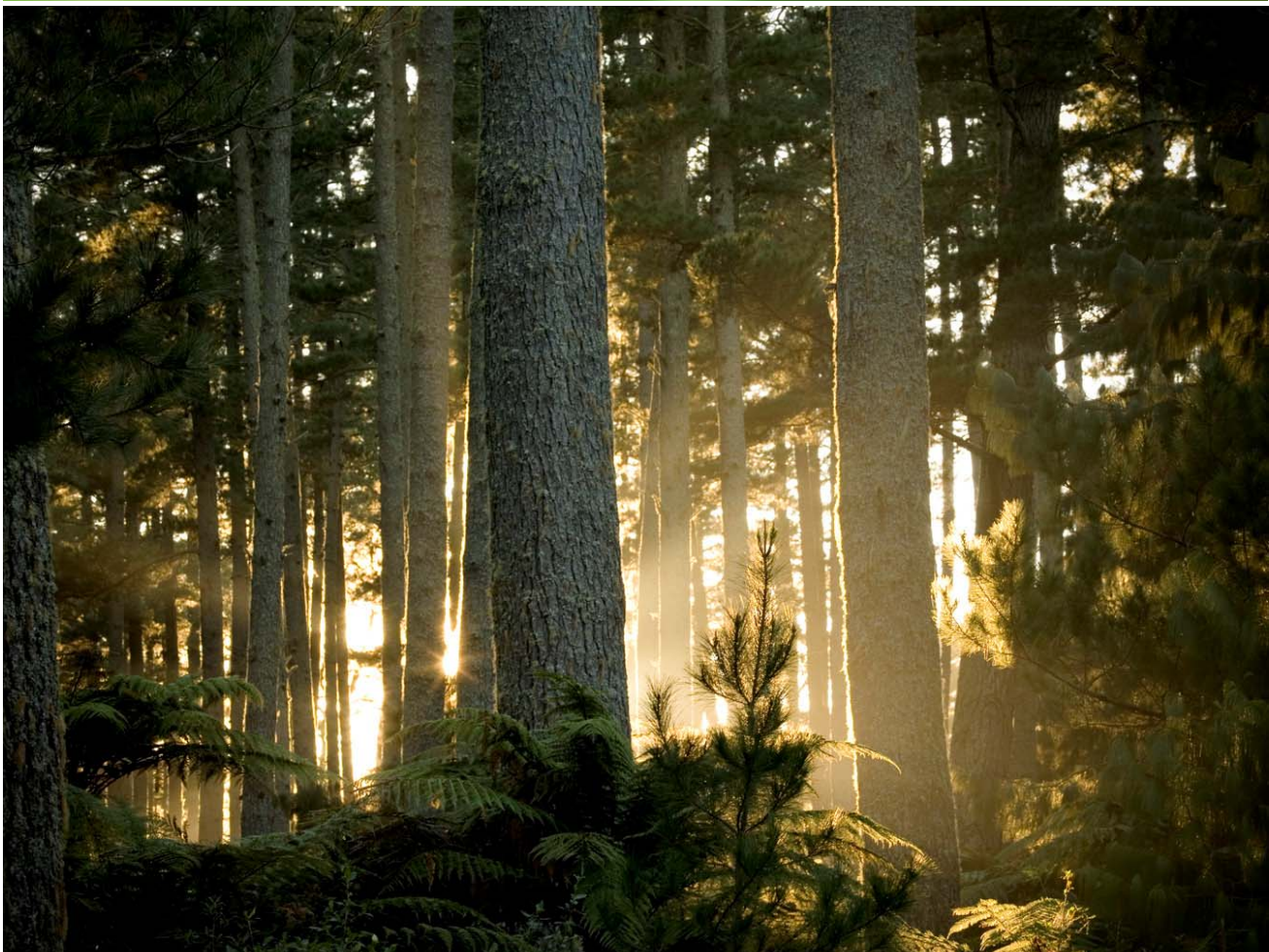


# **THE DURABILITY OF ACCOYA RADIATA PINE SAPWOOD RESULTS FROM GROUND CONTACT TESTS AFTER SIX YEARS EXPOSURE**

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**Dave Page, Mick Hedley and Jackie van der Waals**

Scion  
Rotorua, New Zealand

Report prepared for:

Accsys Technologies PLC  
66 Hammersmith Road  
London W14 8UD  
UK

Correspondence to:

Approved for Release

Project Leader  
Bioactives and Wood Preservation  
Private Bag 3020  
ROTORUA

Project Leader

Date: March 2011

Phone: (07) 343-5777

Fax: (07) 343-5507

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# **THE DURABILITY OF ACCOYA RADIATA PINE SAPWOOD RESULTS FROM GROUND CONTACT TESTS AFTER SIX YEARS EXPOSURE**

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## **SUMMARY**

Radiata pine sapwood, declared as Accoya produced by the Accsys Technologies process was exposed in accelerated decay chambers and in exterior ground contact tests. After six years, the Accoya wood had some discolouration but only occasional minor decay. It was in better condition than the heartwood of four naturally durable species and radiata pine treated with CCA to the H3.2 and H4 specifications.

## **INTRODUCTION**

Radiata pine timber was shipped from New Zealand to the Accsys Accoya production plant in the Netherlands and treated in 2004. Some of this timber was forwarded to Scion for testing in early 2005. A series of durability stakes and accelerated decay testing stakelets were cut from this timber and installed at Scion in March 2005.

## **MATERIALS AND METHODS**

The shipment of Accoya wood for testing included 180 x 18 mm, 35 x 90 mm and 45 x 90 mm boards all two metres long and in two lots marked with the process codes LG 004 and LG 031. No treatment or other details were supplied with the timber except that all pieces carried an identification number.

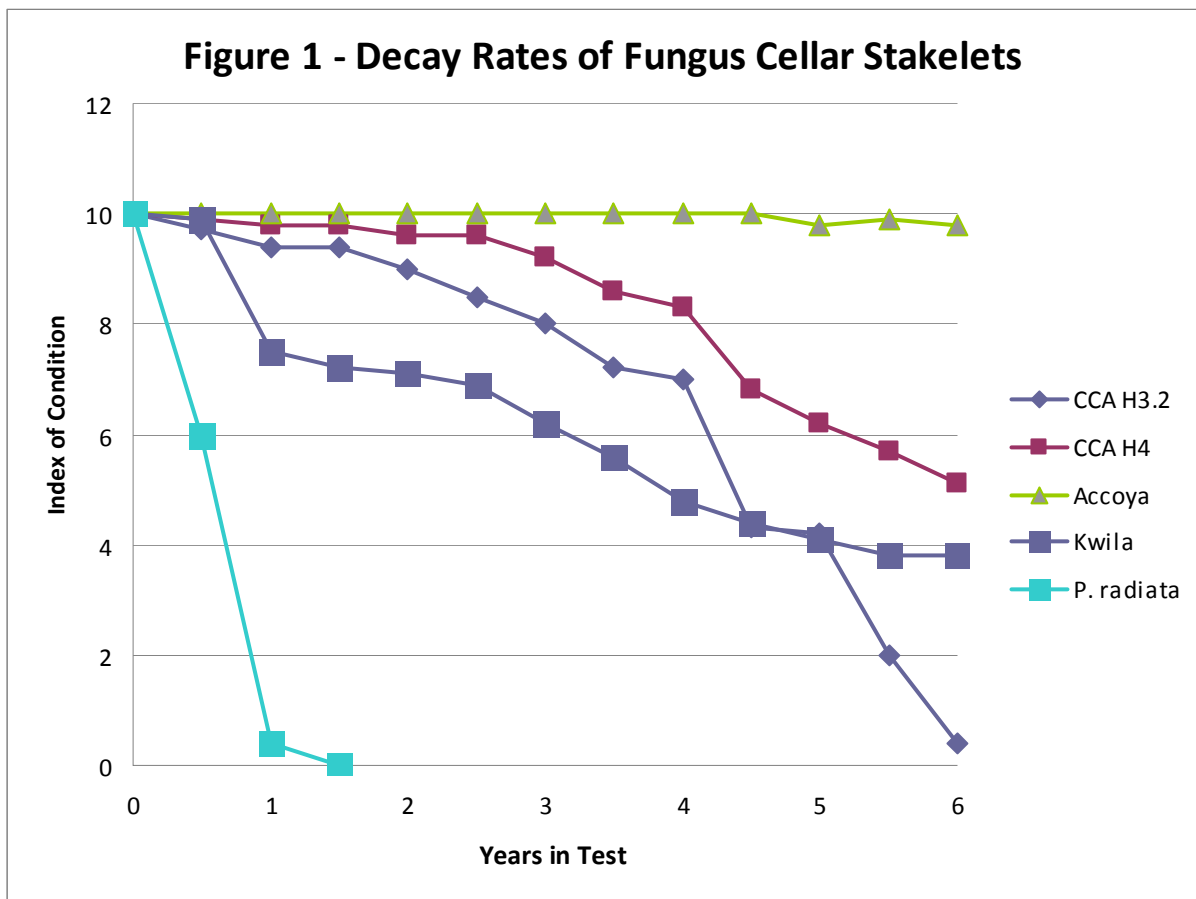
Fungus cellar stakelets were cut from five pieces of 180 x 18 mm and five pieces of 90 x 45 mm timber from each of the process batches. These stakelets were 10 x 5 mm, 160 mm long, with the growth rings approximately at right angles to the widest face (quarter sawn). They were planed on three sides and smooth sawn on one face. There were two stakelets from each of the original pieces of wood. These were installed in soil beds in the fungus cellar facility at Scion, Rotorua on 14<sup>th</sup> March 2005. The chambers in this facility are maintained at approximately 27°C and 85% humidity. The stakes have been removed from the soil beds, washed and assessed for decay at three-monthly intervals since installation. The decay assessment scale used is similar to that described in ASTM D 1758 (Appendix I). After assessment the stakes were returned to freshly prepared soil beds.

Ground contact stakes 20 x 18 mm x 500 mm long were cut from the same 180 x 18 mm boards as the fungus cellar stakelets, two from each board. The stakes were installed in the Whakarewarewa outdoor test area at Scion, Rotorua on 15<sup>th</sup> March 2005. They have been removed from the ground and assessed for decay using a blunt 3 mm diameter probe at 12 monthly intervals since installation. The decay assessment scale is similar to that used for fungus cellar stakelets.

## FUNGUS CELLAR RESULTS

The Accoya fungus cellar stakelets are all in good condition after 72 months exposure. Only six stakelets in the LG 004 group had minor decay. Untreated pine stakelets installed at the same time had an average life of 11 months. Radiata pine sapwood stakelets treated with copper chrome arsenate (CCA) to retentions suitable for exterior above ground and non-critical ground contact situations (New Zealand specifications H3.2 and H4) had been installed in an earlier test. These were cut to the same size specifications as the acetylated stakes from larger dimensioned timber after treatment. After six years exposure only two of the lower retention stakes remained and they were in poor condition. Two stakes had failed in the higher retention group and the remaining stakes contained moderate to severe decay.

Decay rates for the fungus cellar stakelets are shown in Figure 1. Results from an earlier trial that included kwila (*Intsia bijuga*) stakelets are also shown in Figure 1. Kwila heartwood is in Class 1-2 on the Australasian natural durability classification scale and could be expected to have similar durability to H3.2 treated radiata pine sapwood. These stakelets were of a larger size but three had failed and the remainder had severe decay after 72 months.

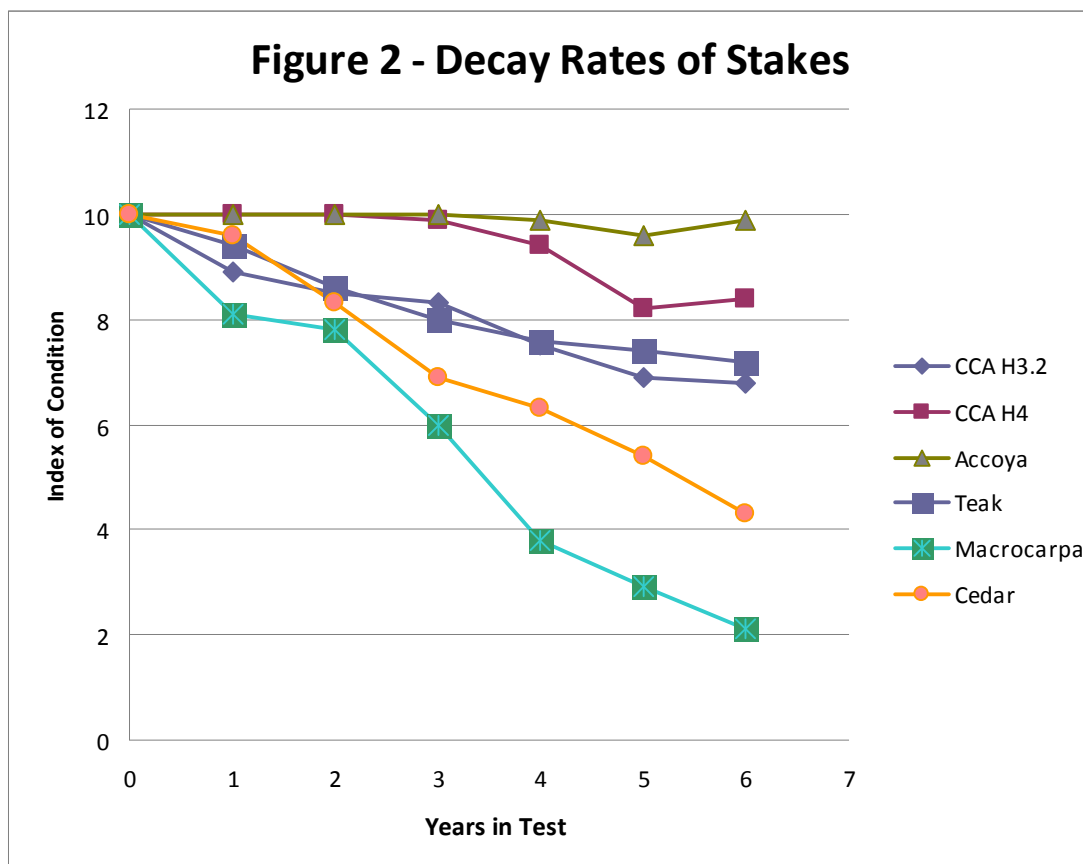


## EXTERIOR GROUND CONTACT STAKE RESULTS

After six years exposure Accoya stakes installed in the Whakarewarewa test area were all in good condition. Discolouration was widespread and patches of slight softening had developed but very little could be positively identified as decay.

These results were compared with data from earlier tests of H3.2 and H4 CCA treated stakes from the same source as the fungus cellar stakelets and with heartwood natural durability data from earlier tests of plantation grown teak (*Tectona grandis*) imported from Western Samoa, western red cedar (*Thuja plicata*), imported from North America and macrocarpa (*Cupressus macrocarpa*) from Whakarewarewa Forest (Figure 2). The naturally durable species represent a range of durability classes. Teak is in Australasian durability Class 1-2 (approximately equivalent to H3.2) and is regarded as suitable for exterior, moderate-high decay hazard situations e.g. exterior structural timbers. The cedar (Class 2-3) is suitable for exterior, above-ground situations where there is a moderate decay hazard, e.g., roof shingles and exterior cladding, and the macrocarpa (Class 3) is suitable for low-moderate decay hazard situations, e.g., external joinery and cladding.

The comparison in Figure 2 shows that the CCA treated stakes have deteriorated more quickly than the Accoya stakes. While the teak stakes have deteriorated at a similar rate to the H3.2 treated pine, the cedar and the macrocarpa have deteriorated much more rapidly.



## **DISCUSSION**

Radiata pine timber treated to the H3.2 specification is widely used in exposed, above-ground situations such fence rails or in structural situations where there is a moderate decay hazard. Timber treated to the H4 specification is used for fence posts and critical above ground, structural situations where a long service life is required. Although the outdoor stake test has only been running for six years the Accoya wood has given consistently better results than H3.2 treated pine and a range of naturally durable species exposed over the same time period. Accoya wood was also in better condition than H4 treated pine after six years.

Fungus cellar stakelets usually give much faster results than outdoor tests although conditions in the test beds favour soft rot fungi and a narrower range of brown rot fungi than outdoor conditions. Outdoor and fungus cellar tests have so far given similar results. The good condition of the Accoya stakes after six years in accelerated fungus cellar conditions suggests that outdoor stakes will continue to deteriorate at a much slower rate than H3.2 and H4 treated pine.



**Figure 3** – Accoya pine stakes, from the LG031 treatment at the bottom and from the LG004 treatment at the top after five years exposure, showing weathering above ground and very little deterioration in the ground contact section.



**Figure 4** – The same stakes as in Figure 3 after six years exposure. While there was slightly more discoloration the stakes were still hard and appeared free from decay.

## **APPENDIX I**

### **DECAY/INSECT DAMAGE RATING SYSTEM (ASTM D 1758)**

10= No decay or insect damage.

T = Discolouration or trace of decay, not positively identified as decay.

9 = Minor decay, 0-3% of the cross section.

8 = Lightly established decay, 3-10% of the cross section.

7 = Well established decay, 10-30% of the cross section.

6 = Extensive and deep decay, 30-50% of the cross section.

4 = Deep and severe decay, more than 50% of the cross section.

0 = Failed.