ANALYSIS OF THE POTENTIALITY OF EXTRACTED PEANUT HUSK FIBRES

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ABSTRACT *With increasing environmental pollution and the worldwide energy crunch, much attention is being directed towards the field of green composites. Natural fiber is the most abundantly available renewable resources in the world. It can be obtained from the naturally available biomass or waste from plantations, forest and agriculture products. It is also known as lignocellulose fiber because its main components are cellulose (α-cellulose) and / or lignin and may contain other components such as hemicelluloses. In this study fiber is extracted from peanut husks as to utilize it on the basis of eco friendly aspect. A lot of research work has been performed all over the world on the use of natural fibers such as flax, bamboo, sisal, hemp, and jute as reinforcing materials for the preparation of various types of composites. In this study, the agricultural residue such as groundnut husk particles were chemically modified and added to the polymer to form novel bio-based composites. The main objective of this study was to investigate the potential of peanut husk (Arachis hypogaea L.) .*

Keywords:

INTRODUCTION

The peanut, also known as the groundnut or the goober[2] and taxonomically classified as *Arachis hypogaea,* is a legume crop grown mainly for its edible seeds. It is widely grown in the tropics and subtropics, being important to both small and large commercial producers. It is classified as both a grain legume[3] and, because of its high oil content, an oil crop.[4] World annual production of shelled peanuts was 42 million tonnes in 2014. Atypically among crop plants, peanut pods develop underground rather than aboveground. It is this characteristic that the botanist Linnaeus used to assign the specific name *hypogaea,* which means "under the earth."

As a legume, the peanut belongs to the botanical family Fabaceae; this is also known as Leguminosae, and commonly known as the *bean,* or *pea,* family.[1] Like most other legumes, peanuts harbor symbiotic nitrogen-fixing bacteria in root nodules.[5] This capacity to fix nitrogen means peanuts require less nitrogen-containing fertilizer and also improve soil fertility, making them valuable in crop rotations.

Peanut (Arachis hypogaea) is a plant grown mainly for its fruits and it is one of the world's important edible crops. The peanuts are often called groundnuts because their pods (shells) develop underground. Nigeria is the leading peanut growing country in Africa and the forth in the world after China, India, and USA. The production of peanut generates large quantities of waste peanut shells. Efforts to find utilization of these waste materials have resulted mostly in low-value or limited application [16]. Just as it is the case of other cellulosic materials, peanut shells contain cellulose, hemicelluloses, and lignin microfibrils, which are grouped into macrofibrils. Chemical compositions of peanut shell fiber was found to be cellulose (35.7%), hemicelluloses (18.7%), lignin (30.2%), and ash content (5.9%) [3]. Therefore, the utilization of peanut husk (shell) as natural filler in polyolefins will foster a new application route in the conversion of agrowastes to useful resources for plastic industries. This promotes the universal call for improved environmental sustainability through the reduction of municipal solid wastes and "waste to wealth" generation.

Demand for forestry products continues to grow despite decreases in industrial wood products from natural forests.High demand for wood in the forestry industry due to increasing population and new applications puts great pressure on existing forest resources. The decline in raw materials deleteriously affects the medium-density fiber-board (MDF) sector, as well as others. Consequently, the forestry industry seeks new substitute materials. Since agri- cultural residues are plentiful, widespread, and easily accessible, fiberboard manufacturers are now studying their use as raw material substitutes.Wood shortages and inadequate timber resources in
Turkey result in greater dependency on foreign suppliers.

Consequently, several studies have examined the feasibilityof substituting wood-based materials, including renewable biomass (Ye et al., 2007), peanut hull (Guler et al., 2007), hazelnut husk (Copur et al., 2007), cotton carpel (Almaet al., 2005), cotton stalks (Gu¨ler and O¨zen, 2004), sun-flower stalks (Bektas et al., 2005), and kiwi prunings (Nem-li et al., 2003), to produce composite panels.The aim of this study was to investigate the potential utilization of peanut husk supplements in MDF production to alleviate raw material shortages. Peanuts are anabundant agricultural product in Turkey, used for bothhuman and animal consumption.

METHODOLOGY
FLOW CHART

Selection of Peanut Husks

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Sourcing of Peanut Husks

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Seperation of Husks from Peanut

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Extraction of Fibres from the Peanut Husks

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Investigation of Potential of Peanut Husks

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Analysis of Physical and Chemical Properties of the Peanut Fibres

a) RAW MATERIAL

The peanut fruits were collected from the farms of Salem district, Tamilnadu, India. After removing the fruits from the roots of the plant the seeds and husks were separated. The husks are then washed and ready for fiber extraction.

b) EXTRACTION PROCEDURE FOR THE FIBER

Materials Required

a) Peanut Husks
b) Water
c) A Steel Vessel

The Peanuts were sourced and collected with great care.The collected peanuts were washed thoroughly many times until all the soils all removed completely.Then it was immersed in water for about three days until which outer layer gets separated from the nut by itself.Then from it the outer layer of nerves were removed which is a fiber. Tt was then shade dried to remove the moisture content.Thus the fiber was extracted and used for further process and analysed for its properties and potentiality.

TENSILE TESTING

Tensile tests were carried out using a universal Instron tensile tester 3366 according to ASTM D638 with the samples obtained as described. Tensile properties were measured at room temperature at 5 mm/min crosshead speed to obtain the tensile strength, elongation at break, and Young's modulus. Averaged values of five runs of each were obtained.

RESULTS AND DISCUSSION
PREPARATION OF SPECIMENS

The tab for mounting the specimen in the machine is prepared out of thick paper. A slot of length equal to the gage length is cut out in the middle of the tab .

A single filament is randomly chosen from the fiber bundle and pasted at both the ends of the slot in the paper tab using suitable adhesive. The actual gage length of the fiber is measured using a vernier caliper to the nearest 0.1 mm.

TESTING OF SPECIMENS

The specimen to be tested is mounted on the INSTRON machine. Immense care is taken to ensure that the axis of the fiber is aligned in-line with the axis of the cross-head in order to simulate a uniform stress condition over the cross-section of the fiber. The full-scale load is set to 1 N and the cross-head and chart speeds are set to 2 mm/ min and 20 mm/min, respectively. Without disturbing the compliance is calculated. Now, the compliances of all the specimens are plotted against their gage lengths.

A best fit line is drawn for these set of points. The Y-intercept of this line, which indicates the system compliance, (C_S), is determined. The true compliance is determined by subtracting the system compliance from the indicated compliance as follows.

$$C_a = \frac{I}{F} \frac{H}{S}$$

where,
I= full-scale elongation, mm
P= full-scale load, N
H= cross-head speed, mm/min
S= chart speed, mm/min
C_a= indicated compliance, mm/N
C_s= system compliance, mm/N
C= true compliance, mm/N

TABLE 1

Type of test: Single fibre Tensile Test

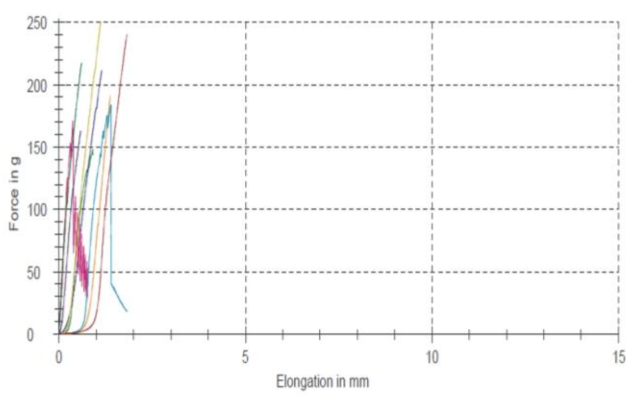
Testing Standard: Customized

Testing Details:

Test speed – 2 mm/min.
Guage length – 20mm

No.	Specimen ID	F_H g	ε_H %
1	NATURAL FIBRE	126	1.2
2	NATURAL FIBRE	149	4.6
3	NATURAL FIBRE	211	5.7
4	NATURAL FIBRE	191	6.9
5	NATURAL FIBRE	171	1.9
6	NATURAL FIBRE	184	7.0
7	NATURAL FIBRE	250	5.6
8	NATURAL FIBRE	240	9.1
9	NATURAL FIBRE	217	3.1
10	NATURAL FIBRE	163	2.9

FIGURE 2



Series n = 10	F_H g	ε_H %
$\bar{x}$	190	4.8

Legends:

FH – Maximum tensile force
EH – Elongation

The test results for tensile strengths and tensile modulus are shown in Table1. It is seen that the tensile strength of the composite increases with increase in fiber length.

CONCLUSION

Peanut husk fibres has great potential for commercial use. Peanut husk fibres is used as a fuel, filler in cattle feed, hard particleboard, cork substitute, activated carbon, etc. De-hulled groundnut husk is used in more.. Natural fibre/particle sources are not only strong and lightweight but are relatively very cheap. However,the peanut husk fibres produced were totally biodegradable, and modifications in the peanut husk fibres, such as decreased basis weight and blending with other natural fibers may result in a material that can provide the desired flexibility, strength, and light and moisture transmission requirements. Overall, the research demonstrates that peanut fibers can be obtained from the hulls, processed with current nonwovens equipment, and may be useful in certain geotextile application.

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