

Acoustic Properties of *Syzygium* sp., *Dialium* sp., *Gymnostoma* sp., and *Sindora* sp. Wood

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Acoustic properties such as specific dynamic Young's modulus (E_d/γ), internal friction (Q^{-1}), and acoustic conversion efficiency (ACE) of wood are important properties frequently examined using free-free flexural vibration. This study determined the suitability for making musical instrument soundboards and frameboards from four tropical wood species; namely *Syzygium*, *Dialium*, *Gymnostoma*, and *Sindora*. The results show that (E_d/γ), (Q^{-1}), and ACE were in the range of 20.0 to 28.9 GPa, 0.0031 to 0.0085, and 3.41×10^7 to 10.83×10^7 , respectively. Based on the results, *Syzygium* was preferred for making the frameboard of violins and guitars. The outer sapwood (outer part) of *Syzygium* was the most suitable for making frameboard by considering the lowest ACE and highest Q^{-1} . Based on E_d/γ , the inner sapwood (middle part) in *Dialium* was the most suitable for making soundboard, but based on Q^{-1} and ACE, heartwood (inner part) was the most preferred for making soundboard. *Gymnostoma* was also preferred for making soundboard of violins and guitars (inner sapwood) because it yields the highest mean value of Q^{-1} and ACE. Considering ACE and Q^{-1} , the outer sapwood in *Sindora* was the best for making frameboard. When considering E_d/γ and Q^{-1} , the heartwood is the most suitable for making the frameboard of violins and guitars.

Keywords: Acoustic properties; Tropical wood species; *Syzygium*; *Dialium*; *Gymnostoma*; *Sindora*

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INTRODUCTION

There is great opportunity to explore the acoustic properties of various wood species for manufacturing high quality musical instruments, since wood is found in numerous tropical forests in Malaysia. Even though tropical rainforests have enormous resources of timber (especially in Borneo), where the major timber consumers are housing developers, wood fabricators, and furniture manufacturers, research on tropical wood for musical instruments is still lacking. Musical instruments are manufactured from wood due to its unique acoustic properties, even though there are other various materials currently available. However, up to this point, experienced manufacturers have determined the suitability of tropical wood for making musical instruments mainly based on trial and error. Therefore, although there are a lot of other wood species available in Malaysia, the tropical wood species that have been selected by experienced manufacturers in making musical instruments are very limited, such as *Intsia palembanica* (Merbau) and *Artocarpus champeden* Spreng. (Cempedak) (Chong 2000). The importance of this study is to employ a scientifically based approach in determining the acoustic properties of wood rather than trial and error.