Phytophylactica 18, 51-53 (1986)

FIRST REPORT OF *MYCOSPHAERELLA GIBSONII* IN SOUTH AFRICA

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ABSTRACT

Key words: *Mycosphaerella gibsonii, Cercoseptoria pini-densiflorae, Pinus* spp., needle blight

Mycosphaerella gibsonii, the cause of brown needle disease, is reported for the first time from South Africa. The disease was found on *Pinus canariensis, P. griffithii, P. pinaster and P. radiata* in the Southern Cape, Eastern Cape and Eastern Transvaal forest regions, and is briefly described.

Uittreksel

EERSTE AANMELDING VAN MYCOSPHAERELLA GIBSONII *UIT SUID-AFRIKA*

Mycosphaerella gibsonii, *die oorsaak van bruin naaldsiekte, word vir die eerste keer uit Suid-Afrika aangemeld. Die siekte is gevind op* Pinus canariensis, P. griffithii, P. pinaster en P. radiata *in die Suid-Kaapse, Oos-Kaapse en die Oos-Transvaalse bosboustreke en word kortliks beskryf.*

INTRODUCTION

Brown needle disease was first observed affecting young *Pinus densiflora* Sieb. & Zucc. in Japan in 1913 (Ito, 1972). The causal fungus was subsequently indentified as *Cercospora pini-densiflorae* Hori & Nambu (Nambu, 1917) and later renamed *Cercoseptoria pini-densiflorae* (Hori & Nambu) Deighton (Deighton, 1976). Brown needle disease apparently remained confined to Japan and Taiwan until about 1960, but was later found in East Africa (Gill, 1963), Malaysia (Anonymous, 1967) and Central Africa (Gibson, 1979) affecting *P. caribaea* Mor., *P. oocarpa* Schiede and *P. radiata* D. Don. *C. pini-densiflorae* has recently been observed in a natural pine forest in Central America where it might be indigenous (Evans, 1984).

Evans (1984) has suggested that, in addition to the anamorph, this fungus might produce a synanamorph (*Asteromella* sp.), and a teleomorph (*Mycosphaerella gibsonii* H. Evans) within the same stroma. Although the connection between anamorph and teleomorph has not been conclusively demonstrated, there is strong circumstantial evidence to support the association of these states. Evans (1984) re-examined collections disposed as *C. pini-densiflorae* and *Mycosphaerella pinicola* (Fautr.) Naoum. in the Commonwealth Mycological Insitute (CMI) herbarium and found that the teleomorph, *M. gibsonii*, has been present in East Africa and Central Africa since 1962, and South East Asia since 1966, always in association with the *Cercoseptoria* anamorph. The teleomorph has, however, not been found in any of the Japanese collections.

C. pini-densiflorae can cause severe defoliation and death of late nursery stock and young plantations of a number of susceptible pine species (Ivory, 1972; Gibson, 1979). Most species, however, become resistant within a few years (Suto, 1982). The disease spreads by means of rain-splashed conidia during wet weather and requires two or three days of moist humid conditions for dispersal and infection, with symptoms appearing after about 5 wks (Ivory, 1972).

During a recent tour to investigate the occurrence of diseases in forest plantations in various parts of South Africa, *M. gibsonii* was found on several pine species. This fungus has not previously been recorded from South Africa.

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Received 14 November 1985; accepted for publication 24 January 1986

MATERIALS AND METHODS

Pines in the Western, Southern and Eastern Cape, Natal, Eastern and Northern Transvaal were checked for the presence of pathogens by examination of obviously diseased trees, and collection of foliage and litter samples from apparently healthy trees. Where possible, trees in arboreta were examined to increase the number of pine species surveyed. Herbarium voucher specimens of *M. gibsonii* (Ivory 1624, 1665 and 1675) collected in this study were deposited in the CMI herbarium (IMI 296387, IMI 296388, IMI 296389) and the National Fungus Collection in Pretoria (PREM 48216, PREM 48217 and PREM 48218).

Isolates of *M. gibsonii* were made from two collections (Ivory, 1624 and 1665) on 2 % malt extract agar medium. These cultures are presently maintained at the Oxford Forestry Institute, Oxford, and Plant Protection Research Institute, Stellenbosch.

RESULTS AND DISCUSSION

M. gibsonii was found at four sites in three different forest regions (Table 1) along with other needle fungi, including *Lophodermium australe* Dearness, *Cyclaneusma minus* (Butin) DiCosmo, Peredo & Minter, *Sphaeropsis sapinea* (Fr.) Dyko & Sutton, *Pestalotiopsis* sp. and *Truncatella* sp. These fungi are usually saprophytic on dead needles, including those killed by *M. gibsonii*. Some trees on which *M. gibsonii* was found were also affected by insects or other fungi (Table 1) that could mask the presence of *M. gibsonii*.

Symptoms of brown needle disease caused by *M. gibsonii* appear as pale green spots or bands at any point along infected primary or secondary needles, particularly on seedlings and young trees. Bands on needles turn yellow and then a grey-brown colour. Numerous black stromata of *M. gibsonii* form within the stomatal cavities of affected bands and these, depending on their abundance, give a grey or black discoloration to the bands. Broad bands of black stain may also form in affected foliage before tissues are killed. Foliage of the lower crown is usually the most affected due to the more favourable conditions for infection which occur there. Dead foliage usually remains on the tree for many months but can be shed during high wind or heavy rain.

After the formation of black stromata in the stomatal cavities, brush-like tufts of elongate conidia (Fig. 1–4) are formed on the erumpent parts of the stromata. Production of conidia continues during warm damp weather, which also favours germination and infection. During dry weather, conidia are not produced, but the fungus

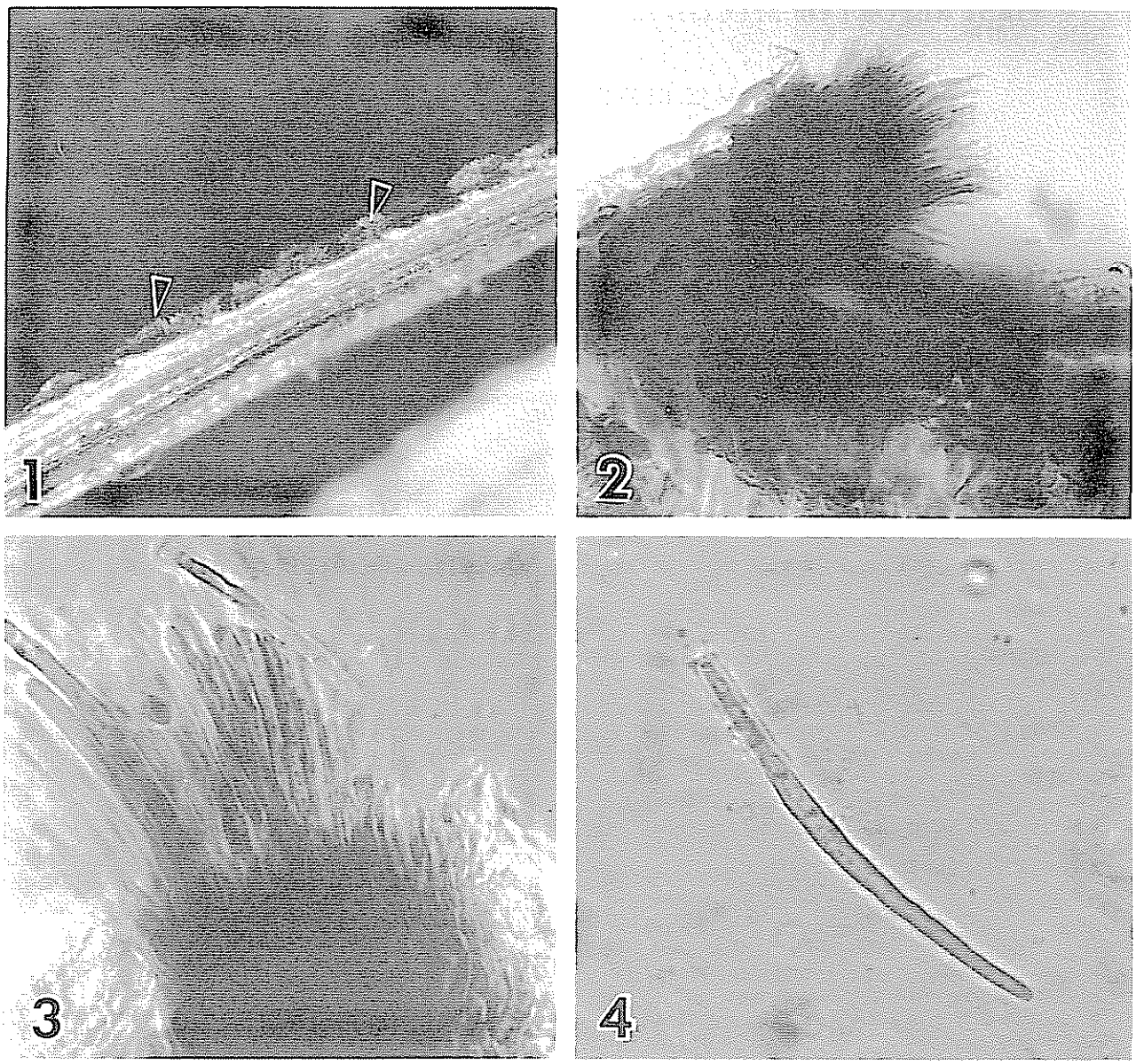

FIG. 1–4 Conidiophores and conidia of *Cercoseptoria pini-densiflorae*
1 Tufts of conidiophores (arrows) on pine needles
2 Stroma and conidiophores displacing needle epidermis (× 400)
3 Conidia and conidiophores (× 1 750)
4 Elongate conidium (× 1 750)

remains dormant in the host tissues (Gibson, 1979). The fungus can survive for long periods in dry needles, but in more temperate climates it might overwinter as latent infections in green needles which become infected late in the year. These latent infections would then give rise to symptoms in the spring of the following year (Suto, 1982).

Shoot and needle blight symptoms have been noted in South Africa on pines, such as *P. radiata*, for many years (Wingfield & Knox-Davies, 1980) with much of this damage reportedly due to *S. sapinea* [syn. *Diplodia pinea* (Desm.) Kickx] infection following severe hail storms. *S. sapinea* has thus been blamed for the abandonment of *P. radiata* planting in the warmer parts of South Africa (Lückhoff,1964; Laughton, 1937). In addition, dothistroma needle blight caused by *Mycosphaerella pini* E. Rostrup was reported from an unspecified site in the Eastern Cape Forest region in 1965 (Ivory, 1967) and more recently from the same region by Lundquist & Roux (1984). The symptoms of brown needle disease and dothistroma needle blight can be confused with, or masked by, symptoms of *S. sapinea*. For this reason, brown needle disease and dothistroma needle blight might be more common than presently supposed. These diseases could also have contributed to the poor performance of *P. radiata* in Natal and Transvaal.

Evans (1984) noted morphological differences between collections of *M. gibsonii* from Asia and Africa, but considered these to be induced by climate or host factors. Ivory (unpublished) observed similar differences between Asian and African collections of *M. gibsonii*, but also found that the African fungus appears to be less pathogenic to young *P. patula* than strains in India and Nepal.

Of the major pine species grown in South Africa, only *P. radiata* and *P. pinaster* are known to be highly susceptible to *M. gibsonii*. Very little information is available regarding the susceptiblity of other species. Suscep-

TABLE 1 Distribution and hosts of *M. gibsonii* in South Africa

Forest region	Collection area	Host	Approximate host age (yrs)	Collection number	Associated insect or disease
Southern Cape	Saasveld Forest Research Station	*P. pinaster* Ait.	5	Ivory 1614	Pine woolly aphid (*Pineus pini* Macquart)
		P. canariensis C. Smith	25	Ivory 1619	Dothistroma needle blight
Eastern Cape	Isidenge State Forest	*P. radiata*	3	Ivory 1620	Dothistroma needle blight
	Nelshoogte State Forest	*P. radiata*	18	Ivory 1624	None
		P. radiata	8	Ivory 1665	Diplodia shoot blight (*S. sapinea*)
Eastern Transvaal	D. R. de Wet Forest Research Station	*P. canariensis*	25	Ivory 1675	Pine woolly aphid
		P. griffithii McClelland	25	Ivory 1676	None
		P. radiata	20	Ivory 1677	None

tibility trails should therefore be established using al the widely-grown and promising pine species in South Africa and local isolates of *M. gibsonii*.

ACKNOWLEDGEMENTS

The survey of pine forests in South Africa by the first author was undertaken as part of Research Project R. 3809 on tropical pine diseases funded by the Overseas Development Administration (London). This article is published with the approval of the Overseas Development Administration and Plant Protection Research Institute. We are grateful to staff of Plant Protection Research Institute and Department of Environment Affairs for assistance.

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