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**Session 1: Cell structure and formation**

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Performance of Composite Board Manufactured from Stem and Branch of Tree

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Introduction

Nowadays, community forest in Indonesia is one of attractive raw material resources for wood based products. Its potency was 9.3 million cubic meters per annum [1], that mean the potency more extremely high compared to natural forest with potency 6.89 million per annum [2]. The potency that stated including only merchantable tree. For optimum utilization of these resources, the whole tree utilization of tree, include of its branch is very important to be developed. Results of the previous study showed that the branch potency for three community forest tree species were 18.09%, 31.99%, and 15.69% (the mean was 21.9%) based on stem volume for candlenut, gmelina, and sengon wood species respectively [3]. Thus, based on the data potency, estimated potency for branch of tree from community forest was 2.04 million cubic meters per annum. Since the very limited log supply for wood based product, the raw materials from branch of tree is very important to be utilized.

Furthermore, for effective utilization in composite board produced, we must be utilizing the raw materials in any shave including of wafer and shavings. As we know, particle with high slenderess ratio like wafer could be produce high strength board compared to other particle shave, like shavings. However, it not to be able produce wafer particle from all raw materials due to its limited dimension. For very small dimension raw materials, we can convert it to shavings particle. Based on these reason, we should be get information about the comparison properties of board produced from wafer or shaving particle. This study was conducted; to analyze the quality of composite board made of community forest tree species, to compare the board quality made of stem and branch of tree, and to compare the quality of board made from wafer and shavings particle.

Materials and methods

The materials used in this study were stem and branch from three wood species obtained from community forest area namely candlenut (Aleurites moluccana), gmelina (Gmelina arborea) and sengon (Paraserianthes falcataria L. Nielsen) taken from Bogor area, about 60 km from Jakarta. These materials were converted to wafer and shaving particle and dried to obtaining 2 – 4% moisture content. Dry particle then put in blender and was sprayed by melamine formaldehyde adhesive resin using spray gun. The resin solid content of the board was 10% based on oven dry particle and the target density was 0.7 gcm³. The manufacture condition was 25 kgcm⁻², 130°C and 10m for pressure, temperature, and pressing time respectively. The board then conditioned for two weeks before cut according to JIS A 5908-2003 standard [4]. Each board types were tested in four replications, totally 48 boards was produced in this study.

Results and discussion

The performance of composite board based on physical and mechanical properties were presented in Table 1. Data in the table showed that the performance of composite board made of gmelina and candlenut woods more superior compared to sengon wood. Good dimensional stability for gmelina boards was caused by the lower compaction ratio for he boards (1,63) compared to sengon (1,89) and candlenut (2,30). These value was obtained from calculation of ratio of board density to raw materials density. Its compaction ratio more higher compared to ideal compaction ratio for particle board namely 1.2 to 1.6 [5]. However, for maximizing utilization reason, the raw materials in any density must be utilize, even in high compaction ratio. Based on the phenomenon, some board types still needed to be improvement in dimensional stability.

The result of this study showed that, there are no special trend among of three wood species in term of modulus of rupture (MOR). For wafer particles, the board MOR made of gmelina wood stem more imperior compared to the hers, while in shavings particles, the board MOR made of gmelina wood stem particle more superior compared to the hers. In contrast, the board made from gmelina wood branch have lowest MOR for shavings particles, but in wafer particle its MOR was highest. Furthermore, in modulus of elasticity (MOE) parameter, the board made from wafer of gmelina wood have superior compared to the other wood species, while in shavings particles, the board made from gmelina wood species have lowest MOE, which mean the relation of MOR and MOE are linearly. This phenomenon