tree pathology news

NEWSLETTER OF THE TREE PATHOLOGY COOPERATIVE PROGRAMME
UNIVERSITY OF PRETORIA

NO 20

NOVEMBER 1999

CONTENTS

DIRECTOR'S REPORT and CHRISTMAS MESSAGE

Tree Pathology News has appeared bi-annually for almost ten years now. During this time, the Tree Pathology Co-operative Programme (TPCP) has grown and matured considerably. From early beginnings, with a very small group of students, a commitment to providing the Forestry Industry with extension and diagnostic services and research on Cryphonectria canker of *Eucalyptus*, the programme has become the strongest single group dealing with tree disease problems in the world. **The group has a proud record of providing service to a massive industry that is spread over many thousands of kilometers - Cape Town to Tzaneen - and encompasses nearly one and a half million hectares of plantation.** Other than providing support to this great industry in extension and disease monitoring, the TPCP has established research projects (short and long term) on every important or potentially important disease of pine, *Eucalyptus* and wattle in Southern Africa. In excess of 30 M.Sc. and Ph.D. students have graduated from the programme, and thus, the body of theses dealing with a wide range of aspects of tree disease has reached heights that were not even dreamed of at the inception of the programme.

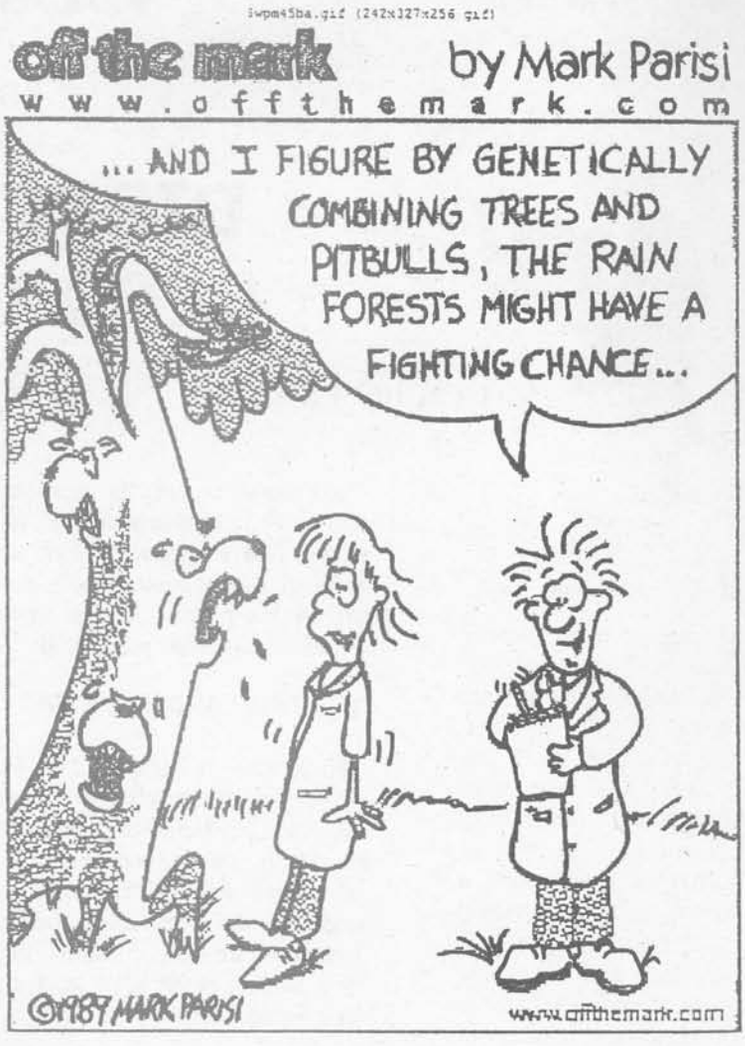
THE TPCP AND THE ICFR

The decision to dispatch Tree Pathology News, the newsletter of the Tree Pathology Co-operative Programme, together with the ICFR newsletter has been widely welcomed by members of the TPCP. I would like to extend my thanks to those colleagues who have responded to this change which is intended to underpin the very close liaison between the two groups. Indeed, as we stand currently, the TPCP might be considered to be a satellite of the ICFR, taking care of the specialised field of Tree Protection.

FOREST ENTOMOLOGY AND THE TPCP

Many readers of Tree Pathology News will know that the TPCP has begun to expand its forest entomology interests. This most exciting development is in line with the recommendations in various reviews of forestry research in South Africa - most notably the Bill Dyck report. The fields of pathology and entomology are extremely closely linked. Indeed, since its inception, the TPCP has maintained a number of research projects that span the cusp between the two fields. With the resignation of Peter Atkinson from the ICFR and Prem Govender's move to FABI, a perfect opportunity arose to begin to establish a unified protection programme to serve our forestry industry. Although this process has been marked by a relatively slow start, the forest entomology component of the TPCP has taken root strongly and is set to grow to meet the needs of the Industry.

Subsequent to the appearance of the last issue of Tree Pathology News, various negotiations have been held to develop a funding model to support forest entomology as part of the Forestry and Agricultural Biotechnology Institute (FABI), which houses the TPCP. At the present time, a relatively small but adequate base of funding has been committed by the Industry and it is hoped that it will be possible to procure matching grants to augment this funding. In practical terms, it has been possible for the TPCP to maintain a skeleton forest entomology group that has been able to attend to extension needs during this time of change. We have also been able to begin to attract students to this field. This will hopefully enable us to establish a critical mass of participants in forest entomology at FABI. Clearly, growth and development of this crucially important field will depend on our success in funding the new venture, but we are optimistic that it will be possible to "grow" the programme significantly in 2000.



As we move towards formalising our activities in forest entomology, changes will also need to be made to our pathology programme. A funding model based on acreage of land under plantation is being considered for entomology and change to a similar model for pathology is already under discussion. The name of the TPCP might also need revision. This could be simply achieved by replacing 'pathology' with 'protection' - leaving us with the TPCP but incorporating our interests in entomology. Clearly, much work needs to be done to reach the goal that we have set for ourselves, but good progress is being made and you can expect to hear of further progress in subsequent issues of our newsletter - possibly under the changed title - 'TREE PROTECTION NEWS'.

FUTURE FUNDING

Placing the key support area of forest pathology at a University was a bold move for the forestry industry. The establishment of the TPCP was the first fully co-operative research programme in South African forestry, and it clearly was an experiment. The success of the programme has been widely acclaimed both nationally and internationally and this has also led to the establishment of various other successful co-operative research ventures in the Industry. Promoting forestry research through partnership with Universities has had many unexpected benefits. Other than linkage to research institutions with a tremendous capacity, funding from industry has been significantly augmented by University funds and grants that are available to accomplished University researchers. Thus the TPCP benefits from more than 50% of its funding from the University of Pretoria, grants to individual participants of the programme from the National Research Foundation and other national and international groups, as well as through matching funding from the THRIP programme. Although levels of support vary somewhat, currently the forestry industry contributes approximately one third of the annual funding to the TPCP. In my view, fantastic value for all concerned. Industry benefits from the research product, University benefits from funds to augment its research effort and to train students, students benefit from linkage to the 'real world' and the business environment, the country benefits from the promotion of Science and Technology.

Having 'painted' a very optimistic and positive view of the funding model for forest protection research, I need also to consider the future that seems rather uncertain at this stage. While the industry remains hugely supportive of the activities of the TPCP, great change is occurring, which could significantly disturb progress of the programme. Amongst the many changes that are occurring, the outcome of the privatisation of SAFCOL is likely to impact strongly on the future of forestry research. During its relatively short existence, SAFCOL has been a keen supporter of forestry research in South Africa. Membership to the TPCP and various matching grants have brought much benefit to the industry as a whole. It can only be hoped that an alternative can be found to this base of funding. This will be crucial if South Africa can hope to maintain its status as a world leader in plantation forestry.

Another significant threat to the future of forestry research is a suggested change to the THRIP programme that could exclude biological research. During the course of the last four years THRIP, supported by the Department of Trade and Industry (DTI), has provided matching funds for virtually every Rand contributed to the TPCP by forestry. This funding has not only significantly enhanced the outputs of the TPCP, but has added structure to the programme that will ensure long term stability. A demise of THRIP support could mean a reduction in funding of 30% or more and the impact of this change can only be hugely negative for forestry.

THE YEAR AHEAD

The accomplishments of the TPCP have always been very closely linked to the many hundreds of foresters in South Africa that assist the programme with enthusiastic 'in field' support. These foresters play a crucial role in monitoring outbreaks of

pests and diseases. Samples sent to the diagnostic laboratory of the programme serve to maintain a clear focus on the problems being experienced. Field trials make it possible to establish cause and effect relationships, and they also play an important part where decisions must be made on ideal planting material for deployment.

I would like to take this opportunity to thank all friends of the TPCP for the important part that they have played during another most successful year. The entire TPCP also wishes you all a joyous Christmas, a restful holiday season and a fantastic start to the new Millennium.

Keeping Trees Healthy

ANNUAL TPCP MEETING 7-8 March 2000

Many colleagues have repeatedly been asking us for dates of the next Annual meeting of the TPCP.

Our meeting in 2000 will also mark the occasion of our 10th Anniversary and we will have a bumper programme to offer. The meeting will take place on Tuesday 7th and Wednesday 8th of March and will include a number of guest speakers including Mr Adrea Rossi of Sappi and Prof Albert van Jaarsveld who will share with us new developments in GIS applications. If you are interested in attending, please make this known to your TPCP board member (Dr Andrew Morris – SAPPI, Dr Bernnard Janse, Mondi, Mr. Peter Keyworth – NTC, Mr. Waldo Hinze – SAFCOL, Dr. Themba Sinelane – DWAF, Prof Colin Dyer – ICFR) or contact us directly

Sunshine and Frankenstein in Oxford this summer

The Forest Biotech 1999 meeting held in Oxford was attended by a number of South Africans. Among them were representatives from the FABI, FMBC and TPCP family. So what was this meeting all about? The web site (http://users.ox.ac.uk/~dops0022/conference/info.html) says it in a nutshell. "Forest Biotechnology '99" was a joint meeting of The International Wood Biotechnology Symposium and IUFRO Working Party 2.04-06 for the Molecular Genetics of Trees.

For those of us interested in genes and trees, this meeting was a MUST. One whole day was devoted to lignin biosynthesis and the genes involved in lignin. Other days included sessions discussing the genes involved in floral development and flowering and also a day dealing with markers and mapping tree genomes. There is an amazing amount of research being done on trees, tree genes and tree genetics. With molecular techniques changing so fast the speed at which things develop is incredible.

One day was focused on the issue of genetically modified trees. It was very well rounded with talks ranging from those in favour of GMO's, to those against any thought of genetic modification. Many research groups are in the process of sequencing huge numbers of possible useful genes. Just to make things more interesting there was also a demonstration against genetic modification of trees and forests outside the conference venue. One of the demonstrators was dressed up in a fancy dress costume of a green Frankenstein - he had a sign on him saying "Frankenstein tree".

The venue for the meeting was the stunning Oxford Natural history museum. The weather was also superb: not a single drop of rain the whole week. I managed a number of long walks along to the Thames (quite a small river while it is near Oxford) in the evenings after the meetings. We have suggested that South Africa might host the next meeting in the year 2003. The challenge now is to find a suitable setting, but this should not be a problem in sunny South Africa.

Abstract at Forest Biotechnology '99 Oxford

MICROSATELLITE FINGERPRINTING OF *EUCALYPTUS* IN SOUTH AFRICA

B.D. Wingfield

Eucalyptus grandis and *E. grandis* hybrids are widely utilised in exotic plantations in South Africa. A large number of the eucalypts in these plantations are derived from vegetative propagation. Routine verification of the identity of these clones using molecular markers has become increasingly important to the South African Forestry Companies. This enables the resolution of problems linked to mistaken identity and is also important where clones are being licensed to other groups for propagation. The most widely used technique for molecular fingerprinting at this stage is RAPDs. It is, however, difficult to standardise RAPD profiles produced in different laboratories. Recently a number of simple sequence repeats (SSRs) or

microsatellites have been developed by the Forest Molecular Biology Co-operative Programme (FMBC) to be used as markers for *Eucalyptus* in plantations. These markers target specific alleles and, therefore, produce data that are more readily comparable between laboratories. The aim of this study was to evaluate SSR markers that are in the public domain as well as those developed in our laboratories. Evaluation has been based on South African *E. grandis* and hybrid material as well as a pure *E. grandis* pedigree, which we have developed for this as well as other studies. All the SSR markers segregated in a typical 1:1 ratio. We were thus able to identify the linkage groups of our markers relative to a previously published *E. grandis* linkage map. This study is part of a larger international initiative aimed at producing fingerprinting markers for *Eucalyptus* and developing saturated linkage maps of the most commonly deployed *Eucalyptus* species.

FOREST ENTOMOLOGY AT THE TPCP

In 1999 the Forest Owners Association made a commitment to the Forestry and Agricultural Biotechnology Institute (FABI), University of Pretoria, to assist in establishing a centre of excellence in Forest Entomology to serve the South African Forestry Industry. An important step in achieving this goal was Prem Govender joining FABI and the Department of Zoology and Entomology at the beginning of 1999. Prem now manages the entomology side of the Diagnostic Clinic team run by Teresa Coutinho. This expands the capacity of the diagnostic clinic to provide free disease diagnostic and insect identification services to its members. Information accumulated through this diagnostic service is added to the database on diseases and pests held by the TPCP. These records of insect and disease outbreaks will be valuable in the development of expert management systems for the pests.

Guidelines for submission of insect samples:
It is important to contact Prem or Teresa before dispatching samples to the clinic. It is best to telephone beforehand so that specific sample submission techniques can be discussed. This also helps with the tracking of samples that might get lost in the mail. Samples should be send via courier to ensure that they are fresh and the correct diagnosis of the problem is made.

As a general rule all insects, excluding moths and butterflies, can be submitted in 70% alcohol for identification. Information that should accompany any sample or telephonic query include the name and address of the contact person, company, area, estate, telephone and fax numbers, species affected, age, extent or distribution of damage and the symptoms (consult disease sample submission pamphlet). Any additional information, such as compartment numbers, GIS location, soil type etc. will also be appreciated. We also encourage any information from foresters and extension officers on both sporadic and severe pest infestations, even if diagnosis or advice is not required. This greatly enhances the capacity of the TPCP and the forestry industry to acquire information to ensure plantation health in South Africa.

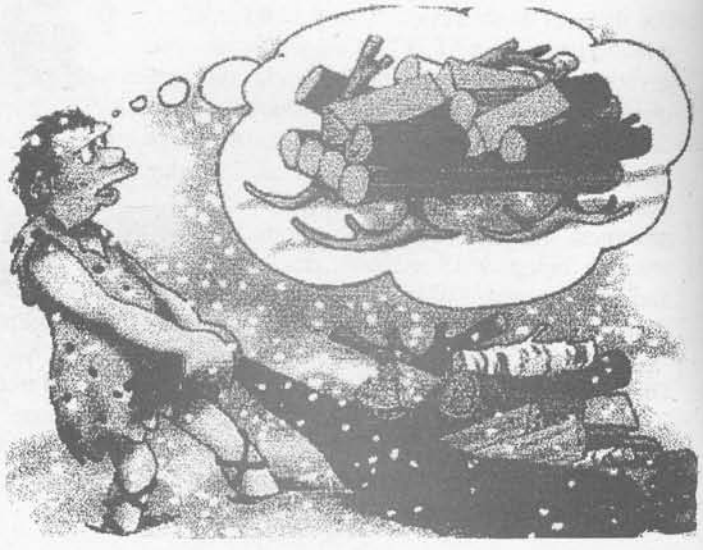
Our contact details are:

FABI/TPCP reception:
Telephone: 012 – 4203938
Fax: 012 – 4203960

Diagnostic clinic
Diseases (Teresa Coutinho): 012 – 4203934
Insects (Prem Govender): 012 – 4203854
Field Services (Jolanda Roux): 012 – 4203855
082 372 8350

THE RESEARCH TEAM OF THE TREE PATHOLOGY CO-OPERATIVE PROGRAMME

The research team of the Tree Pathology Co-operative Programme is varied. It includes full time staff of the University of Pretoria (Prof. M.J. Wingfield, Director and Mondi Professor, Prof B.D. Wingfield, Dr. T.A. Coutinho, Dr. A. Viljoen and Dr. J. Roux, Rosemary Visser, Shazia Shaik, Marveline Molema, Helen Doman and Sonja de Beer, colleagues and students attached to other organisations 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, provide advice and support where this is required.



CLINTON GETS THE MESSAGE ON BIOMASS ENERGY

[Washington] President Bill Clinton last week announced plans to boost research on biomass energy sources, with a view to tripling the use of biomass fuels by 2010. These currently account for 3 percent of US energy use.

Speaking at the Department of Agriculture on 12 August, Clinton said that biomass would provide extra farm income while enabling the United States to cut greenhouse-gas emissions. "Bio-energy is a means to heat our homes, to fuel our vehicles, to power our factories, while producing virtually no greenhouse-gas pollution," he said.

Clinton announced a scientific task force headed by Bill Richardson, the energy secretary, and Dan Glickman, the agriculture secretary, to draw up a research plan by the end of this year to prepare to meet the target. The task force is expected to recommend significant expansion of the $200 million that the United States spend each year on biomass research.

Biomass advocates say that advances in biotechnology – in particular the availability of cheaply produced enzymes that break down the cellulose in plants – are set to transform the economics of biomass as an energy source.

The President's Council of Advisors on Science and Technology recently recommended increases in research into new energy sources, including biomass.

But Clinton said he was alerted to the potential of biomass energy by a "brilliant" article in *Foreign Affairs* by Richard Lugar (Republican, Indiana), chair of the Senate Agriculture Committee, and James Woolsey, the former head of the Central Intelligence Agency. The president added: "It's not only brilliant, but a guy who is scientifically challenged like me can understand it."

Henry Kelly, assistant director for technology at the White House Office of Science and Technology, says: "The science says that the time is ripe for a major initiative" in biomass research.

The existing US ethanol programme, which subsidizes the conversion of corn seed into ethanol fuel, has been roundly criticized as an agriculture subsidy programme. Critics point out that the intensive farming of the corn fed into the ethanol plants consume more energy than the fuel that comes out of them. That would change if cellulose in the rest of the corn plant, which is currently wasted, or in other crops such as switchgrass, could be cheaply broken down. According to Lee Lynd, an engineer at Dartmouth College, New Hampshire, research could find enzymes that will do this cheaply, perhaps reproducing themselves as they go. Clinton's announcement comes during a summer in which low rainfall and depressed crop prices are creating major farm crisis in the United States. Officials said that the announcement would do little to help farmers in the near term. But Clinton saw it as an opportunity to argue that action to counter global warming could provide economic benefits, in this case for farmers. C.M.

Article in Nature (Vol. 400, August 1999)

All I need to know about life I learned from Trees.

It's important to have roots. In today's complex world, it pays to branch out.

Don't pine away over old flames.

If you really believe in something, don't be afraid to go out on a limb.

Be flexible so you don't break when a harsh wind blows.

Sometimes you have to shed your old bark in order to grow. If you want to maintain accurate records, keep a log. To be politically correct, don't wear firs. Grow where you're planted.

It's perfectly okay to be a late bloomer. Avoid people who would like to cut you down.

Get all spruced up when you have a hot date.

If the party gets boring, just leaf.

You can't hide your true colours as you approach the autumn of your life.

It's more important to be honest than poplar.

The Culture Collection of the TPCP

One of the most important assets of the TPCP is, without doubt, its collection of living cultures of tree pathogenic fungi. The aim of the Culture Collection is to keep these fungi alive for future reference. With a dead fungus you cannot do much. To effectively study a pathogen, you need it to be alive.

All the fungi in the collection have been isolated from infected parts of diseased trees and seedlings that were either sent to the Disease Clinic by members of the TPCP, or collected during field trips by team members. Once the fungus is transferred from the plant material to an artificial growth medium, we refer to it as an isolate. Several cultures can be made of a single isolate by transferring it to different bottles or Petri dishes containing growth media.

Various techniques are used for preserving cultures, because different groups of fungi require different storing conditions. The most common method is to store the cultures at 10°C on agar slants. For each isolate there are three bottles with cultures: one on agar only, one on agar covered with mineral oil and one in sterile water. These bottles are stored in specially designed cabinets in the cold room. Another method is to freeze-dry cultures in a lactose suspension and store them in sealed glass ampules in boxes in a -20°C freezer. The third technique is at this stage only applied to storing fungal populations. A population is a few hundred isolates of a particular fungus isolated from a specific area (e.g. a single stand of trees). These isolates are stored in cryo-tubes under glycerol. The tubes are then stored in the -70°C freezer.

The Culture Collection currently contains almost 10 000 cultures. Finding particular isolates in this huge collection can pose a problem, was it not for a specialised computer database. This enables us to locate a particular isolate within seconds. Each isolate has its own file containing the culture number, species name, host, area of origin, date of isolation and the name of the collector. A search in the database can be designed according to the searcher's needs: you can search for all isolates of a particular fungal genus or species, or all isolated from a single host, or all those originating from a specific area.

The costs of maintaining a collection of this stature are in excess of R250 000 per year. One part-time and two full-time staff members are currently employed by the TPCP to maintain the collection.

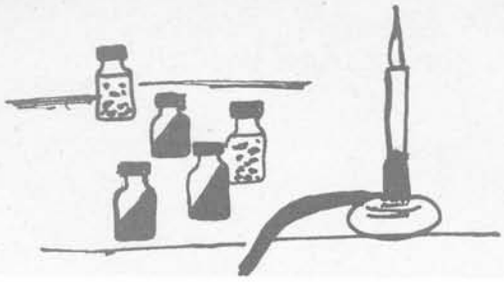
The importance of maintaining the Culture Collection can be summarised as follows:

1. The Culture Collection is essential for the correct identification of pathogens and therefore, of diseases. South African isolates can be compared morphologically and genetically with isolates from other countries to ensure correct identification.
2. The Culture Collection provides the means for population studies through which we can determine the origin of a disease by looking at the variability within fungal populations. With the advent of biological control, understanding the population structure of the pathogen is of extreme importance for successful control.

Helen Doman, Shazia Shaik and Sonja de Beer

3. The Culture Collection enables us to do pathogenicity tests with living cultures at a suitable time of year and at relevant locations. Pathogenicity tests are essential in the screening of newly developed clones and in determining the exact cause of any particular disease.

The Culture Collection of the TPCP is probably the largest single collection of tree pathogens in the world. The collection is viewed as an essential long-term investment by the forestry industry of South Africa. Long after we are all gone, these cultures will be alive and available for future generations of pathologists and foresters to study and effectively control diseases.



A first (but not the last) for FABI –

Annual Entomological Congress

For many years students and staff associated with the TPCP, and lately also from FABI, have made substantial contributions to annual congresses of scientific societies, both nationally and internationally. The most regular contributions were made at meetings of the Southern African Society for Plant Pathology (SASPP) and the South African Society for Microbiology (SASM). This year, for the first time, contributions from the TPCP and FABI were made to the Annual Entomological Congress. With the addition of an entomology section to the TPCP, headed by Prem Govender, this is set to become a regular feature on the TPCP/FABI calendar. The congress was held from 12-15 July in Potchefstroom and was hosted this year by the ARC – Grain Crops Institute. The congress was well represented with about 300 national delegates from Universities, Museums, Research Institutes and other organizations, as well as a number of international visitors and speakers. Session topics ranged from Integrated Pest Management and Biological Control to various aspects of insect ecology, biology and etiology. With four speakers from FABI a special session was, however, arranged for Forest Entomology. This session was very well received by everyone who attended. From the responses afterwards it was clear that FABI's contribution to the scientific content of the congress was much appreciated by the Society. With the enthusiasm that is going into this new route within FABI, this contribution will only increase in years to come.

> ..... it was clear that FABI's contribution to the scientific content of the congress was much appreciated by the Society.

Abstracts for Annual Entomological Congress - Potchefstroom

FUNGI, BARK BEETLES AND SAPSTAIN IN SOUTH AFRICA

Z.W. de Beer, X. Zhou & M.J. Wingfield

The forestry industry in South Africa looses millions of rands in profit every year as a result of sapstaining fungi. These fungi discolour high quality pine timber by penetrating the lateral rays and tracheids, rendering the wood cosmetically unacceptable to overseas customers. Many fungal species can cause sapstain, and some of these are associated with bark beetles. In South Africa, only three species of bark beetles have been reported on pine. These are *Orthotomicus erosus*, *Hylastes angustatus* and *Hylurgus ligniperda* (Coleoptera: Scolytidae). All three species have been introduced into South Africa accidentally and are thus exotic, as are the *Pinus* species which occur here. Although the bark beetles have been studied for several years, little is known about the fungal species associated with these pests in South Africa. During the past year, fresh pine logs were set out to trap beetles in the eastern parts of the country. The aim was to determine to what extent the bark beetles contribute to the sapstain problem and to identify the fungi associated with these insects. Preliminary results indicate that a number of ophiostomatoid fungi, including several *Ophiostoma* and *Leptographium* species, are associated with the bark beetles. A comprehensive understanding of the involvement of bark beetles, as well as the biology of the fungi causing the sapstain, is essential for effective control of the problem. These data are rapidly being accumulated and promise to be of practical significance in the future.

PESTS AND DISEASES OF ESTABLISHMENT OF *EUCALYPTUS* PLANTATIONS IN KWAZULU NATAL

P. Govender

The limited availability of land and water to forestry and the ensuing emphasis on intensive silviculture, developed a renewed interest in soil pests and diseases in the establishment of plantations. Three field trials were planted in representative areas over three seasons to determine the mortality factors influencing the establishment of commercial eucalypt plantations in KwaZulu Natal. A complex of indigenous soil pests contribute to an average 13,9% (range of 3,9% to 21,3%) failure of eucalypt seedlings from reaching full establishment. This pest complex, which includes termites, whitegrubs, cutworms, tipulid larvae, grasshoppers and millipedes, was responsible for up to 16,6% of the failure of the plantings to establish. Results are compared for various clones and species of eucalypts grown in both low and high productivity areas of eucalypt forestry in the Natal Midlands and Zululand. Registered chemical control measures are discussed.

SIREX NOCTILIO IN THE SOUTHERN HEMISPHERE – A FUNGAL PERSPECTIVE

B. Slippers, M.J. Wingfield, T.A. Coutinho and B.D. Wingfield

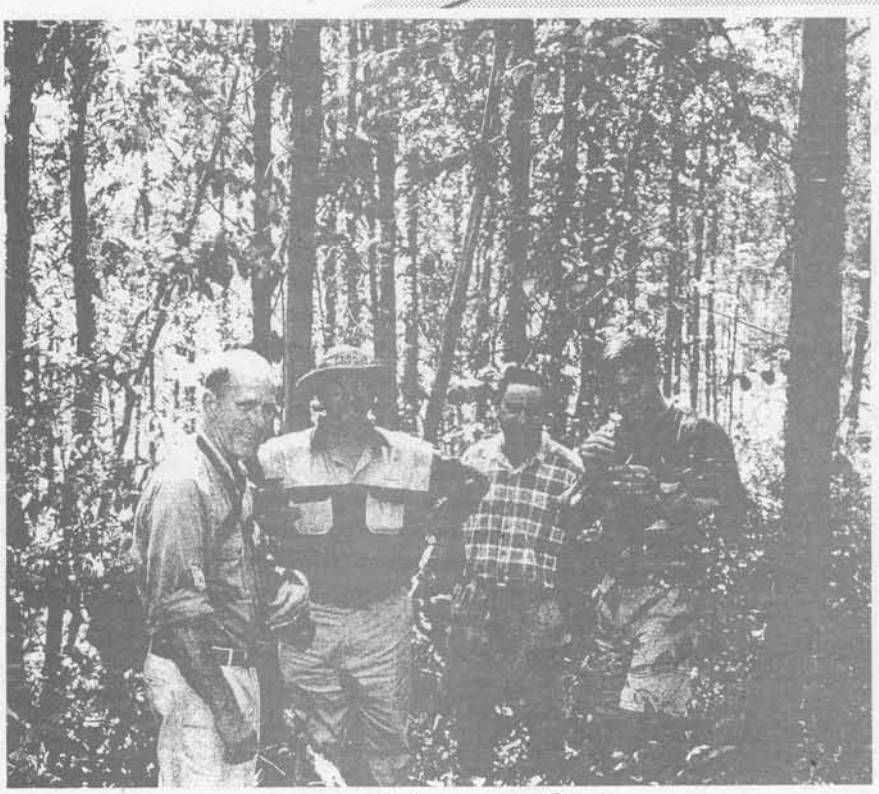
The symbiotic *Sirex noctilio-Amylostereum areolatum* complex is not considered a serious pest in its native range in the Northern Hemisphere. In the Southern Hemisphere it has, however, caused serious tree mortality in exotic pine plantations. A successful biological control programme for *Sirex*, using the parasitic nematode, *Deladenus siricidicola*, and seven parasitic wasp species, has been developed and implemented in Australia. During this process, little attention was given to the fungal symbiont associated with *Sirex*, despite the important role that it plays in the life cycle of this insect and its parasites. In this investigation, the taxonomic status and genetic relationship of isolates of *Amylostereum* that are associated with *S. noctilio* from different regions were studied using vegetative compatibility, DNA sequencing and restriction fragment length polymorphism (RFLP) analysis. Results have shown that the populations of the fungus associated with *Sirex*

in South Africa and Brazil are genetically uniform. This indicates that the fungus, as well as the insect, in these countries either has a common origin or that it was introduced to South Africa from Brazil. Furthermore, the fungal populations from these two countries are also genetically related to isolates of the fungus from other Southern Hemisphere countries. This suggests that since the initial introduction of the insect and fungus to the Southern Hemisphere, it has spread between the different pine growing countries of this region and was not reintroduced from the Northern Hemisphere. The *A. areolatum* strain that is used to mass-rear the nematode, *D. siricidicola*, was, however, found to be more closely related to European isolates of the fungus than to other isolates from the Southern Hemisphere. This implies that a different genetic entity of the fungus has been distributed with the nematode to countries such as Brazil and South Africa where this biocontrol programme has been implemented. It might also explain initial low parasitism rates of *Sirex* by the nematode in these countries. These results show the value of studying the fungal symbiont associated with this insect pest when planning control strategies.

FUNGI ASSOCIATED WITH *TOMICUS PINIPERDA* ON *PINUS YUNNANESIS* IN CHINA

Zhou Xudong, Ye Hui and Francois Lieutier

Tomicus species (Coleoptera: Scolytidae) are serious pests of pines with a wide distribution in Europe, Asia and America. In Yunnan, south-western China, *Tomicus piniperda* has killed more than 100 000 hectares of *Pinus yunnanesis* in the past 15 years. A blue stain fungus belonging to the genus *Leptographium* and thought to be an undescribed species is associated with *T. piniperda* in both the shoot-feeding and trunk-attacking stages of its life cycle. In this study we considered two stands of *P. yunnanesis* that were heavily damaged and two stands that were lightly damaged by the bark beetle. The occurrence of the fungus was closely linked to the different levels of stand damage. From February to April 1997 (the trunk-attacking period), and from June 1997 to January 1998 (the shoot-feeding period), *T. piniperda* had a fungal frequency of 5.5% and 17.5% respectively. Thus, the occurrence of the fungus increased greatly during gallery construction. In pine forests where damage was severe the occurrence of the fungus was 15.2% and 9.0% where damage was less severe. The occurrence of the fungus was also much higher than that reported from Europe. We believe that the fungus plays an important role in beetle attack in Yunnan and perhaps more so than elsewhere in the world.



EUCALYPTUS RUST
An International vision to prevent

***Puccinia psidii* (guava/eucalyptus rust pathogen) is known to infect five out of the eleven groups of genera within the Myrtaceae, including species of *Eucalyptus*.** Fortunately *P. psidii*, to date, seems to be restricted to South and Central America. There, it affects a wide range of Myrtaceous spp. and is very damaging to commercial *Eucalyptus* plantations, especially in Brazil. It is most severe on seedlings and juvenile trees, infecting meristems and leading to defoliation, stunting, multiple branching and in severe cases death. It is considered to be one of the most serious threats to commercial *Eucalyptus* plantations world-wide, as well as to native Myrtaceae.

The threat posed by *P. psidii* is two fold. As stated earlier it threatens not only commercial plantation forestry, but more importantly also the native Myrtaceae of the countries where *Eucalyptus* is planted. This is particularly worrying for Australia, since the Myrtaceae, especially *Eucalyptus* spp., are the dominant element of the Australian landscape. South Africa also has a number of representatives of the

Dr Ken Old, Marius van Jaarsveld, Paul Vierro and Bernard Slippers

Top:
Powdery Eucalyptus rust spore masses on infected plant.

Left:
Spores of the Eucalyptus rust pathogen viewed with an electron microscope

family Myrtaceae, while its forestry industry relies heavily on the propagation of *Eucalyptus* spp. From information gathered in Brazil, *E. grandis* and *E. cloeziana* are especially susceptible, while native species in the genera *Melaleuca*, *Psidium* and *Pimenta* are also affected.

The possibility of *P. psidii* spreading to South Africa and Australia has lead to the establishment of an international collaborative effort to control and limit the threat of this pathogen. Countries involved in this research programme are Australia, Brazil and South Africa. Earlier this year the programme was initiated with a visit by an Australian contingency to South Africa and Brazil to meet with all partners in the programme and introduce forestry companies and other relevant institutions to the threat of Eucalyptus rust. For this purpose, Australian collaborators Drs. Kenneth Old and John Fryer from the CSIRO and ACIAR respectively, visited FABI, Sabie, Kwambonambi and Pietermaritzburg to present a project proposal to South African forestry companies and meet with South African researchers involved in the project.

Presentations on Eucalyptus rust were made at Sabie, Kwambonambi and the ICFR in Pietermaritzburg. Our Australian visitors also had the opportunity to spend some time in the field, looking at plantations and disease trials and to meet some of our foresters. There was also an opportunity to show off some of our wild life in the Hluhluwe Game Park and St. Lucia Estuary, after which their visit was concluded by meetings at FABI. From South Africa, Ken and John went on to Brazil to negotiate and plan the next step in combating Eucalyptus rust.

Future research will include the screening of *Eucalyptus* and other genera of economic and conservation importance for susceptibility to *P. psidii*. Pest risk assessments, bioclimatic mapping of *Eucalyptus* hosts and *P. psidii* and, importantly, the development of diagnostic methods for *P. psidii* in asymptomatic plants and germplasm also form important components of the proposed project. All disease screening will take place in Brazil where this pathogen already occurs.

Any comments and suggestions regarding this project will be more than welcome and can be directed to FABI. We would like to thank our forestry colleagues for help during the visit of our Australian collaborators. Accommodation, facilities for presentations, sight seeing trips, meals and tours of plantations were highly appreciated. Ken and John left South Africa with wonderful memories and many new friends. Thanks to you all.

1999 TPCP Graduandi

During the last graduation at the University of the Orange Free State the TPCP had three more students obtaining their degrees in aspects of forest pathology. Congratulations on a job well done!!

Ph.D:
Francois Wolfaardt
Utilization of wood decay fungi for biokraft pulping of softwood.

M.Sc.
Bongani Maseko
Oomycetes associated with citrus and Eucalyptus root rot in South Africa.

Christa Visser
Molecular taxonomic studies on selected species of *Ceratocystis* and *Ophiostoma*.

Mensurationists field day at Kwambonambi

On Tuesday, 3rd August, the Mensuration and Modeling Research Consortium (MMRC) and TPCP presented a field day to update Mensurationists on the scoring system used to evaluate the impact of diseases on Permanent Sampling Plots (PSP's). Mensuration teams from Mondi, Sappi, Safcol and the ICFR attended the day. Heinz Kotze welcomed all to the field day and provided background to the MMRC and the progress made to date. This was followed by a presentation on *Eucalyptus* diseases in South Africa by Jolanda Roux during which some of the tricky symptoms were pointed out and new diseases were introduced to the group.

Evaluation of trees during the MMRC and TPCP field day at Kwambonambi

Since the 1997 MMRC meeting in Kwambonambi, where a similar presentation on *Eucalyptus* diseases was given, "new" diseases of *Eucalyptus* have appeared in South Africa. One "old" disease had also made a reappearance after 10 years during which it was not seen. The appearances of **new diseases and continual changes** in genetic composition of plant material/clones serve to emphasize the importance of continual monitoring of diseases. Selecting material tolerant/resistant to disease today, is no guarantee that the trees will still be resistant five years from now. The pathogens currently in South Africa are continuously changing and adapting and new fungi and bacteria, including potential pathogens, are introduced into South Africa on a daily basis. The more people **monitoring and reporting** diseases and their development with time, the greater the chance of any such potentially disastrous development being noticed and acted upon in a timely fashion.

After the indoor presentations the field day was moved into a seedling compartment where the TPCP and ICFR had selected *Eucalyptus* trees with as many as possible of the known diseases. Once again the most important symptoms were pointed out, whereafter each mensuration team was handed a disease rating sheet to score the 30 trees that had been selected for the exercise. Each team had to evaluate all 30 trees, whereafter scores were compared between the teams. Eight trees were also selected for the discussion of points on which a low correlation was found between teams. In general, all teams agreed in the scores given to each tree. This is very important for the maintenance of a nationwide disease database.

It was agreed that the day was a great success and a valuable experience for the mensurationists. The only way that South Africa can continue its proud history of commercial plantation forestry, especially clonal forestry, is by paying careful attention to pests and diseases. One need not search far to find examples of the devastating impact that these little organisms can have on plant and tree health. South Africa has been fortunate. This is mainly due to the rapid action taken by the South African forestry companies 10 years ago, when the first disease outbreaks on clonal trees in the country appeared. It is essential not to loose this advantage by becoming complacent about pathogens.

CHINA BEACH

In March this year the Governments of South Africa and the People's Republic of China signed an agreement to strengthen economic and cultural ties between the two countries. This agreement also includes the

Jinbiao Chen, Li Hong, Renfeng Pang, Minhao Shi, Brenda Wingfield, Xudong Zhou and Yuchen Wang

development of ties in Science and Technology. In August the Counselor of Science and Technology, **Mr. Shi MingHao**, the vice chairman of the China-Africa Engineering Association (CAEA) and **Mr. Pang RenFeng** visited FABI to establish research links between the two countries in the field of biotechnology. Their visit to FABI included tours of the facilities and discussions on possible collaborative research ventures. **Xudong Zhou** and Wilhelm de Beer, both Ph.D students of FABI, presented talks on the interaction between blue-stain fungi and bark beetles, something of great concern to both countries.

As a result of this visit and the discussions on biotechnology, articles on FABI, as well as on Mike and Brenda, appeared in the China News South Africa newspaper of 26 August. A presentation by Xudong Zhou on "Fungi, bark beetles and blue stain in China and South Africa" was also presented at the First National Conference of Chinese Scholars in South Africa on September 25th in Johannesburg.

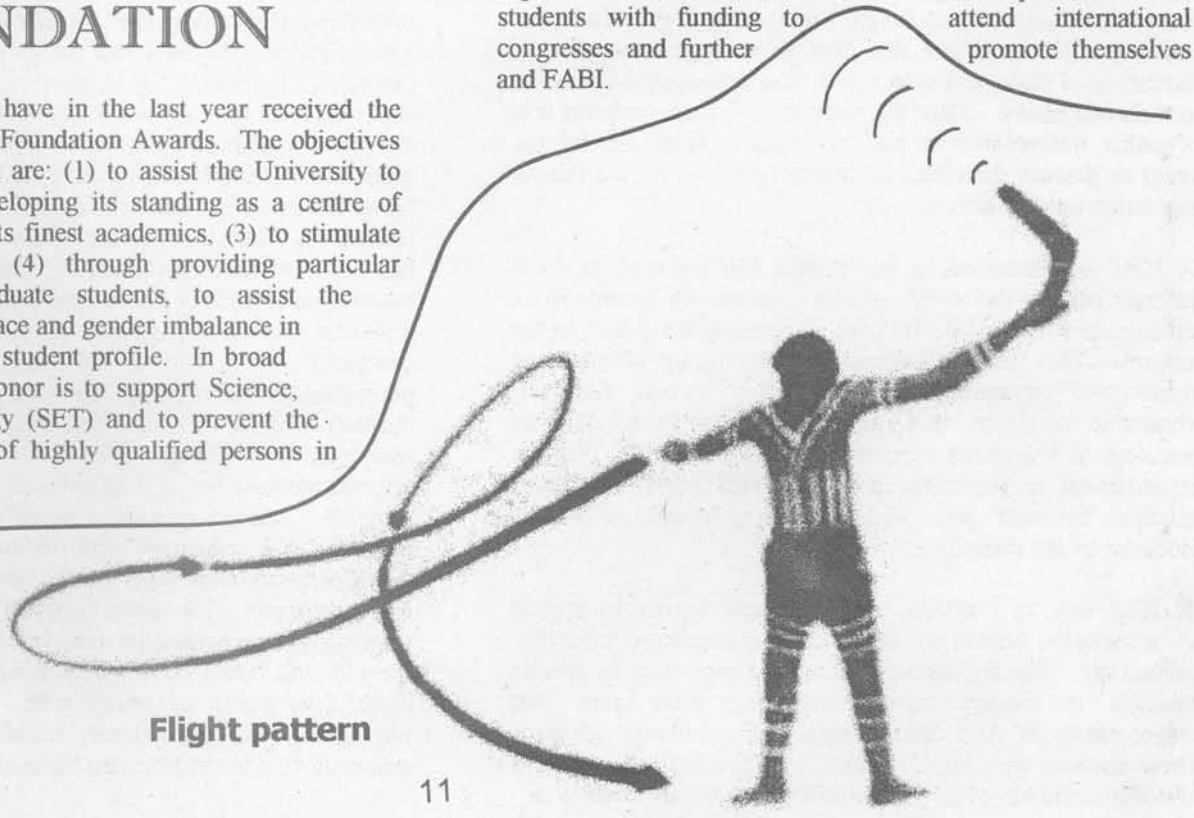
Students and their mentors.

Back: *Treena Burgess, Teresa Coutinho Ntsane Moleleki, Brenda Wingfield, Bongani Maseko Mike Wingfield and Oliver Preisig.*
Front: *Bernard Slippers, Robert Mokgatla and Martin Coetzee*

PRESTIGOUS AWARDS for FABI STUDENTS from MELLON FOUNDATION

Five of FABI's students have in the last year received the highly prestigious Mellon Foundation Awards. The objectives of the Mellon Foundation are: (1) to assist the University to achieve its vision of developing its standing as a centre of excellence, (2) to retain its finest academics, (3) to stimulate postgraduate study and, (4) through providing particular opportunities to postgraduate students, to assist the University in altering the race and gender imbalance in its staff and postgraduate student profile. In broad terms, the wish of the donor is to support Science, Engineering & Technology (SET) and to prevent the erosion of skills or loss of highly qualified persons in these critical areas.

These awards seek to combine elements of academic and research excellence and to provide suitable mentoring by staff members with proven records of postgraduate supervision. Research projects considered to be of importance to the future of tertiary education in South Africa also receives a high priority. The awards thus, go to both the students and their mentors and some of the criteria used to evaluate applications include the academic records of the student and the staff member.In the first round of awards Robert Mokgatla with Mike Wingfield and Ntsane Moleleki with Brenda Wingfield received awards. In the latest rounds three more students received awards with either Mike or Brenda as mentors. They are Bongani Maseko, Martin Coetzee and Bernard Slippers. This is a substantial boost to the FABI research programme and allows the group to buy equipment and fund general running costs, such as the very expensive chemicals we need. It also provides the students with funding to attend international congresses and further promote themselves and FABI.



Flight pattern

KOALAS, BOOMERANGS AND FUNGI

International congress of MYCOLOGY held in SYDNEY, AUSTRALIA

Sydney (Australia) hosted the combined 9th International Congress of Bacteriology and Applied Microbiology (IX ICBAM) and the 9th International Congress of Mycology (IX ICM) from 16 to 20 August. These congresses concentrated, in general, on bacterial and fungal biodiversity. Emphasis was placed on the important role that these organisms play in harnessing of biological resources to the advantage of humans, animals and plants. Thus, the main focus of the congress was to gather microbiologists and mycologists from around the world to discuss the effect of microorganisms on the human population into the next century.

IX ICM was attended by more than 350 mycologists from different parts of the world. Martin Coetzee and Jolanda Roux represented FABI, while Bernard Slippers sent a poster to the congress. They had the opportunity to expose the international mycological community to the FABI. It was, however, wonderful to learn that many scientists from different mycological disciplines were already aware of FABI. This can be attributed to the existing FABI WEB page, congresses attended by staff and students and publications already produced by the institute.

IX ICM was an excellent arena for mycologists to present advances in the field of mycology to the international scientific community. Plenary sessions included topics such as species concepts in modern fungal taxonomy, biodiversity and biogeography of Australasian fungi and population genetics. These sessions were supplemented with symposia on diversity of different classes of fungi, molecular analysis and biology of human and plant pathogenic fungi, mycotoxins and fungal plant interactions, to name but a few.

Several points were clear from the congress. The first is that the taxonomy of many of the fungi is still obscured by the reluctance of some taxonomists in realising the importance of molecular biology to clarify and support morphological findings. This leads to unnecessary reclassification of fungi and duplication of work. Many people still do not realise how much molecular and morphological biology can compliment each other. Secondly, data from Africa and the Southern Hemisphere is still, in a mycological sense, mostly ignored in larger studies conducted by Northern Hemisphere researchers. This is an unfortunate situation and creates many missing links in mycological and other data. It is clear that the Southern Hemisphere can contribute much to mycological knowledge in the future. The scientific community in the Southern Hemisphere needs to use this opportunity to their advantage, and fill the missing links in mycological databases. Thirdly, the Forestry and Agricultural Biotechnology Institute is producing cutting edge science and is making an important contribution to mycology in Africa and internationally.

Abstract for presentation at 9th International Congress of Mycology - Sydney

PHYLOGENETIC RELATIONSHIPS OF AUSTRALASIAN *ARMILLARIA* SPECIES

Martin Coetzee[1], Brenda Wingfield[1], Mike Wingfield[1], Geoff Ridley[2]

[1]Department of Genetics, Forestry and Agricultural Biotechnology Institute (FABI), Tree Pathology Co-operative Programme, University of Pretoria, Pretoria, South Africa, 0002. [2]New Zealand Forest Research Institute Ltd., New Zealand.

Armillaria (Basidiomycetes, Agaricales, Tricholomycetaceae) species cause Armillaria root rot on a variety of plant species throughout the world. A number of *Armillaria* spp. occur in Australia namely *A. hinnulea*, *A. fellea*, *A. fumosa*, *A. pallidula*, *A. novae-zealandiae*, *A. luteobubalina* as well as two unidentified but morphologically distinct *Armillaria* spp. In New Zealand, *A. limonea* and *A. novae-zealandiae* were recognised. The taxonomy of these different *Armillaria* spp. has been extensively studied in Australia and New Zealand based on morphology and sexual compatibility. No molecular based taxonomic or phylogenetic studies have, however, been conducted. The aim of this study was to determine the phylogenetic relationship between *Armillaria* spp. from Australia and New Zealand and to develop a quick PCR-RFLP (polymerase chain reaction restriction fragment polymorphisms) based diagnostic technique to identify them. The IGS-1 and ITS regions of the rRNA operon were amplified and the DNA sequences were determined. ITS sequences of *Armillaria* spp. from other geographical regions were included for comparison. Phylogenetic trees were generated from the sequences using parsimony analysis. The amplified DNA from the ITS and IGS-1 were digested with restriction enzymes to detect interspecific polymorphisms. *Armillaria hinnulea* was phylogenetically more closely related to the other *Armillaria* spp. occurring in the Northern Hemisphere than it was to the

other Australian and New Zealand *Armillaria* spp. The rest of the Australian and New Zealand *Armillaria* spp. included in this study formed a monophyletic clade. Interspecific polymorphic PCR-RFLP bands were observed enabling the development of a rapid identification technique for *Armillaria* spp. from Australia and New Zealand.

JOINT MEETING OF THE AMERICAN AND CANADIAN PHYTOPATHOLOGY SOCIETIES Montreal, Canada, 7-12 August 1999

This year, Teresa Coutinho had the privilege of representing the Tree Pathology Co-operative Programme (TPCP) at the annual American Phytopathology Society Meeting in Montreal. Every ten years the Canadian and American Societies hold a joint meeting and 1999 was the year of their combined meeting. Approximately 1500 plant pathologists attended the meeting from various parts of the world. Apart from Teresa, Dr. Adrian Smit from INFRUITEC was the only other South African participant.

A forest pathology field trip was held the day before the conference officially started. Ninety keen pathologists headed about 150 km north of Montreal. Not only was it great to see different diseases but it was also a wonderful opportunity to meet other forest pathologists. Our first stop was at a Scots pine plantation, ~641 000 ha in total, that had been severely damaged the previous year by ice storms and wind. The next two stops were to observe two root diseases which do not occur in South Africa, viz. Annosus and Tomentosus root rot. Both these diseases are caused by Basidiomycetes (Armillaria also belongs to this group of fungi). The last stop was probably the most spectacular – Scleroderris canker of red pine. The fungus responsible for this disease causes what the foresters term "scleroderris twister" – a deformation of the trunk that takes the shape of a corkscrew.

The welcome and plenary addresses were fascinating and focused on the economic and social impacts of plant diseases. The example that was used was Fusarium head blight which has descimated wheat and barley farms in the USA. One of the speakers was a psychologist who treated farmers and their families who were financially ruined by the disease and lost everything. In our profession, one often only focuses on the science and often forgets the devastating effects diseases can have on the livelihood of farmers.

A number of paper presentations were held concurrently on a diverse range of topics. The forestry session was strongly focused on tree diseases caused by rusts - their incidence and allelic diversity. One other interesting presentation in this session was on the involvement of insects as a vector of the oak wilt pathogen. Tremendous progress is also being made in understanding the interactions between pathogen and their hosts at the biochemical and molecular levels. There were some excellent presentations on this topic. The congress also provided a valuable venue for meetings with fellow forest and plant pathologists.

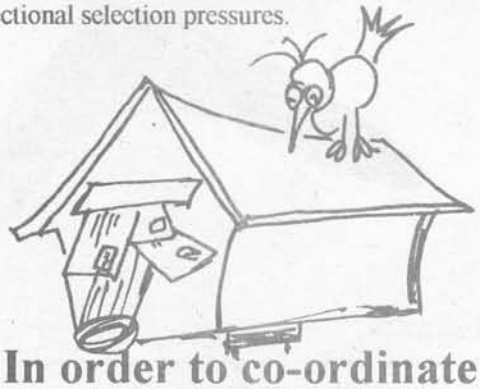
Poster abstract at American Phytopathological Society meeting – Canada

MORPHOLOGICAL, CULTURAL AND PATHOGENIC CHARACTERISTICS OF *CONIOTHYRIUM ZULUENSE* ISOLATES FROM DIFFERENT PLANTATION REGIONS IN SOUTH AFRICA

Van Zyl L.M., Coutinho T.A. and Wingfield M.J.

Coniothyrium canker, caused by *Coniothyrium zuluense*, is the most serious stem disease of *Eucalyptus* spp. in sub-tropical regions of South Africa. This disease is typified by necrotic bark lesions that coalesce to form large kino-impregnated cankers along the stems. The strategy currently used to manage Coniothyrium canker in plantations is to deploy *Eucalyptus* species or clones that are tolerant to the disease. Considerable success has already been achieved in this regard, but the long-term durability of tolerance is of concern. Thus, forest managers are interested in the genetic diversity of the pathogen and its potential to overcome disease tolerance in planting stock. In this study, 343 isolates of *C. zuluense* from different plantation regions in South Africa were compared on the basis of colony colour, conidial morphology, growth characteristics on agar and virulence to a susceptible *E. grandis* clone. Conidia of all *C. zuluense* isolates were similar in size and shape. The fungus is slow growing in culture, which is

indicative of its apparent biotrophic habit with optimum growth observed at 30°C. Isolates of *C. zuluense* displayed considerable variation in colony colour and pathogenicity to inoculated trees. Variation in morphology and pathogenicity amongst isolates suggests that *C. zuluense* has been present for an extended period of time, or that it is changing rapidly due to strong directional selection pressures.



In order to co-ordinate our services to you please help us by using the following contact address

PCR-BASED DIFFERENTIATION OF *MAT-1* AND *MAT-2* FROM *GIBBERELLA FUJIKUROI* MATING POPULATION H

Steenkamp E.T., Wingfield B.D., Coutinho T.A., Wingfield M.J., Marasas W.F.O. and Leslie J.F.

Fusarium subglutinans f.sp. pini is a pathogen of pine and belongs to the H mating population of the *Gibberella fujikuroi* complex. Isolates of this biological species are heterothallic, with individuals of either *MAT-1* or *MAT-2* mating type. Identifying mating type by sexual crosses is a time-consuming procedure and results are often inconclusive. A fast and reliable method for differentiating the two mating types is, therefore, needed. We designed PCR primers from conserved regions of the *MAT-1* and *MAT-2* idiomorphs. One primer pair was designed from the alpha domain in the *MAT-1* idiomorph. The other was designed from the *MAT-2* HMG domain. A PCR reaction containing both these primer pairs amplified either an 800 bp fragment, for *MAT-2* isolates, or a 200 bp fragment, for *MAT-1* isolates. It was thus, possible to determine the mating types of strains of *Gibberella fujikuroi* mating population H in a single PCR reaction.

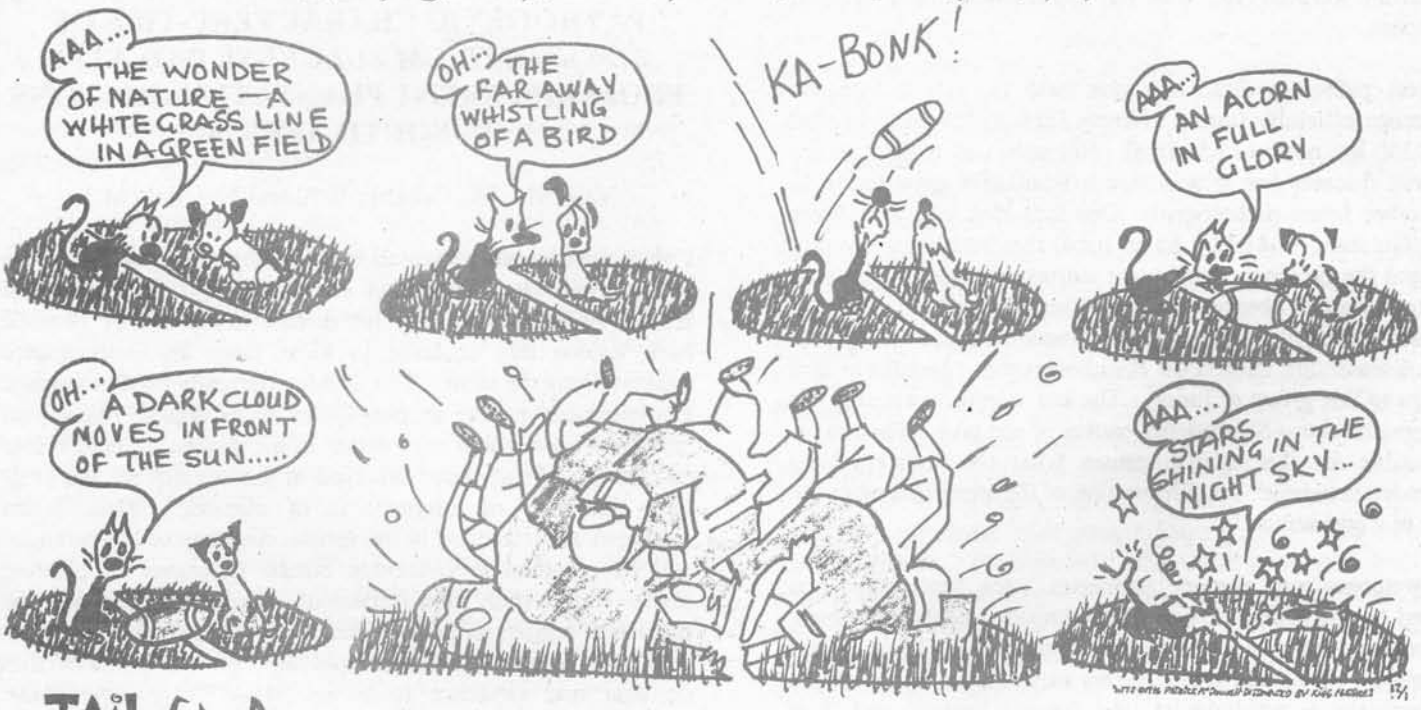
POSTAL ADDRESS

Tree Pathology Co-operative Programme
Att: Prof. Michael J. Wingfield
Mondi Professor of Forest Pathology and Director of FABI
Forestry and Agricultural Biotechnology Institute (FABI)
University of Pretoria 0002

STREET ADDRESS FOR DELIVERIES

74 Lunnon Road (between Tindall and Herold Street)
Hillcrest
Pretoria

Tel: 012-420 3939 Fax: 012-420 3960
E-mail: Mike.Wingfield@fabi.up.ac.za
Web page: http//www.up.ac.za/academic/fabi/tpcp



TAIL END by PatrickMcDonnell

Layout and design by Susan Christie