

## NEWS AND VIEWS/NUUS EN MENINGS

## Current status and future prospects of forest pathology in South Africa

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Unlike most countries in the northern hemisphere, South Africa has poor natural resources of timber. The forestry industry in this country is, therefore, dependent on plants of exotic tree species such as pines, eucalypts and wattle. In general, single species of these trees are planted over extensive areas. The manner in which timber is produced is thus not obviously different from the monoculture used in the establishment of agricultural crops.

In view of their susceptibility to disease, monoculture of crops raises considerable concern. Because of the genetic uniformity of the crop, a pathogen to which the host is not resistant can result in devastation. Disease epidemics such as late blight of potato caused by *Phytophthora infestans* (Mont.) de Bary, which was responsible for the Irish potato famine between 1845 and 1847,<sup>1</sup> justify these fears.

The most important difference between monoculture of agricultural and tree crops is that trees, once planted, require many years, even decades, before they realise their growth and economic potential. Plant production and establishment costs are also exceptionally high. Considerable losses can, therefore, be experienced if a disease becomes established in a young plantation.

Although the fact is perhaps not well recognised outside forestry circles, diseases have had a significant impact on forestry in South Africa. For instance, the pathogen *Sphaeropsis sapinea* (Fr.) Dyko & Sutton (= *Diplodia pinea* (Dsm.) Kickx) that infects and kills certain *Pinus* species after hail damage was responsible for restricting the planting of the highly susceptible *P. radiata* D. Don. to areas where hail damage is infrequent.<sup>2-4</sup> Similarly, a leaf disease caused by *Mycosphaerella molleriana* (Thum.) Lindau apparently resulted in an inability to establish *E. globulus* Labill. in this country. More recently, the same pathogen has caused considerable damage to *E. nitens* (Deane & Maiden) Maiden and only certain provenances of this species can be planted today.<sup>5</sup>

Despite the impact that certain diseases have had on forestry in South Africa, the losses have been comparatively small. Our commercial tree species have been isolated geographically from most of their native diseases. Thus, any one of a large number of pathogens that have, as yet, not appeared here could result in devastation. The ex-

tensive losses that New Zealand experienced after the accidental introduction of *Dothistroma septospora* (Dorog.) Morelet exemplifies this threat.<sup>6</sup>

The aim of this review is to provide an overall impression of the status of forest pathology in South Africa. Although examples are restricted to pathology, most arguments apply equally to the broader field of forest protection including entomology. The current status of forest pathology in this country is briefly sketched using examples of native and exotic pathogens. This provides a foundation for a discussion of the future prospects for this field of research. This is pertinent in view of increasing population pressures and rapidly diminishing arable land.

### Current status

Diseases of commercially planted forest trees were recognised early this century.<sup>7</sup> The two most notable diseases to receive attention were die-back of pines due to *S. sapinea* and root rot caused by *Armillaria*.<sup>8</sup> Subsequently, numerous diseases were recorded by mycologists and plant pathologists but very little attention was given to these disorders. Only in recent years has more detailed research been undertaken on some of the more important diseases.

Diseases of forest trees in South Africa include those caused by introduced as well as native pathogens. Although there are exceptions, introduced pathogens are mostly fungi that infect leaves and stems. In contrast, most root pathogens are probably native to this country.

### Introduced pathogens

The best examples of introduced pathogens of pines are *S. sapinea* (mentioned above) and *Rhizina undulata* Fr., a pyrophilous fungus that can cause significant losses to pines after plantation fires.<sup>9</sup> *Dothistroma septospora* has been responsible for extensive losses to *P. radiata* in various parts of Africa and New Zealand.<sup>6</sup> This pathogen has been present in South Africa for many years but has remained restricted to small areas of the eastern Cape.<sup>10</sup>

An interesting group of fungi with a range of pathogenic abilities are associated with pine-infesting bark beetles that were introduced accidentally, with their micro-

bial flora, into the country.<sup>11-14</sup> These include numerous species of *Ophiostoma* H. & P. Sydow and their anamorphs such as *Leptographium* Lagerb. & Melin and *Graphium* Corda. The role of these fungi in the life cycles of their vectors is the subject of considerable debate and represents an exciting and important area of research.

As is true in the case of pines, numerous pathogens of eucalypts in South Africa are of exotic origin. Some of the most notable are *Mycosphaerella molleriana*. Other leaf pathogens that occur commonly and have the potential to cause extensive losses are *Aulographina eucalypti* (Cooke & Masee) Von Arx and Muller and *Phaeoseptoria eucalypti* Hansf. emend. Walker.<sup>15,16</sup> The most recent pathogen to be discovered on eucalypts in this country is *Cryphonectria cubensis* (Bruner) Hodges.<sup>17</sup> This fungus has caused considerable losses to eucalypt crops in Brazil and elsewhere so its appearance in South Africa is of obvious concern. This is particularly true because one of the more susceptible hosts is *E. grandis* Hill: Maiden,<sup>18</sup> which is the most widely planted *Eucalyptus* species in South Africa. It is currently assumed that the pathogen is of exotic origin. Further studies, particularly including molecular characterization, are necessary to establish the origin and thus evaluate the potential threat of the pathogen to our *Eucalyptus* plantations.

### Native pathogens

Pathogens of pines and eucalypts that are probably native to South Africa include the root pathogens, *Phytophthora cinnamomi* Rands, *Armillaria heimii* Pegler and *Pseudophaeolus baudonii* (Pat.) Ryv. As is typical of most root pathogens, these all have wide host ranges and have been found on both pines and eucalypts. Losses due to these fungi in plantations have been sporadic and not significant thus far.<sup>19</sup>

*Phytophthora cinnamomi* is the best known of the tree pathogens thought to be native to this country. This fungus is a notorious pathogen of woody plants and has a cosmopolitan distribution.<sup>20</sup> There is considerable controversy over its origin and there has been strong evidence to suggest that it originated in Papua New Guinea.<sup>21</sup> Equally convincing evidence supports the notion that the fungus is native in more than one geographic location including Southern Africa,<sup>22-24</sup> a view I share.

The opportunistic stem pathogen *Botryosphaeria ribis* Grossenb. & Dug. is common on many native woody plants including Proteaceae.<sup>25</sup> This fungus has also been found to cause sporadic incidences of extensive die-back of pines and eucalypts. Because of its presence on indigenous

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