

Role of Extractives in the Durability of *Neobalanocarpus heimii* and *Shorea falcifera* Heartwoods

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Wood durability refers to the resistance of the wood from decay agents such as fungi, termites, marine borers and weathering. Extractives isolated from the heartwood of durable hardwood species and some other plants species may provide alternatives to pest control because of their bioactive compounds. Wood extractives are known to affect wood resistance against fungi and termites attack. This study was carried out to determine the role of extractives of two natural durable woods namely *Neobalanocarpus heimii* (chengal) and *Shorea falcifera* (balau kuning) towards fungal decay and termites attack. A non-durable wood, *Dyera polyphylla* (jelutong paya), was used as control. Sequential Soxhlet extractions were done by using firstly mixture of 95% ethanol and toluene at a ratio of 2.32:1 (v/v), followed by 95% ethanol, 95% methanol and finally hot distilled water. The extracted and unextracted wood cubes were tested for decay resistance based on soil blocks decay test using white-rot (*Trametes versicolor*) and brown-rot (*Coniophora puteana*) decay fungi. A no-choice termite resistance test was carried out using a subterranean termite *Nasutitermes* sp. The weight loss due to fungal decay and termite attacks were determined after twelve weeks and three weeks of exposure, respectively. Chemically extracted test blocks were compared to unextracted blocks. Extracted durable species were also compared to non-durable controls. Sequential Soxhlet showed that *Shorea falcifera* yielded the highest amount of extractives at 19.81%. Results showed that extracted and unextracted blocks of *Dyera polyphylla* a non-durable wood recorded the highest weight loss in both fungi and termite attacks. Decay resistance test also showed that all extracted *N. heimii* and *S. falcifera* blocks exhibited significantly higher weight loss due to fungi and termites attacked compared to unextracted blocks. Overall results of these tests indicated that extractive content is primarily responsible for durability of *N. heimii* and *S. falcifera*.

Keywords: natural durability; heartwood; extractive free; soil block test; termite resistance test.

I. INTRODUCTION

Neobalanocarpus heimii (chengal) and *Shorea falcifera* (balau kuning) are among the Malaysian heavy hardwoods from the dipterocarpaceae family. Chengal also known as 'Penak' in Peninsular Malaysia is widely distributed in Selangor, Negeri Sembilan, Western Pahang and Southern Pattani in Thailand. It has been reported to occur in the state of Perlis and Melaka, and in diverse localities, on low-lying flat land as well as on hills up to 900 meter

(Symington *et al.*, 2004). The chengal wood have air dry density ranging from over 915 to 980 kg/m³ that is very durable even under adverse condition (Yamamoto and Hong, 1988). Chengal is resistant to termite and fungi, and is among the strongest timbers in the world, that it is 50% stronger than teak (Symington *et al.*, 2004). It is commercially used for heavy construction, bridges, boat building, and also source for dammar penak, one of the finest natural dammars. The dammar penak has been used in the manufacture of varnishes (Orwa *et al.*, 2009). The

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