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Department of Conservation
and Land Management

Wood Utilisation Research Centre

IMPEL RODS ARE UNSUITABLE FOR CONTROLLING ROT IN KARRI TREES

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W.U.R.C. Technical Report No. 31

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SUMMARY

'Impel' rods (anhydrous disodium octaborate) are used to treat decay in in-service timber. A trial was established to determine whether they could be used to restrict rot in living karri (*Eucalyptus diversicolor* F. Muell.) trees without causing damage to bark and wood. 'Impel' rods were inserted into regrowth karri trees, which were felled after 4, 13 and 52 weeks. Bark around the rod had died after 13 weeks. Sapwood and heartwood were discoloured after 4 weeks, and a dry zone had formed around the 'Impel' rod after 13 weeks. Boron concentrations above, below and at the side of the rods were greater than those in controls at all sampling times. Because 'Impel' rods can damage karri trees, it is considered inadvisable to use them to control rot in living trees.

INTRODUCTION

The development of rots in living trees is of major concern, especially where the tree has aesthetic value, and the rot will continue to develop unless some control measures are implemented.

'Impel' rods (anhydrous disodium octaborate), marketed by Timber Treatment Industries Ltd of Perth, are an effective way of treating decay in in-service timber. The rods are inserted into the timber and the chemical diffuses into both the sapwood and heartwood.

There was no information on whether 'Impel' rods could prevent development or restrict existing rot in living trees. Although boron is an essential element for plant growth, it is toxic in high concentrations. The level of boron around the 'Impel' rod in a live tree might cause damage to the sound sapwood and heartwood. To determine whether visible damage occurs around 'Impel' rods and whether boron is likely to reach toxic levels in live wood, a small trial was set up to determine the effect of 'Impel' rods in trees of regrowth karri (*Eucalyptus diversicolor* F. Muell.).

METHODS

Ten regrowth karri trees of between 250 and 300 mm d.b.h.o.b., growing in Warren Block near Pemberton, were used in the study. An 'Impel' rod was inserted into an

110 mm deep horizontal hole drilled at breast height on one side of the tree. A similar size hole was drilled on the opposite side of the tree as a control. The 'Impel' rod was sealed with a stopper, while the control hole was sealed with Vaseline. Two trees were felled after 4 weeks to check the methodology, four trees after 13 weeks, and the final four trees after 52 weeks.

Immediately after felling, the tree was cut transversely 500 mm above and below the inoculation points, and then split lengthwise between the drill holes. Subsequent examination was carried out at Como within 4 days of felling.

Each billet was cut transversely just above the inoculation point and then split through the drill hole. Transverse and longitudinal discolouration of the sapwood and heartwood was measured. Blocks of wood 20 x 20 x 10 mm were cut at 30 - 50 mm and 200 - 220 mm above and below and 20 - 40 mm at the side of the inoculation point. Each wood block was split into sapwood and heartwood, and then each sapwood and heartwood sample was cut into match-sized pieces. The wood samples were dried at 60° C, and then ground. Their boron content was analysed by a modification of the dianthrimide method (Gorfinkel and Pollard 1954).

RESULTS AND DISCUSSION

After 4 weeks, 13 weeks and 52 weeks, discolouration in the sapwood above, below and at the side of the 'Impel' rods was greater than in the control treatments (Table 1). After 13 weeks dry zones were present in the sapwood around the 'Impel' rods in three of the four trees. By 52 weeks the sapwood above and below the 'Impel' rod was dark brown. The heartwood too was discoloured but this was not as extensive as in the sapwood (Table 1).

After 13 weeks the bark had died around the hole where the 'Impel' rod had been inserted into the tree. After 1 year dead bark extended 96 mm (range 90 - 115 mm) above and 112 mm (range 75 - 135 mm) below the point where the 'Impel' rod had been inserted. The area of dead bark around the control wounds only extended 10 mm above and below the drill hole.

Table 1
Discolouration (mm) around Impel rods inserted into regrowth karri trees

		4 weeks (n = 2) Impel rod	Control	13 weeks (n = 4) Impel rod	Control	52 weeks (n = 4) Impel rod	Control
Above	sapwood	73 (4)	0 (0)	93 (21)	1 (3)	127 (69)	9 (5)
	heartwood	20 (28)	10 (14)	39 (31)	30 (47)	6 (2)	17 (13)
Below	sapwood	65 (7)	0 (0)	145 (71)	1 (3)	138 (66)	10 (6)
	heartwood	30 (42)	10 (14)	31 (23)	7 (6)	6 (2)	13 (8)
Side	sapwood	22 (2)	10 (0)	58 (19)	9 (4)	39 (85)	14 (3)
	heartwood	7 (10)	15 (1)	18 (6)	16 (3)	12 (8)	16 (5)

Standard deviations shown in parentheses.

After 13 and 52 weeks discolouration in the sapwood above, below and at the side of the hole where the 'Impel' rod had been inserted was significantly greater ($P<0.001$)f than around the control hole. The discolouration in the heartwood around the 'Impel' rod was not significantly different from that around the control hole.

Chemical analyses after 13 weeks showed boron concentration in the sapwood and heartwood above and below where an 'Impel' rod had been inserted. Statistical analysis confirmed that boron concentration was significantly greater ($P<0.001$) than in controls (Table 2). After 52 weeks the boron concentration in the sapwood above and below an 'Impel' rod was also greater ($P<0.01$) than control values, but heartwood values did not differ significantly.

Table 2
Boron (ppm) around 'Impel' rods inserted into regrowth karri trees

		4 weeks (n = 2) Impel rod	Control	13 weeks (n = 4) Impel rod	Control	52 weeks (n = 4) Impel rod	Control
30-50 mm above	sapwood	397 (22)	1 (0)	387 (28)	3 (5)	2768 (972)	8 (8)
	heartwood	181 (38)	2 (3)	392 (23)	5 (8)	1621 (1344)	181 (138)
200-220 mm above	sapwood	25 (16)	2 (2)	25 (19)	1 (0)	43 (35)	5 (1)
	heartwood	39 (48)	15 (9)	14 (5)	1 (0)	73 (53)	38 (30)
30-50 mm below	sapwood	413 (0)	9 (12)	403 (7)	1 (1)	2468 (1721)	10 (12)
	heartwood	212 (109)	6 (8)	399 (8)	4 (8)	2124 (2132)	324 (304)
200-220 mm below	sapwood	21 (7)	14 (19)	37 (28)	1 (0)	68 (56)	6 (2)
	heartwood	17 (8)	1 (1)	30 (24)	1 (0)	490 (148)	137 (223)
20-40 mm at the side	sapwood	4 (5)	15 (19)	59 (34)	10 (20)	148 (105)	8 (7)
	heartwood	21 (0)	6 (1)	92 (43)	1 (1)	696 (416)	45 (43)

Standard deviations shown in parentheses.

Lateral movement of boron from the 'Impel' rod appears to be slower than vertical movement. After 13 weeks the concentration of boron in both the sapwood and heartwood was significantly greater ($P<0.001$), in the samples 30 to 50 mm above and below the rod, than in the wood samples 20 to 40 mm at the side where the rod had been inserted (Table 2). After 52 weeks boron concentrations 30 to 50 mm above and below, and 20 to 40 mm at the side of the rod, did not differ significantly.

This experiment has shown that when 'Impel' rods are inserted into live karri trees, boron diffuses into the sapwood and heartwood, resulting in increased boron levels at least 220 mm above and below the inoculation point. The boron did not appear to be very mobile, however, because there was a very steep gradient in the 170 mm between the sampling points above and below the place where the rod was inserted. In addition, lateral movement was also slow (Table 2).

Although boron is essential to plant growth, it is toxic in high concentrations. The concentrations toxic to karri are unknown but there was clear evidence of tissue damage around the 'Impel' rod. After one year a large area of bark had died around the rod and discolouration in the sapwood was evident at every harvest.

In summary, the evidence of this experiment indicated that 'Impel' rods can damage karri trees and that it would be inadvisable to use them to control rot in living trees.

ACKNOWLEDGEMENTS

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REFERENCE

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