ISSN 2347 - 3983

International Journal of Emerging Trends in Engineering Research (IJETER), Vol. 3 No.6, Pages : 492 - 494 (2015)
*Special Issue of NCTET 2K15 - Held on June 13, 2015 in SV College of Engineering, Tirupati*
***http://warse.org/IJETER/static/pdf/Issue/NCTET2015sp87.pdf***

# Compression properties of PALF fiber polymer composite

**Shaik Nilofer[1], Chand Badshah S B V J[2]**

[1]S.V.College of engineering,India,Neelofer26.sk@gmail.com
[2]S.V.College of engineering,India,Chandbadshah36@gmail.com

**ABSTRACT**
In recent years natural fibres appear to be outstanding materials which are abundant and come as viable substitute for the expensive and non-renewable synthetic fibre. Pineapple leaf fibre (PALF) is one of them that has good potential as reinforcement in thermoset composite. The objective of the present work is to determine the mechanical properties of Pineapple leaf fibre (PALF).This study highlights the fibre preparation using alkali method with different concentrations. It is determined that long fibres with fillers show better tensile strength with 10% conc. NaOH displays higher strength with lower elongation when compared to fibers treated with other concentrations.

**KEY WORDS**
Composites, Natural Fibre, Properties, PALF.

## 1 INTRODUCTION

With growing environmental awareness, ecological concerns and legislations, Eco fiber reinforced plastic composites have received increasing attention during the recent decades. The composites have many advantages over traditional glass fiber and inorganic materials. In this paper, tests are conducted for composite material constitutes less discovered pineapple as filling materials. These composites are adhered using epoxy resin consists resin and hardener suitably mixed in appropriate volume. Here for preparing samples Hand layup method is used, specimens are prepared and tests are carried out. The compressive tests were applied on specimens of 300×50×10 mm in dimensions but in different proportions of pineapple by weight.

*Figure1. Pineapple plant*

PALF fibres are also widely used around the globe for various other commercial purposes.

These composites can be used in various purposes because of its unique features of recycleability, waste utilization, environment friendly, biodegradibility, good strength and a good alternative to plastics.

## 2 FIBER EXTRACTIONS

PALF is contained in the spiky leaves of pineapples. The pineapple leaves are very fibrous and have high contents of hemicellulose, pectin and lignin. The wax content available in the leaves must be retained in order to retrieve high strength and hence the method of fiber extraction must be adopted with utmost care. The leaves are pressed using two-roll mill to remove circa and 90 % of the water content.

The long fiber (fig 2.) extracted from the leaf and the chopped PALF are shown below. The fibers are washed thoroughly in 2 % detergent solution at 70°C followed by tap water. Basically this removes most of the foreign objects and impurities inside the fibers. They are later dried in an oven at 70°C for 24 hours before characterizing and chemical treatment for further processing.

*Figure2. Pineapple fibres*

ISSN 2347 - 3983

**International Journal of Emerging Trends in Engineering Research (IJETER), Vol. 3 No.6, Pages : 492 - 494 (2015)**
*Special Issue of NCTET 2K15 - Held on June 13, 2015 in SV College of Engineering, Tirupati*
***http://warse.org/IJETER/static/pdf/Issue/NCTET2015sp87.pdf***

## 3 COMPOSITE MAKING

The fibres were extracted using decorticating machine and the fibers have a diameter of 0.017 – 0.13 mm. Banana and pineapple fibers of required length were accurately weighted. For making composite pineapple fiber were combined using epoxy resins as a bonding material. Hand layup method is used for making this composite material. While making this composite material various precautions should be taken like the fiber should be in parallel position and the resin should be applied layer by layer so equal distribution of fiber and resin should be all at all place.

The fibers were aligned parallel in mould so that they were oriented at 0◦ along the axial direction of specimen. While putting fibers in mould it is should be in consideration that the fibers length should be uniform, unbroken and not twisted at any place means fibers should be place straight. While applying epoxy resin to fibers the proper mixture of resin and hardener in desired ratio should be made because improper ratio leads toward the earlier breaking of specimen. Resin take some time to bond itself under proper pressure in some interval of time and to bond the material properly this factor should be taken in consideration.

## 4 TESTING OF SPECIMEN

Compression result of Pineapple composites:

### 4.1 Compression Properties

*Fig 3. Compression Testing Machine*

| | *A* | *B* | *C* | *D* |
|---|---|---|---|---|
| compressive strength, N/mm$^2$ | 191.3 | 196.66 | 202.98 | 208.53 |

*Table 1. Compressive Properties of pineapple*

| Specimen | Combination % | Weight (gms) | Total weight (gms) |
|---|---|---|---|
| A | PP-90% FIBER-10% | 1350gms 150gms | 1500gms |
| B | PP-80% FIBER-20% | 1200gms 300gms | 1500gms |
| C | PP-65% FIBER-35% | 975gms 525gms | 1500gms |
| D | PP-55% FIBER-45% | 825gms 675gms | 1500gms |

*Table.2 Polymer and fiber proportions*

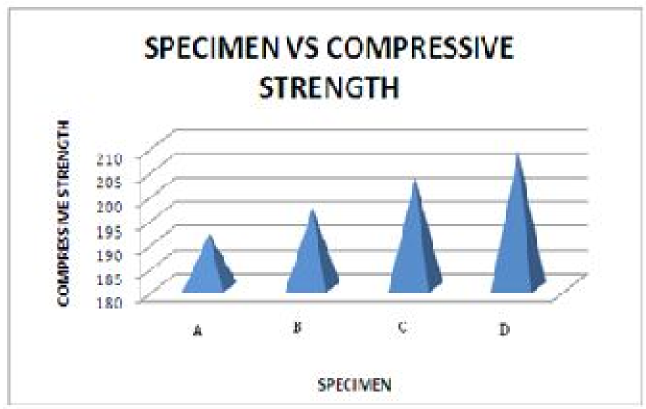


*Fig 4. Specimen vs. comp strength*

## 5 SCOPES FOR IMPROVEMENT

For extracting PALF we carried out manual extraction process. This resulted in fibers of comparatively lower strength because of reduced wax content. Hence different methods of extraction like microbial extraction and water retting can be adopted in order to rectify problem. For improving the strength of the fiber, other methods of surface treatment like bacterial treatment, silane coupling can be used. Fibers can also be oriented in different direction to determine their effect on the physical properties of the composite.

## 6 CONCLUSIONS

This work shows that successful fabrication of pineapple fiber reinforced polymer composites by hand-layup process. The present work proved that PALF has good potential as reinforcement in bio-composites.

ISSN 2347 - 3983

**International Journal of Emerging Trends in Engineering Research (IJETER), Vol. 3 No.6, Pages : 492 - 494 (2015)**
*Special Issue of NCTET 2K15 - Held on June 13, 2015 in SV College of Engineering, Tirupati*
***http://warse.org/IJETER/static/pdf/Issue/NCTET2015sp87.pdf***

NaOH displays higher strength with lower elongation when compared to fibers treated with other concentrations.

This work shows the way for the future researchers to conduct various testing and processing methods with increased physical and mechanical properties in order to satisfy the growing demands.

It is concluded that the inclusion of treated pineapple fiber at optimum proportion with polymer increases the compressive strength.

## 7 REFERENCES

[1] International Organization for Standardization, ISO 14040: environmental Management-life cycle assessment-principles and framework. 1997.

[2] Corbiere-Nicollier T, Laban BG, Lundquist L, Leterrier Y, Manson JAE, Jolliet O. Lifecycle assessment of biofibers replacing glass fibers as reinforcement in plastics. Resource Conservation Recycling 2001; 33: 267-87.

[3] Schmidt WP, Beyer HM. Life cycle study on a natural fiber reinforced component. SAE Technical paper 982195. SAE Total Life-cycle Conf. Graz, Austria; December 1-3, 1998.

[4] Diener J, Siehler U. Okologischer vergleich von NMT- und GMTBauteilen Angew Makromol Chem 1999; 272(Nr. 4744):1-4.

[5] Wotzel K, Wirth R, Flake R. Life cycle studies on hemp fiber reinforced components and ABS for automotive parts. Angew Makromol Chem 1999; 272(4673):121-7.

[6] Boustead I. Ecoprofiles of plastics and related intermediates, Association of Plastic manufacturers of Europe (APME) Brussels, Belgium; 2002.

[7] Goedkoop M. Eco-indicator 95-Weighting method for environmental effects that damage ecosystems or human health on a European scale. Report by Pre Consultants and DUIF Consultancy, Netherlands; 1995.

[8] Pre Consultants: Loos B: De produktie van glas, glasvezel en glaswol, RIVM: April 1992.

[9] Danekien A, Chudakoff M. Vergieichende okologische bewertung von anstrichstoffen im baubeich. Bundessamt fur Unwelt, Wald und Landwirtschaft (BUWAL) Nr 232, Bern Switzerland; 1994.

[10] Guinee JB, Gorree M, Heijungs R, Huppes G, Klejin R, Koning AL, Wegener AS, Suh S. Udo De Haes A, Bruin H, Duin R, Huijbregts MAJ. Life cycle assessment-an operational guide to ISO standards. Report by Center for Environmental Science, Leiden, Sweden; 2001.

[11] Patel M, Bastioili C, Marini L, Wurdinger E. Environmental assessment of bio-based polymers and natural fibers. Netherlands: Utrecht University; 2002.

[12] Eberle R, Franze H. Modeling the use phase of passenger cars in LCI. SAE Technical Paper 982179, SAE Total Life-cycle Conference, Graz Austria; December 1-3, 1998.

[13] Pre Consultants: SimaPro 5-LCA software: Data tables for Diesel and Petrol Demo version.