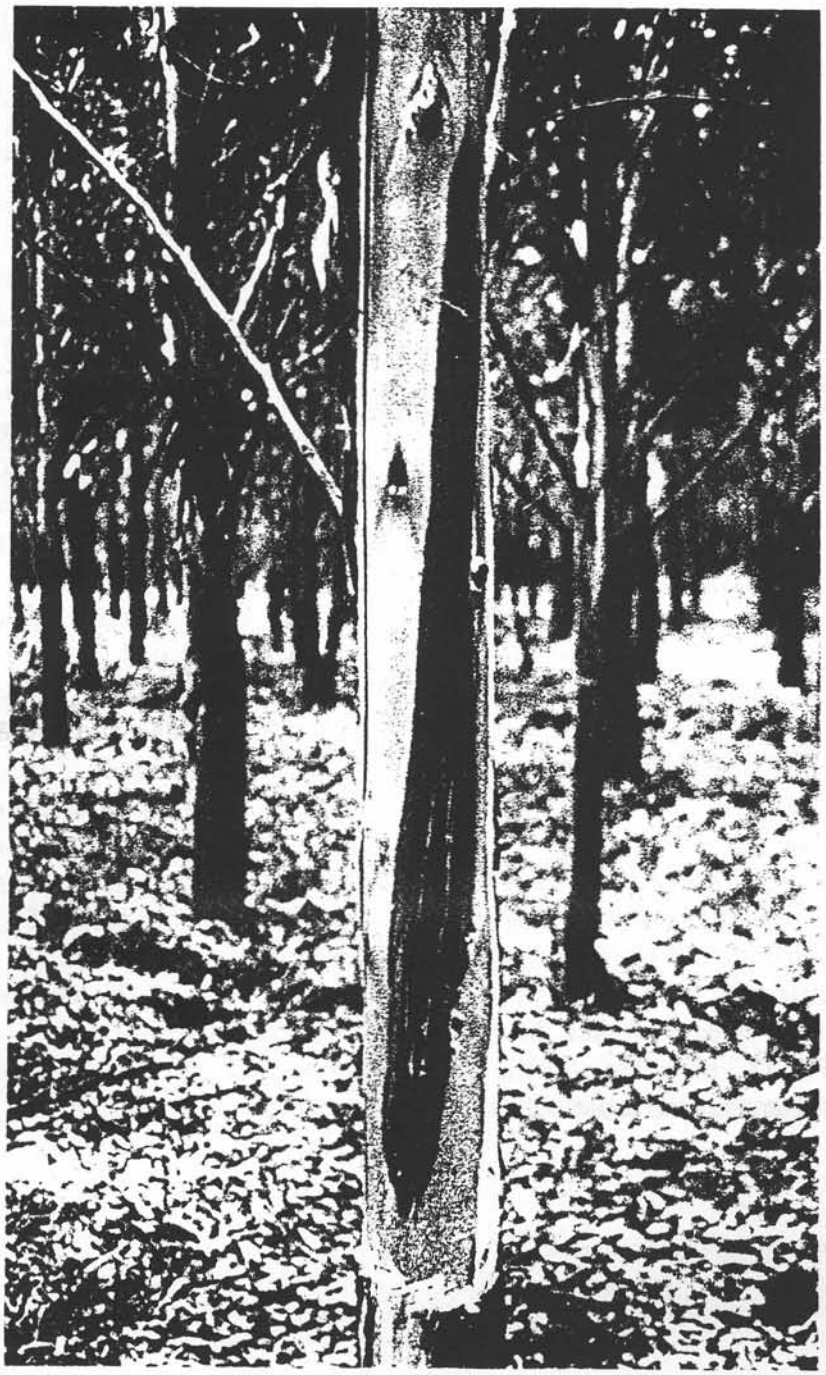
TREE PATHOLOGY NEWS

NO 9

JULY 1994

NEWSLETTER OF THE TREE PATHOLOGY COOPERATIVE PROGRAM - U.O.F.S.



Tree Pathology Cooperative Programme
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Lesion caused by *Phytophthora cinnamomi* inoculated on *Eucalyptus fastigata*

MESSAGE FROM THE DIRECTOR

Tree Pathology News appears at irregular intervals and is intended to keep members abreast of developments in the tree pathology research programme. This is the first issue of the newsletter for 1994 and it is indeed appearing rather later than we had hoped. Our initial intention was to post this newsletter shortly after the Annual Meeting of the TPCP which was held in Bloemfontein during the last week in March. However, my being in the United States on sabbatical leave has slowed this process and I must apologise for this.

The TPCP Annual Meeting this year was a resounding success. Every year, after a successful meeting, one has to wonder whether the next be at least equally good. This meeting was different in some ways to those that came before it. One of the most significant differences was that the greater part of the planning was conducted by electronic mail between the Department of Plant Pathology at Iowa State University and the laboratories of the TPCP. Thus, the Annual Report was prepared on foreign territory and many documents were sent to and fro on the internet. There were some frustrations to be sure, but one again a great team of assistants and students made it possible for us to entertain many of you to two days of lectures and discussions. To those of you that were able to attend, we thank you for taking the time and trouble to visit with us. It is always a great pleasure to have visitors interested in our various experiments and other undertakings aimed at reducing the impact of forest tree diseases in South Africa.

In this issue of Tree Pathology News, we are including a selected set of abstracts of research studies that were presented at the Annual Meeting of the South African Society for Plant Pathology held at Rob Ferreira in January. Once again, students and staff connected with the TPCP were a significant force at these meetings and the interests of our forest Industry was well publicised. I always find it interesting to remember back to the late 1970's when a single presentation on diseases of forest trees was the rule. How times change!!

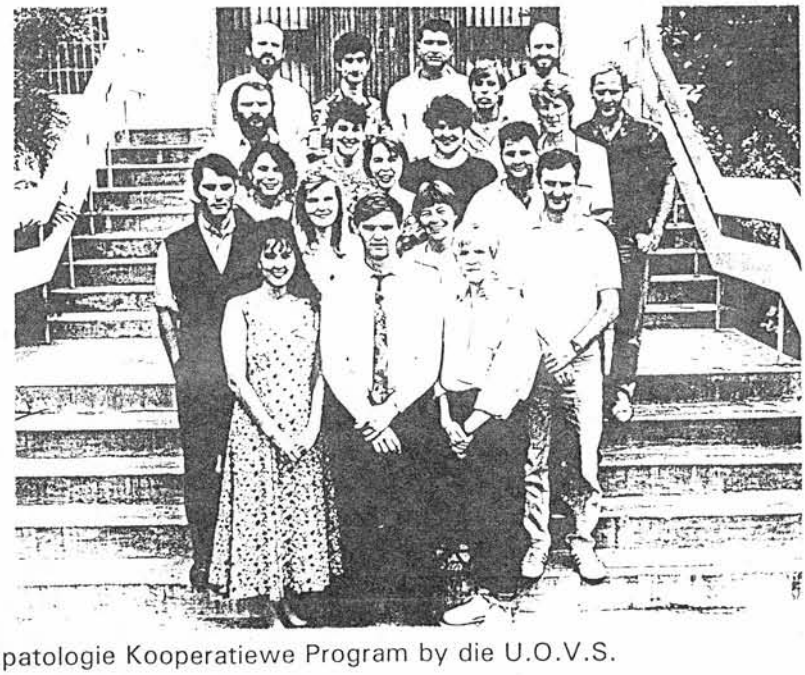
As a typical for the TPCP, much of the research effort is contributed by post graduate students who study tree diseases as part of their M.Sc. or Ph.D. projects. This does mean that we loose colleagues each year while others join the programme. Thus Gert Marais who has worked on the well known group of tree pathogens in the genus *Ceratocystis* left us to join Foodtek where he will work on fungi contaminating maize. Carolien de Beer who worked on wattle wilt caused by a fungus very similar to *Ceratocystis fimbriata* also left early in the year to join AECI in their Industrial Microbiology programme. Corli Strydom who worked on various molecular techniques to identify fungal tree pathogens completed her M.Sc. degree and she has taken a year off to tour the world - so to speak. We hope to have her back in our ranks from 1995 onwards. Finally Andre Cilliers who conducted some really exciting and useful research of fungi causing black discoloration of pine seeds completed his M.Sc. and has joined the Oil Seeds Research Institute to study fungi that produce the deadly mycotoxin known as Aflatoxin.



While it is always sad to have to deal with members of our team leaving we have begun to enjoy having contact with them under different circumstances. They continue to acquire new ideas and techniques as we do, and this cross fertilization and growth of knowledge is valuable to all. We like to think that our laboratories will remain a home to all that have passed through them and enjoy visits from past colleagues and students immensely.

Various new students have joined the TPCP research effort this year. These include Dr Teresa Coutinho who will augment our programme to study pitch canker of pines caused by *Fusarium subglutinans*. Four B.Sc. honours students from the 1993 class have chosen to continue their studies and have registered for M.Sc. degrees. Jolanda Roux will thus embark on a study of diseases of black wattle and continue with the word started by Carolien de Beer, Karin van der Westhuizen will continue with studies on *Ceratocystis* spp. that are important as tree pathogens, Emma Steenkamp will begin to study virus infections of *Sphaeropsis sapinea* (*Diplodia pinea*) in the hope that we might reduce the impact of the *Diplodia* dieback through biological control in the future. Cassi Myburg will join the team of students who study various aspects of the eucalypt pathogen, *Cryphonectria cubensis*. We are hoping that she will be able to help us to evaluate the diversity of the population of this pathogen and thus improve our procedures for screening clones.

We are now well into the year and our research, field studies and extension efforts continue apace. We hope that you will find the various notes and abstracts in this newsletter of interest and encourage you to continue to be on the lookout for tree disease problems in your plantations. The receipts of samples for diagnosis of disease has not stopped increasing since the inception of the TPCP and this has become one of the most critical aspects our programme to monitor the development and spread of disease problems. We thank all of you that submit samples for your interest and support and encourage all plantation managers to contact us at the our address at any time when disease problems arise.



Lede van die Boompatologie Kooperatiewe Program by die U.O.V.S.

Dr. Wijnand J. Swart, Mnr. Christopher Viljoen, Mnr André Cilliers, Prof Mike Wingfield
Mnr Gert Kemp, Mej Wilmarie Botes, Dr. Teresa Coutinho, Mnr Sakkie van der Westhuizen, Mej Celeste Linde, Mnr Len van Zyl
Mnr Wilhelm de Beer, Mej. Christa Visser, Mej. Carolien de Beer, Mej Henriette Britz, Mnr Henk Smith
Mej Karin van der Westhuizen, Mnr Wouter de Lange, Mej. Yolanda Roux, Mej, Cassie Myburgh, Mnr Altus Viljoen

THE ETIOLOGY AND IMPORTANCE OF RUST FUNGI, WITH PARTICULAR REFERENCE TO COFFEE LEAF RUST

A wide variety of plants are attracted by a destructive group of fungi called rusts. Major losses have occurred in the forestry industries in Asia. Europe and North America due to several species of the *Cronartium* rust which, for example, causes white blister of pine. Coffee trees are attacked by two species of rust. The most economically important of the two, commonly referred to as leaf rust, is responsible for losses in profit from the sale of coffee beans worldwide to be estimate at between $1-2 billion per annum.

There are 150 genera and 6000 species of rust fungi. They generally have a very narrow host range, being restricted to a single family, a single genus or even a single species. The are however exceptions to this rule. A classic example is *Puccinia psidii*, the rust devastating young eucalyptus trees in Brazil. This rust does not only infect eucalyptus but it is also a serious pathogen of guava.

Rusts are obligate biotrophs, that is, they only live in association with a living host. Between two and five different spore types produced by the fungus may play a role in their life cycle. These appear in a definite sequence. Some of the spore types parasitize one host, while others infect and parasitize different, alternate hosts. An example is pine blister rust. The uredium and telium appear on cultivated gooseberry and currant bushes whereas the basidiospores attack, and aecium appear, on pine.

Coffee rust, also called orange or leaf rust, occurs in all regions of the world where coffee is grown. Some countries have remained free of this pest for decades and it is only in recent years that the rust has appeared. The causal organism is *Hemileia vastatrix*. The word *Hemileia* translated from Latin refers to the morphology of the urediospore which is covered with spines on the upper surface and smooth on the lower surface. *Vastatrix* on the other hand means "terrible destruction". At the turn of this century, when coffee rust was first described by Rev. Berkeley who was working in Sri Lanka at the time, severe outbreaks of the disease occurred. Sri Lanka had been Producing 42 million kilograms of coffee per year and the damage caused by the rust reduced this amount to less than 3 million kilograms over a 21 year period. Coffee plantations were abandoned and tea and rubber were planted in its place. The economic importance of this disease stems from the premature leaf fall and dieback of branches which occurs and this ultimately has a marked effect on yield.

Pathogenic or physiological races of rusts occur and a specific race or races may only occur in a certain country or region of that country. The races are identified by inoculating a range of differentials with rust isolates. The reaction of the differential to each rust isolate is known. When screening new cultivars or species for disease resistance or susceptibility it is of the utmost importance that all known races of the pathogen are tested. Coffee rust was first recorded in SA as early as 1878 and devastated plantations. When coffee was again re-introduced in the 1960s, cultivars were pre-screened for disease resistance/susceptibility. However, this did not prevent the re-appearance of the rust.

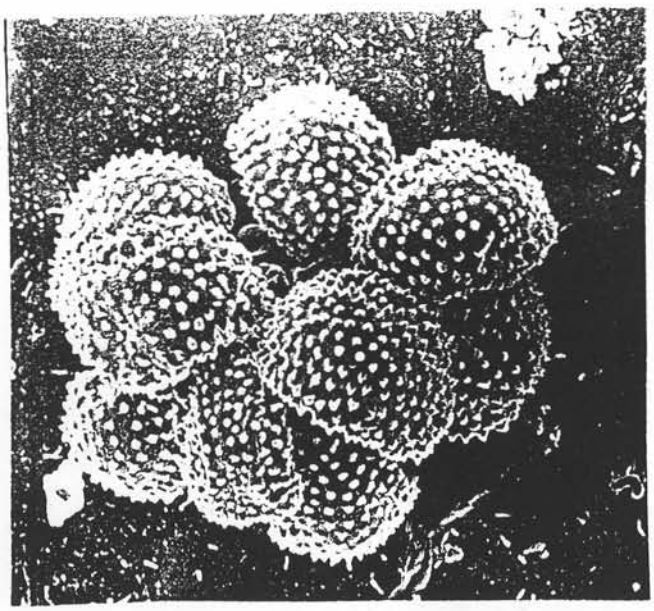
The climatic conditions in South Africa are not ideally suited to growing coffee. At the time of this study (between 1988-1990) approximately 11 000 ha of coffee were grown. The number of hectares on which coffee is grown today has been significantly reduced due to the drought. In some cases entire plantations have been removed to make way for other crops. When the host is under any form of stress. for example, lack of water, the rust is able to gain a

strong-hold and spreads rapidly through the plantation.

The best quality coffee in the world is grown between 20° North and South of the equator. The three most important species grown worldwide are *C. arabica*, *C. canephora* and *C. liberica*. The former, produces what is called Arabica coffee which is of a superior quality and is used exclusively in the instant coffee industry. Robusta is resistant to rust whereas Arabica coffee is susceptible to all rust races although cultivars differ in their susceptibility, that is, some are highly susceptible while others are moderately or less susceptible. A natural hybrid between the two, HDT, has been used successfully over the past few years in crosses to produce resistant cultivars. Traditional breeding methods have retained the superior quality of the beans of the Arabica parent. One of the few countries in the world which are using resistant plants on a large scale is Colombia. Unfortunately, new races of the pathogen virulent to these new varieties of the host have appeared in some regions.

Generally, chemicals are used to control coffee rust. However, this has proved unsuccessful. Protectant fungicides are of limited use and only prove successful when used in conjunction with a sophisticated forecast system. Coffee rust has a very long latent period varying between 30 and 65 days. Once the fungus has entered the leaf protectant fungicides lose their efficacy. Systemic fungicides are useful but very expensive. As coffee is generally grown in the Third World, farmers are unlikely to be able to afford this added expense.

The following sequence of infection is common to all rust fungi. The described structures do however differ in both morphology and the time it takes for each structure to form. In the presence of free water and in darkness (typical of all rusts) the urediospore germinates producing between one to five germ tubes although only one extends over the lower leaf surface. When the tip of the germ tube comes into contact with a stoma (which only occur on this surface) a uniquely shaped appressorium forms over one end of the stomatal slit. Rust fungi rarely penetrate the host directly. A distinct appressorial foot us wedged within the stomatal vestibule. It's function is unknown. A torpedo-shaped substomatal vesicle initial develops bilaterally from the apex of the infection wedge. The substomatal vesicle initial extends in length becoming anchor-shaped and is then termed a substomatal vesicle. Hautorial mother cells are formed on stubby primary



A mass of coffee rust spores on the leaf surface

infection hyphae which curve back on to subsidiary cells. Haustoria or feeding structures develop from the haustorial mother cells, which are appressed to host cells, into the cytoplasm of these cells. A much-branched mycelium ramifies intercellularly throughout the tissue. In coffee rust, between 30 and 65 days after penetration, a hyphal knot is formed below a stoma. Sporogenous cells form from this knot and emerge through the stoma. They are initially covered with a membrane. Urediospores and sometimes teliospores are borne singly on these sporogenous cells. Each cluster of spores is termed a urediosorus. The fungus grown in a radial manner, producing mature urediosori in the centre and young urediosori on the margins. On the abaxial surface of the coffee leaf, the diseased area is bright orange. The formation of the uredium in this manner only occurs in coffee rust. Usually, the uredia forms below the epidermis and the force of developing urediospores raptures the surface. The purpose of the teliospore in the life cycle of coffee rust is unknown. Teliospores germinate *in situ* and produce basidiospores. These basidiospores do not infect coffee and no alternate host has so far been found.

Brazil produces 65% of the world's coffee. Despite all attempts to keep this country free of coffee rust it appeared there in 1970. A number of hypotheses have been proposed on how the rust entered the country. The most widely accepted hypothesis is that urediospores were carried from Angola by the north-east trade winds. Other likely hypotheses include the spread by man, by insects, by infected seedlings and in rain water. The latter however usually only takes place over short distances. Rust spores are known to travel long distances in wind currents. To prevent the introduction of rusts, not previously known to occur in a country, stringent measures to prevent introduction must be taken. *Puccinia psidii*, for example, is known to be highly virulent to *Eucalyptus grandis* selection from South Africa. It's introduction will herald devastation to the forestry industry in this country. The adage "prevention is better than cure" should be applied and perhaps pre-screening of South African *Eucalyptus* selections to this rust should already be taking place.

Typical symptoms of coffee rust on the lower leaf surface

SELECTED ABSTRACTS FROM PRESENTATIONS BY THE TPCP TEAM MEMBERS AT A RECENT CONFERENCE

POPULATION DIVERSITY ON BRAZILIAN ISOLATES OF *CRYPHONECTRIA CUBENSIS*

Cryphonectria cubensis is a serious canker pathogen of *Eucalyptus* trees in Brazil and many other parts of the world. Preliminary results suggested that isolates of *C. cubensis* in South Africa represent a uniform population structure. This is indicative of an introduced pathogen. The aim of this study was to determine the genetic variability amongst Brazilian isolates of this pathogen. Isolates of *C. cubensis* were collected throughout the *Eucalyptus* growing areas of Brazil and were compared based on their vegetative compatibility reactions. Results of this study suggest that *C. cubensis* in Brazil has a much more diverse population structure. This is not unexpected given the abundant presence of the teleomorph in Brazil as opposed to in South Africa. These results suggest that *C. cubensis* has been present in Brazil for an extended period of time and that the fungus has only recently been introduced into South Africa.

INFECTION OF *PINUS ELLIOTTII* SEED BY *LASIODIPLODIA THEOBROMAE*

Clonal seed orchards of *Pinus elliottii* in the Eastern Transvaal consistently yield a relatively large number of seeds that are discoloured and have reduced viability. *Lasiodiplodia theobromae* is commonly associated with the disease phenomenon and preliminary observations suggest that it is related to cone harvesting and seed extraction procedures. Moist or humid conditions and temperatures above 25°C, which promote fungal activity, are inadvertently created during the collection and precuring of cones prior to seed extraction. A trial was therefore initiated to investigate the effect of storage under these environmental conditions on the incidence of *L. theobromae* on seeds. Mature two-year-old cones from five *P. elliottii* clones were collected during March at the optimum stage for harvesting. One batch of cones was placed in Hessian bags and stacked as tightly as possible to prevent free movement of air and to encourage moisture build-up. A second batch was spread on kiln trays to allow maximum air movements and drying. Seeds were extracted from cones immediately after harvesting and again from each batch of cones at two weekly intervals and screened for the presence of *L. theobromae*. Seeds from cones in bags generally showed a higher percentage of *L. theobromae* than those stored on trays. Both batches indicated a significant decrease in the percentage *L. theobromae* isolated from four to six week after harvest. These results suggest that the maturity of *P. elliottii* cones together with the environmental conditions under which they are stored, strongly influence the incidence of *L. theobromae* on seeds.

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SUSCEPTIBILITY OF *PINUS PATULA* AND *P. ELLIOTTII* TO INFECTION BY THE PITCH CANKER FUNGUS, *FUSARIUM SUBGLUTINANS* F.SP *PINI*

Fusarium subglutinans f.sp *pini* (FSP) is responsible for the pitch canker disease of pines. The fungus has been associated with *Pinus patula* seedlings in a South African forest nursery, but has as yet not been responsible for cankers on established trees. Inoculation of one-year-old *P. patula* and *P. elliottii* saplings with isolates of FSP resulted in canker development and shoot mortality. No significant differences in pathogenicity were found amongst eight isolates of the pathogen, but disease development was significantly more severe on *P. patula* than *P. elliottii*. Pathogenicity tests on four-year-old trees yielded comparable results. Resinous cankers developed on trees in the vicinity of inoculation points, and cross-sections of cankers revealed a pitch-soaked wedge deep into the wood. Lesions did not girdle stems and trees were not killed by the pathogen. Control inoculations with sterile agar and isolates of *F. oxysporum* did not result in canker development. These results confirm that South African isolates of FSP from pine seedlings belong to the pitch canker pathotype. Multiple infections by FSP could cause severe damage to *P patula* in plantations, while *P. elliottii* is likely to provide a source of resistance.

PHYTOPHTHORA CINNAMOMI ASSOCIATED WITH HIGH ALTITUDE SPECIES OF *EUCALYPTUS* IN SOUTH AFRICA

High altitude *Eucalyptus* spp. in South Africa namely *E. fastigata*, *E. fraxinoides*, *E. smithii* and *E. macarthurii* are all prone to root diseases. This disease is associated with a complex of fungi including *Phytophthora* spp., *Endothia gyrosa*, *Botryosphaeria dothidea* and a *Fusarium* sp. However, data from recent surveys suggest that *Phytophthora cinnamomi* is the only pathogen consistently associated with the disease complex. In the case of *E. fastigata*, *P. cinnamomi* causes primary infections resulting in basal cankers, whereas the *Fusarium* sp. causes secondary stem cankers. Basal cankers of *E. smithii* and *E. macarthurii* are primarily associated with *P. cinnamomi*, after which secondary cankers associated with *E. gyrosa* and *B. dothidea* appear. Pathogenicity tests have shown that *P. cinnamomi* is highly virulent on *E. smithii* and *E. fastigata*. It is therefore, suggested that *P. cinnamomi* is the primary factor in the root disease complex associated with high altitude *Eucalyptus* spp. in South Africa.

EVIDENCE FOR TOXIC METABOLITE PRODUCTION BY *PYTHIUM SPLENDENS*

Pythium splendens causes a severe root disease of Eucalyptus grandis in the Kwambonambi area of northern Natal. Although *Pythium* spp. are known as damping-off pathogens, *P. splendens* is associated with mortalities of 1 to 2-year-old trees under field conditions. It has been suggested that *Pythium* spp. can produce toxic metabolites that play a role in pathogenesis. In this study, an *in vitro* bioassay was developed to investigate the effect of *P. splendens* culture filtrate on the roots of *E. grandis* seedlings. Seeds of *E. grandis* were surfaces disinfested and germinated before being transferred to water agar supplemented with 2.5% culture filtrate of *P. splendens*. After 10 days of growth on the treated medium, the emerging roots appeared thinner and shorter than those of the controls. Microscopic observations showed an absence of root hairs and collapse of cortical and epidermal cells.

Symptoms observed *in vitro* were similar to those associated with infections of *P. splendens* on *E. grandis* in greenhouse tests. This preliminary study supports the hypothesis that *P. splendens* produces metabolites that are involved in pathogenicity to *E. grandis*.

FIRST REPORT OF *OPHIOSTOMA QUERCI* IN SOUTH AFRICA

In recent years an investigation was undertaken to determine which blue-stain fungi with ophiostomatoid characteristics occur in Southern Africa. A large number of isolates resembling *Ophiostoma piceae*(Munch) H. and P. Sydow and *Ophiostoma querci* (Georgevitch) Nannfeldt were collected from areas ranging from the Southern Cape to Natal. Isolates originated from various hardwood hosts including endemic *Olinia* spp. and exotic species like *Eucalyptus grandis* and *Quercus robur*. Morphological studies confirmed that the isolates collected could have been either *Ophiostoma querci*. Since the two species cannot be distinguished from each other morphologically, additional taxonomic criteria had to be used to determine to which of the two species the South African isolates were therefore paired against single ascospore cultures of authentic overseas isolates of both *O. piceae* and *O. querci*. All the South African isolates were sexually compatible with *O. querci*, while none showed compatibility with *O. piceae*. The results of these studies proved that *O. querci* is widely distributed throughout South Africa, but that *O. piceae*, which is mostly isolated from conifers, is not commonly found, if present at all, in this country.

Representatives of members of the TPCP from Sappi, H.L. + H., Safcol, Mondi, U.O.F.S. and I.C.F.R. who attended the Annual meeting of the programme at Bloemfontein.

THE RELATIVE PATHOGENICITY OF *LASIODIPLODIA THEOBROMAE* AND *SPHAEROPSIS SAPINEA* ON *PINUS* SPECIES

The widespread fungal pathogen *Lasiodiplodia theobromae* has been associated with numerous plant diseases on a wide variety of hosts including numerous forest trees. Recently the fungus has been associated with diseased *Pinus elliottii* seeds obtained from clonal seed orchards as was reported in previous TPCP newsletters. It is however puzzling that *Sphaeropsis sapinea*, a far more common pathogen of pines in South Africa, has so far not been associated with this problem. The pathogenic status of *L. theobromae* as a pine pathogen when compares to *S. sapinea* is still largely unresolved and a study was therefore conducted to compare the pathogenicity of *L. theobromae* and *S. sapinea* on *Pinus* spp.

Two artificial inoculation studies were conducted, one in the forest and the other in the glasshouse. Four-year-old trees of *P. patula* and *P. elliottii* were inoculated with *S. sapinea* and *L. theobromae* and evaluated after 3 months by measuring the lengths of the resultant cambial lesions surrounding inoculation points. *S. sapinea* proved to be significantly more pathogenic to both *Pinus* spp. than *L. theobromae*. *P. elliottii* was more resistant to *S. sapinea* than *P. patula* but there were no statistically significant differences between the lesion lengths caused by *L. theobromae* on these two species.

In the glasshouse, the stems of one-year-old potted plants of five *Pinus* spp., *P. elliottii*, *P. taeda*, *P. patula*, *P. kesiya* and *P. greggii* were inoculated with *S. sapinea* and *L. theobromae*. The resulting cambial lesions on the stems of each plant were measured after 14 days. In this study, *S. sapinea* also proved to be considerably more pathogenic than *L. theobromae* on *P. taeda*, *P. greggii* and *P. kesiya*. The pathogenicity of the two fungi did not however, differ significantly on *P. patula* and *P. elliottii*.

These preliminary studies have provided the first clear evidence that *S. sapinea* is a far more virulent pathogen of pines than *L. theobromae*. This was to be expected as there are very few reports of *L. theobromae* infecting pine seedlings or mature trees. The question that remains to be answered therefore is: why has *S. sapinea* thus far not been associated with the disease of *P. elliottii* seeds? Further studies that are currently being conducted will hopefully provide the answer.

THE RESEARCH TEAM OF THE TREE PATHOLOGY COOPERATIVE PROGRAM

The research team of the Tree Pathology Cooperative Program is varied. It includes full time staff of the University of the Orange Free State (Prof M.J. Wingfield, Dr B. Wingfield, Dr W.J. Swart and Mr G.H.J. Kemp), 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 of the Departments in the University obviously provide advice and support where this is required.

"NEW" DISEASES AND THEIR "SUDDEN" APPEARANCE

One aspect of plant pathology which always intrigues members of the farming/forestry community is the "sudden" appearance of a disease that was never previously recorded in that region or country. The explanation may be due to one or both of the following scenarios:

1. The pathogen (the disease-causing organism) may have always been present but in either very low numbers or the host may have been absent. Environmental conditions suitable for disease development may play an important role in this case.

2. The pathogen may have been accidentally introduced via contaminated seed or plant material. It has been reported that human beings have probably caused all of the major plant epidemics in history, mostly by moving plants and pathogens from their point of origin to every corner of the earth.

In order to illustrate the above we would like to use the example of late blight of potato which was responsible for the Irish potato famine in the 19th century.

The potato has its origin in South America. About 200 years after its introduction into Europe, one of the important fungal pathogens of the potato inadvertently crossed the ocean from South America to Europe where it infected tubers, leading to epidemics and human starvation. The question which comes to mind is why did the disease "suddenly" appear. In the early weeks of the summer of 1845, records show hot and dry weather overall. The weather then changed and overcast, wet cool weather continued for six weeks. Under these conditions late blight is able to spread rapidly through a potato field.

The purpose of the above is to implore all "explorers" to resist the temptation of removing plants from their present habitat and bringing them "home".

PUBLICATIONS

Viljoen, A., M.J. Wingfield, and W.F.O. Marasas. 1994. First report of *Fusarium subglutinans* f.sp. *pini* on pine seedlings in South Africa. Plant Disease 78:309-312.

Wingfield, M.J. and W.J. Swart. 1994. Integrated management of forest tree diseases in South Africa. Forest Ecology and Management 65:11-16.

Wingfield, M.J. 1994. Three new *Leptographium* species associated with conifer roots in the United States. Canadian Journal of Botany 72:227-238.

PERSPECTIVES OF TWO MICROBIOLOGISTS ON SABBATICAL IN AMERICA

As a graduate student, I remember having visions of great glamour and excitement on being told that one or other of my professors was going off to some far off country on Sabbatical leave. This surely must be the ultimate holiday I thought. Something like an overseas vacation without the usual time limits. Our first sabbatical has served as a fine example of the complexities as well as the opportunities offered by sabbatical leave. In this brief letter, I cannot hope to share even a fraction of the many fascinating, fulfilling and even frustrating experiences associated with our sabbatical. If you have chosen to read this missive, I do however hope to leave you with at least our perspective of undertaking study leave abroad.

At the outset, I will have to admit that I had great misgivings of being away from my laboratory and research program. I could not imagine that the Tree Pathology Cooperative Program and all other activities could possibly proceed and prosper without my bodily presence. How vain we mortals can be!! On a brief return visit to Bloemfontein, I realized very readily that a fine team of scientists, support staff and students could function and prosper extremely well without my day to day interference!! Perhaps not particularly good for my ego but indeed an important lesson for me. On the other hand, I must also acknowledge that this major change in environment was necessary for me to recognize how much, I for one needed a change of scene and how set in my ways I had become. One often hears colleagues extolling the virtues of study leave. I certainly never realized how beneficial and indeed necessary such an experience could be. My final admission is then that Brenda would say "I told you so" to all of the above. Is this the wisdom of women I have to ask myself?...

... I now come to the end of this rather rambling letter which attempts to put some perspective on our sabbatical experience. I think it is clear that thus far, the experience has been wonderfully enriching both scientifically and socially. If I have one regret, it is being away from South Africa at the time of our first democratic election. While we share the concerns and anticipation of many of our friends and family at this time, we also believe that this is one of the most exciting events of our lifetime. Our belief is that the changes while perhaps adding an element of difficulty to our lives, marks the birth of an exciting period of growth and development for South Africa. On this eve of the beginning of a new and exciting future for our country, we feel rather displaced but also proud to be part of a nation with the courage to embark on this challenging and potentially fulfilling journey.

Extract from letter by Prof Michael J. Wingfield