

# Mechanical Properties of Screw Pine (*Pandanus Odoratissimus*) Fibers—Unsaturated Polyester Composites

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Interesting fibers researched was taken from leaves of screw pine plant of species *Pandanus Odoratissimus* (PO fibers). In this research, effect of alkali treatments for various soaking time and effect of fiber content on mechanical properties of unsaturated polyester matrix composites was studied. Both cross-section area and moisture absorption of individual PO fibers before and after treatment with 5% NaOH solution for various soaking times show changing. The cross section area decreases continuously, since PO fibers were treated for long time. Untreated PO fibers has the highest moisture absorption and PO fibers treated by the longest soaking times has the lowest one. PO fibers treated by longest soaking time displays the largest damage of the fiber structure. PO fiber treated by various soaking time in 5% NaOH for 90 minutes gives effect significantly on increasing tensile strength and tensile modulus of polyester composite. Effect of various PO fiber content on mechanical properties of composite was also shown in this research. Fibers content of 40% displayed maximum tensile strength of composite. From observation with scanning electron microscope (SEM), some conditions of fracture surface of the composite was obtained.

**Keywords** Composite; Fracture surface; Screw pine fibers

## INTRODUCTION

Natural vegetable fibers have excellent advantages that include cost effectiveness, low density, high specific strength, no abrasion during processing as well as their availability as renewable resources; therefore, they have been used as reinforcement material in polymer composites to replace synthetic fibers like glass. Base on the advantages, nowadays, using of natural fibers as reinforcing material in polymer composite applied for automotive spare part have been increasing significantly<sup>[1]</sup>.

It is believed that natural fibers have also disadvantages such as owning poor wettability and high moisture absorption due to a large amount of hydroxyl groups in cellulose<sup>[2,3]</sup>. Consequently, cellulosic fibers became incompatible with polymeric materials due to their hydro-

philic nature. There are amount of earlier studies to improve the compatibility of hydrophobic thermoplastic and hydrophilic cellulose fiber by modification of fiber surface<sup>[4,5]</sup>. One of populer surface modification uses natrium hydroxide (NaOH) called by mercerization. Many last investigations reported the effects of mercerization in improvement the mechanical properties of polymeric matrix composites<sup>[6–9]</sup>.

There are many form and type of natural fibers available in our earth, however, a little amount of them has been explored and investigated in according to apply reinforcement in polymeric material. Therefore, a big change is still open to explore the new natural fibers available in this earth. Earlier study of relative new natural fibers was reported by Spinace<sup>[10]</sup> about characteristic of lignocellulosic curaua fibers, meanwhile, Singha<sup>[11]</sup> has investigated physical, chemical and mechanical properties of hibiscus sabdariffa fibers/polymer composite.

One of other relative new and potential natural fiber to be applied as reinforcement substance comes from leaves of screw pine plant *Pandanus Odoratissimus* (PO) belonging to pandanaceae family. Their leaves are believed have excellent mechanical properties in comparison to pinnapple leaf, because amount of them was applied for making some kinds of traditional products, including mats, baskets, hats, fans, pillows, canoe sails, toys, and other plaited wares. The PO fiber belongs to the strong natural fibers because it has 52% cellulose content<sup>[12]</sup>.

PO leaves have unique characteristic with many thorns on edge of long green leaf. This plant is very abundant found widely, specially in wild tropical forest. However, earlier studies that reported characteristic and properties of PO fibers used for reinforcing polymeric material were still limited. Therefore, aim of this study is to research effect of PO fiber treatment and PO fiber content on the properties of unsaturated polyester resin (UPR) composites. Results of this research is expected to give important information in according to PO fibers-UPR composite.

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