

SUMMARY OF BIENNIAL REPORT - JARRAH DIEBACK RESEARCH

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This summary covers the period June to December, 1967.

1. POT TRIALS.A. To test several species of Eucalyptus for resistance to Phytophthora cinnamomi

The aim was to determine which eucalypt species are hosts of *Phytophthora cinnamomi* and to observe their gross reaction when inoculated with this fungus.

The trial was shown on the 15/12/66 and closed on the 26/7/67.

Results:

P. cinnamomi was recovered from dying seedlings of the following species:-

Eucalyptus andrewsi	Eucalyptus pauciflora
" baxteri	" pilularis
" cloeziana	" radiata
" globulus	" salubris
" gracilis	" sieberi
" micrantha	" wandoo
E. obliqua	

At the conclusion of the experiment root pieces from apparently healthy seedlings of all species were plated onto 3P agar.

P. cinnamomi was recovered from these additional species :-

Eucalyptus botryoides	Eucalyptus maculata
" camaldulensis	" marginata
" campaspe	" paniculata
" cladocalyx	" robusta
" dalrympleana	" salmonophloia
" fibrosa	" tessellaris
" goniocalyx	" viminalis

The host list of *P. cinnamomi* in eucalypts has been extended to a total of 27 new host records. Though it appears that a wide range of eucalypts are hosts of *P. cinnamomi*, the response to inoculation has varied between species and a number appear to be moderately tolerant to root rot.

The root systems of all pots in the inoculated series were washed and classified into four categories using *E. marginata* as a reference.

TABLE 1.

<u>Category</u>	<u>Root Rot Rating</u>	<u>Species</u>
1.	Root systems markedly better than those of jarrah	E. resinifera maculata globulus propinqua robusta goniocalyx grandis
2.	Root systems better than those of jarrah	blakelyi botryoides fibrosa calophylla citriodora gummifera microsorys paniculata bosistoana tessellaris sideroxyton cladocalyx melliodora wandoo dalrympleana camaldulensis saligna tereticornis cornuta
3.	Root systems the same as those of jarrah	salmonophloia viminalis micrantha pilularis radiata
4.	Root systems worse than those of jarrah	baxteri sieberi obliqua pauciflora campaspe andrewsi scabra gracilis cloeziana salubris

TABLE 2.AVERAGE PERCENT MORTALITY BY CATEGORY CLASS

<u>Category</u>	<u>No. of Species (from Table 1)</u>	<u>Average % Mortality</u>		
		<u>Inoculated</u>	<u>Control</u>	<u>Difference</u>
1	7	6%	6%	0%
2	19	12%	6%	6%
3	5	38%	12%	26%
4	10	69%	44%	25%
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A correlation between susceptibility to *P. cinnamomi* root rot and taxonomic classification (according to Blakely) was observed. Species belonging to the section *Renantherae* appear to be more susceptible to *Phytophthora* root rot.

For the present, with only the odd exception, the Stringy Bark and Ash group of eucalypts must still be regarded as suspect. Species from this group should not be included into field trials other than for experimental purposes.

Unfortunately this section includes the bulk of the hardwood species of economic importance to Australia.

After considering the sawmilling potential, root rot tolerance and adaptability to the West Australian environment; it is suggested that the following species be used for trial planting in dieback areas :-

First preference	<i>Eucalyptus maculata</i> <i>resinifera</i> <i>propinqua</i> <i>goniocalyx</i>
Second preference	<i>Eucalyptus saligna</i> <i>microcorys</i> <i>grandis</i>
Third preference	<i>Eucalyptus bosistoana</i> <i>globulus</i> <i>citriodora</i> <i>botryoides</i> <i>robusta</i> <i>blakelyi</i>

B. Nutrition Trial WP.36/66:

The influence of nutrition on host resistance to Phytophthora cinnamomi.

The effects of eight nutrient regimes on the resistance of Eucalyptus marginata and Pinus pinaster to Phytophthora root rot are being studied. The species were shown in April 1967. Nutrient amendments commenced in August and are applied at fortnightly intervals. The trial was inoculated on the 31st. October, 1967.

Results:

Nutrition.

Nutrient amendments have markedly improved the height growth and leaf area production of Eucalyptus marginata in all treatments other than -P, -N and Water.

The effect of nutrition on the growth of Pinus pinaster has not been as marked.

Mortality.

Within one month of inoculation seven jarrah seedlings have died. Phytophthora cinnamomi has been recovered by direct plating of root tissues. No pinaster deaths have occurred to date.

No relationship between mortality and nutrient amendment is yet possible.

C. Factorial Trial WP.6/67:

Susceptibility of Pinus pinaster seedlings to Phytophthora cinnamomi root rot.

The influence of seedling age, nutrition and watering levels on the resistance of Pinus pinaster to Phytophthora cinnamomi are studied in this trial. One and two year old pinaster seedlings were inoculated in May and September, 1967. Height measurements are recorded monthly and the trial is expected to close in March, 1968.

No pinaster mortalities have occurred in the inoculated series. Inoculation has caused a slight depression in top height in both age classes of pine. In the one year old stock, nutrition has resulted in a marked increase in growth but this increase is only slight in two year old pines. To date there has been no response to the watering treatments.

D. To test seedlings of some coniferous species for resistance to Phytophthora cinnamomi.

The experiment was designed to test whether P. cinnamomi was pathogenic to P. pinaster and to compare the resistance of this species with that of other hosts.

Ten coniferous species and nine seed lots of *P. pinaster* were tested. The trial was sown on the 9/1/67 and closed on the 26/7/67.

Results:

P. cinnamomi has been recovered from the roots of all species except:-
Araucaria cunninghamii (Hoop pine).

At the completion of the experiment the root systems in the inoculated pots were washed and rated into four categories :-

<u>Root Rot Rating</u>		<u>Species.</u>
Slight	Less than 20% of roots rotted	<i>Pinus taeda</i> " <i>elliottii</i>
Moderate	Between 20% & 50% root rot	<i>Pinus pinaster</i> (Leiria) " " (Corsican) " <i>insularis</i> <i>C. lusitanica</i> <i>C. glauca</i> <i>A. cunninghamii</i>
Severe	Between 50% & 90% root rot	<i>Pinus radiata</i> " <i>halepensis</i>
Complete	Over 90% root rot	<i>A. pyramidalis</i>

Discussion.

The pathogenicity of *P. cinnamomi* to the Leirian and Corsican strains of *P. pinaster* has been demonstrated. Under the conditions of this trial *P. elliottii* and *P. taeda* have demonstrated a greater tolerance to root rot than has *P. pinaster*, which, in turn, is better than *P. radiata*.

A wide range of root rot within *P. pinaster* has been observed. It appears that the Leirian strain may be more susceptible than the Corsican. Further work on the root rot resistance between and within strains of *P. pinaster* is planned. Because of its current field tolerance, the continued use of *P. pinaster* for the reforestation of dieback areas is recommended.

It is considered that further trial plantings with *P. taeda* and *P. elliottii* are warranted.

1. NUTRIENT CULTURE TANKS.

The large nutrient culture tank purchased by the Forest Research Institute has required an extended period of modification and testing. This unit has been formally handed over by the Works Department.

3,500 seedlings are being raised in the Shadehouse and Nursery for subsequent screening in this tank.

During this period several small trials have been run in nutrient solution using battery cases. Seedlings of jarrah, marri, *P. pinaster* and lupin have been successfully established in nutrient solution. In the earlier trials severe algal and fungal contamination occurred. These problems were overcome by the use of darkened containers, weaker solutions and the addition of animal charcoal. Successful infection of all four species has been achieved using zoospores of *P. cinnamomi*.

2. FIELD TRIALS.

The planting of field trials was completed in July 1967. Trial plots are inspected at two monthly intervals and survival counts made at each inspection. To November 1967, 6% of the seedlings in the inoculated series have died compared with 3% in the controls.

3. SOIL BAITING.

A. Pinus pinaster - The Dell, Manjimup Division.

Soil and root samples were collected from dying 11 year old *Pinus pinaster* and *Pinus radiata* planted in an old dieback area. The roots of both species had severely discoloured cortices and steles. Though *Phytophthora cinnamomi* was recovered from the soil sample by the lupin baiting technique, no recoveries were obtained by direct plating of root material on to 3P plates. Microscopic observation of the dead roots revealed black pycnidia within the tissues. When plated on to a general medium a fungus, tentatively identified as *Macrophomina phaseoli*, was recovered. The culture was checked against isolates obtained from the Agricultural Department and were shown to the University Plant Pathologist, Mr. R. Hilton. All current evidence points to the probability of this fungus being *Macrophomina phaseoli*. A sub-culture will be forwarded to Kew for positive identification. This fungus is considered to be an important root parasite in warm regions.

B. Eucalyptus diversicolor - Bridgetown/Nannup Road - Nannup Division.

Root samples collected from this area by D.F.O. B. White were baited for *Phytophthora*. Both large and small roots were extensively decayed. No recoveries of *Phytophthora cinnamomi* were obtained. It is considered that the unthriftiness of the Karri trees in this area may be due to waterlogging, rather than to damage by *P. cinnamomi*.

C. Muja Construction site - Collie Division.

Patch dying of the native flora and ornamental species in this area are affecting the plans for the beautification of the site.

At the request of the Construction Engineer, A.D.F.O. Butcher sampled this area and the samples were baited for Phytophthora. Positive recoveries of *P. cinnamomi* were obtained and Mr. Butcher advised accordingly.

It was suggested that the area be planted with a mixture of *P. pinaster*, *P. elliottii*, *P. taeda*, *Eucalyptus saligna* and *Eucalyptus grandis*.

4. CO-OPERATION WITH A.D.F.O. S. SHEA.

(a) Predisposition of jarrah dieback.

Inoculum for the field infection of jarrah stands in the Dwellingup area has been produced at the Forest Research Institute. Lupins infected with *P. cinnamomi* in nutrient culture solutions were used as a source of inoculum.

(b) Pot trials.

Lupins infected with *Phytophthora* and mycelial suspensions were produced at the F.R.I. and used by A.D.F.O. Shea to inoculate pot trials at Dwellingup. Subsequently, dead seedlings were plated on to 3P agar and recoveries of *P. cinnamomi* obtained.

(c) Lupin baiting.

A number of samples collected by A.D.F.O. Shea from logging equipment have been baited for the presence of *P. cinnamomi*. Several positive recoveries were obtained.