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TREE PATHOLOGY NEWS

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THE SCREENING OF EUCALYPTUS FOR RESISTANCE TO CRYPHONECTRIA CANKER

The recent discovery of the fungal pathogen, Cryphonectria cubensis in South Africa is cause for great concern in the local forestry industry. This fungus causes a serious canker disease of Eucalyptus species in many tropical areas of the world. In Brazil, for example, it has severely curtailed the development of plantations of susceptible Eucalyptus spp. In South Africa, the planting of Eucalyptus spp. has become increasingly important with a general trend towards the propagation of clones and hybrids. The threat posed by this pathogen is dependant on the susceptibility of the Eucalyptus species or clones planted. It is, therefore, important not to plant clones or species susceptible to C. cubensis in areas where the pathogen is likely to occur. For this reason, an intensive programme has been launched by the Tree Pathology Cooperative Program (TPCP) at the University of the Orange Free State to screen Eucalyptus species, clones and hybrids for their susceptibility to C. cubensis.

The strategy being employed by the TPCP is to conduct screening trials in both the glasshouse and forest. The technique is to inoculate various selections of clones, hybrids or species with C. cubensis and then measuring and comparing the sizes of the resulting lesions. Forest trials are currently being established by all members of the TPCP and each trial will be supplemented by a glasshouse trial as well. Should it become apparent that results in the glasshouse correlate with those of larger trees in the forest, then forest trials may be stopped in favour of glasshouse trials. Until such time, however, the cooperation of field managers in laying out forest trials and supplying young plants in sufficient quantities for glasshouse trials, is very important.

Results have so far been very encouraging and indicate that there are significant differences in susceptibility among clones and hybrids. It is envisaged that the screening programme will eventually form an intergral part of the forestry industry's management strategy whereby species, provenances, clones or hybrids are selected for afforestation. In so doing, the potential threat that Cryphonectria poses for the industry can be greatly reduced.

ROOT DISEASE OF EUCALYPTUS IN SOUTH AFRICA

In recent months, a large number of enquiries concerning root disease of various Eucalyptus have been received. Numerous Eucalyptus spp. have been involved and this has raised fears that severe losses might be expected in the future. The aim of this note is to attempt to place the problem in perspective.

In the past, the two species of Eucalyptus that have been particularly sensitive to root disease have been E. fastigata and E. fraxinoides. This disease appears to most severe on the latter species. We have proven pathogenicity of Phytophthora cinnamomi to both these species and believe that in many cases this is the primary causal organism. There have however been a number of cases where other Phytophthora spp. are involved and we are in the process of studying these occurrences.

More recently, many cases of root disease in *E. smithii* have been encountered. Most of the samples that we have studied have been from the Piet Retief area and from the Eastern Transvaal. As is true in the case of most root diseases, many fungi are associated with the disease. These include species of *Phytophthora*, *Pythium*, *Fusarium*, *Cylindrocladium* and *Botryosphaeria* as well as a plethora of saprophytic moulds. All of these fungi have the potential to cause root disease individually but various combinations of them are probably contributing to the disease. Moreover, the fungi involved probably vary from site to site.

An interesting situation has recently developed in the Northern Natal area where root and root collar disease has been observed in scattered young *E. grandis*. Again, a number of fungi are associated with the problem. Of particular interest however, is a *Pythium* sp., apparently undescribed and which occurs quite commonly in isolations. We have done pathogenicity tests with this fungus and have found it to be highly pathogenic. However, it is important to note that this need not necessarily be the only cause of root disease in the area.

In addition to the above mentioned problems, a wide variety of *Eucalyptus* spp. in the Seven Oaks area are apparently showing signs of root and root collar disease. Of concern is that these species apparently include *E. nitens*. Our isolations as well as those of others have yielded *Phytophthora* and *Pythium* spp.

PREDICTIONS

Perhaps the most important point to make at this stage is that root diseases are often complex and variable. It is therefore essential that blanket diagnoses are not made based on information from a single area.

Root diseases are strongly site dependant. In most cases, we should expect that the sites where problems are being experienced are conducive to root disease. In the case of *Phytophthora* and *Pythium* spp., heavy poorly draining soils are usually associated with disease. High water tables are also often found where disease problems are being experienced.

Root disease are often associated with stressed trees or trees with poor root systems. Thus if seedlings or cuttings with poor root systems are planted, we might expect root disease to be a problem.

FUTURE REQUIREMENTS

1. We know very little about the root disease complex on *Eucalyptus* in South Africa. Our priority at this stage is to undertake extensive surveys to determine exactly what fungi are associated with the disease on different hosts and in different areas. As is obvious from the above statements, this work has been underway for some time now. In fact we know a great deal more today than we did even a year ago.
2. It is essential that the factors associated with the root disease problem be studied. A better knowledge of site characteristics associated with this problem and the species involved in particular areas will help us to avoid problems.
3. Although the complexity of this disease problem will make it difficult for us to undertake such studies, pathogenicity tests with the various fungi must be undertaken in the future. Host range studies and clonal susceptibility trials will then be possible.
4. Finally, although the disease is of considerable concern in certain areas, we believe that it would be inappropriate to over react to the situation at this stage. Our knowledge of this sort of root disease suggests that it is most unlikely that epidemic losses will occur. On the other hand, it is likely that we will have to match species to our sites carefully to avoid problems.



TREE PATHOLOGY NEWS

We have established Tree Pathology News as a means of conveying recent results and observations on diseases in forest plantations and nurseries to members of the Tree Pathology Cooperative Program. In other words, this informal newsletter is, at this stage, intended for interested staff of SAPPI, Mondi and H.L.&H. Comments in the newsletter might be published in a similar form elsewhere in order to solicit response from forestry personnel where this might enhance our knowledge of tree diseases. The brief articles included in Tree Pathology News can also be freely quoted without permission assuming that fair credit is given.

It is our intention to produce Tree Pathology News at irregular intervals. This will be particularly at times when we are in possession of information that we believe is of particular interest to our members. We also intend to share preliminary research results with you in the hope that these will result in feedback that will enhance our research program. Thus any comments or constructive criticism of news items in Tree Pathology News would be very welcome. These can be sent to us care of Prof M.J. Wingfield at the address the cover of this document.

A NOTE ON THE TREE PATHOLOGY COOPERATIVE PROGRAM

As most of you will be aware, the Tree Pathology Cooperative Program is a membership program that was established at the University of the Orange Free State to ensure continued the presence of a competent and active tree pathology research team to serve the South African forestry industry. At present, members of the Program are SAPPI, Mondi and H.L. & H. who with the University of the Orange Free State provide financial support. The ICFR is an honorary non-paying member and this, of course, implies close cooperation with the latter organisation. The University of the Orange Free State obviously contributes significantly in terms of infrastructure and technical back-up. Various projects on more fundamental aspects of tree diseases are funded by the University and through grants from the CSIR Foundation For Research Development (FRD). We believe that this team approach to research bodes well for the continued growing of healthy trees in South Africa.

ACTIVITIES OF THE TREE PATHOLOGY COOPERATIVE PROGRAM

The activities of the Tree Pathology Cooperative Program are varied. We provide a free laboratory diagnostic service for our members. In addition, research is conducted on priority disease problems. Our major project funded by members of the program concerns the recently discovered Cryphonectria canker of *Eucalyptus*. This disease which occurs primarily in Northern Natal but which has also been found in the White River and Tzaneen areas has caused serious damage to *E. grandis* in other parts of the world. For instance, during the early stages of clonal propagation of *E. grandis* in Brazil, Cryphonectria canker resulted in severe losses. Subsequent selection for resistant trees has, however, considerably reduced the problem in that country.

Our research program on Cryphonectria canker in South Africa is aimed at ensuring that susceptible clones of *E. grandis* are not widely planted in areas where Cryphonectria canker could be serious. The first phase of the project will last approximately one year and aims to evaluate techniques for the evaluation of tolerance in clones commonly planted by member companies. Initially, these techniques will involve artificial inoculation of trees but hopefully we will be able to initiate more rapid screening procedures in the future. Other issues to take into consideration will be the evaluation of variation in the pathogenicity of isolates of the causal fungus. An ultimate goal would be to identify groups of susceptible and tolerant clones using electrophoretic techniques.

Although research on Cryphonectria canker is a primary objective of the Tree Pathology Cooperative Program, members of the research team are involved in various other research activities. We have for instance established a significant project on root diseases of forest trees and continue internationally recognised research on insect-associated tree pathogens such as *Ceratocytis* spp. We are also studying various stem canker diseases of *Eucalyptus*, *Eucalyptus* leaf diseases (in cooperation with Nicky Knipscheer (ICFR) and Pedro Crous (PPRI)); diseases of seedlings and cuttings in nurseries and the well-known pine pathogen, *Sphaeropsis sapinea*.

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, Mr. W.J. Swart and Mr. G.H.J. Kemp), colleagues and students attached to other organisations such as Ms. N. Knipscheer of the ICFR and Mr. P.W. Crous of PPRI, 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 Departments in the University obviously provide advice and support where this is required.



THE INFLUENCE OF CLIMATE ON CRYPHONECTRIA CANKER OF EUCALYPTS

The incidence and severity of Cryphonectria canker in Eucalyptus plantations varies greatly depending not only upon Eucalyptus species, but also on climatic conditions prevailing in an area. Information on the influence of climate in various parts of the world could provide clues to the potential damage the disease can cause in South Africa. Although the pathogen has to date primarily been recorded in Natal, it is possible that the disease could become more widely spread in other eucalypt-growing areas of the country. Its' overall impact on the forestry industry has, till now, been relatively small, but with changing weather patterns the present situation could change drastically.

The distribution of Cryphonectria canker is probably determined by humid conditions needed for the growth and spread of the pathogen. The disease is favoured by high rainfall (2 000 - 2 400 mm/year), high elevation and temperatures above 23 C. In Brazil, C. cubensis causes heavy losses in areas where high rainfall occurs throughout the year, and temperatures average 23 C or higher. Infection rates under such conditions sometimes reach 80% with 20% mortality after three years. In cooler or drier areas of Brazil, infection rates are much lower as is the extent of canker development. In other parts of the world where Cryphonectria canker occurs, climate also seems to determine the severity of the disease. In Kerala, in India, the disease is worst in areas with high rainfall and temperatures between 20 to 25 C. In southern Florida in the USA, damage is small. The summer rainy season in Florida lasts for about four months, the winter is cool, and spring and fall, although hot, are usually dry. In contrast, the climate of Hawaiian islands offers ideal conditions for disease development.

The distribution of C. cubensis in South Africa is unknown and field surveys are, therefore, urgently required. Such surveys must take both short- and long-term climatic factors into account. In so doing, a better picture can be obtained as to the potential impact of the pathogen in certain areas of the country and at certain times of the year. This information could make a valuable contribution to the overall control strategy against this pathogen.