



CHARACTERIZATION OF PARTICLEBOARD PRODUCED FROM RESIDUES OF *MUSA PARADISIACA* PSEUDOSTEM, *THEOBROMA CACAO* POD, *THEOBROMA CACAO* STEM AND *CEIBA PENTANDRA*



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ABSTRACT

The suitability of four agro-forest residues for particleboard production using cassava starch and urea formaldehyde as adhesives was investigated. The results shows that with the exception of *Theobroma cacao* pod the physical and mechanical properties of the particleboards produced from the other agro-forest residues were higher than that recommended by ANSI A208.1. Therefore, they could be used as a raw material for production of particleboards. Composite boards produced from these agro-forest residues could be utilized for indoor applications and other general purposes under dry condition.

INTRODUCTION

- In the past, wood was the main raw material used for particleboard production.
- Many factors including forest depletion, environmental awareness and generation of large quantities of agro-forest residues have increased the need to explore new raw materials for particleboards production.
- Previous studies to explore alternative raw materials for production of particleboards have recognised agro-forest residues as potential source for its manufacture.
- Additionally, the emission of carcinogenic substances resulting from the use of urea formaldehyde in the production and use of particleboards has been a major concern to many researchers.
- Therefore, the main objective of this study is to characterise the physical and mechanical properties of particleboards produced from residues of *Musa paradisiaca* pseudostem, *Theobroma cacao* stem and pod, and *Ceiba pentandra* sawdust using cassava starch as adhesives.

MATERIALS & METHODS

Materials

- Musa paradisiaca* pseudostem
- Theobroma cacao* stem and pod
- Ceiba pentandra* sawdust
- Urea formaldehyde
- Cassava starch



Ceiba pentandra sawdust

Material preparation



Fresh *M. paradisiaca* pseudostem



Water extraction from *M. paradisiaca* pseudostem



C. M. paradisiaca pseudostem particles



Cocoa plantation



Cocoa stem



Cocoa stem particle



Fresh cocoa pod



Dried cocoa pod



Cocoa pod particles

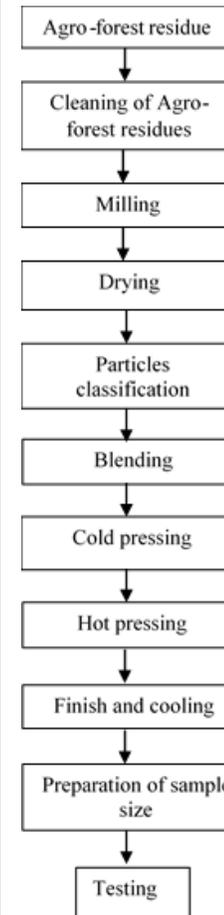


Cassava tubers



Cassava starch

Particleboard Manufacturing Process



Types of Test

- Density
- water absorption
- Hardness
- Modulus of elasticity

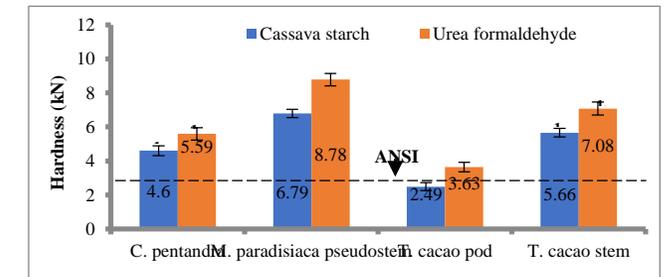
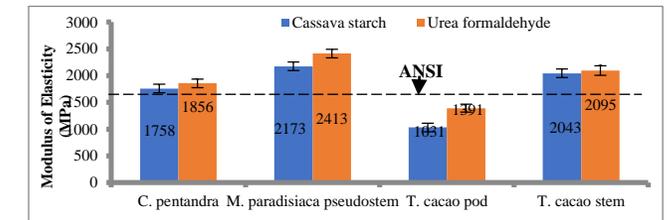
RESULTS

Density of particleboard

Biomass materials	Density (kg/m ³)			
	100% starch	Cassava	100% Urea formaldehyde	Urea
<i>Ceiba pentandra</i>	536 ^a (11.69)		472 ^a (67.86)	
<i>Musa paradisiaca</i> pseudostem	543 ^a (32.25)		493 ^a (84.83)	
<i>Theobroma cacao</i> pod	598 ^b (34.31)		557 ^b (30.90)	
<i>Theobroma cacao</i> stem	497 ^a (26.24)		421 ^a (62.47)	

Water absorption

Agro-forest residue	Water absorption (%)			
	2-hour		24-hour	
	CS	UF	CS	UF
<i>Ceiba pentandra</i>	19.15 ^c (3.16)	13.07 ^b (1.82)	50.08 ^d (1.63)	30.97 ^b (1.07)
<i>M. P.</i> pseudostem	9.86 ^a (0.84)	7.66 ^a (1.49)	23.79 ^a (3.13)	18.17 ^a (1.58)
<i>T. cacao</i> pod	22.41 ^c (1.21)	14.98 ^b (1.57)	59.46 ^d (1.04)	43.80 ^c (5.09)
<i>T. cacao</i> stem	12.65 ^b (1.83)	8.10 ^a (1.32)	30.82 ^b (2.46)	22.08 ^a (1.64)



CONCLUSION

M. paradisiaca pseudostem, *T. cacao* stem & *Ceiba pentandra* sawdust could be used for particleboard production for indoor applications and general purposes under dry condition such as furniture production.