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Tensile properties of banana fibre polyester composite

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ABSTRACT

Banana plantation generates a huge volume of fibres as residues. The use of natural fibres as fillers in the rubber industry is a new trend. This is especially due to their availability, low cost and environmental friendliness. Of the commonly available natural fibres, banana fibre contains the highest cellulose content of 60-65%.However, indiscriminate use of synthetic fibres causes severe impact on the environment as it pollutes the environment and is non-biodegradable. Thus it becomes necessary to explore natural fibres such as banana fibres. The objective of the present work is to investigate the effect of banana fibre loading on tensile properties.

KEY WORDS

Banana fibre, Composites, Natural Fibre, Tensile.

1 INTRODUCTION

Fibers that are obtained from natural sources are known as natural fibers. Natural fibers have become the recent trend in composite materials studies. It has many advantages than artificially manufactured synthetic fibers. Natural fibers are low in cost. These fibers have high specific properties and low density. Natural fibers are eco-friendly unlike synthetic fibers because they are bio degradable and non-abrasive. The technology of banana fibre extraction has been developed in South India where in a good number of banana fibre extraction units have been running very successfully. Some firms are exporting the banana fibre products. Banana growing states of N.E. Region has adopted the technology from South and started production of banana fibre and fabric. This plant is belongs to India, but nowadays it is cultivated all over the world. The fiber is obtained from its rosette of sword shaped leaves. The fiber is extracted by a process known as decortication. The plant has a life span of 7-10 years. On an average per leaf of a banana plant contain about 290 fibers. Banana fibers are also widely used around the globe for various other commercial purposes.

The present work deals with the effect of tensile tests are conducted for the composite and the results exhibit an enhancement in the mechanical properties.

2 BANANA FIBRE PROCESSING

The extraction of the natural fibre from the plant required certain care to avoid damage. In the present experiments, initially the banana plant sections were cut from the main stem of the plant and then rolled lightly to remove the excess moisture. Impurities in the rolled fibres such as pigments, broken fibres, coating of cellulose etc. were removed manually by means of comb, and then the fibres were cleaned and dried. This mechanical and manual extraction of banana fibres was tedious, time consuming, and caused damage to the fibre. Consequently, this type of technique cannot be recommended for industrial application.

A special machine was designed and developed for the extraction of banana fibres in a mechanically automated manner. It consisted mainly of two horizontal beams whereby a carriage with an attached and specially designed comb, could move back and forth. The fibre extraction using this technique could be performed simply by placing a cleaned part of the banana stem on the fixed platform of the machine, and clamped at the ends by jaws. This eliminated relative movement of the stem and avoided premature breakage of the fibres. This 209 was followed by cleaning and drying of the fibres in a chamber at 20^{o} C for three hours. These fibres were then labelled and ready for lamination process.

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Figure1. Banana plant

Figure 2. Banana Fibres

3 COMPOSTIE MATERIAL MAKING PROCESS

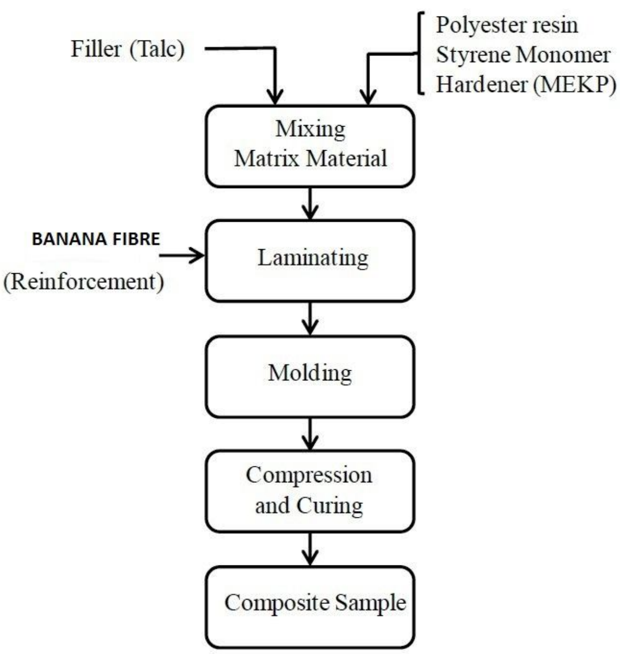

Fig 3. Schematic flow diagram for fabrication of banana fibre polyester resin composites.

Figure 3 shows the scheme for the preparation of banana fibre reinforced polyester resin composites. The composite specimens were prepared in open mould cold compression method. Double layer mats were used to prepare the samples. Unsaturated polyester resin, 7.5 wt% of styrene monomer and 1.5% (vol %) of hardener (MEKP) were taken in a steel bowl. Talc powder was added at different weight percentages (0%, 5%, 10% and 15%) as filler. They were then mixed well and made ready for laminating reinforced mats. The composite samples were fabricated by hand lay-up technique.

Two open moulds were used. At first, a melot paper was placed on dried bottom part. Then some of the prepared resin mixture with or without filler was spread evenly on the paper. After that, a piece of banana fibre was placed on the resin mixture and a part of resin mixture was spread on the mat. Another piece of banana fibre was placed and similarly rest of the resin mixture spread on the mat.

4 MATERIAL PROPERTIES

The main objective is to determine the material properties Tensile Strength of banana fibre reinforced composite material by conducting the below respective test.

- Tensile Test

5 RESULTS AND DISCUSSION

Tensile strength is one of the important properties of composite materials. Generally, composite materials are designed to transfer load in the direction of the reinforcements are embedded. However, in some cases where the applied load direction is off-axis and not parallel to the fibers, it becomes important to investigate mechanical properties of composites.

5.1 Tensile properties

Fig.4 Universal Testing Machine

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This research uses the equipment Universal Testing Machine. Tensile test specimen made in the form of a composite plate manufactured by the method of hand lay-up. The geometry and dimensions of specimen tensile test customized standard ASTM D 3039. Set-up tool test on static tensile tests tailored to the holder of the specimen on the tension testing machine. Tensile loading provided parallel to the axis of the axial and is assumed to be uniform in every point of testing.

Tensile test specimen holder is designed in accordance with the test tool holder to be used as a specimen holder shaped plates. In order to be considered the holder of the specimen must be capable of holding the specimen with strong and attempted to slip does not occur. Tensile measurement of tensile specimen based on the theory of Hooke's Law. The theory states that materials behave in elastic and showed a relationship between stress and strain linear called elastic finite. Variables that will be observed in this study i.e. tensile strength so that the maximum tensile stresses get value added, the length of which indicates the strain that occurs.

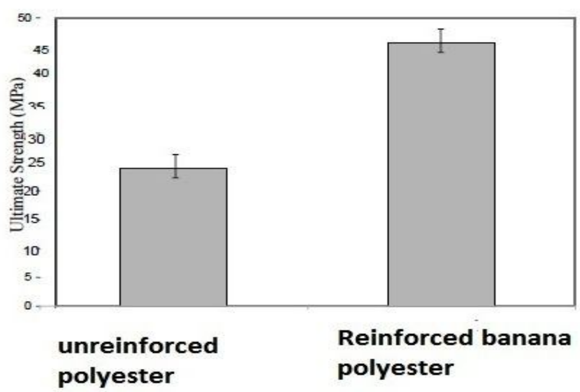

Fig 5. *Ultimate Tensile Strength of virgin polyester and banana reinforced polyester composite*

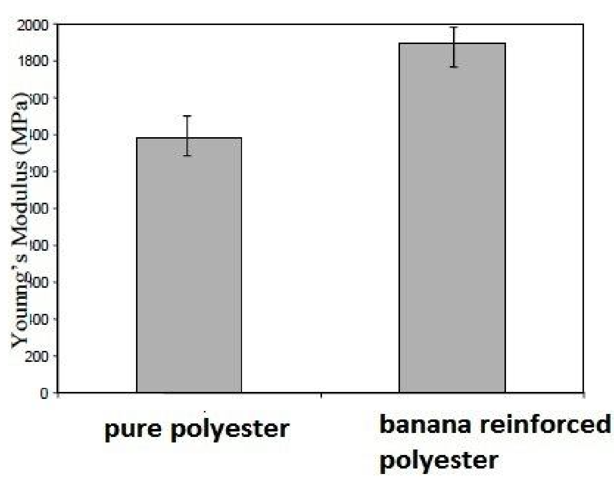

Fig 6 . Tensile Young's modulus of virgin polyester and Banana fibre reinforced polyester composite.

8 CONCLUSIONS

The following conclusions can be drawn from the present study

1. The tensile strength on the banana fibre reinforced polyester composite is increased by 90% compared to virgin polyester.
2. The banana fiber composite exhibits a ductile appearance with minimum plastic deformation.

9 REFERENCES

1. F. T. Wallenberger and N. Weston, "Natural Fibers, Plastics and Composites Natural", *Materials Source Book* from C.H.I.P.S. Texas, 2004.

2. K. G. Satyanarayana, K. Sukumaran, P. S. Mukherjee, C. Pavithran and S. G. K. Pillai. "Natural Fiber–Polymer Composites", *J Cement and Concrete Composites*, **12**(**2**)(1990), pp. 117–136.

3. K. G. Satyanarayana, K. Sukumaran, A. G. Kulkarni, S. G. K. Pillai, and P. K. Rohatgi, "Fabrication and Properties of Natural Fiber-Reinforced Polyester Composites", *J. Composites*, **17**(**4**)(1986), pp. 329–333.

4. T. M. Gowda, A. C. B. Naidu, and R. Chhaya, "Some Mechanical Properties of Untreated Jute Fabric-Reinforced Polyester Composites", *J. Composites Part A: Applied Science and Manufacturing*, **30**(**3**)(1999), pp. 277–284.

5. Laly A. Pothana, Zachariah Oommenb, and Sabu Thomas, "Dynamic Mechanical Analysis of Banana Fiber Reinforced Polyester Composites", *Composites Science and Technology*, **63**(**2**)(2003), pp. 283–293.

6. L. A. Pothan, T. Sabu, and Neelakantan, "Short Banana Fiber Reinforced Polyester Composites: Mechanical, Failure and
Aging Characteristics", *J. Reinforced Plastics and Composites*, **16**(**8**)(1997), pp. 744–765.

7. S. Joseph, M. S. Sreekala, Z. Oommen, P. Koshy, and T. Sabu, "A Comparison of the Mechanical Properties of Phenol Formaldehyde Composites Reinforced with Banana Fibers and Glass Fibers", *Composites Science and Technology*, **62**(**14**)(2002), pp. 1857–1868.

8.T. Corbière-Nicollier, B. G. Laban, L. Lundquist, Y. Leterrier, J. -A. E. Månson, and O. Jolliet, "Life Cycle Assessment of Bio fibers Replacing Glass Fibers as Reinforcement in Plastics", *Resources, Conservation and Recycling*, **33**(**4**)(2001),
pp. 267–287.