PROPERTIES OF PARTICLEBOARD FROM ADMIXTURE OF PETAI BELALANG (*LEUCAENA LEUCOCEPHALA)* AND KENAF CORE (*HIBISCUS CANNABINUS L.*) PARTICLES

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Abstract

The objective of this study was to determine the properties of particleboard from mix Kenaf core with Petai Belalang at different mixing ratio of (10:90), (30:70) and (50:50). Particleboard was produced in homogenous board with size of particle 2.0 mm until 0.5mm. The target density of the board was 700 kg/m^3. The board was bonded using Urea Formaldehyde (UF) as the resin and resin content of 7%. In the study particleboards made with 50% kenaf core showed the lowest properties of MOR, MOE, IB and worst TS value. Addition of kenaf core was found to significantly affect the MOR, MOE, IB and TS values. Boards made with at least 10% kenaf core were able to surpassed the minimum requirement of EN STD for MOR, MOE and IB. However, all boards failed to meet the minimum requirements of 12% for the TS.

Keywords: *particleboard, Petai Belalang, Kenaf core, admixture, UF*

INTRODUCTION

Particleboard is a panel product produced by wood particle such as sawdust, flakes, chips, strands, and wafers. The particles are combined together with adhesive under heat and pressure. This panel produced offer lower manufacturing cost, light weight, high density and more attractive than plywood and conventional wood. It is used in furniture, desk and counter tops, cabinets, floor, wall, ceiling panels, and office dividers (Wang et. al., 2002).

Kenaf is an herbaceous annual of the family Malvaceae. Kenaf has been widely considered as a suitable biological resources and potential substitute for fossil fuels and wood pulp, because of its extensive adaptation, strong resistance, large biomass and rich cellulose (Juliana et. al., 2011). Petai belalang is a small, variably shrubby and highly branched. The family of Petai Belalang is Fabaceae. It is essentially a tropical species requiring warm temperatures for optimum growth and with poor cold tolerance and significantly reduced growth during cool winter months in subtropical areas. It is strong, medium textured, close grained and easily workability.

Panel product is a good material to replace solid wood and control wood waste. The intention of this research is to investigate whether Petai Belalang mixed with Kenaf core can be used as raw material for particleboard and to determine whether different ratios of particle board give significant effect on particle board properties.

MATERIALS AND METHODS

Petai Belalang was harvested at Gua Tongkat, Jerantut, Pahang. The stems were taken from Petai Belalang trees that are approximately between 8-10 years old. Three Petai Belalang tree were selected. Kenaf core was supplied by Lembaga Kenaf dan Tembakau Malaysia in Kuantan, Pahang. Kenaf core was packed in bundle of large particle without bark. Refiner machine was used to reduce the kenaf core into smaller particle. Petai belalang stems were first chipped and flaked to produce the particles. All the particles were then screened to remove oversize particles (>2.0 mm) and fines particles (<0.5mm) All particles were then ovendried in an oven at 80 C for 48 hours to reach a moisture content of less then 5%. In the manufacture of particl;eboard, urea formaldehyde (UF) was used as a binder. The UF was supplied by a private company in Shah Alam, Selangor.

The UF was sprayed onto the particles of Petai Belalang and Kenaf core's in the Particle Mixer. The resin content of UF used was 7%. Four different ratios of Petai Belalang particle and Kenaf Core particle, (100:0), (90:10), (70:30), (50:50) were studied. The target density was 700 kg/m^3. The sprayed particles were laid in a mould with dimensions of 35cm X 35 cm And the formed mat was prepress for about 30 seconds at a pressure of about 300 psi. The consolidated mat was then hot pressed at 165 C for 6 minutes to a final thickness of 12 mm. The boards were then cooled and conditioned according to the EN Std methods. The boards were then cut into test pieces and tested for their mechanical and physical properties in accordance to EN standard methods.

RESULTS AND DISCUSSIONS

Mechanical and Physical Properties of Particleboard

The mechanical and physical properties of admixture particleboard made from petai belalang and kenaf core are shown in Table 1. Particleboards made from 100% petai belalang had the highest value of MOR (16 MPa), MOE (2381 MPa), IB (0.70) and lowest TS of 12.47%. Particleboards made with 50% kenaf core showed the lowest properties of MOR, MOE, IB and worst TS value. Boards made with at least 10% kenaf core were able to surpass the minimum requirement of EN Std for MOR, MOE and IB. However, all boards failed to meet the minimum requirements of 12% for the TS.

Table 1 : Mechanical and Physical Properties of Mixed Particleboard

RATIO	DENSITY	MOR	MOE	IB	TS (%)
* 50 : 50	657.3	11	1794	0.41	26.21
* 70 : 30	650.8	13	1795	0.59	18.55
* 90 : 10	650.3	15	2177	0.61	16.31
* 100	650	16	2381	0.70	12.47
EN Standard	> 650	> 14.00	>1800	> 0.40	<12

* Petai Belalang (*Leucaena Leucocephala)*

Effect of Mixing Ratios

MOR and MOE Values

Figure 1 shows the effects of mixing ratios on the MOR and MOE values. In the study it was shown in Figure 1, the addition of kenaf core significantly decreases the MOR values. A decrease of 34% was observed when 50% kenaf core was added during particleboard manufacture. For MOE value a decrease of about 25% was observed.

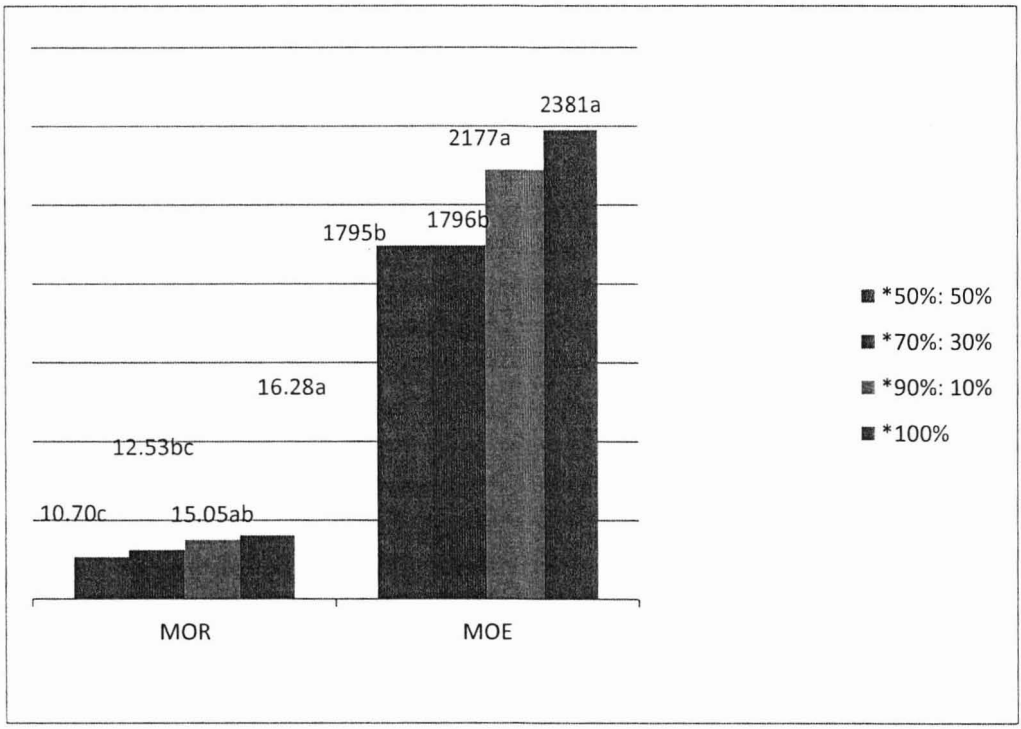

Figure 1 : Modulus of rupture (MOR) and Modulus of elasticity (MOE) of Belalang (*Leucaena Leucocephala)* and Kenaf Core (*Hibiscus Cannabinus L.*).

IB and TS Values

The effects of mixing ratio on the IB and TS values are shown in Figure 2. With addition of kenaf core it was observed to significantly affect the IB values. The IB values decreases by about 41% when 50% kenaf core was added. The decrease in IB is similar to the trend exhibited by MOR and MOE values. However for TS values, addition of kenaf core increases uptake of water thus worsen its TS values. The TS values worsen by about 52% when 50% kenaf core was added during board production.

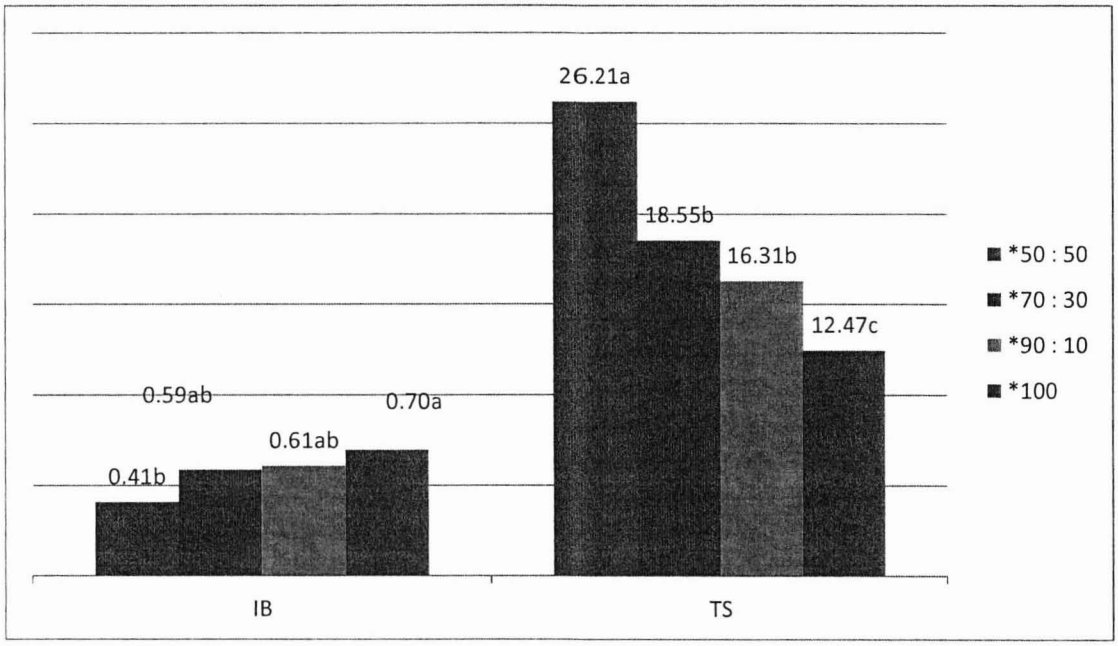

Figure 2 : Internal Bonding and Thickness Swelling of Belalang (*Leucaena Leucocephala)* and Kenaf Core (*Hibiscus Cannabinus L.*).

CONCLUSIONS

In the study petai belalang particles were added with kenaf core particles up to 50%. Particleboards made with 50% kenaf core showed the lowest properties of MOR, MOE, IB and worst TS value. Addition of kenaf core was found to significantly affect the MOR, MOE, IB and TS values. Boards made with at least 10% kenaf core were able to surpass the minimum requirement of EN Std for MOR, MOE and IB. However, all boards failed to meet the minimum requirements of 12% for the TS.

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