

# Mechanical and Material Properties of Areca/ Epoxy Composite



T. Naresh Kumar, S. Sathishkumar, A. Jeevarathinam, R. Sivaprasad, R. Praveen Kumar

**Abstract:** The contemporary test targets learning the perfunctory conduct of half breed regular fiber combinations. Tests of a few Areca-Epoxy were made utilizing layup strategy where the assembling of handles was substitute and the weightiness division of polymer % and fiber & network was kept at 90%- 10% , 80% - 20% and 30%-70%.Specimens were cut from the created cover as indicated by the ASTM models for various analyses. For Ductile test and flexural test were cut fit as a fiddle and level bar shape separately.

**Keywords:** Natural Fibers, Polymer, Material Properties, Mechanical Properties..

## I. INTRODUCTION

The enthusiasm for common fiber-strengthened polymer composite materials is quickly becoming both as far as their modern applications and principal look into [1]. They are inexhaustible, modest, totally or somewhat recyclable, and biodegradable. Plants, for example, flax, cotton, hemp, jute, sisal, kenaf, pineapple, ramie, bamboo, banana, and so on., just as wood, utilized from time prehistoric as a wellspring of lignocellulosic filaments, are increasingly more regularly applied as the support of composites [2]. Substantial excellent has revolved into a rudimentary bit of configuration for engineers, since of user-friendliness of multifarious assortment of resources that have analogous possessions and encounter the item plan precise [3-5]. Accomplishment of realistic going-over unaccompanied brands it hard to discriminate the flawless edifice of the last amalgamated [6]. A harmonized approach between measurable prototypical and micromechanical model is wanted.

Revised Manuscript Received on December 30, 2019.

\* Correspondence Author

**T. Naresh Kumar**, Department of Mechanical Engineering, Malla Reddy Engineering College (Autonomous), Hyderabad (Telangana) 500100 India. E-mail: [nareshpiler@gmail.com](mailto:nareshpiler@gmail.com), Mob:9966617463.

**S. Sathishkumar**, Department of Mechanical Engineering, Karpagam College of Engineering, Coimbatore-641032 (Tamil Nadu) India. E-mail: [sathishkumarsk90@gmail.com](mailto:sathishkumarsk90@gmail.com).

**A. Jeevarathinam**, Department of Mechanical Engineering, Hindusthan Institute of Technology, Coimbatore-641032 (Tamil Nadu) India. E-mail: [a.jeevamechanical@gmail.com](mailto:a.jeevamechanical@gmail.com).

**R. Sivaprasad\***, Department of Electrical and Electronics Engineering, Sri Sairam Engineering College, Chennai-600044 (Tamil Nadu) India. Email: [sivaprasad.eee@sairam.edu.in](mailto:sivaprasad.eee@sairam.edu.in), Mob: 9445358356.

**R. Praveen Kumar**, Department of Mechanical Engineering, St. Peter's Institute of Higher Education and Research, Avadi, Chennai (Tamil Nadu) India. E-mail: [pk29031991@gmail.com](mailto:pk29031991@gmail.com), Mob:9884480465

© The Authors. Published by Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP). This is an open access article under the CC-BY-NC-ND license <http://creativecommons.org/licenses/by-nc-nd/4.0/>

In this paper, subsequent normal fiber and polymer link from past scrutiny is exploited to gauge the mechanical possessions, for instance, thickness, Young's modulus and elasticity [7-9]. Four degrees of fiber stacking are employed to scrutinize the ideal regular fiber strengthened polymer compound [10].

## II. SPECIMEN AND EXPERIMENTAL

Areca which remain conveyed and gutted with aquatic and dehydrated. By then the aggregates are gently dispersed with hand sedentary serenely. By then its outside projectile is cleared by the cutting edge and it is expurgated into obligatory estimation [11-13]. We take precise proportion of polymer which we have decided previously and 10% of its hardener [14-16]. By then this mix is blended totally till it transmutes into to some degree warm. Bit extra quantity of hardener is taken for the wastage at the same time. Hardener should taken minutely bearing in mind the way that little further quantity of hardener can destroy the compound [17-19].

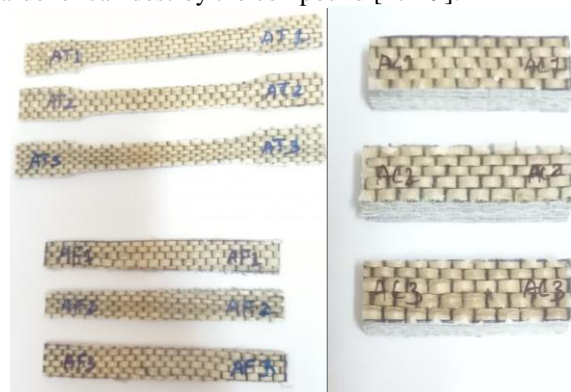


Fig.1 Areca /Epoxy Composite Specimen

Most ordinarily the example lies on a help range and the heap is applied to the middle by the stacking nose creating three point twisting at a predetermined rate. The parameters for this test are the help length, the speed of the stacking, and the greatest redirection for the test. These parameters depend on the test example thickness and are characterized distinctively by ASTM [20].

Table 1. Standard for Characterization

TEST NAME	STANDARD
TENSILE TEST	ASTM D 638
FLEXURAL TEST	ASTM D 790
IMPACT TEST (CHARPY)	ASTM E 23

SEM Fractography

The surfaces of the examples are analyzed legitimately by examining electron magnifying lens and the compound examples are astride on counterfoils through silver glue.

III. TEST RESULTS

From the Tensile, Flexural and Impact test results shown in Figure 2 to 6 it can be observed that specimen 2 (80% polymer & 20% fiber composition) possess good mechanical properties and also SEM images shown in figure from 7 to 9 it can be observed that good bonding and less porosity between fiber and polymer composites.

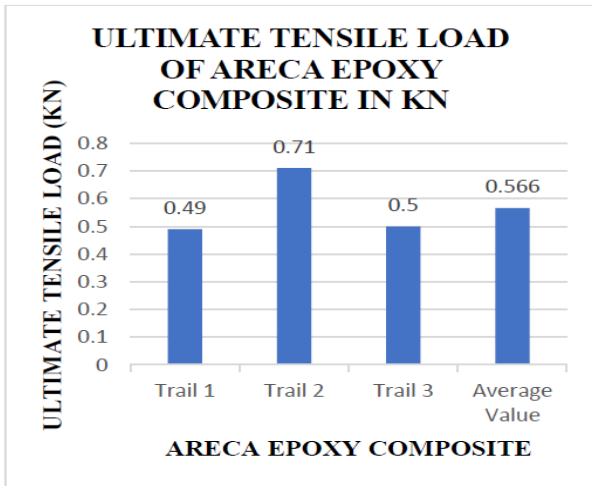


Fig.2 Tensile Load comparison

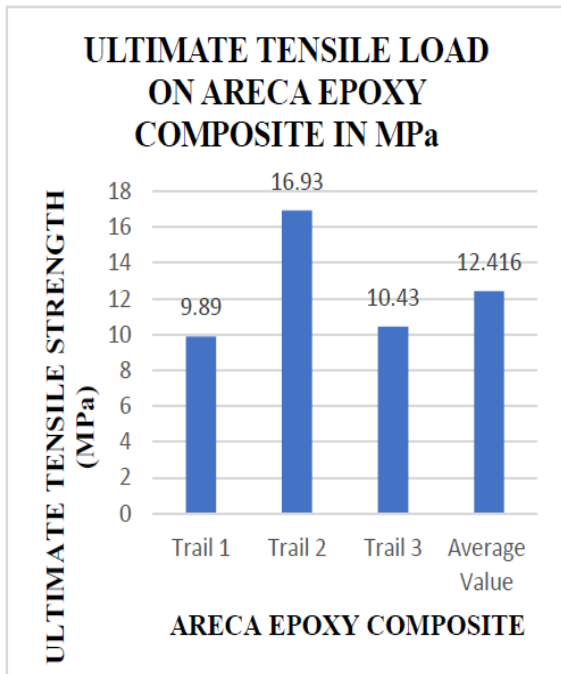


Fig.3 Tensile strength comparison

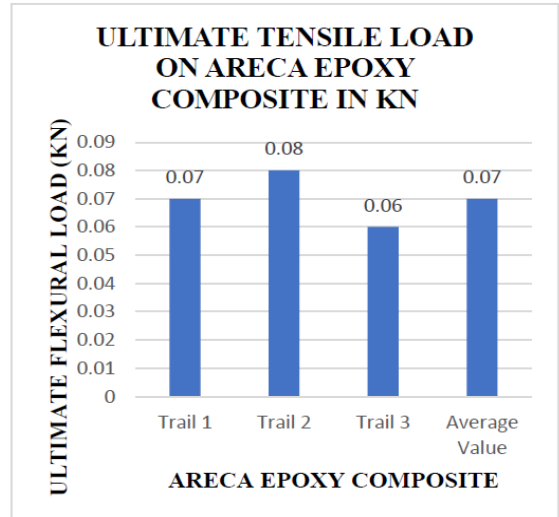


Fig.4 Flexural Load comparison

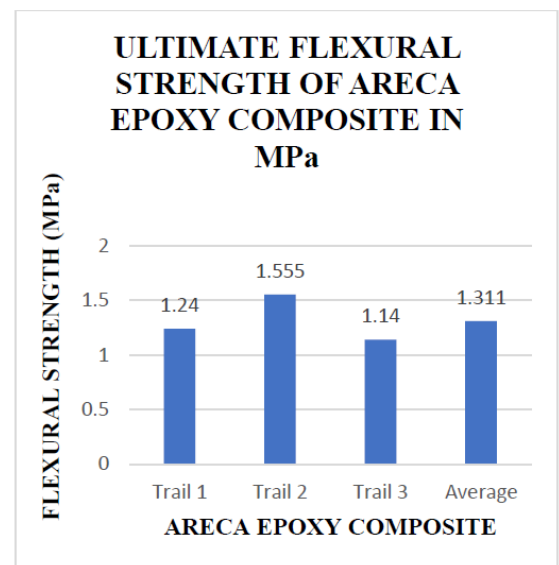


Fig.5 Flexural strength comparison

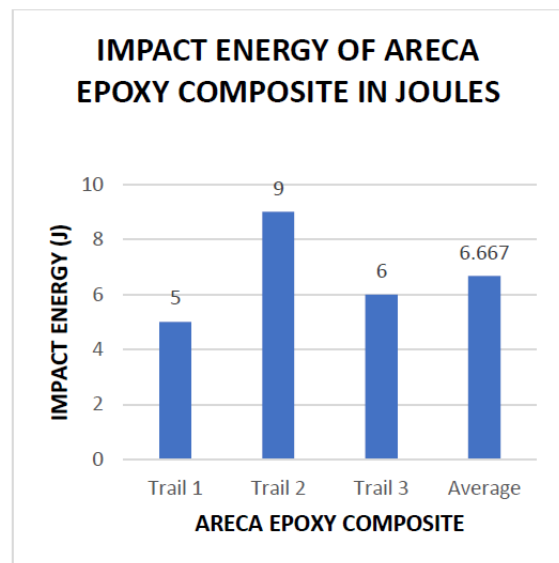


Fig.6 Impact Energy comparison

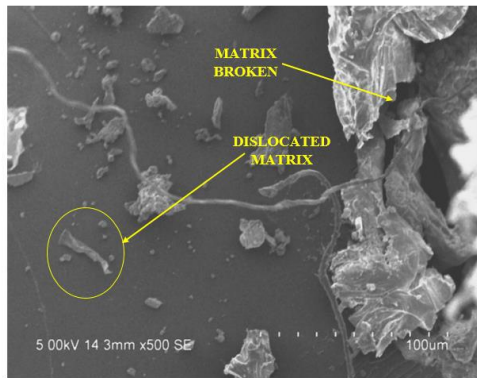


Fig.7 SEM of Tensile specimen

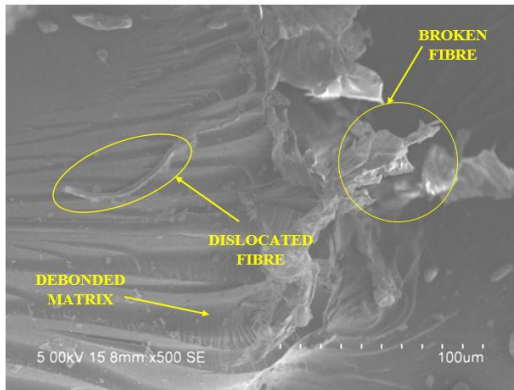


Fig.8 SEM of Flexural specimen

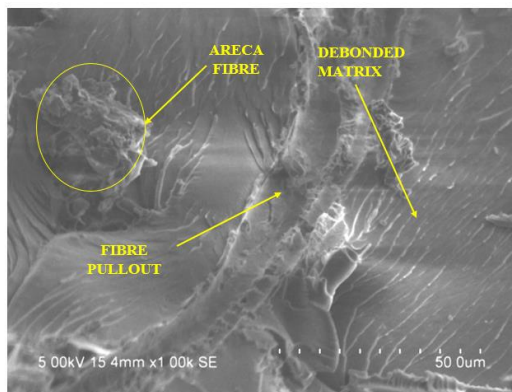


Fig.9 SEM of Impact specimen

#### IV. CONCLUSION

In this work, the common fiber picked as Areca fiber. Unidirectional mats were created and layered up, course of action with epoxy gum network. The overlay is fabricated utilizing hand lay-up system. The Mechanical properties, for example, rigidity, flexural quality and effect quality are broke down on the created material. Too Miniaturized scale structure of the composite is examined utilizing checking electron magnifying lens (SEM). Specimens were cut from the created cover as indicated by the ASTM models for various analyses. For Tensile test and flexural test tests were cut fit as a fiddle and level bar shape separately. The outcomes showed that one-sided Areca epoxy composite have great tractable, flexural and sway quality. Upgrade of mechanical properties might be achieved by utilizing the treated strands and right technique for creation. The surface morphology demonstrates that the development of voids and holes in every one of the examples composites. Thus in this examination woven fiber mats are utilized in setting up the

composites; uniform conveyance of pitch around the filaments and air voids are the significant causes as seen in micrographs.

#### REFERENCES

- Chandramohan, D., Bharanichandar, J, *Carbon - Science and Technology*,5(3), pp. 314-320,2013.  
<http://www.applied-science-innovations.com/cst-web-site/CST-5-3-2-013/CST%20-%2080%20-%20FINAL.pdf>
- Chandramohan, D., Rajesh, S., *International Journal of Applied Engineering Research*, 9(20), 6979-6985,2014.
- Chandramohan, D et.al., *American Journal of Applied Sciences*, 11 (4),623-630,2014.  
<https://pdfs.semanticscholar.org/19e8/56abe7720e513b65612dad30edff976d4d2.pdf>
- Murali, B et.al., *Carbon - Science and Technology*,6(1), pp. 330-335,2014.
- Pandayaraj, V et.al., *International Journal of Mechanical Engineering and Technology*,9, pp. 1034-1042,2018.  
[http://www.iaeme.com/MasterAdmin/UploadFolder/IJMET\\_09\\_12\\_1\\_03/IJMET\\_09\\_12\\_103.pdf](http://www.iaeme.com/MasterAdmin/UploadFolder/IJMET_09_12_1_03/IJMET_09_12_103.pdf)
- Murali, B et.al., *Journal of Chemical and Pharmaceutical Research*,6(9), pp. 419-423,2014.  
<http://www.jocpr.com/articles/chemical-treatment-on-hemppolymer-composites.pdf>
- Chandramohan, D., Murali, B., *Academic Journal of Manufacturing Engineering*, 12(3), 67-71,2014.
- K Gurusami, et.al. (2019); *International Journal of Ambient Energy*, DOI: 10.1080/01430750.2019.1614987.
- Chandramohan, D., Rajesh, S., *Academic Journal of Manufacturing Engineering*,12(3),72-77,2014.  
[https://www.researchgate.net/publication/286590092\\_Study\\_of\\_machining\\_parameters\\_on\\_natural\\_fiber\\_particle\\_reinforced\\_polymer\\_composite\\_material](https://www.researchgate.net/publication/286590092_Study_of_machining_parameters_on_natural_fiber_particle_reinforced_polymer_composite_material)
- Chandramohan.D., and A.Senthilathiban., *International Journal of Applied Chemistry*, 10 (1),153-162,2014.
- Chandramohan, D et al. *Journal of Bio- and Tribo-Corrosion* (2019) 5:66.  
<https://link.springer.com/article/10.1007/s40735-019-0259-z>
- Sathish, T., Chandramohan, D. *International Journal of Recent Technology and Engineering*,7(6), 287-290,2019.
- Sathish,T et.al., *International Journal of Mechanical and Production Engineering Research and Development*, Volume 2018, Issue Special Issue, 2018, Article number IJMPERDSPL201883, Pages 705-710.
- D Chandramohan and Ravikumar L., *Materials Today: Proceedings* Volume 16, Part 2, 2019, Pages 744-749  
<https://www.sciencedirect.com/science/article/pii/S221478531930999X>
- Murali, B et.al., Mechanical properties of boehmeria nivea reinforced polymer composite, *Materials Today: Proceedings*, Volume 16, Part 2, 2019, Pages 883-888.  
<https://www.sciencedirect.com/science/article/pii/S2214785319310193>
- M. D. Vijayakumar, et.al., Experimental investigation on single point incremental forming of IS513Cr3 using response surface method, *Materials Today: Proceedings*.
- T. Adithiyaa et.al., Flower Pollination Algorithm for the optimization of stair casting parameter for the preparation of AMC, *Materials Today: Proceedings*.  
<https://doi.org/10.1016/j.matpr.2019.07.711>.
- T. Adithiyaa et.al., Optimal Prediction of Process Parameters By GWO-KNN in Stirring-Squeeze Casting of AA2219 Reinforced Metal Matrix Composites, *Materials Today: Proceedings* (2019). DOI:10.1016/j.matpr.2019.10.051.
- K. Gurusami, D. Chandramohan, S. Dinesh Kumar et al., Strengthening mechanism of Nd: Yag laser shock peening for commercially pure titanium (CP-Ti) on surface integrity and residual stresses, *Materials Today: Proceedings*.  
<https://doi.org/10.1016/j.matpr.2019.09.141>.

## Mechanical and Material Properties of Areca/ Epoxy Composite

20. Prabhakaran Vasantha-Srinivasan, Raja Ganesan Sengodan Karthi, Muthiah Chellappandian, Athirstam Ponsankar, Annamalai Thanigaivel, Sengottayan Senthil-Nathan, Devarajan Chandramohan, Aspergillus flavus (Link) toxins reduces the fitness of dengue vector Aedes aegypti (Linn.) and their non-target toxicity against aquatic predator, Microbial pathogenesis,128,281-287,2019.  
DOI:https://doi.org/10.1016/j.micpath.2019.01.014.

### AUTHORS PROFILE



**Mr. T. Naresh Kumar**, Assistant professor in Mechanical Engineering Department, Malla Reddy Engineering College(Autonomous), Maisammaguda, Hyderabad. He has 5.6 years of teaching experience. He completed M.Tech in 2013 at MITS, Madanapalle, Jawaharlal Nehru Technological University, Anantapur. He had guided 3 M.Tech projects and published 13 papers in various National and International Journals and Conferences.



**Mr. S. Sathishkumar**, Assistant Professor in Department of Mechanical Engineering ,Karpagam College of Engineering ,Coimbatore-32. He Completed his B.E. - Mechanical Engineering in 2012 M.E. - Thermal Engineering in 2015 PhD - Mechanical Engineering- (Pursuing). From 04.06.2012 to 10.04.2013 worked as Lecture in Karpagam Polytechnic College. From 18.08.2018 working as Assistant Professor in Karpagam College of Engineering. He has published 17 journals and 17 conference proceedings.



**Mr. R. Sivaprasad** was born in Madurai, Tamil Nadu, India in 1982.He received B.E. degree in Electrical and Electronics Engineering from University of Madras in 2003, and M.E. degree in Energy Engineering, College of Engineering, Guindy in 2007. Currently he is working as a Associate Professor in the Department of Electrical and Electronics Engineering, Sri Sairam Engineering College, Chennai - 600044, India. He has more than 15 years of teaching experience. His fields of interest are Energy Engineering, Control Systems and Electrical Machines. He has Published 5 international Journal papers.



**Mr. R. Praveen Kumar** pursuing Ph.D., in Department of Mechanical Engineering, St. Peter's Institute of Higher Education and Research, Avadi, Chennai, Tamil Nadu, India. He is having more than 6 Years of Teaching Experience and Published 15 papers in SCOPUS indexed Journals. His area of research is Metal Matrix Composites.