TREE PATHOLOGY NEWS

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

NO 4 NOVEMBER 1991

Christmas Message

The Tree Pathology Cooperative Program has come to the end of its second year of formal existence. Most of you that have dealt with the program will agree that it has been a rushed, frenetic, surprising and yet exiting year!! A few new diseases have crept up on us rather unexpectedly and many of our old "friends" have continued to act as we might have expected.

Two of the rather surprising NEW problems that we have had to consider have been cankers on eucalypts caused by *Endothia gyrosa* and a new and previously unknown root pathogen of pine seedlings that has caused great concern in nurseries. Perhaps the most important point associated with the "discovery" of these diseases previously unknown in our country is the reminder of how critical it is that we continue to survey our plantations for new problems. In this way, we should have a reasonable chance to deal with such problems before they cause unacceptable losses.

It is rather amazing to think that we were unaware of *Endothia* cankers at the beginning of 1991 and that we are now finding them widespread and causing serious problems on many species of *Eucalyptus*. The widespread nature of the pathogen suggest that it has been present in the country for many years. On the other hand, our surveys have been relatively thorough during the last 10 years and I am inclined to believe that the problem has become more serious of late. Indication are that *E. gyrosa* is a stress-associated pathogen and off site plantings and drought appear to have exacerbated the problem. On the clonal side, there are also clear indications that certain clones exhibit greater susceptibility to the problem than others.

It is too early to make strong statements about the new root pathogen of pine seedlings in nurseries. Indications are however that a species of *Fusarium* that causes a notorious disease of pines in the United States is responsible for the problem. In name, this fungus has been known to occur in South Africa for many years but only as a pathogen of maize. The discovery of its presence on pines (albeit on pine seedlings) is of great concern. The extreme virulence of this fungus perhaps explains why we have experienced such dramatic losses in nurseries. The well-known *Fusarium* spp. in pine nurseries could never have caused equivalent problems. We are now working furiously to confirm the identity of the fungus and to evaluate its threat to pine plantings as a whole. On the nursery side, we perhaps have less to be concerned about as the problem can almost certainly be controlled through management and sanitation strategies.

Last year, our big news was the discovery of *Coniothyrium* canker on certain clones of *E. grandis*. We are still battling with this problem. Surveys have been undertaken to determine the distribution of the pathogen in South Africa. The results have been disturbing!! Whereas we believed that the problem would be restricted to the Zululand area, it now seems to be much more widespread. This means that we are going to have to consider clonal plantings in other parts of the country when developing screening procedures to identify disease tolerant clones. At the lab, we are still battling with biological studies on *Coniothyrium*. We also need to find a species name for this destructive yet beautiful fungus. All indications are that the species is new which means that it will have to get a new name. How about *Coniothyrium zuluensis*?

Our research on *Cryphonectria* (the formal undertaking of the TPCP) has continued at a brisk pace. We are now starting to feel more comfortable with techniques for inoculation and evaluation of clones. Our first extensive sets of inoculations at Sappi's Ntenja nursery have greatly enhanced our understanding of the mode of action of the pathogen. Thus, our subsequent inoculations at Mondi (Flatcrown) have been particularly successful.

We will shortly set out for White River to establish inoculations at H.L.& H.'s Tree Improvement Centre and these will be our first in the Transvaal. In 1992, we will, for the first time, have replications of our trials and also be able to evaluate the effect of site on susceptibility. All in all, *C. cubensis* is tremendously pathogenic and we will have to continue to search for means to reduce it's impact on our plantations.

If I were to write a paragraph on every disease that we have investigated during the course of the last year, this newsletter would be the equivalent of the long awaited comprehensive book on tree pathology in South Africa!! The aim of this newsletter is not to report on all diseases and rather to highlight some of our activities. But! talking of books, H.L.& H. and more specifically Deon Brits and Denham Grey have prepared a brief field guide to some of the more worrying disease problems on eucalypts. This pamphlet was developed to assist them in undertaking field surveys for disease problems of concern particularly to their company. The document is, however, useful "across the board" and they have indicated that they will make it available to all interested parties.

It is frightening to think that the year has come to an end while it feels that we have just celebrated its debut. There are so many problems that deserve consideration and time available to take on such studies is just not available. Yet, we have had a most successful and productive year. This is in no small part due to the outstanding assistance and interest of many friends working "out there" in the forests. We sincerely appreciate your help and participation in our program. After all, this is a "Cooperative" venture and in the end, this partnership aims to produce the very best trees on the land available to us.

In conclusion, we thank you all for your support and wish you and yours a very Joyous Christmas and a great, healthy, happy and successful 1992. We look forward to sharing this year with you, seeing you in lecture halls and in the forests and to seeing trees grow vigorously and in the absence of debilitating diseases.

SELECTED ABSTRACTS FROM PRESENTATIONS BY THE TPCP TEAM MEMBERS AT RECENT CONFERENCES.

MYCOFLORA OF PINE BARK GROWING MEDIUM USED IN FORESTRY NURSERIES

Milled and composted pine bark is commonly used as a growing medium for *Pinus* seedlings in South African forest nurseries. Recently, *Fusarium* root rot epidemics in *P. patula* seedlings growing in pine bark medium have been experienced. A detailed study of the mycoflora of the medium was therefore undertaken to determine whether this might be the source of infection. The most satisfactory results were obtained through use of the dilution plating method and transfer of isolated fungi immediately after germination. Most fungi isolated were common saprophytes including high populations of *Trichoderma* and *Gliocladium*. Species of these genera are known to be mycoparasitic. A species of *Fusarium* was the only potential pathogen isolated and this fungus was isolated only once. Results of this study indicate that the pine bark medium has the advantage of favouring mycoparasites and that it is an unlikely source of pathogens.

FUSARIUM SPECIES ASSOCIATED WITH ROOT ROT OF *PINUS PATULA* IN A SOUTH AFRICAN FOREST NURSERY

Fusarium root rot is a well known disease of *Pinus* seedlings in forest nurseries. The disease is best known in open rooted nurseries. It has, however, recently resulted in considerable losses of containerised *P. patula* seedlings growing in pine bark medium in South Africa. In this study, the species of Fusarium associated with the disease and the source of inoculum in a large commercial forestry nursery was considered. Isolations from diseased seedlings yielded *F. Oxysporum* and *F. semitectum*. Five *Fusarium* species were also isolated from irrigation water which appeared to be the main source of inoculum. These species included *F. solani*, *F. oxysporum*, *F. proliferatum*, *F. clamydosporum*, *F. semitectum* and an unknown *Fusarium* species. In contrast, seed and the bark medium were virtually free of pathogens.

NEW CANKER DISEASE OF *EUCALYPTUS GRANDIS*

A severe canker disease has recently been observed in clones of *Eucalyptus grandis* in Natal. The disease is characterised by small necrotic lesions in the green bark of young trees which ultimately result in extensive malformation of the boles. A fungus tentatively identified as a species of *Coniothyrium* was found sporulating profusely on lesions. Symptoms of the disease were reproduced by inoculating young stems of a clone of E. grandis with a culture of this fungus. Using scanning electron microscopy, distinct annellations were observed on conidiogenous cells. This confirms the disposition of the fungus in *Coniothyrium* and all indications are that it is of an undescribed species.

DISTRIBUTION OF *CRYPHONECTRIA CUBENSIS* IN SOUTH AFRICA.

Cryphonectria cubensis is a well known canker pathogen of *Eucalyptus* spp. in tropical areas of the world. Ideal conditions for the pathogen include high temperatures and humidity throughout the year. These climatic conditions represent the most important factors that determine the distribution of *C. cubensis*. In South Africa, some of the main *Eucalyptus* growing areas experience drier or colder conditions than those usually associated with *Cryphonectria* canker. Losses caused by the disease are therefore expected to be more severe in the warmer areas of the country that also have high rainfall. This hypothesis has been confirmed in a preliminary field survey.

COMPARATIVE SUSCEPTIBILITY OF *EUCALYPTUS GRANDIS* CLONES AND HYBRIDS TO *CRYPHONECTRIA CUBENSIS*

Cryphonectria cubensis has recently been found in South Africa, causing serious stem cankers on commercially propagated *Eucalyptus grandis* in plantations. Susceptibility of different *E. grandis* clones and hybrids was tested. Artificial inoculations were made on 6-month-old trees using 10mm diameter plugs from 3-week-old cultures of *C. cubensis* on malt extract agar (MEA). Sterile MEA-plugs were used for control inoculations. Lesion development was measured six-weeks, six-months and one year after inoculation. Statistically significant differences in susceptibility between clones were found. Hybrids of *E. grandis* with *E. camaldulensis*, *E. urophylla* or *E. tereticornis* tended to be more tolerant to the pathogen than pure *E. grandis* clones. The potential, therefore, exists to manage disease development by planting clones selected for tolerance to the disease through artificial inoculation.

THE POTENTIAL THREAT OF CRYPHONECTRIA CANKER AND EUCALYPTUS RUST TO THE SOUTH AFRICAN FORESTRY INDUSTRY

The South African forestry industry has embarked on an extensive program to propagate clones and hybrids of *Eucalyptus grandis*. This program is similar to one in Brazil where a number of pathogens have caused noteworthy losses. The best known of these are stem canker and rust caused by *Cryphonectria cubensis* and *Puccinia psidii* respectively. Cryphonectria canker has recently been discovered in South Africa and a program has already been established to assess its significance as well as to screen clones for susceptibility to the disease. *Puccinia psidii* is known only in Brazil and has originated from native Myrtaceae in the area. All indications are that it would cause significant losses to the *Eucalyptus* industry in South Africa. Every attempt must therefore be made to ensure that it does not become established in this country.

LOSSES ASSOCIATED WITH *SPHAEROPSIS SAPINEA* INFECTION FOLLOWING HAIL DAMAGE.

Following a hail storm over Kruisfontein State Forest in the Southern Cape during February 1986 widespread infection by *Sphaeropsis sapinea* occurred over an area of approximately 1930 ha. Approximately one quarter of this area was evaluated as being so heavily damaged that thinning or clearfelling was carried out to eliminate dead and malformed trees. An assessment was subsequently made of the amount of timber damaged or lost as a result of this outbreak.

An area of 191.5 ha comprising of *Pinus radiata* (80.3%), *P. elliottii* (12.2%), *P. pinaster* (6.7%) and *P. taeda* (0.8%) was demarcated for study purposes. In this area, 100.4 ha of *P. radiata* was clearfelled due to extensive tree mortality, and replanted with the same species. Potential yields of the replanted stands were predicted for the number of years needed to complete the previous rotation at the age of 30 years. The total of the achieved yield at the felling stage, and the potential yield predicted for the replanted stands, was then compared to the potential yield of the original hail-damaged stands. It was assumed that these stands would have been harvested at the age of 30 years had they not been disturbed by hail damage and *S. sapinea* infection.

LOSSES

In total, 8 731 m^3 of *P. radiata* timber valued at R 102 396 had to be prematurely harvested in the study area. Had these stands not been damaged, they would have produced approximately 39 653 m^3 of timber in the 30 years needed to complete the rotation. The amount of timber harvested prematurely, plus that predicted for re-established stands during the same time period, was 72.2% of the volume and 45.5% of the value of the potential production, i.e. production not disrupted by hail associated *S. sapinea* infection. The timber loss due to *S. sapinea* infection in compartments prematurely clearfelled was therefore 27.8% of volume and 54.5% of value. Total predicted volume of timber lost in compartments not clearfelled was an average of 11.4%. In monetary terms the calculated loss was approximately R496l/ha. Assuming that 25% of the total area affected in this outbreak was clearfelled

prematurely because of *Sphaeropsis*-dieback, then the economic loss for the region could be estimated as R 2.5 million (2000 ha x 0.25 x R4961/ha).

Twenty five outbreaks of dieback after hail have been recorded during the years 1923-1983; this is approximately 0.4 outbreaks/yr. Assuming that the magnitude of the outbreak in this study was double the average, this would mean that the forest industry in the Southern Cape is losing about R500 000 per year.

Extrapolation of this result to all the pine plantations in South African would be an average loss of R 9.5 million/yr due to *S. sapinea*.

RECOMMENDATIONS

The decision to clearfell stands infected by *S. sapinea* is difficult because potential mortality cannot be reliably predicted at the time that hail damage occurs. The decision should not be influenced by extensive foliage discolouration soon after the occurrence of hail because foliage can regenerate after a year. A more reliable indicator of disease development is the amount of timber discolouration. A small number of hail damaged trees could be felled periodically and examined for discolouration of the cambium, wood and pith during the first six months after symptoms appear. Consideration should first be given to removing infected trees in commercial thinnings when discolouration spreads to the lower crowns below the minimum utilizable stem length. Stands should, therefore, only be clearfelled when infected trees are too numerous to be eliminated by thinning.

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), collegues 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 has been experienced during the last few months 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:

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From the dawn of civilization, forests have been a very important part of man's environment. They have always supplied many of man's basic needs - material, aesthetic and spiritual. Through careful management, forests yield countless products for man's use and enhance environmental quality at the same time.

Forests are a very important part of man's environment. Their value for timber, wildlife, recreation, water, erosion control, and aesthetics has long been recognized. But, forests also screen dust from the air, suppress loud noises, dissipate unpleasant odours, produce atmospheric oxygen, reduce atmospheric pollutants, and temper the climate. For people seeking relief from the busy world, forests provide a place of quiet, rest and inspiration. Forests are a relatively permanent type of land cover. Unless seriously disturbed by man, widespread catastrophe, or major climatic change, forests persist indefinitely on a given area of land. Their contribution to the ecological stability of nature benefits many forms of life, including man.

The importance of individual trees, groves of trees and small forests near and within cities is becoming increasingly understood and appreciated.