TIMBER TECHNOLOGY BULLETIN
NO. 77, 2017
ISSN: 139-258

DURABILITY PERFORMANCE OF TIMBER GROWN ON EX–MINING AND BRIS SOIL

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INTRODUCTION

On degraded forest lands, unprofitable or marginal agricultural lands, and abandoned or idle lands, planted forests may constitute a legitimate land-use option for providing sustainable livelihoods, ensuring food security and alleviating poverty (Walter kollert, Undated).

The aim of this paper is to show the durability performance of timbers planted in the land with no potential for agribusiness namely, ex-mining areas and Beach Ridges Interspersed with Swales (BRIS) soil. It was postulated that ex-mining areas contained heavy metals which might provide natural durability on plants living in such soils. This study was expected to prove that the timbers do possess some degree of durability against fungi due to the existence of heavy metals.

The pertinent constraint to the usefulness of timber is its susceptibility to decay. Weight loss is the most common method for assessing timber decay in the laboratory (Anagost & Smith 1997). Weight loss is used to measure natural durability, fungal decay capability and decay rates, normally by basidiomycetes fungi. Basidiomycete decay fungi are actually fungi that can degrade timber by removing the lignocellulosic components of any timber structure, and hence affect its timber strength. In Malaysia, the typical basidiomycete fungi are the white rot, while the brown rot fungi are not common. It would be useful to determine the decay resistance of timber samples based on their ability to resist both white rot and brown rot decay. The main advantage of using laboratory accelerated decay test is in producing results in a shorter period compared with the graveyard method. The results are reproducible as long as the conditions are controlled. One objective of this study was to assess the suitability and effectiveness of the test procedures in evaluating the durability of the ex-mining timbers against decay fungi.

MATERIALS AND METHODS

The heartwoods of Khaya, Acacia and Merawan were collected from three authenticated trees from ex-mining area in Bidor, Perak and BRIS soil located in Setiu, Terengganu. The samples were sawn into blocks of 200 cm × 20 cm × 5 cm and dried for about one month in a solar dryer. European beech (*Fagus sylvatica*) which was used as a control species, was dried in a kiln with the temperature between 20 and 60 °C. After the samples had achieved the moisture content (MC) of 10–12%, they were sawn into the test specimens of dimensions 50 mm × 25 mm × 15 mm and kept in a conditioning room at the temperature of 20 ± 2 °C and 65 ± 5% relative humidity (RH) until the mass became constant prior to testing.

Decay resistance test

The decay test procedure was carried out based on EN 350-1: 1994 and EN 113: 1997 and exposed to timber decaying fungi. Figure 1 summarises the procedure of how a test for durability of species was conducted. By this method, the *X*-value for each species was calculated

by dividing the average weight loss of each set of test specimen by the average weight loss of the reference species after exposure to the fungus. Figure 2 shows the flow of accelerated decay test conducted in the lab. The decay rating are presented in Table 1.

All heartwood blocks (50 mm × 25 mm × 15 mm) were conditioned at 20 ± 2 °C and 65 ± 5% RH until moisture content (MC) was constant

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Each block was weighed to the nearest milligram using a calibrated balance

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Two blocks from each set and the beech (reference) were oven dried at 103 ± 2 °C to determine the average MC

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The MC values were used to correct the moisture of conditioned blocks so as to obtain the 'oven dry' weights of the timber blocks at the start of the test

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The timber blocks were sterilised and inserted into the test chamber containing 3% Malt Extract Agar with *Coriolus versicolor* (CV)

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The timber blocks were incubated with the fungus in agar medium for 16 weeks. During the final stage, mycelium was removed from the block surfaces, and they were oven-dried until reduced to constant weight

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Average weight loss for each set was determined using BS EN 350-1 durability ranking

Figure 1 Testing procedure for durability test according to EN 350-1

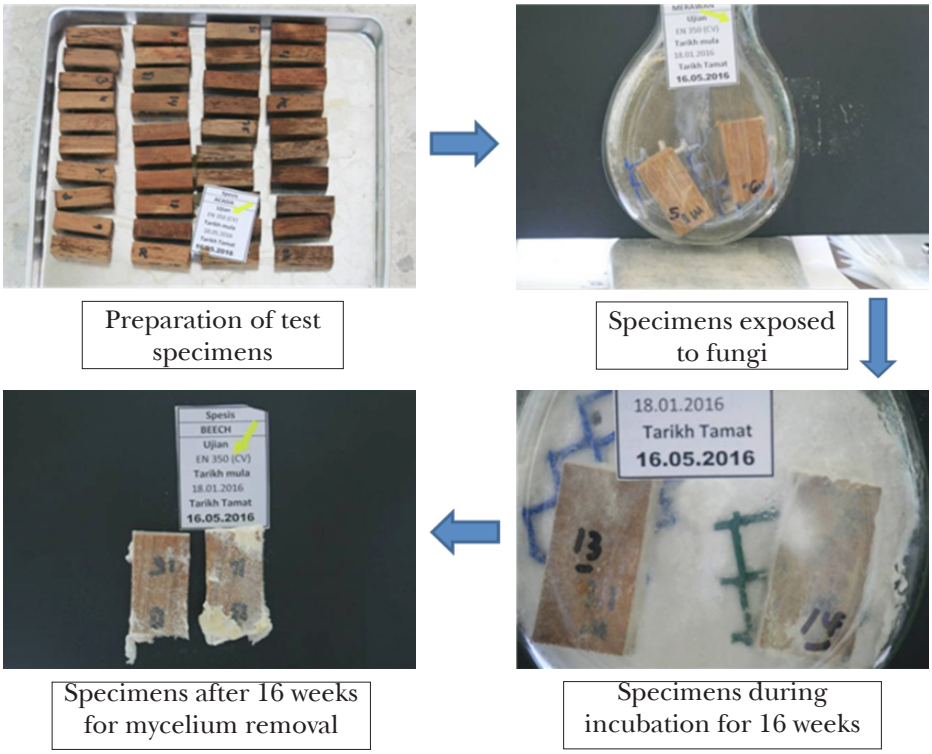

Figure 2 Accelerated decay test using BS EN 113

Table 1 Durability classes and their range BS EN 350

Durability class	Description	*X*- value
1	Very durable	$X \leq 0.15$
2	Durable	$X > 0.15$ but ≤ 0.30
3	Moderately	$X > 0.30$ but ≤ 0.60
4	Slightly durable	$X > 0.60$ but ≤ 0.90
5	Not durable	$X > 0.90$

Table 2 Durability ratings of 3 species from Bidor

Species	Beech as a reference		
Species	*X*- value	Durability rating	Description
Acacia	0.7130	4	Slightly durable
Khaya	0.6558	4	Slightly durable
Merawan	0.8227	4	Slightly durable

Table 3 Durability ratings of 3 species from Setiu

Species	Beech as a reference		
Species	*X*- value	Durability rating	Description
Acacia	0.8941	4	Slightly durable
Khaya	0.6650	4	Slightly durable
Merawan	0.8266	4	Slightly durable

RESULTS OF DISCUSSION

Table 1 shows the durability classes with their range as provided by BS EN 350 standard test method. This was used as a guideline to determine the durability class of the tested specimens. Table 2 shows that Acacia, Khaya and Merawan from ex-mining area of Bidor were slightly durable. Table 3 shows the same species planted on the beach area of Setiu also falls under the same classes of durability.

CONCLUSION

The results of the decay resistance of wood from ex-mining and BRIS soil show evidence that the metal laden soils do provide some degree of decay resistance to the three species grown on them. For the three species that were tested Acacia, Khaya and Merawan falls under the category of slightly durable with the *X*-values range from 0.6558 to 0.8941. This study had shown that there was a possibility of tree species planted on soil containing heavy metals to be slightly durable than tree of the same species planted on normal soils.

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Timber has been material of choice since time immemorial. However, under certain conditions of use and storage, timber is easily degradable by biological elements such as fungi. This causes immeasurable losses each year. Therefore, the cause and effect of timber degradation by fungi can hardly be overlooked. The processes of timber decomposition by fungi, and the technology used for protection against them have been continually studied either in the field or laboratory condition. Durability is one of the key performance factors used to assess the suitability of a timber species for a specific application. The durability rating of a species is based on the ability heartwood of that species to resist decay fungi and insect pests (including termites). This paper entails to the ability of some species, namely Acacia, Khaya and Merawan, which were grown on unproductive land such as ex-mining or BRIS soil which can provide some degree of natural durability due to the presence off heavy metals.

Series Editor : MK Mohamad Omar
Managing Editor : S Vimala
Typesetter : Y Rohayu

Set in NewBaskerville 11

MS ISO 9001:2008

Printed by Publications Branch, Forest Research Institute Malaysia
52109 Kepong, Selangor