



TREE PATHOLOGY NEWS

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

NO 6

NOVEMBER 1992

COMMENTS FROM THE DIRECTOR

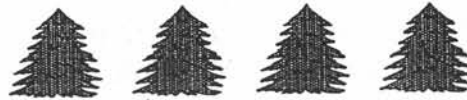
The very severe drought that we have experienced during this past year has complicated our activities considerably. Pathogens such as *Botryosphaeria* and *Endothia* that are favoured by drought have of course flourished. Other pathogens that preferentially infect healthy trees have, in contrast, been less severe. It is perhaps the latter group of fungi which, in the longer term are most threatening to our industry. Therefore, the misconception that disease problems will disappear once the drought ends, should be allayed. Given the importance of this issue, we are including a comment on the relationship between drought and tree disease in this newsletter.

During the last year, the important eucalypt pathogen, *Corticium salmonicolor* was discovered for the first time. The associated disease called "Pink Disease" is very severe elsewhere in the world and, for this reason the discovery is being treated with concern. There are many anomalies concerning this disease and these will become the subject of in-depth studies in the coming years.

Christmas Message from the T.P.C.P

Once again the TPCP has had a most industrious and rewarding year. This could never have been possible without the outstanding support that we have enjoyed from many friends and colleagues in the forestry industry. At the outset then, I must very heartily thank all of you for making it possible for us to deal with the many disease problems that are currently troubling our industry.

As we reach the end of yet another year (don't they seem to just fly by faster each year?) we take this opportunity of wishing each and every one of you a most joyous Christmas. We also wish you a superb 1993 and look forward, once again, to working with you - hopefully also in a much wetter year than the one that has passed!!



Surveys of forestry plantations for the occurrence of *Phytophthora* and *Pythium* spp. have yielded many interesting results. Many species belonging to these genera have been found in the country for the first time. These include known pathogens of woody plants and others about which very little is known. Determining the significance of these fungi is one of our priorities.

While on the subject of the so-called Pythiaceae fungi, it is appropriate to include mention of the establishment problems on old agricultural lands. Briefly, the problem involves the virtual impossibility of establishing plantations

on lands that have previously been planted to other crops such as corn and wheat. This fascinating yet troubling situation has also been experienced in other parts of the world and a common component of the problem is a high level of various pathogens. Results of our preliminary investigations into this problem has led us to believe that a species of *Pythium*, namely, *P. irregulare* is closely associated with the disease. All indications are that this problem could be reasonably easily overcome after some relatively simple research.

Another "new" disease to appear during the past year is a

wilt disease of black wattle. At this stage we know very little about the disease but have determined that it is caused by a fungus, very similar to *Ceratocystis fimbriata*. Elsewhere in the world, this fungus is one of the most destructive pathogens of woody plants. For this reason, it is imperative that we treat its discovery in South Africa with the greatest concern. A first step in our strategy to deal with this disease is to survey wattle plantations throughout the country and thus, to get an idea of the distribution of the problem. We will certainly have a great deal more to say about this disease in the future.

While it is always important to make note of new disease problems on the horizon, we must not forget those problems that are well established in the country. In this regard, we have continued our indepth studies of *Diplodia (Sphaeropsis sapinea)*, *Cryphonectria* canker, *Coniothyrium* canker, *Botryosphaeria* canker, *Endothia* canker and pine nursery diseases. Details of progress in dealing with these problems will be presented in our annual report which, as is custom, will be presented before the end of January.

During the past year, we have once again provided training courses for various groups. In some areas a third annual lecture series has been presented. These courses are tailored to the specific needs of companies and regions and

are provided on request. In all cases they have been very well received. Perhaps more importantly, they have promoted a greatly enhanced utilization of the TPCP services by staff members.

To conclude this brief report, let me thank you all once again for your interest in the TPCP and especially for your support. It should not be forgotten that this programme is YOURS. It is intended to serve the needs of the industry. It is thus incumbent upon foresters to make their needs known to us. We welcome enquiries, advice and comments on disease situations. In the end, this is essential if we are going to successfully protect our plantations from diseases that currently threaten us, and those that will plague us in the future.

Onlangs is 'n nuwe siekte op *Eucalyptus* spp. in die Pietermaritzburg omgewing waargeneem. Die siekte staan algemeen bekend as die "Pink Disease" wat veroorsaak word deur die swam *Corticium salmonicolor*. Die voorkoms van die swam in Suid-Afrika is nie onbekend nie en is al aangeteken op vrugte bome in die Kaap. Die kenmerkendste simptome is die wit tot pienk spinnerakagtige miselium groei in die omgewing van die kankers. Die voorkoms van klein pienk vratagtige strukture is in baie gevalle ook waarneembaar. Dit word verder ook as een van die belangrikste siektes wêreldwyd in die -



'N NUWE SIEKTE IN BOSBOU VERSKYN OP DIE HORISON

bosboubedryf beskou. Die siekte word normaalweg geassosieer met hoë gemiddelde temperature en 'n reënval van 2000 mm/jaar. Pietermaritzburg voldoen glad nie aan die vereistes nie maar die aanplant van hoogs vatbare spesies in 'n direkte misbeld, het die siekte die kans gegee om homself te vestig. Die voorkoms van die siekte is huidiglik in 'n *Eucalyptus* spesies proef en siektebepalings toon dat *E. macarthurii* die mees vatbaarste spesies is. Verder bleik dit ook uit die bepaling dat *E. grandis* nie so vatbaar is as wat daarna in die literatuur verwys word nie.

DIE VERSPREIDING VAN CONIOTHYRIUM STAM KANKER IN SUID-AFRIKA

Coniothyrium stam kanker is vir die eerste keer in 1989 in Kwambonambi, Zoeloeland, waargeneem. Die uitbraak van die siekte het aanvanklik pandemonium veroorsaak deurdat dit nie as 'n siekte geïdentifiseer was nie, maar eerder die gevolg van lugbesoedeling. Die lug besoedeling is egter op die voorstoep van ander industriële gelê. Die probleem is egter ter syde gestel met die identifikasie van *Coniothyrium* stam kanker as die oorsaak. Op die stadium is daar geen inligting bekend dat die siekte in ander dele van die wereld voorkom nie. Dit gee dus 'n unieke status aan die siekte van Suid-Afrika.

Vroeër opnames (1990) het getoon dat die siekte net in Noord-Natal voorgekom het. Sekere opnames is gemaak omtrent die vereiste omgewingstoestand vir siekteontwikkeling en daar was gespekuleer dat die siekte net in Noord-Natal sal voorkom. Tydens verdere opnames (1991) het dit egter net 'n spekulasie gebly en die siekte is ook in die Baberton omgewing in Oos-Transvaal waargeneem. Dit het egter nie net daar gebly nie en is ook op 'n latere stadium in die omgewing van Louis Trichardt asook Tzaneen met groot kommer waargeneem. Die probleem area op die stadium is Noord-Natal, en die rede daarvoor is dat die meeste, indien nie al die vatbare klone in daardie gebied alreeds besmet is met die siekte.

Met kommer oor die tempo asook die geografiese verspreiding, was daar "gelukkig" nog gedeeltes van die bosbougebiede wat nie geraak was deur die siekte nie. Dit was die Hoëveldgebiede waar die meer koue bestand spesies aangeplant word. Die geluk was egter van korte duur met die uitbraak van die siekte in die Amsterdam omgewing. Om die spreekwoordelike kroon te span, is die siekte in 1992 in Bloemfontein waargeneem.

'n Vergelykende studie het dan ook getoon dat die isolate

vanaf die verskillende verspreidings gebiede, dieselfde fungus is.

As daar na die verspreiding gekyk word, is die siekte nie beperk tot sekere gebiede van Suid-Afrika nie. Die siekte sal egter baie erger wees in die warmer bosbougebiede, maar daar word ook verwag dat dit sal uitbrei na al die gebiede waar *Eucalyptus* spp. verbou word. Daar kan dus met reg gesê word dat dit kommerwekkend is as die tempo van verspreiding asook die vatbaarheid van sekere spesies en klone, in ag geneem word.

Early signs of dieback on *E. nitens* caused by *Botryosphaeria dothidea*. This disease is common in Spring, apparently after late frosts



DROUGHT AND THE IMPACT OF DISEASES

Diseases have caused and are causing some very serious losses to the South African forestry industry. The current drought that is besieging the country has, to some extent, detracted from the impact that diseases are having. In many cases, where trees are dying as a result of primary disease situations, deaths are being blamed on drought. Here trees that would "otherwise not have died" have succumbed to drought. There are obviously some interesting yet worrying misconceptions about diseases and the effect that drought might be having on them. The aim of these few comments is therefore to attempt to place the situation in better perspective.

Diseases of forest trees are caused by a wide range of pathogens that respond to the environment in various ways. Many obligate pathogens require healthy, vigorously growing tissue to survive effectively. For example, recent data generated by the TPCP has shown that stressed *Eucalyptus grandis* is much less susceptible to infection by *Cryphonectria cubensis* than healthy non-stressed trees. One would expect the same to be true of pathogens such as *Coniothyrium* that is responsible for the serious canker disease of eucalypts in Zululand. Therefore, the drought might in fact be expected to limit infections by these fungi.

Whereas stress limits the extent of some diseases, it can favour others. The plant pathological terminology used here is "predisposition" and many scientific studies have been conducted on the effects of predisposition and tree disease. Opportunistic fungi, such as species of *Botryosphaeria* and *Endothia gyrosa* rely on stress to severely damage trees. The current drought might therefore, be expected to favour diseases caused by these fungi. The inoculum (spores available for infection) will increase under drought conditions and they might also be found to infect apparently healthy trees.

Many trees are infected by pathogens but are able to continue to grow reasonably effectively. For example, it is common to find *Cryphonectria* canker on

large, yet apparently vigorously growing trees in Zululand. Here infection will have occurred under optimal growing conditions. With the onset of drought, such cankered trees are likely to die. If they had not been moderately diseased, these trees would probably have lived.

It is important not to allow the drought situation to mislead us into believing that tree diseases have abated. There are obviously some diseases that will be less important. Others will be much worse. In the end, we must not forget that pests and diseases pose one of the greatest threats to our forest industry. It is therefore essential that we continue to study these problems in order that we can successfully grow trees despite expected changes in climatic conditions.



Two students of the TPCP taking a break from measuring reactions on trees after inoculation with the canker pathogen *Cryphonectria cubensis*.

CLONES TO BRAZIL

During the past year, we have presented a serious proposal to the forestry industry as a whole, to screen eucalypt clones of interest to our industry (or at least the genetic background of these

clones) for resistance to *Eucalyptus* rust. This proposed project might seem rather unusual at the outset but, is probably one of the most important steps that we can take to ensure the long

term safety of our eucalypt plantations. For those that are not aware of this project, we are including with this newsletter, the following proposal as it was presented to the industry.

FIELD TESTING OF SOUTH AFRICAN EUCALYPTS IN BRAZIL FOR TOLERANCE TO RUST

INTRODUCTION

It has often been said that the South African forestry industry has "been fortunate" in not being particularly seriously affected by diseases. This is somewhat of a misrepresentation of fact, as diseases have had a substantial impact on our industry. They have indeed rather "shaped" many of our forestry operations. There are many situations to exemplify this fact. A few of the best are:

- (i) Our planting of pine species susceptible to infection by *Diplodia* (*Sphaeropsis sapinea*) in areas not affected by hail;
- (ii) The overall avoidance *Eucalyptus globulus* and provenances of *E. nitens* susceptible to *Mycosphaerella* leaf blotch;
- (iii) Avoidance of slash burning or delayed planting after accidental fires to prevent extensive losses due to *Rhizina*.

Diseases already established in South Africa continue to cause substantial losses. For example, loss assessments over a 50 year period indicate that annual losses due to *Sphaeropsis* die-back are in excess of R9.5 million. In addition, new diseases are appearing at regular intervals. The recent appearance of *Cryphonectria cubensis*, a notorious pathogen of eucalypts elsewhere in the world, is an example of this trend. In South Africa, forest timber species have been isolated from their natural enemies. There are many hundreds pests and pathogens of these species that do not occur in the country at this stage and it is likely that many of them will eventually reach us.

SCREENING OF IMPORTANT GENETIC MATERIAL AGAINST PATHOGENS IN ANTICIPATION OF THEIR ARRIVAL

Screening or selection of species, provenances or cultivars for tolerance to disease is a well established plant pathological practice. It is also the most effective strategy with which to reduce losses due to disease in woody host plants. Screening of genetic material against diseases that have, at the time, not appeared in an area is perhaps a less well known strategy. However, this strategy has been, and continues to be, applied in many instances.

Perhaps the best documented example of screening of crop plants to the introduction of a pathogen is the wheat rust screening programme in the U.S.A. This

programme is based on what is known as the "Puccinia pathway". New races of wheat rust first appear in the Southern States where planting commences in advance of that in the Northern States and Canada. Rust races are thus collected in the Southern States each year and wheat cultivars are tested against these prior to planting. Another example pertains to the New Zealand forestry industry. In New Zealand, one of the most feared diseases is western gall rust of pines which is native in the United States. Selected New Zealand clones of *Pinus radiata* have therefore been tested for susceptibility to rust in the United States.

Most programmes to screen genetic material against disease that have not entered an area of propagation have been against rust diseases. This is primarily because rusts produce huge numbers of powdery air borne spores. They are consequently known to spread rapidly within and between continents. It might logically be expected that rust diseases occurring in the Northern Hemisphere will reach South Africa more slowly than those occurring in the Southern Hemisphere. Based on this supposition, pine rusts which (thus far) occur only in the Northern Hemisphere, are less threatening to our forestry industry than eucalypt rust which is already well established in Brazil.

EUCALYPTUS RUST AND ITS THREAT TO SOUTH AFRICAN FORESTRY

Rust diseases of eucalypts are unknown in their native range. First reports of a rust of eucalypts in South America were therefore viewed with misgiving. What appears to have transpired is that guava rust caused by *Puccinia psidii* has adapted to eucalypts and become well established on that host. Eucalyptus rust is, therefore, what might be termed a "new" disease of eucalypts.

Eucalyptus rust is of relatively recent origin and is now well established on various eucalypt species in Brazil. It has become one of the highest priority diseases for the Brazilian eucalypt industry and is feared in many other parts of the world. Perhaps the most threatened is Australia where certain species of eucalypt might totally lack resistance to the pathogen. If the pathogen were to enter Australia, losses equivalent to chestnut blight and Dutch elm disease might be expected.

It is our view that *Eucalyptus* rust is potentially, the most threatening disease to the South African forestry industry. This opinion is based on the following:

- a. Rust diseases spread rapidly and Brazil is in relatively close proximity to South Africa.
- b. Our most important species, *E. grandis* is said to have a very high level of susceptibility to this disease. South African seeds of *E. saligna* has given rise to the most susceptible plants in Brazilian trials.
- c. There are very strong indications that eucalypt rust has recently spread from Brazil to Asia. If this is indeed so, intercontinental spread of the pathogen is already underway.

RATIONALE

If *Eucalyptus* rust were to enter South Africa, it could have a devastating effect on

our forestry industry. At this stage, we have no information on the relative susceptibility of our species to the pathogen. We also have no knowledge of the level of disease tolerance within species such as *E. grandis* and *E. saligna* that are known to be highly susceptible.

It is therefore proposed that the South African forestry take a PRO- ACTIVE approach to this threatening disease. The primary aim would be to identify resistance in genetic material of interest to the industry.

PS. We are happy to announce at this stage that a decision has been made by members of the TPCP to take preliminary steps towards initiating this programme. During the coming year a feasibility study will be undertaken in Brazil to answer the following questions:

1. Who would be the best partners in Brazil to assist us in this venture. Here we must consider both forestry companies as well as plant pathologists.

2. Might it be possible to enter into an exchange agreement with our Brazilian partners. Here we

might screen material of interest to them for resistance to diseases occurring in South Africa but not in Brazil.

3. How should the material be transported to Brazil? What are the quarantine requirements and how should we meet these possible restrictions.

THE OCCURRENCE OF *LASIODIPLODIA THEOBROMAE* ON PINE SEEDS

The fungus *Lasiodiplodia theobromae* has been implicated as the primary cause of many plant diseases on a wide variety of host species. The notoriety of *L. theobromae* as a pathogen of coniferous species is well documented. Tip dieback of seedlings, root rot of mature trees, canker, blue-stain of timber, discolouration of pine seeds, and needle cast have been attributed to it.

Significant problems related to reduced germination of discoloured seeds of *P. elliottii* are currently being experienced by the local forestry industry. The association of, *L. theobromae* with this phenomenon is consequently being investigated by the TPCP.

An independent study conducted in the United Kingdom with *P. caribaea* seeds indicated that 25% of seeds examined were found to be externally contaminated with *L. theobromae*. The location of the fungus inside seeds also indicated the possibility of internal infection and spread. More than 30% of the embryos from seeds with infected endosperms were dead. Fragments of septate hyphae, identified as *L. theobromae*, were found in the cavity between the endosperm and embryo. Evidence showed that seeds are generally infected via the seed primordium, either directly from the mother plant, or by transmission from the outside. It was suggested that infection of *P.*

caribaea seeds by *L. theobromae* could possibly take place during pollination if the ovule was fertilized by an internally infected pollen grain. Seeds could also be infected by penetration of the pathogen through the ovary wall and seed coat or through natural openings or injuries.

Various research strategies are being employed by the TPCP to study the phenomenon of seed discolouration in South Africa and *L. theobromae* as a general pine pathogen. Seeds of *P. elliottii* from clonal seed-orchards are being screened on a regular basis in order to determine the degree of fungal infestation of different seedlots. The pathogenicity of *L. theobromae* on seeds and seedlings is also being investigated. This information will hopefully form the basis of an effective control strategy for this important pathogen.

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 W. J. Swart and Mr G.H.J. Kemp), colleagues and students attached to other organisations such as Mrs N. Nicol of the ICFR, technical assistants funded by the University or through membership fees and post graduate students (at present seven) who are mainly funded by the CSIR/FRD. Staff from various of the Department in the University obviously provide advice and support where this is required.

IMPORTANT : READ THIS

Some difficulty continues to be experienced with the receipt of samples sent to the Tree Pathology Cooperative Program for diagnosis. These have been sent to various members of the TPCP team as well as to the general University address. In order for us to coordinate our services to you please help us by using the following contact address:

TREE PATHOLOGY COOPERATIVE PROGRAM

For attention Prof M.J. Wingfield
Department of Microbiology and Biochemistry
University of the Orange Free State
P.O. Box 339
BLOEMFONTEIN
9300

PHONE : 051 - 401-2581

FAX : 051 - 482004



Back: Mr A. Cilliers, A. Smit, Miss C. de Beer, Dr W. Swart, Mr I. van der Westhuizen, Mrs C. Moolman, Mr G. Kemp, Prof M. Wingfield, Mr G. Marais, F. Wolfaardt, Dr P. van Wyk. *Middle:* Mr C. Viljoen, Dr B. Wingfield, Mr W. de Beer, Miss E. Benade. *Front:* Miss C. Linde, C. Strydom, Mr H. Smith, Mrs M. Mouton, Mr L. van Zyl, Miss E. Conradie, Mr A. Viljoen.
Absent: Mrs. S. Christie, Miss T. Filmalter, C. Visser.
Mr F. Wolfaardt and Miss E. Conradie have since resigned.

