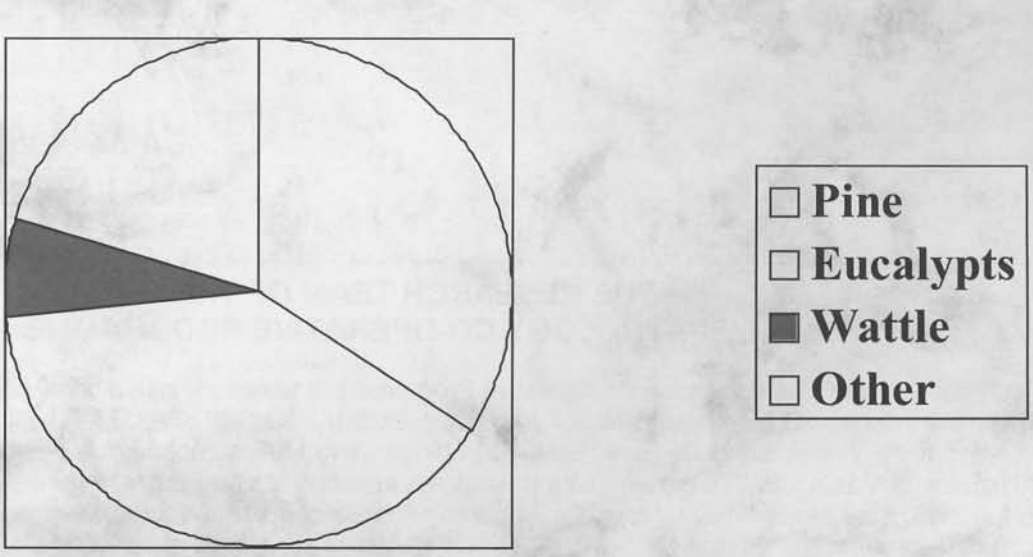


Figure 3
NUMBER OF SAMPLES RECEIVED FROM DIFFERENT HOSTS (Jan to Mar 2003)



Expanding our wood decay studies to utility poles

Eskom currently has an estimated 2.2 million wooden utility poles in service within it's entire distribution network. The average expected life of a utility pole is between 18-35 years depending on the wood species being used and the exposure area. Figures from 1998 indicate that the failure rate has increased to 5% over a four-year period (i.e. 46 875 wooden poles per annum). The average cost of replacing a pole is approximately R250 per 11m pole, excluding the installation costs, resulting in an additional cost to the company of R12 million per annum.

Various factors have been identified as contributing to the early failure of utility poles:

- Lack of quality control procedures on the supply side as the demand exceeds supply,
- Insufficient hardening and drying of the pole prior to installation, and
- Leaching of chemical preservatives from poles.

Elsie checking on a telegraph pole

These factors contribute to increased fungal and termite attack on the poles as well as twisting and cracking of poles. Conventional treatment of these poles included chemical treatments with fungicides and preservatives such as creosote. At present, these methods seem to be only partially effective. Most of these methods are, furthermore, damaging to the environment. Alternative methods, therefore, need to be investigated to increase the life span of these utility poles.

Decay of poles is primarily caused by fungi attacking the wood, which leads to a reduction in strength and eventual disintegration of the wood. Many species of fungi can be involved in decay. The fungal species vary between different types of wood, wood treated with different chemicals, and also in different geographical areas.

In South Africa, utility poles are produced primarily from eucalypt, pine and wattle trees. A considerable amount of research has been conducted on the production, strength, specifications and treatment of poles in South Africa during the past 40 years. However, no published data is available on the fungal species responsible for decay of poles in South Africa. Most of the treatments were considered to be effective against a broad spectrum of species, but with no knowledge about the causal agents, it is possible that some of these methods might not have been effective against all the organisms involved.

Eskom recently approached FABI with a request to conduct a survey to identify the causal agents of decay on poles in different geographical and climatic regions in South Africa. The aim of the project, which started in January this year, is to make a proper diagnosis of which fungal species are involved in the decay of poles.

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THE RESEARCH TEAM OF THE TREE PATHOLOGY CO-OPERATIVE PROGRAMME

The research team of the Tree Protection Co-operative Programme is varied. It includes full time staff of the University of Pretoria: Prof MJ Wingfield, Director and Mondi Professor, Prof B Wingfield, Prof TA Coutinho, Dr J Roux, and Dr P Govender, Rosemarie Visser, Sonja de Beer, Elizabeth Attinger, Eva Muller, Brett Hurley, Hardus Hatting, Helen Doman, Valentine Nkosi, and Martie van Zyl, colleagues and students attached to other organizations such as the ICFR, technical assistants funded by the University or through membership fees and post graduate students who are mainly funded by the NRF. Staff from various Departments in the University obviously provide advice and support where this is required.

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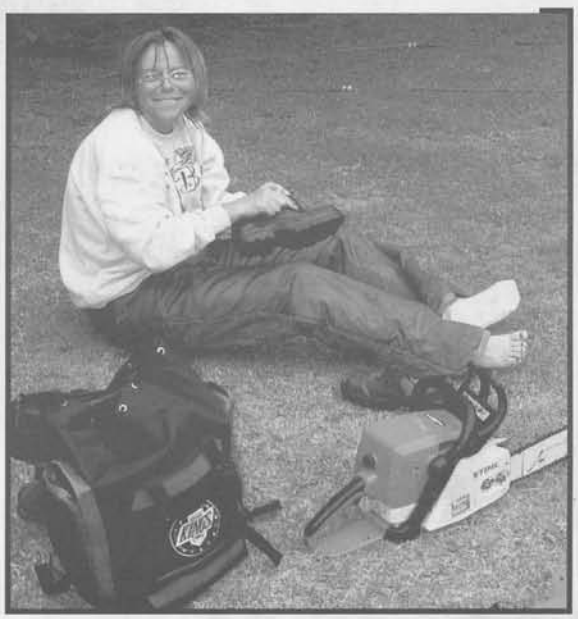
Contacting the TPCP : Your 2-STOP-SHOP

For all members' pest and disease problems please make use of the following two people to assist you.

PEST AND DISEASE DIAGNOSTIC CLINIC

Dr. Teresa Coutinho
Email: teresa.coutinho@fabi.up.ac.za
Tel: 012 420 3934/8/9
Fax: 012 420 3960

FIELD ENQUIRIES AND EXTENSION



Dr. Jolanda Roux
Email: jolanda.roux@fabi.up.ac.za
Tel: 082 372 8350/ 012 420 3938
Fax: 012 420 3960

Bilateral Agreement between the Belgium and South African Governments

The TPCP under leadership of Prof. Teresa Coutinho applied and were recently awarded a two-year grant from an initiative between the Flemish Community in Belgium and the South Africa Government. The Agreement funds scientific and technological research of mutual interest to both partners. The research collaboration is between the Universities of Gent and Pretoria. The research focuses on *Pantoea ananatis*, the causal agent of bacterial blight and dieback of young eucalypt trees in South Africa. The disease is widespread in this country, occurring on a number of different species, hybrids and clones. Trees younger than 3 years are particularly susceptible. Repeated infections lead to multi-stemmed trees, and undesirable silvicultural trait.

Specific aims of the collaborative research project are to:

- Develop a rapid, identification technique for *P. ananatis*
- Identify and characterise isolates of *P. ananatis* infecting hosts from other countries, including eucalypts
- Determine the genetic relatedness between *P. ananatis* isolates from different hosts
- Identify and characterise the two species of *Pantoea* associated with Coniothyrium canker of eucalypts
- Investigate the synergism that exists between the two *Pantoea* species and *Coniothyrium zuluense*.

THE BLUESTAIN PUZZLE

For the past six years a team from FABI has been researching the sapstain problem on pine logs exported from South Africa for veneer production. These logs are infected with staining fungi and on arrival in south east Asia the sapwood are stained severely, causing extensive losses to the companies involved.

Initially, a survey was conducted over a two-year period to determine the causal agents, the seasonal occurrence of stain, and to evaluate currently applied treatments of the logs. The results of this survey showed that logs are stained during all seasons, but that it develops slower during the winter months. Furthermore, we found that although the chemical treatment initially slows down stain development, levels of stain were the same in treated and untreated logs after 4 weeks in summer and 8 weeks in winter.

Most importantly, we identified a number of fungal species causing the stain. These included several bark-beetle associated ophiostomatoid fungi, which are known to cause bluestain all over the world on almost all kinds of wood. Also included was *Diplodia pinea*, a well-known endophyte (i.e. living inside the healthy tree) and stress related pathogen of pines in South Africa. However, to our surprise, we found that *Lasiodiplodia theobromae* was responsible for the staining of more than 80 % of logs surveyed. This fungus has been recorded previously as a pathogen from many different species of plants. It has also been recorded as the agent of sapstain on several tropical hardwoods. What is interesting, is that is has never been recorded as the agent of sapstain of pines from countries such as Chile and New Zealand, which competes with South Africa for the same markets in South East Asia.

Following the survey, 16 antisapstain compounds available on the South African market were screened in laboratory tests against the fungi involved. Based on performance, 8 of these were selected for trials in the Richards Bay harbour on 1.5 m logs. The results showed that the treated logs all had the same amount of stain as the water treated control logs. The trials were repeated on 3 m logs with the same disappointing results. One of the reasons for the failure of the chemicals in log trials is due to the fact that *Lasiodiplodia theobromae* grows much faster than most of the other staining fungi, and failure to treat logs within hours after felling results in stain penetrating deeper than the chemicals before it has been applied. The chemicals were, furthermore, developed against fungi penetrating the wood from the cut and debarked surfaces. Sapstain fungi reported from the Northern Hemisphere and New Zealand infect logs in this manner. The water-based chemicals themselves, however, penetrate the logs at most 1 cm deep, meaning any fungus already inside the sapwood further away than 1 cm from the surface, is not affected by the chemical. The possibility of endophytic infections might also contribute to the difficulty to control the stain. The efforts by FABIANS to understand the biology and infection strategy of the fungus, which should assist us in developing effective control measures, continue.

Sirex: The road ahead

First recorded in South Africa at Cape Town in 1994, the woodwasp *Sirex noctilio* is rapidly spreading through South Africa's pine forests. Last year *Sirex* was detected as far east as Weza, just within KwaZulu-Natal, and it is expected that *Sirex* will be detected in areas beyond this during the intensive monitoring programme that began this year. The spread of *Sirex* is coupled with the absence of its biological control agents, which have failed to establish and spread with their host. The result of the unhindered spread of *Sirex* is already evident in certain plantations, where some compartments have 30% and greater loss due to *Sirex*. If no action is taken, *Sirex* associated mortality can far exceed this and has the potential to cripple our pine industry.

In response to the serious threat posed by *Sirex*, FSA (Forestry South Africa) has provided funds to the TPCP for the establishment of a *Sirex* Control Programme, including the employment of two full-time staff. These staff, namely Mr Brett Hurley and Mr Hardus Hatting, will be responsible for the establishment and management of the *Sirex* Control Programme. The active involvement and co-operation of the entire forest industry in this programme has recently been secured. The strategy proposed by the TPCP to form the basis of the *Sirex* Control Programme was discussed and agreed upon with the industry.

The management strategy consists of six major components. **Monitoring** is the first component and involves an intensive approach to identify the distribution and infestation levels of *Sirex* within South Africa. **Biological control** is the main component of the strategy. This involves the re-introduction of biological control agents in *Sirex* infested areas and the assessment of their efficiency. The primary biological control agent has the potential to achieve above 90% parasitism if effectively introduced. ***Sirex* awareness** aimed at forestry staff, timber buyers and the general public is needed to promote the basic awareness of *Sirex* and its situation in South Africa. **Quarantine**, **silviculture** and **research** are the other three components of the strategy. Research includes assessing the biological control agents, obtaining a better understanding of *Sirex* and our situation in South Africa and investigating alternative control measures. The strategy will commence from this year onwards.

A *Sirex* Programme Steering Committee (SPSC) and *Sirex* Programme Technical Committee (SPTC) have been established to manage South Africa's *Sirex* Action Plan. The *Sirex* Programme Steering Committee initially chaired by Prof. Colin Dyer of the ICFR, will oversee the programme. The *Sirex* Programme Technical Committee will be responsible for the implementation of the strategy and report to the *Sirex* Steering Committee. Both committees include members of industry and government and staff of the TPCP. These committees will work towards the success of the *Sirex* Control Programme in managing the population of *Sirex* at levels below concern for the forest industry.

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NEWSFLASH

MARCH 2003 - SIREX FOUND IN HOWICK AREA!!!!

FABI/TPCP Group attending the ICPP Congress in Christchurch, New Zealand February 2003

The International Congress of Plant Pathology (ICPP)

The 8th International Congress of Plant Pathology (ICPP) was held in Christchurch, otherwise known as the garden city of the world, New Zealand from the 2nd to the 7th of February 2003. The theme of this year's congress was "Solving problems in the real world". A total of 1300 delegates attended the congress and they represented 74 countries. A total of 1200 poster presentations were exhibited and there were invited oral presentations on various aspects of plant pathology. The Forestry and Agricultural Biotechnology Institute (FABI) and the Tree Pathology Co-operative Programme (TPCP) were well represented with a group of fourteen postgraduate students and staff in attendance.

There were five keynote themes during the congress. Each day one of the keynote themes formed the basis for the day's scientific sessions and presentations.

Theme 1: Plant Pathology in the Asia/Pacific region

• The Asia/Pacific region is an important agricultural sector of the world. Climatic factors such as highly disease conducive rainfall and temperatures contribute to the development of several plant diseases that lead to significant losses.

Theme 2:Towards Integrated management of soilborne diseases.

• Soilborne diseases pose a significant threat to agriculture and forestry and as such can result in significant losses to production and revenue.

Theme 3: Host/Pathogen interactions and molecular plant Pathology

• Molecular studies of host/pathogen interactions allow scientists to understand the biology of many plant pathogens. This contributes to the development of efficient control and breeding strategies against many economically important pathogens.

Theme 4: Towards Integrated management of airborne diseases.

• Airborne diseases are some of the most destructive diseases that often lead to epidemics. This is because large amounts of pathogen inoculum are built up and dispersed over large distances in a short time period. Rusts are especially well known for their air dispersal and here, *Eucalyptus* rust, poses a serious threat to plantation forestry worldwide.

Theme 5: Knowledge transfer for Plant Pathology.

• To control a plant disease effectively, sufficient and competent transfer of knowledge between plant pathologists is crucial. Of even greater importance is the transfer of this knowledge, and solutions, to farmers and foresters.

Various aspects of the research that is conducted in FABI and the TPCP were presented at the conference. These included posters on diseases such as *Mycosphaerella*, *Cryphonectria*, *Diplodia*, *Ceratocystis*, *Fusarium*, pink disease and bacterial blight. Professor Mike Wingfield delivered the Daniel McAlpine memorial lecture with a paper entitled "Exotic plantation forests in the Southern Hemisphere are increasingly threatened by diseases". This seminar focussed on *Cryphonectria* canker of *Eucalyptus* and the research that has been conducted by the TPCP in South Africa. Professor Brenda Wingfield presented a paper entitled "Understanding the threat of pitch canker to exotic plantation forestry in the Southern Hemisphere". This paper focussed on the problem of this disease in South African nurseries, difficulties that the pitch canker fungus causes at establishment and various methods of identification that have been used in diagnosing the disease. These two seminars were among several presentations and posters that focussed on forest pathology. These papers generated much interest and lively debate among the delegates.

Apart from the many scientific sessions at the congress, there was a full social itinerary for the delegates as well as a number of field tours. On the first evening of the congress delegates attended a welcoming cocktail evening with wine and very good edible mushroom treats, allowing delegates to reunite with old friends and make new bonds with other scientists. Congress delegates were also treated to a Barbeque evening at one of the local vineyards where they indulged in more good food and local wine. To end the congress, a Pacifica dinner was held where delegates could enjoy traditional food accompanied by dance and music from the New Zealand Mauri culture. Following the congress, Mike Wingfield and Jolanda Roux participated in a two-day forest pathology field tour on the North Island. They looked at several important diseases including Dothistroma needle blight, Armillaria root rot of Pines, Mycosphaerella Leaf Blight of *Eucalyptus* and Seridium canker of *Cypress*.

The ICPP congress was a great success. Much was learnt by all the attending delegates, and many new contacts were made.

ABSTRACTS FROM THE RECENT INTERNATIONAL CONGRESS FOR PLANT PATHOLOGY HELD IN CHRISTCHURCH, NEW ZEALAND

Taxonomic re-evaluation of the genera *Cryphonectria* and *Endothia* based on morphology and DNA sequence data.

Henrietta Myburg, Marieka Gryzenhout, Brenda D. Wingfield, R. Jay Stipes and Michael J. Wingfield

The fungal genera *Cryphonectria* and *Endothia* include some of the most important pathogens of forest trees. Despite their importance, their generic and species level taxonomy has never been investigated at the DNA level. The objective of this study was to compare representative species of *Cryphonectria* and *Endothia*, for which cultures were available. Variation in sequences of the ITS1 and ITS2 regions of the ribosomal RNA operon and two regions of the □-tubulin gene were considered. In addition, morphological characteristics of these species were studied. Two discrete clades representing *Endothia* and *Cryphonectria* were strongly supported in the emerging phylogenetic trees. The *Cryphonectria* clade included *C. parasitica*, *C. macrospora*, *C. nitschkei*, *C. eucalypti* and *C. radicalis*. The genus *Endothia* was characterised only by *E. gyrosa* isolates. Isolates representing *E. viridistroma* and *E. singularis*, grouped separately from each other and outside the *Endothia* clade. Isolates of the *Eucalyptus* pathogen, *Cryphonectria cubensis*, and a supposed *Cryphonectria* species from New Zealand formed two groups separate from *Cryphonectria* and *Endothia*. The different clades representing *Endothia*, *Cryphonectria*, *C. cubensis*, the New Zealand isolates, *E. singularis* and *E. viridistroma* could be distinguished based on anamorph and stromatal morphology as well as ascospore septation. Results of this study show clearly that *Cryphonectria* and *Endothia* are polyphyletic and that their taxonomy must be revised.

Bacterial blight of *Eucalyptus* species in Uganda.

Grace Nakabonge, Teresa Coutinho, Jolanda Roux and Michael Wingfield

Over exploitation of natural forests has significantly increased the dependency on exotic plantations for the supply of wood and wood products in the tropics and Southern Hemisphere. In Uganda, *Eucalyptus* species

are amongst the most widely grown plantation trees, covering 40% of afforested areas. Diseases, however, reduce their growth rate, survival and product quality. Most *Eucalyptus* diseases are caused by fungi, but bacterial pathogens are increasing in importance. In 1999, a disease was reported in the Entebbe area along the shores of Lake Victoria. Diseased trees showed leaf spots, lesions along the main leaf veins, premature abscission of the leaves, die-back and death. Isolations were made from wilted shoots and from leaves with water soaked lesions, consistently yielding bacterial isolates. The samples were characterized using Gram stain, Hugh-Leifson oxidation fermentation, oxidase and catalase tests as well as 16S Rrna gene sequences. The bacterium was identified as *Pantoea ananatis*, a known leaf pathogen of *Eucalyptus* spp. In South Africa. Bacterial blight is consequently of great concern in terms of establishment of future plantations, especially as it affects young trees. In South Africa, it has been shown that there is great variation in susceptibility of different *Eucalyptus* species and clones. To enhance productivity, the Ugandan forestry industry should thus establish trials to select bacterial blight tolerant planting stock. . This study represents the first report of bacterial blight, caused by *P. ananatis* in a country other than South Africa.

Rapid identification of African strains of *Ralstonia solanacearum.*

J.P. Weich, S. Poussier, D. Trigalet-Demery, A. Trigalet, G. Nakabonge, D.K. Berger and T.A. Coutinho

Ralstonia solanacearum, the causative agent of bacterial wilt, is one of two bacterial pathogens known to infect *Eucalyptus* in South Africa. Rapidly and accurately identifying the causative agent in a plantation is crucially important to managing the disease. In this study, a rapid identification method, developed in France, was used to confirm the identity of Ugandan and Congolese isolates thought to be *R. solanacearum*. The method used is a PCR-RFLP technique that is based on the *hrp* (hypersensitive response and pathogenicity) gene region. This region is needed by many plant pathogenic bacteria to cause symptoms on susceptible hosts and a hypersensitive reaction on resistant or non-hosts. Three primer pairs were used. The restriction enzymes *Ava*I, *Bss*HII, *Hae*II, and *Pvu*II were used selectively: to cut the PCR products obtained which yielded two to four bands in a distinct pattern. The relatedness among isolates of *R. solanacearum* from Congo and South Africa were also determined using AFLP's. The AFLP results showed that the Congo isolates and two of the South African isolates grouped together, based on the presence/absence of AFLP fragments. The AFLP groupings also corresponded with biovar groups. The diagnostic technique will now enable researchers to identify the pathogen rapidly and management strategies can then be implemented within a week after an outbreak occurs.

Population structure of *Cryphonectria cubensis* in South Africa.

R.N. Heath, J. Roux, N.A. van der Merwe, B.D. Wingfield and M.J. Wingfield

Cryphonectria cubensis is a canker pathogen of Eucalyptus in tropical and sub-tropical regions world-wide. In addition to its presence on Eucalyptus, this pathogen has been recorded on clove and *Tibouchina* spp. In South Africa, *C. cubensis* results in symptoms on Eucalyptus, which are different to those elsewhere in the world. Recently, analyses of DNA sequence data have shown that the fungus is different to *C. cubensis* occurring in South America, South East Asia and Central Africa. The origin of the South African fungus known as *C. cubensis* has thus been in question. A recent survey of indigenous Myrtaceae in South Africa, led to the discovery of *C. cubensis* on native *Syzigium* spp. Detailed morphological and molecular investigations confirmed that the fungus is identical to the one found on Eucalyptus in South Africa. The primary aim of this study was to gain insight into the population structure of this fungus, using vegetative compatibility and amplified microsatellite markers. Results showed that the population from *Syzigium spp.* has greater genetic diversity than populations from Eucalyptus in South Africa. Isolates from *Syzigium* also had a lower level of linkage disequilibrium than a population isolated from South African *Eucalyptus*. Therefore, the *Syzigium* population displays random mating, which is not true for the *Eucalyptus* population. These observations provide good evidence that the fungus known as *C. cubensis* in South Africa, originated from native Myrtaceae in this country and subsequently became established on exotic *Eucalyptus* and *Tibouchina* spp.

FABI becoming Fabylon?

A stranger walking through the passages of the FABI might wonder if he/she has not perhaps rediscovered the Babylon of old? This impression would arise due to the large number of foreign Post Doctoral fellows, Masters and Ph. D. students, that populate FABI. Of course, the many South Africans speaking a wide array of local languages contribute to this, not unpleasant, cacophony.

An informal survey was conducted recently in FABI to determine exactly how many languages are currently spoken in the Institute. Of the 66 people who responded to the questionnaire, all but one FABIAN, speaks two or

more languages. And it is known that the one person who recorded that she only speaks English, understands Afrikaans perfectly well! The person who speaks the most languages in FABI, is a South African Ph. D. student, Bongani Maseko, who speaks nine languages. Then there are seven FABIANS who each speak six languages, five who speak two languages, four who speak four languages, twelve speaking three, and the remaining 34 speaking two languages each.

The languages spoken (numbers of people in brackets), from South Africa included: Afrikaans (30), Zulu (5), Xhosa (4), S-Sotho (4), Tswana (4), N-Sotho (3), Swazi (2), Ndebele (1), and Hindi (1). The number of Afrikaans speaking people seems high, but this is mainly because almost all the African language speakers also speak Afrikaans as a second or third language, while very few of the Afrikaans speaking people speaks any of the African languages. FABIANS from the remainder of Africa speak the following languages: Amharic (3), Oromigna (2), Swahili (1), Luganda (1), Shona (1), Tonga (1), Chewa (1), Ndebele (1), Herero (1). Those from Europe and Asia: German (7), French (3), Azerbaijanian (1), Russian (1), Turkish (1), Serbian (1), Portuguese (1), Italian (1), Norwegian (1) and Chinese (Mandarin) (1). Then there is 5 FABIANS from South America who speaks Spanish. All of the respondents speak English, which is also the operational language in FABI.

In celebration of the international flavour in FABI, the FABI Christmas card for the past festive season, featured the season's greetings in 22 of the 29 languages spoken in this very multicultural institute.

Graduations

We wish to congratulate the following people who recently received their degrees.

Grace Nakabonge – M.Sc. Cum Laude – Diseases associated with plantation forestry in Uganda.

Rodrigo Ahumada – M.Sc. Cum Laude – Diseases in commercial *Eucalyptus* plantations in Chile, with special reference to *Mycosphaerella* and *Botryosphaeria* species.

Mohammed Abdo – B.Sc. honours – *Rhizobium* spp. associated with various hosts in South Africa including *Acacia mearnsii*.

Prem Govender – Ph.D – Soil invertebrate pests in the re-establishment of plantations in South Africa.

Xudong Zhou - Ph.D - *Taxonomy and biology of ophiostomatoid fungi associated with conifer-infesting bark beetles.*

IMPORTANT : PLEASE READ THIS

In order for us to coordinate our services to you please help us by using the following contact address:

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