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Experimental Research on Musa Sepientum and Hen Egg Shell Hybrid Reinforced Composite Material

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Abstract*: *A hybrid reinforced composite material which composite comprises banana fiber modified to powder form, egg shell modified to fine powder ,the said powders of said natural fibers being mixed in a matrix of bio epoxy resin using a catalyst to effect complete mixing of the said powdered fibers to yield the said hybrid reinforced composite, the said hybrid composite capable of being molded to any geometrical object, the said composite having a low water retention property with retention being in a range of 14-23% with a soaking time of 120hrs. Before and after chemical treatment in both with and without moisture, the young's modulus varies from 12321.5241 N/mm^2 to 25779.2532 N/mm^2 , the flexural values varies from 17.4 N/mm2 to 25.5 N/mm^2 , impact strength varies from 12.6 J to 20.9 J ,% of elongation varies from 5.6% to 10.1%.

Keywords* : *Banana Fiber, Hen egg shell, Bio epoxy resin, Material properties.

I. INTRODUCTION

Composite consisting of a combinant structure of cellulosic wood or polymeric fibers mixed with non fibrous materials [1]. The disclosure relates to economic and environmental efficiencies to wood, non woods paper making and other polymeric operations. The disclosed invention also provides application to various categories of products like automotive , construction , food and non-food items. And personal care items [2]. However, the said disclosure is not clearly stating use of any other natural fiber other than wood. This still is not a beneficial use as wood means deforestation and hence threat to environment [3]. The fiber of the invention may also nit have bi degradability property. The disclosed materials have been proposed fro use in construction industry [4]. The natural fibers used in the disclosed invention include hemp, jute bamboo, coco, sisal and preferably flax [5]. Depending on the end use, the disclosed invention further educates that the natural fiber may be added with any other man made fiber like aramid, ceramic and the like [6]. However , the disclosure still might have limitation of bio degradability. The amount of natural fibers used in the modification of wood powder is in a range of 5-95%.The disclosure is limited to modification of wood only by adding natural fibers listed [7].

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II. MATERIALS AND METHODS

Table 1 Materials

Material	Type	Supplied by
Matrix	Epoxy resin	Lab chemicals, Chennai
Catalyst	Hardner	
Releasing agent	Poly vinyl acetate	
Reinforcement agriculture waste of banana stem outer layer (Musa sepientum) & Egg shell	Particle	Banana stem extracted from the waste product of banana cultivation. Egg shell was obtained from a local market.

Table 2 Sample Preparation

Specimen	% of Musa sepientum	% of Egg shell	% wt of Resin	Total % of wt
Specimen 1	2.5	2.5	95	100
Specimen 2	5	5	90	100
Specimen 3	7.5	7.5	85	100

Table 3 Experimental Standards [8-10]

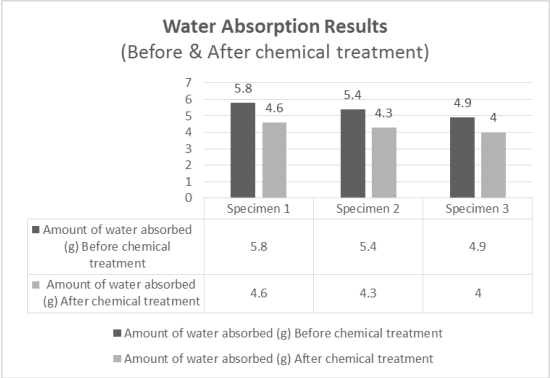
Test	Specimen standards	Specimen size (mm)
Flexural Properties.	ASTM D7264	154 X 13 X 4
Impact Test	ISO 180	64 X 12.7 X 3.2
Water Absorption	ASTM D5229	100 X 100
Hardness Test	B Scale	50 X 50

III. RESULTS & DISCUSSION

Water absorption Treatment

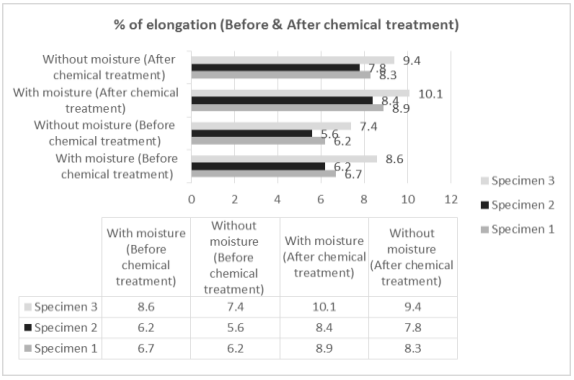
Water retention limit is another urgent factor to be considered when considering the impact of water on the composite material created. The impact of water ingestion is significant incase the material that has been created when utilized for applications comes in contact of water.

From the perception it very well may be presumed that if fitting blend of egg shell and banana substance can retain less dampness for various application condition [11-13].



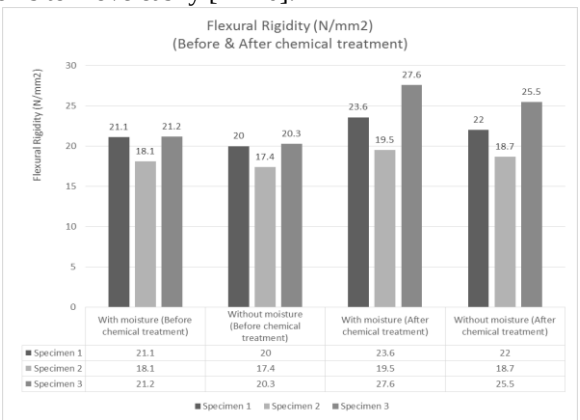
Tensile Test

The half and half composites demonstrated nearly better execution, the micrographs taken for the cracked example 1 , 2 and 3 composites. Fiber 5% and Resin 95% and Fiber 10% and Resin 90% fiber composites, on ductile stacking condition, demonstrated a weak like disappointment (less in % of extension). Curved breaks and their quick engendering could be watched. Less fiber haul out is watched and this could be explanation behind the decrease in the elasticity. The nature is advocated, where more rate prolongation could be watched for the Fiber 15% and Resin 85% (high in % of stretching) fiber composites which display flexible nature [14-16].



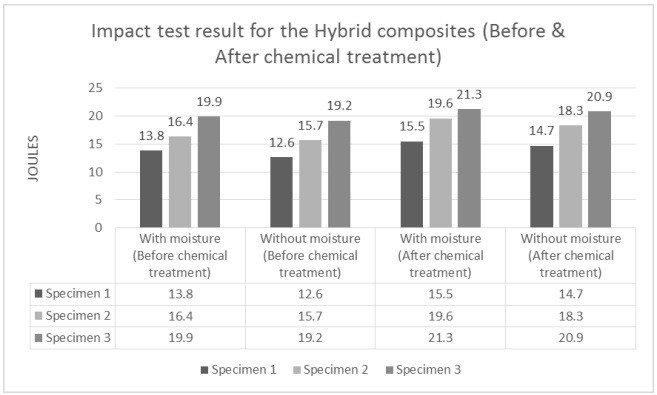
Flexural Test

The impact of flexural stacking on the presentation of the created composite materials is appeared in diagrams. Three point twisting test was utilized to examine this impact. The nearness of banana and egg shell fiber in the support invigorated. The explanation could be the nearness of water assault on the cellulose structure and enable the cellulose atoms to move easily [17-20].



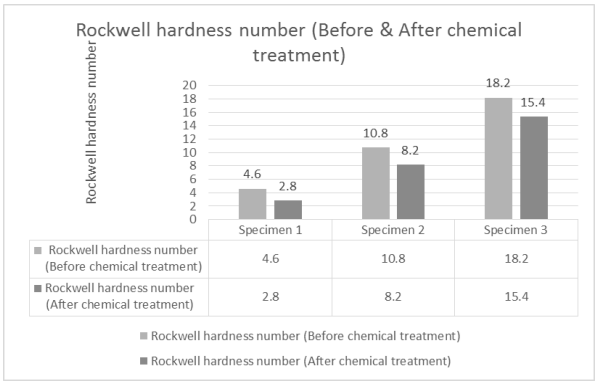
Impact Test

The impact of filaments on effect quality for the examples arranged for both dry and dampness conditions. Fiber 5% and Resin 95%and Fiber 10% and Resin 90% ingest more vitality on effect stacking conditions both in the dry just as dampness condition it demonstrates their fragile nature however Fiber 15% and Resin 85% which demonstrates its pliable nature by retain less vitality on effect stacking conditions [21-23].



Hardness Test

Before and after chemical treatment specimen 1,2 % 3 under goes hardness test. From the hardness test results it shows specimen 3 having more ductility in nature compared to specimen 1 & 2 [24,25].



IV. CONCLUSION

The unveiled creation gives crossover fortified composite materials. The composite fundamentally contains horticulture squander materials like banana stem external layer (Musa sepientum) and Egg shell. The said composite has great versatile and mechanical properties and has low water retention. Commonly the water assimilation is accounted for to be about 13.3% (suitable blend of egg shell and banana content half breed) ingestion test time of 120hrs .Natural filaments have the favorable position that they are sustainable assets and have bio degradable properties. In this development , powder material of normal fiber Banana stem external layer (Musa sepientum) and hen egg shell are created with epoxy tar utilizing forming strategy. Flexural inflexibility test, ductile test, sway test and hardness of mixture composite have been revealed.

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