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PROPERTIES OF PLYWOOD FROM *Eucalyptus pellita, Neolamarckia cadamba* AND *Paraserianthes falcataria* WITH DIFFERENT LAYER AND SPECIES ARRANGEMENT

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ABSTRACT

Forest plantation species can be an alternative ways to combat the shortage of raw material for plywood manufacturing. A study on *Eucalyptus pellita*, *Neolamarckia cadamba* and *Paraserianthes falcataria* wood was conducted. This study investigated on basic wood properties and mechanical properties of plywood made from three fast growing species for five and seven layers veneer with different species arrangement using melamine urea formaldehyde glue. The anatomical, physical, chemical and veneer properties are determined based on TAPPI standards. Meanwhile bending on parallel and perpendicular, bonding shear and panel shear properties of the plywood were tested according to Japanese Agricultural Standard for Plywood. From this study, the statistical analysis revealed that species and tree portion were found significantly affect the anatomical, physical, chemical and veneer properties. In the manufacture of plywood, variable of layer and species arrangement were found to effect mechanical properties. Correlation of anatomical, physical, chemical and veneer properties had less association with board properties. It was proven that *Eucalyptus pellita*, *Neolamarckia cadamba* and *Paraserianthes falcataria* is suitable to use as raw material in manufacturing of plywood that meets the Japanese Agriculture Standard requirement. This study shows that these three species had a big potential to be an alternative wood material for Malaysian plywood industry thus can reduce independency of wood species from virgin forest.

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CHAPTER ONE
INTRODUCTION

1.1 BACKGROUND OF STUDY

The term wood composite can be described as any materials that is bonded together with adhesives (Cai and Ross, 2010). Wood based composite are divided into several categories which for panel products (plywood, particleboard, fiberboard, oriented strandboard, laminated veneer lumber (LVL), structural timber products (glue-laminated lumber (glulam)) and wood-nonwood composite (wood fiber-thermoplastics). These wood composites are used for structural and non-structural application including as panel for interior and exterior usage (Irle and Barbu, 2010).

The mechanical properties of wood based composite is depended on the basic factor of wood species, type of adhesive that used for bonded, temperature that applied, geometry of wood elements (veneer, strand, chip, flake, particles) and density of the product (Cai, 2006). Mechanical properties are commonly evaluated based on elastic and strength properties of wood panel products for minimum requirement standard or product specifications. Elastic properties which is a test of modulus of elasticity (MOE) from bending strength and compression. Meanwhile strength properties of modulus of rupture (MOR) are test in bending strength, compression parallel to surface and shear strength (Bal and Bektas, 2014).

Plywood is one of the wood engineered products that is usually lay-up with arangement of an odd number of wood veneer or plies that are bonded by gluing with adhesives and its direction of adjacent grain is perpendicular to other layers (Ors, Colakoglu, Aydin and Colak, 2002). This wood based composite product is manufacture from combination of different veneer species and has some advantages for mechanical properties compared to solid wood (Aydin, 2004). These panel products have many type of layers in product structure and different type of glue that used for bonding present different properties of strength. Plywood that was glued with phenol formaldehyde glue can be made into water proof products, melamine urea formaldehyde can resists from water and urea formaldehyde can resists from moisture intake (Edoga and Kovo, 2006). Strength of plywood can increased when number of