

Black-Butt Disease of Black Wattle Caused by *Phytophthora nicotianae* var. *parasitica*

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ABSTRACT

Inoculation experiments show that the black-butt disease of Black Wattle (*Acacia mearnsii*), cultivated for the high-quality tannins in its bark, appears to be caused by *Phytophthora nicotianae* var. *parasitica*. Two syndromes of the disease can be

distinguished. The first takes the form of spreading mottled lesions, possibly related to infection by zoospores, and the second of tongues of diseased bark, originating from the penetration of mycelium. *Phytopathology* 61:144-145.

Additional key words: Gummosis of Black Wattle, Mottled disease of Black Wattle.

Black Wattle (*Acacia mearnsii* De Wild.) is being cultivated in several parts of the world for the high-quality tannins contained in its bark (2). The so-called gummosis disease of Black Wattle has proved to be a complex of diseases of different origin and appearance (3). One form of this disease complex is known as "black-butt", and is usually characterized by the production of large quantities of gum and the blackening of the basal part of the stem. Two distinct syndromes can be distinguished, which are produced by the same pathogen but under different environmental conditions. The first consists of mottled lesions appearing on the young, green-colored bark. These are dark-brown-to-black patches of dead tissue, sometimes localized, but more often spreading to cover the greater part of the stem. The second syndrome is characterized by black-to-brown tongues of dead bark or sunken areas extending upwards from the base of the stem. Depending on the resistance of the tree, a repeated process of recovery and relapse may follow, in which black crusts of dead bark are pushed off; hence the name "black-butt".

From lesions of both types, *Phytophthora nicotianae* var. *parasitica* (Dastur) Waterhouse was isolated (3). This paper reports the results of inoculation of Black Wattle trees in two successive seasons, with wattle isolates of *Phytophthora nicotianae* var. *parasitica*, *Pestalotia crassiuscula*, *Fusarium oxysporum*, and *Rhizoctonia* sp.

MATERIALS AND METHODS.—In the summer of 1968-69, 250 3-year-old wattle trees were inoculated at breast height on one side with mycelium, with the other side being used as a control. In 1969-70, 400 trees were used, 200 for inoculation and 200 for controls. Incisions were made in inverted "U" form in the bark, and the wounds washed with water at ca. 90 C. Inoculations were made with mycelium on potato-sucrose yeast agar, and covered with wet cotton wool and plastic sheeting. Ten trees were inoculated with *Pestalotia crassiuscula* (Ste.) Guba, 10 with *Fusarium oxysporum* Schlecht., 10 with *Rhizoctonia* sp., 10 with *Phytophthora nicotianae* var. *parasitica*, and 10 with a mixture of the last three, once a month from September 1968 up to and including January 1969. A similar series was completed in the same months a year later, but without the *Rhizoctonia* set,

and using different trees for inoculation and for control with each set. All fungi used had been isolated previously from wattle (3). Preliminary reisolation trials were made on potato-sucrose yeast agar and on the medium used by Flowers & Hendrix (1).

RESULTS.—The reactions of the trees were observed 1 to 5 months after the inoculations, and took the form of tongues of dead bark extending up and down the inoculation wounds, mottled lesions spread over the stem, and small cracks (1-3 cm) in the bark exuding gum. The results of both series showed clearly that the inoculation of healthy wattle trees with *Phytophthora nicotianae* var. *parasitica* gave a significantly higher incidence of disease ($P < 0.01$) than the controls, whereas this was not the case with *Pestalotia*, *Fusarium*, or *Rhizoctonia* (Table 1). The experiments in which mixtures including *Phytophthora nicotianae* var. *parasitica* were used also gave a significantly higher disease incidence ($P < 0.01$) than the controls.

In the 1968-69 season, the disease induced by the *Phytophthora* inoculations spread quickly with cracks and mottled lesions all over the stem, killing most of the trees. In the 1969-70 season, the main symptoms were the characteristic tongues which extended slowly up and down the stem. This difference was probably due to differing climatic conditions in the two seasons. In the spring months of 1968, 11 days with max temp above 30 C were recorded, of which 3 were followed by nights in which the temp dropped below 6 C. During this time, there was an appreciable rainfall (5-24 mm/day). In the same period of 1969, there were 11 days with temp above 30 C but no such low min occurred during the succeeding nights.

In the 1968-69 season, several preliminary attempts were made to reisolate *Phytophthora*, but only one of these was successful. In the 1969-70 season, reisolation was attempted in 14 of the 42 diseased trees, and *Phytophthora nicotianae* var. *parasitica* was isolated in 8.

DISCUSSION.—The different reactions of wattle trees on infection with *Phytophthora nicotianae* var. *parasitica*, producing the two different syndromes of the black-butt disease mentioned earlier, were probably due to differences in the weather during the two successive seasons. The first syndrome of black mottled lesions, cracks, and gum produced in the first season

TABLE 1. Artificial inoculation of healthy Black Wattle trees (*Acacia mearnsii*) with several fungi isolated from wattle

Fungus	No. trees inoculated	No. diseased trees	
		Experiments 1968-69	Experiments 1969-70
<i>Pestalotia crassiuscula</i>	50	7	9
<i>Fusarium oxysporum</i>	50	11	16
<i>Rhizoctonia</i> sp.	50	11	
<i>Phytophthora nicotianae</i> var. <i>parasitica</i>	50	37**c	42**
Mixture ^a	50	20**	
Mixture ^b	50		25**
Control, 1968-69	250	45	
Control, 1969-70	200		36

^a *Fusarium* + *Rhizoctonia* + *Phytophthora*.

^b *Pestalotia* + *Fusarium* + *Phytophthora*.

^c ** Significant difference at 1% level compared with control.

of 1968-69, coincides with climatic conditions favoring the production of zoospores. *Phytophthora nicotianae* var. *parasitica* has a high opt for growth (over 30 C), but produces zoospores only after a chilling period

below 6 C when the mycelium is wet. Zoospores are able to travel in the water-film left on the green bark after rain and penetrate the bark all over the stem, presumably through lenticels, producing the local and spreading lesions.

The second syndrome, characterized by dark tongues and sunken areas in the bark spreading upward, was found mainly during the 1969-70 season, when conditions were unfavorable for the production of zoospores. In this case, the attack must presumably have originated from mycelium penetrating through the inoculation wounds.

Isolation experiments on artificially infected trees are still in progress, but the evidence presented (Table 1) indicates that the black-butt disease of Black Wattle is caused by *Phytophthora nicotianae* var. *parasitica*, and it is not very likely that the other fungi used in these experiments are involved in this disease.

LITERATURE CITED

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