

tree pathology news

NEWSLETTER OF THE TREE PATHOLOGY
COOPERATIVE PROGRAMME - UOFS

NO 13

JUNE 1996

Introductory message from

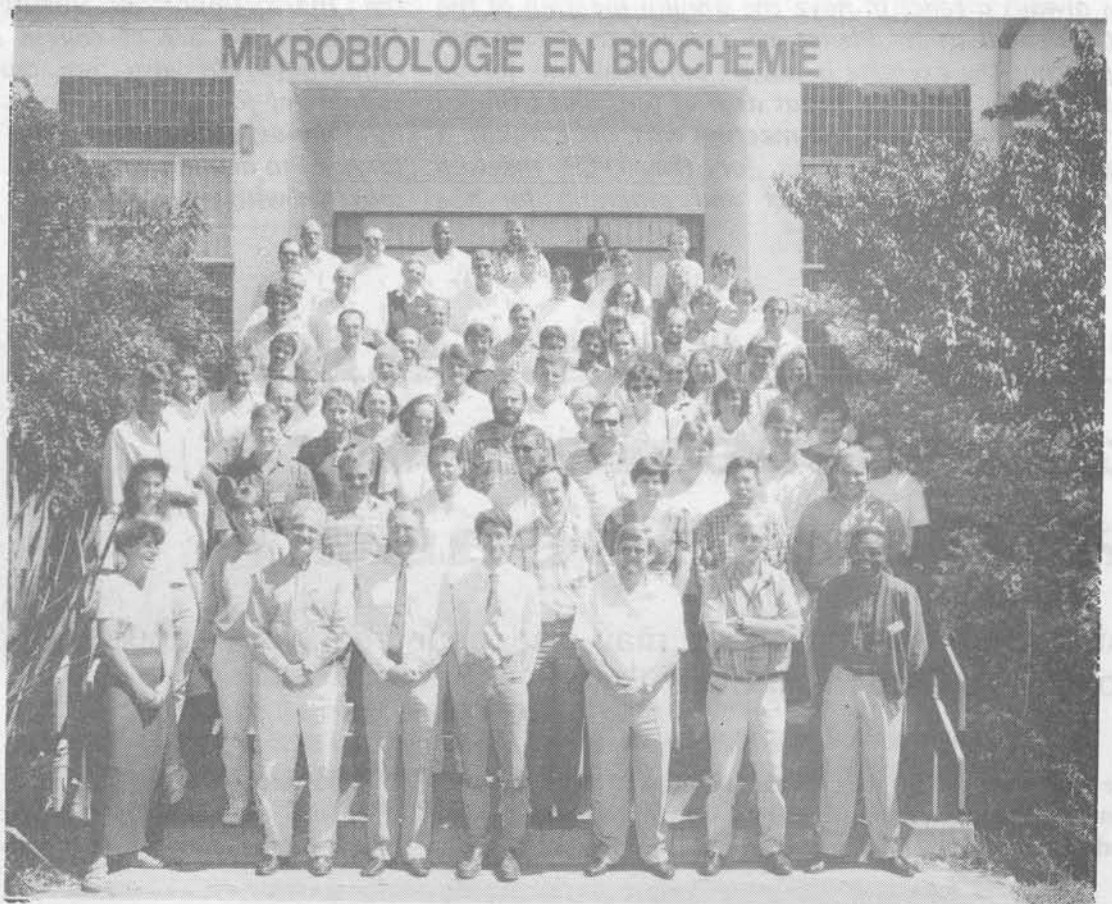
Mike Wingfield and the TPCP TEAM

Almost six months have passed since the dispatch of the last issue of Tree Pathology News. During this time much research has been conducted, a number of major field visits have been made, many team members have attended our Annual Plant Pathology Congress to present results of the past years work (some abstracts are included in this issue) and the annual meeting of the TPCP has been held. Suffice to say that the end of 1995 and the early months of this year have been industrious and productive.

The TPCP has reached the end of its sixth formal year of existence. Most of you that are closely involved in the programme will recognise that this period has marked one of the more exciting periods in our understanding of tree disease, as well as various aspects of biotechnology that pertain to it. I remarked in a recent presentation to a forestry group how remarkable it is, that the majority of major diseases of commercial forest tree species, with which we are concerned WERE UNKNOWN TO US at the initiation of the Programme. This is a matter that is briefly discussed elsewhere in this issue.

Eminent visitors.....

During the course of the past six months, the TPCP has enjoyed the company of a number of eminent visitors from various parts of the world. Towards the end of last year, Dr Bill Dvorak visited the Programme. The aims and intentions of this visit are discussed in a separate feature of this issue of Tree Pathology News. Early in 1996, Dr Keith Seifert of Agriculture Canada visited us and also joined the group attending the annual meeting of the Southern African Society of Plant Pathology at Stellenbosch. Keith, who also briefly visited Zululand and presented



Delegates at the Tree Pathology Cooperative Programme Annual Meeting.

The number of members attending the meeting have over the past six years increased from about twelve to over 80 members.

a lecture to Mondi staff there, is one of the world's best known fungal taxonomists. He has had considerable experience in working with wood-inhabiting fungi - consistent with his first formal post with Forintek Canada Corp. Later in January, we enjoyed a day's visit by five research staff of Weyerhaeuser (USA) also accompanied by Cecelia Bester and Neville Wessels of SAFCOL. This visit allowed the TPCP to share some of their successes with senior forestry colleagues, and to explore opportunities for collaboration.

Visitor from New Zealand.....

Another visitor to the TPCP in recent months was Mr Bill Dyck of Carter Holt Harvey, New Zealand. As many readers of this Newsletter will know, Bill's visit was commissioned by our minister of Forestry, Mr Kadar Asmal who desired a review of forestry research in South Africa. Mr Dyck's visit to Bloemfontein was scheduled for a Saturday, which was not fully ideal, if one considers that we might like to have shown the TPCP engine "roaring at full steam". Nevertheless, we "mobilised the troops" as best we could and enjoyed an interesting and happy day of research and demonstrations. What was particularly enjoyable for our team is that Bill Dyck has a strong academic background and is well informed in the field of forest protection. This meant that we were able to gain much from his experience and perhaps contrary to our expectations, this visit was beneficial to us, and hopefully also to our visitor

It is always a relief to have the annual meeting of the TPCP behind us !! Please be assured that I do not imply that the exercise is not an enjoyable one for all of us. It certainly is a great deal of fun, and I think I can safely report that the meeting was, once again, a great success. Preparing for the TPCP meeting requires considerable effort and planning for the

entire team. This, indeed is the only negative aspect of the entire exercise. Preparing and practicing lectures, preparing reports and budget statements, organising accommodation and catering all begins early in January. Some of us become quite frantic as March creeps closer!!

TPCP meeting.....

This year, the annual meeting of the TPCP included a number of special features. The meeting coincided with a visit to the group by Dr Cynthia Ocamb, and internationally recognised specialist on biocontrol of root diseases in pine seedling nurseries. We were therefore able to enjoy a lecture on this topic as well as one by Dr Janusz Zwolinski who prepared an excellent summary of past research on the Old Lands Syndrome. The meeting was also used as an occasion to inaugurate a new, SAFCOL sponsored, research thrust on *Botryosphaeria* canker of eucalypts. This new and exciting project was announced by Dr Tienie van Vuuren, CEO of SAFCOL, who also signed the five year contract that will provide funding for it. Some details of this project are provided in a short item elsewhere in this issue.

It will be clear from these rather rambling introductory comments that the intervening period since our last Tree Pathology News, has been most active for the TPCP. I believe that all will agree that the Programme has grown from strength to strength in its short seven year history. Many forestry figures, both in South Africa, and abroad, consider the TPCP to be one of the more important institutions of South African Forestry. We are of course all proud of this positive reputation, but also owe our success, largely to the support of foresters and forest managers who assist us in many aspects of our work. We thank you all and look forward to dealing with many tree protection challenges, together with you.

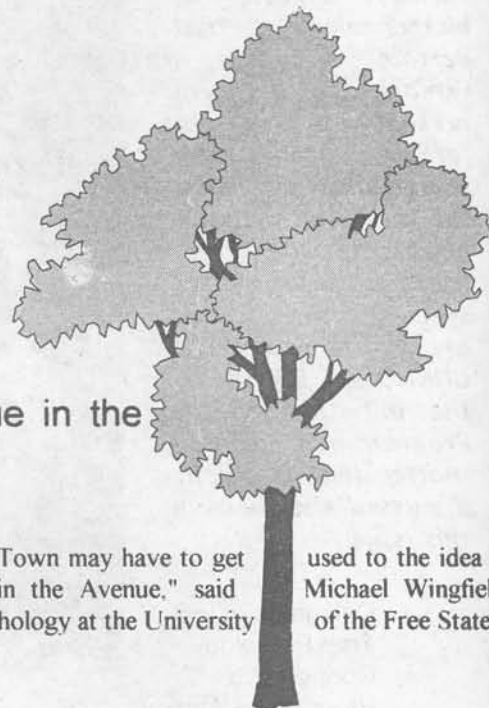
"Avenue's oaks threatened by killer disease"

*After 200 years oak trees may disappear from the Avenue in the Company's Gardens in Cape Town.

The oak trees lining the Avenue in Cape Town's historic Company Gardens are threatened by a killer disease and may be gradually replaced by other species over the next few years.

"The people of Cape Town may have to get no oak trees at all in the Avenue," said professor of forest pathology at the University

used to the idea of Michael Wingfield, of the Free State.



Several oak trees were taken down last week as Professor Wingfield carefully chopped out samples of wood for laboratory analysis.

The most worrying aspect, said Alan Botes of the Cape Town City Council's parks department, was that most of the dying trees were planted only 20 years ago to replace oaks that died of disease or old age.

"We thought that replacing the old trees with other, hardier oak species would ensure the survival of the oak avenue, but that hasn't happened," he said.

Mr. Botes and his colleague, Gardens manager David Curran, agreed that the council hoped to keep the oak avenue as long as possible, but admitted that there had been discussions about other species of trees to replace the oaks.

Oaks were first planted in the avenue in 1795, just over 200 years ago. In Van Riebeeck's day the avenue was lined with orange and lemon trees, and in the following century by chestnut trees.

The oaks are being attacked by "a whole suite of diseases," said the professor.

"There may be ways of delaying or even stopping the spread of the disease."

He said it was coincidental that his visit to Cape Town was so soon after a British visitor was killed when a branch of an oak on the Buitenverwachting estate fell on him.

Professor Wingfield said there was "no way" in which the collapse of a tree could be predicted with certainty.

"Certain municipalities overseas have taken the extreme approach of cutting down all the trees in public places after accidents in which people were injured."

Former Irish soccer international Vic McKinney was killed and his son Victor seriously injured in 1987 when a black wattle tree was blown on to his car in De Waal Drive. Mrs. McKinney sued the council for R3 million but settled out of court for an undisclosed sum.

A lawyer said that there could be liability if it could be foreseen that a tree was dangerous.

Marius Coetzee, acting-director of the parks department, said district managers monitors trees regularly and removed those considered dangerous.

Report by JEAN LE MAY in SATURDAY Weekend
Argus, January 13/14 1996

DYING EUCALYPTS in SOUTH EAST ASIA

Many readers of Tree Pathology News will be well aware of the ongoing and rapid expansion of eucalypt plantations in various parts of South East Asia. Countries such as Thailand, Indonesia and Vietnam are major players in this programme. The major species that is being planted is *Eucalyptus camaldulensis* which is well adapted to both the distinct wet and dry periods experienced, as well as to the generally hot and humid conditions. At this stage, most of the plantings are based on seedling propagation but clonal trials and plantations have already been established in various parts.

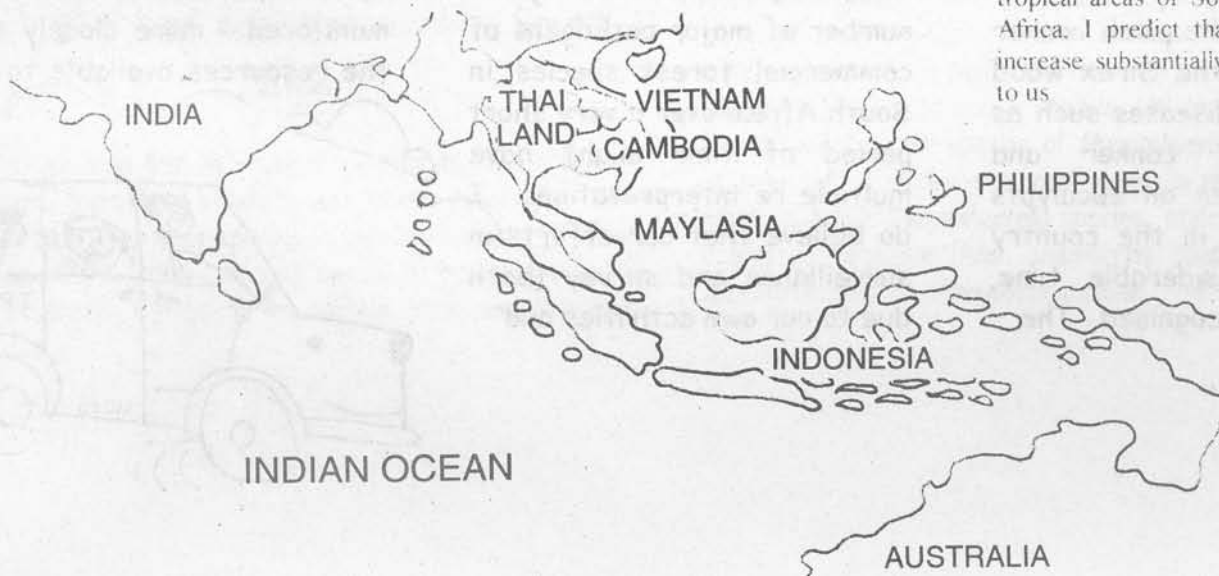
At an early stage in the establishment of eucalypts in S.E. Asia, it was realised that serious disease problems are common. One of the most dramatic has been a leaf blight and shoot die-back disease that tends to begin towards the end of the rainy season. This has come to be known as the "Cylindrocladium leaf disease problem" in the region. It has generally been accepted that this disease is caused by the fungus *Cylindrocladium quinqueseptatum*.

During the course of a number of surveys of eucalypt diseases in S.E. Asia, I have been puzzled at the difficulty that I have experienced in detecting *Cylindrocladium* on samples

Very recently, a new and pathogenic fungus, known as *Cryptosporiopsis eucalypti* has only recently appeared and makes little reference to the pathogenicity. However work done by colleagues in Australia have shown that it is highly virulent.

On a recent visit to Thailand, including a survey of eucalypt diseases, it became evident that *Cryptosporiopsis eucalypti* is very likely the more common cause of the serious leaf and shoot blight of eucalypts in the region. There is clear evidence that different provenances and clones differ markedly in their susceptibility to this disease. Thus great opportunities exist to select trees tolerant to the disease and to develop rapid screening systems to ensure that susceptible trees are not planted.

At this stage, *Cryptosporiopsis eucalypti* is not known in South Africa. It might well be that the climate here is not conducive to infection. However, as planting programmes extend to more tropical areas of Southern and Central Africa, I predict that this disease will increase substantially in its importance to us.



NEW DISEASES GALORE - WHAT DOES THIS MEAN?

In the introduction to this document, it was noted that many diseases including the majority of those of greatest concern to us, were not known in South Africa at the onset of the TPCP. Thus, *Cryphonectria* canker had just been discovered but diseases / pathogens such as *Botryosphaeria* canker of eucalypts, *Ceratocystis* wilt of wattle, the pitch canker pathogen, *Coniothyrium* canker of eucalypts, the *Sirex* wood wasp were not known to us.

A question that must now be asked, is whether all these newly discovered diseases exemplify a marked introduction of new pathogens into South Africa. This is a question to which I have contributed some considerable thought. I certainly have no doubt that new pathogens are entering the country and there appear to be some rather obvious examples. Here I would include the pitch canker pathogen and the *Sirex* wood wasp. Other diseases such as *Botryosphaeria* canker and *Endothia* canker on eucalypts were probably in the country for some considerable time, but just not recognised. The

origin of other pathogens such as the causal agent of *Coniothyrium* canker remain enigmatic.

Many questions relating to the regular appearance of new pathogens and pests remain to be considered, and answered. It will always be essential for us to understand whether a pathogen is native in South Africa, or has been introduced from elsewhere in the world. The major issue that we must consider here is how diverse the pathogen population is. Introduced pathogens, at least in their early years of appearance, would tend to have limited population diversities (a relatively high degree of clonality). Our capacity to deal with these in terms of breeding and selection would be greater than in the case of pathogens that are diverse in genetic base, and changing rapidly.

The discovery of a great number of major pathogens of commercial forest species in South Africa over a very short period of time might have multiple re interpretations. I do believe that our efforts (in surveillance and survey (both due to our own activities and

significant contributions from foresters) have improved greatly during the last decade. This is a trend that I hope will not only continue, but that will also gain further momentum in the future. The TPCP is currently involved in various initiatives to ensure that this is achieved.

New pathogens are almost certainly being introduced into the country. This is perhaps not surprising, given the increased movement of people and products to and from the country.

Although improvements in our quarantine system are warranted, the likelihood that we can isolate our trees from many other pathogens is probably small. In my view, two factors count strongly against our capacity to exclude pathogens and pests from our country. One is that we have a very large coastline with multiple points of entry that need to be monitored - more closely than the resources available to the



country. Secondly, we have a so called "land bridge" into a number of other countries, that might have less effective quarantine initiatives than we do. Any pathogen entering a neighbouring country will thus have the capacity to move into our plantation areas.

The above view might be considered somewhat negative. I do, however, believe that we can, and should, slow the movements of pathogens into South Africa, as actively as possible. Effective monitoring of diseases will also remain an essential component of our

capacity to evaluate the changing health status of our forests. In this way, new introductions will be recognised early and we will have enhanced opportunities to reduce losses through selection and breeding.

BILL DVORAK VISITS BLOEMFONTEIN

Dr. Bill Dvorak, Director of CAMCORE visited Bloemfontein and the TPCP on the 21st September 1995 and after the recent CAMCORE meetings held in Zimbabwe. This visit was focused primarily on holding discussions regarding the pathology risks associated with the international movement of pine seed. These discussions initially arose from concerns expressed by various players in the South African forestry industry and CAMCORE regarding the recent outbreaks of pitch canker of pines in a number of new and widely dispersed geographic areas. During his visit, Bill was to be accompanied by Neville Denison (Mondi), Barri Herman (Mondi), Neville Wessels (SAFCOL) and Cecile Bester (SAFCOL). Neville Wessels unfortunately had to withdraw due to ill health and was not able to join the group.

Discussions on the safe movement of pine germplasm during Bill Dvorak's visit were productive and constructive. CAMCORE has strived to ensure that seed distributed through this important programme is devoid of pathogens. To reduce risks associated with distribution of this material, small seed lots are usually distributed. These are also treated to eliminate fungi and insects. The problem that potentially arises is associated with the fact that many fungal pathogens are internally seedborne.

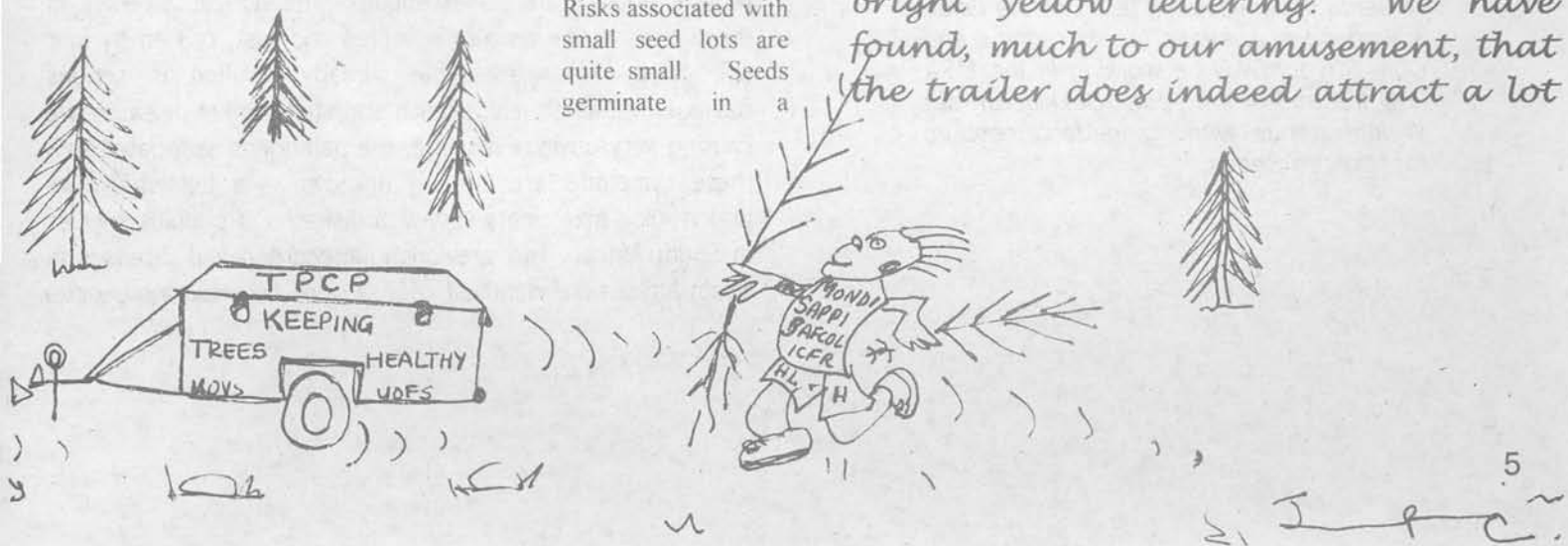
fungicide rich environment and it is assumed that internal pathogenic fungi would be eliminated. Moreover, if seedlings arising from imported seed lots are carefully monitored for disease and treated regularly with fungicides, the risks have to be minimal. CAMCORE is clearly banking on such an approach and also endeavours to collect seed from healthy trees. Large seed importations for commercial plantings are sometimes unavoidable - yet hold a high degree of risks for the South African Forestry Industry

THE GREEN GOLIATH

A new wagon for the TPCP

Towards the end of last year we decided that our presence in the forestry areas of South Africa should become more noticeable. The equipment, together with the large amounts of luggage and food we usually take with on field trips, necessitates the use of a trailer. To achieve our objective we painted the trailer TPCP colours - "BP green" with bright yellow lettering. We have found, much to our amusement, that the trailer does indeed attract a lot

Risks associated with small seed lots are quite small. Seeds germinate in a



of attention. Cars now frequently overtake to read the information portrayed on it and our existence is becoming better known. At garages we are often questioned about our work and the public are fascinated with our endeavours. One of the questions usually asked is "Why Bloemfontein???" There are not trees in that province!!!". We are thoroughly enjoying the attention - maybe we should now consider acquiring a green combi..... Should you see us on the road and require assistance with a disease-related problem please do not hesitate to stop us (if you can!!!.....).

ABSTRACTS OF RECENT (1996) CONGRESS PAPERS

Isozyme variability in field populations of South African *Phytophthora cinnamomi* isolates

Phytophthora cinnamomi is an internationally important pathogen with a wide range of hosts. Despite this, the origin of the fungus and thus its biogeographical status, both in South Africa and elsewhere remains unknown. One hundred and fifty South African *P. cinnamomi* isolates from 46 different host species were studied using isozyme analysis to determine variability in the population. A1 and A2 *P. cinnamomi* isolates were isolated from the south and southwestern Cape and A2 isolates from the eastern Transvaal and one A2 isolate from KwaZulu Natal. Thirteen isozymes were used and compared at 20 enzyme loci. Nine electrophoretic types (ET's) were identified. This is in contrast to four ET's found in Australia among the eastern Transvaal isolates. The isolate from Kwa Zulu Natal grouped together with those isolates. The greatest genetic variability as determined with isozyme was found in the south and southwestern Cape, suggesting that this part of South Africa might be the center of origin of *P. cinnamomi*.

A preliminary survey of poplar leaf and canker diseases in South Africa

The propagation of *Populus deltoides* constitutes an important commercial undertaking in South Africa.

Diseases pose a serious threat to tree crops, and, in this regard, poplars are no exception. The genetic diversity of these trees in the country is limited and rust, caused by four species of *Melampsora*, has already resulted in serious damage. Although leaf, branch and stem canker diseases are causing very obvious damage, the pathogens associated with these symptoms are virtually unknown. In this study, we undertook a preliminary survey of diseases of populus species in South Africa. Two previously unrecorded leaf diseases in South Africa were identified. These were *Cercospora populicola*



Our Green Goliath surrounded by staff and students of the TPCP. Some of the students have since left us. Celeste Linde is working in Australia for six months and Corli Strydom will be working in the USA until the end of the year. Sakkie van der Westhuizen is working in Johannesburg for Mayford Seeds.

and *Pseudocercospora salicina*. The most common pathogens causing stem cankers were *Cytospora nivea*, *Lasiodiplodia theobromae* and a species of *Botryosphaeria*. A number of *Fusarium* spp. were also found associated with stem cankers and some of these are considered to be potentially serious. Pathogenicity tests and intensive population studies at the molecular level are currently underway to further evaluate their importance.

A *Seiridium* species associated with diseases of *Acacia mearnsii* in South Africa

During surveys of diseased *Acacia mearnsii* de Wild. in commercial plantation in South Africa, numerous isolates of a *Seiridium* species were obtained from diseased tissue. These isolated superficially resembled *S. unicorne* and *S. cupressi* that are well-known pathogens of *Cupressaceae* in many parts of the world. Isolates of the *Seiridium* spp. from *A. mearnsii* were, therefore, compared with *Seiridium* species causing cypress cankers. Comparisons were based on classical mycological and molecular techniques. No obvious morphological differences were found between the two groups of fungi. A comparison of sequence data using 168 base pairs of the ITS region of the ribosomal RNA operon also showed no meaningful differences between isolates from wattle and cypress. In greenhouse pathogenicity tests isolates of the

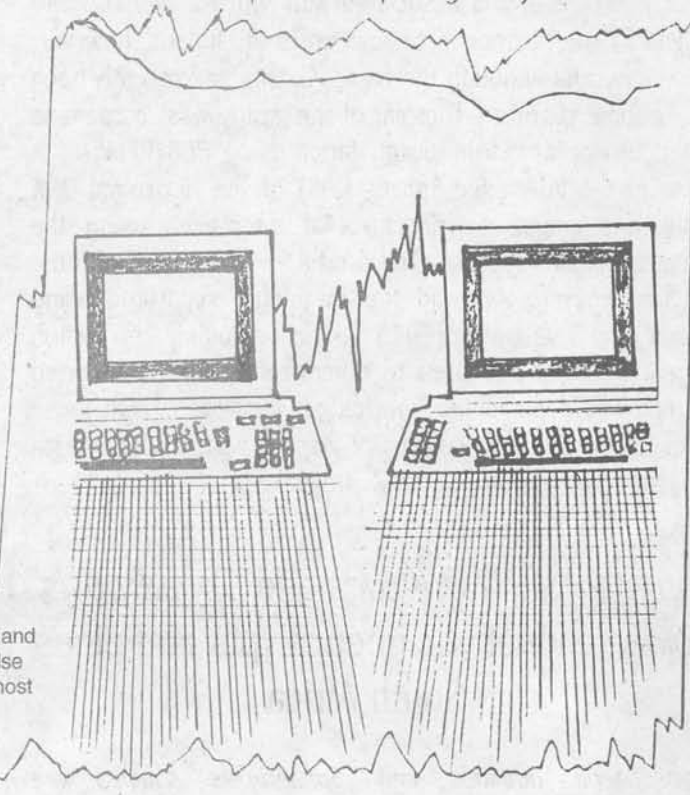
Internet is like teenage sex: everyone thinks about it and everyone talks about it. Everyone thinks everyone else is doing it. The truth is, very few are doing it, and most of them aren't doing it well!

Seiridium spp. From black wattle gave rise to lesions. All results thus suggests that a single species of *Seiridium* spp. Form black wattle gave rise to lesions. All results thus suggests that a single species of *Seiridium* is responsible for cankers on *Cupressus* and *A. mearnsii* in South Africa.

Survey and evaluation of fungi associated with diseased *Acacia mearnsii* in South Africa.

Acacia mearnsii de Wild. in South Africa exhibits various disease symptoms, the cause of which are mostly unknown. Many trees also die each year, leading to substantial financial losses to the forestry industry. Disease symptoms include wilting and die-back; discolouration of the foliage, stem and branches;

gummosis, wood discolouration and basal cankers. Surveys of diseased *A. mearnsii* trees were thus conducted over a two year period in order to identify the fungi most commonly associated with disease. A large number of fungi were isolated, some of which are known pathogens of other plant species. The most common fungi, and those likely to be pathogenism, included species of *Diplodia*, *Fusarium*, *Phytophthora* and *Seiridium*. These fungi were inoculated into established *A. mearnsii* trees in two related field trials. The most pathogenic fungi included species of *Phytophthora*, while species of *Fusarium*, *Diplodia* and *Seiridium* showed moderate virulence. The importance of these fungi will now be evaluated based on more comprehensive pathogenicity trials.



Mycosphaerella spp. and their anamorphs associated with leaf blotch diseases of *Eucalyptus* in South Africa

Mycosphaerella leaf blotch is a serious disease of *Eucalyptus nitens* and several other *Eucalyptus* spp. in South Africa. The aim of the present study was to characterize the variation observed among South African *Mycosphaerella* isolates obtained from eucalypts. Earlier studies had suggested that only one species, *M. molleriana*, occurred on eucalypts in South Africa. Contrary to these reports, *M. molleriana* was not found, but five new species of *Mycosphaerella* were collected and described. A new anamorph genus is also introduced for three of these *Mycosphaerella* species, while two others were found to produce new anamorphs that could suitably accommodated in *Pseudocercospora*. *M. marksii*, recently

described from eucalypts in Australia, is also reported from South Africa for the first time.

Identification of *Armillaria* spp. In South Africa

Armillaria spp. are important pathogens of trees throughout the world. The genus has been well studied in North America and Europe, but it has received minimal attention in Africa. *Armillaria mellea* was first reported to occur in South Africa in the early 1900's and is associated with root rot of *Pinus* and *Eucalyptus*. The taxonomic disposition of the fungus, however, remains doubtful although the name *A. hemii* has recently been used in some reports. The aim of this study was to examine isolated of *Armillaria* from South Africa using PCR RFLP's. A portion of the Intergenic Spacer (IGS) of the ribosomal RNA operon was amplified from mycelial fragments, using the polymerase chain reaction. The product was digested with the restriction enzyme *AuI* and the fragments separated using agarose gel electrophoresis. The resulting restriction fragment patterns appeared to differ from patterns reported for other well documented species of *Armillaria*. From these studies it appears that isolated of *Armillaria* from South Africa represent a species other than *A. mellea*.

Botryosphaeria dothidea and *Sphaeropsis sapinea* endophytic in eucalypts and pines in South Africa

Botryosphaeria dothidea and *Sphaeropsis sapinea* are taxonomically and ecologically similar fungi that cause serious

canker and die-back diseases of *Eucalyptus* spp. and *Pinus* spp., respectively. These fungi occur abundantly on dead eucalypt and pine tissue throughout the country, and cause disease when trees are stressed or physically damaged by hail, wind, frost or insects. Until recently, we have viewed *B. dothidea* and *S. sapinea* as opportunistic pathogens that infect trees only under conducive conditions. In contrast to this view, exhaustive isolations from eucalypt and pine tissue have shown that both fungi apparently exist as symptomless endophytes in healthy trees. The enigma relating to their rapid ingress of stressed and damaged trees can thus be explained by their endophytic habit.

Preliminary studies on the *Amylostereum* symbiont of *Sirex noctilio* in South Africa

Sirex noctilio, a destructive wasp of exotic conifers in the southern hemisphere, was recently introduced into South Africa. Favourable bioclimatic conditions and the importance of *Pinus radiata* D. Don as softwood source, identifies South Africa as a high risk area in terms of this pest. The aim of the study was to confirm the identity of a mutualistic fungal symbiont of the wasp in this country. A large number of cultures were obtained from infected wood and mycangia of female wasps. These were compared to known isolated from international culture collections and isolates from Australia. The identity of the fungus was confirmed as being *Amylostereum areolatum* Boiden. Biological control of *S. noctilio* using the infectious nematode *Deladenus siridicola*, which also feeds on the fungus, has recently been implemented. We are now examining the population diversity of *A. areolatum* in order to evaluate the potential impact that this control strategy may have.

TPCP ON THE WORLD WIDE WEB

One of the more important functions of the TPCP is to maintain regular contact with foresters in South Africa. Contact with colleagues and foresters in other parts of the world is also essential, if we are to maintain a sound knowledge base on pests and diseases that might threaten our forests. Various strategies have been established to maintain our contact with the so-called "grass roots". Obvious examples are our regular visits to plantations, field and lecture days that are presented and through the use of pamphlets and newsletters such as this one.

One of the most powerful tools of communication available to us today is the INTERNET. Thus communication via E-Mail has already provided a fantastic boost to communication between the TPCP and many of its members. We recognise that many forest stations do not have this form of communication available, but have also been surprised at how many have linked to this system. For the time being, we view our e-mail connection as additional to other forms of communication, but also predict that in the future, this will become a much more common tool source such that it will ultimately hold data (with keys and illustration) to major diseases of forest trees in South Africa. We also envisage providing new tools for the identification of forest pathogens to this information base. Ultimately, our newsletters might reside here and

for sharing information. If you have a connection to the Internet do make contact with us at:

- * Our general address - tpcp@wwg3.uovs.ac.za
- * Mike Wingfield's address - mike@wwg3.uovs.ac.za
- * Teresa Coutinho's address - teresa@wwg3.uovs.ac.za
- * Brenda Wingfield's address - brenda@wwg3.uovs.ac.za

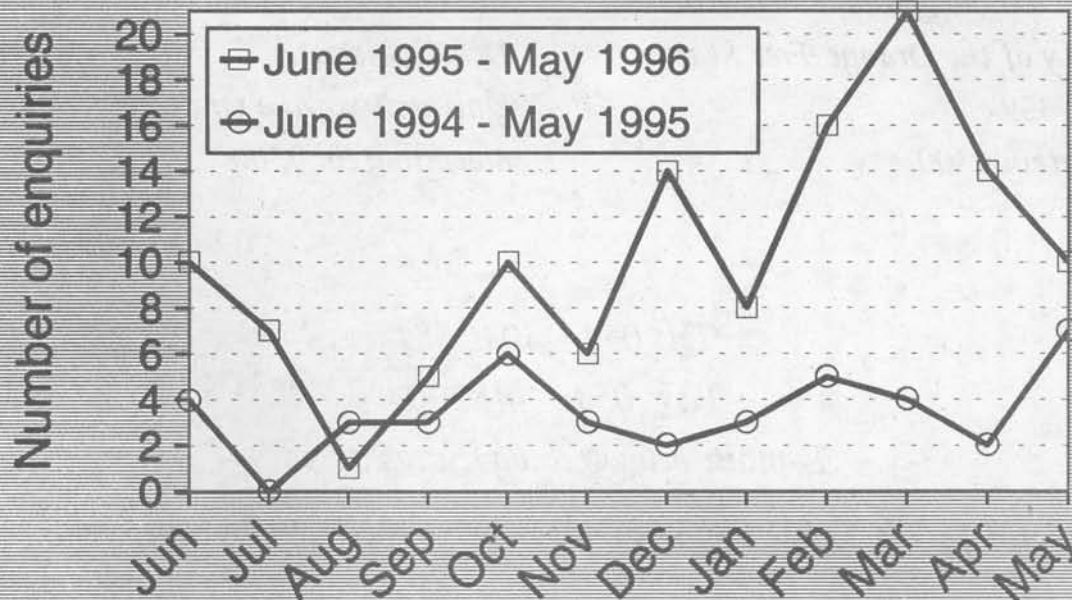
One of our most recent initiatives to improve contact between the TPCP and colleagues has been to establish a WORLD WIDE WEB HOME PAGE. If you have access to the Internet, do visit this at:

<http://www.uovs.ac.za/natwet/mkhoc/tpcp.htm>

For the present, we view our home page as experimental and its contents primarily advertises our activities. We are now in the process of adding information to the with regular updated and the facility for readers to add comments and request feedback.

To those of you that might find these developments rather radical - take heart!! There is truly no magic in this new and wonderful technology. It is easy to use and will, without a doubt, change your entire outlook on life. Be assured that we will also continue to use conventional means of communication until this new technology is widely available!!

The diagnostic clinic becoming increasingly important



The latest data pertaining to the Diagnostic Services of the TPCP show that this component of the programme is becoming increasingly important to our members. Indeed the Diagnostic Services have become a focal point of field extension activities and are now a key factor in deciding on follow-up work in plantations. The total number of enquiries received during the course of the past 12 months was 122. This is three times higher than the 42 enquiries received for the preceding 12 month period. We currently receive an average of 10 "enquiries" per month and we are now succeeding in responding to these within 20 days. It is important to note that each "enquiry" may contain up to 40 samples of soil, leaves, roots, etc. and each of these is analysed separately. It would thus be fair to say that the level of pressure on the Diagnostic Services has grown considerably - but we believe that this is so important that we afford the activity our very best effort. If you should require further information in this regard, please contact Dr Teresa Coutinho, TPCP Manager of Diagnostic Services.

THE RESEARCH TEAM OF THE TREE PATHOLOGY COOPERATIVE PROGRAMME

The research team of the Tree Pathology Cooperative Programme is varied. It includes full time staff of the University of the Orange Free State (Prof M.J. Wingfield, Director and Mondri Professor, Dr. B. Wingfield, Dr T.A.Coutinho, and Dr W.J. Swart), 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 FRD. Staff from various Departments in the University obviously provide advice and support where this is required.

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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.....**Edited and compiled by Susan Christie**.....