A STUDY ON THERMOGRAVIMETRIC ANALYSIS OF PALMYRA SPROUT FIBER

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ABSTRACT:

A new variety in natural fiber Palmyra sprout botanically called "Borassus Flabellifer" is introduced in the present work. The main aim of the study is to extract the neat fiber and is characterized for its thermal gravimetric analysis. In this work the thermal analysis of palmyra sprout fiber and its chemical constituents was performed by thermogravimetric analysis under nitrogen atmospheres. In this Paper the author discussed about the Palmyra sprout fiber showed differences in their thermal degradation, decomposition and also differences in the weight loss.

Key words: Palmyra sprout, Thermal analysis, cellulose

I. INTRODUCTION:

Nowadays there is an increasingly interest in the development of eco-friendly materials. Thus, environmental challenges due to the necessity of reducing worldwide levels of CO2 emissions, to limit the energy consumption and to use natural materials are promoting an increasingly effort to find viable alternatives to minimize pollution from the main productive processes.

Fibres such as coir, sisal, banana, hemp hurds, pineapple, wood or recycled paper fibres, present the vast diversity of applications because of their unique properties and the possibility of mass production at affordable cost, while contributing to the biodegradation and renewal of the ecological cycle Special attention should be given to natural fibres in respect to energy conservation and environment protection. In fact, these materials possess many advantages like low density, high specific strength, no health hazards, and also availability as renewable resources.

The search for lesser known and underutilized crops, many of which are potentially valuable as human and animal food has been the focus for research in recent years. India stands first in the world in terms of its wealth of Palmyra (*Borasssus flabellifer* L) palms with a population nearly 122 million palms

The objective of this work is to investigate the thermal analysis process of natural palmyra sprout fibres.

II. MATERIALS AND METHODS

2.1 Materials

The Palmyra sprout is available plenty in and around kanyakumari and Tuticorin District, Tamilnadu, India. The samples as Palmyra sprout were collected from these regions for this research work. The Palmyra sprout and Palmyra sprout fibres are shown in **Figure 1 and 2**. The information on physico-chemical properties of the Palmyra sprout fibres is given in Table 1.

2.2. Fiber Extraction:

2.2.1. Manual Retting:

The fibers are extracted by using manual retting process. The Outer surface skin of sprout has been removed. The sprouts were cleaned to remove foreign matters, dust, and dirt .With the help of the knife and comber the long fibers were obtained uniformly. These fibers are kept to dry in sunlight to remove moisture content.

Figure: 1-Palmyra sprout

Figure: 2-Palmyra sprout Fiber

The composition of cellulose, Lignin, Wax, Ash and moisture content of Palmyra sprout fiber varies with aging and the environment. The properties of Palmyra Sprout fiber in Manual retting Palmyra spout fiber was discussed below in **Table -1**

Table: 1:physico-chemical properties of the Palmyra sprout fibres

Fiber Chemical Composition Testing	Cellulose Content %	Lignin Content %	Wax Content %	Ash content (on dry basis)%	Moisture Content %	Color
Natural Fiber-Palmyra sprout-Manual Retting	61.72	23.25	0.66	5.15	9.07	Light Brown

III. RESULT AND DISCUSSION:

3.1 Thermal analysis:

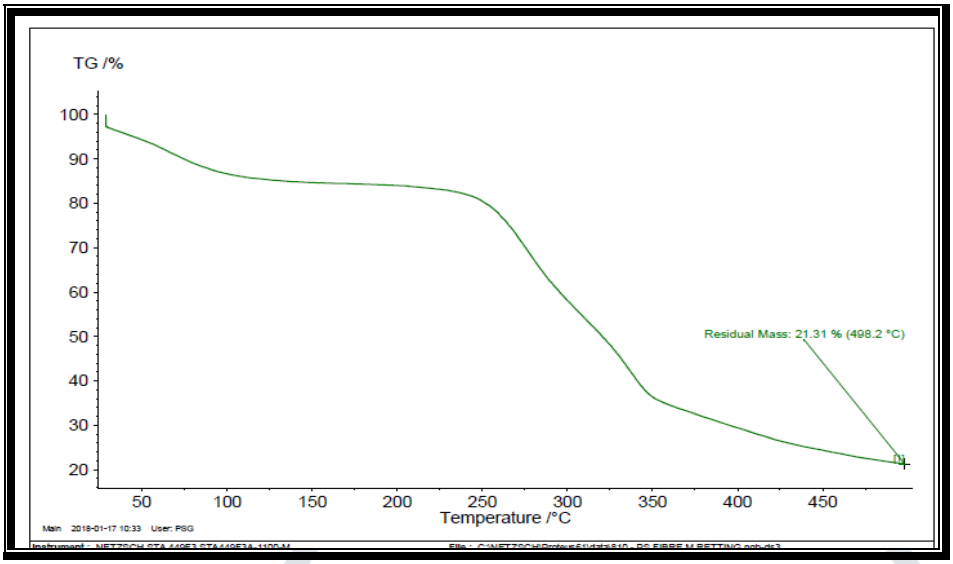
Thermo gravimetric analyses (TGA) were carried out with a Jupiter STA 449F3 instrument (Netzsch, Germany). The thermal changes of the samples which weighed 5 mg, was heated and monitored in aluminum pan from 30 °C to 500 °C C @ 10 k/minute in Nitrogen atmosphere.

Figure: 4- Jupiter STA 449F3 instrument (Netzsch, Germany)

3.2 Thermal Curve:

A TGA thermal curve is displayed from left to right. The descending TGA thermal curve indicates a weight loss occurred. TGA measures the mass of a sample as it is heated, held at a constant temperature in a defined atmosphere. The mass of the sample steadily decreases finally leaving just ashes behind. The burning process of a sample can easily measured by TGA.

Figure: 4-Thermogravimetric analysis-Manual retting Palmyra sprout



Thermo gravimetric analysis (TGA) is a very useful thermal analysis technique to investigate the thermal stability of a material, or to investigate its behavior in different atmospheres (e.g., inert or oxidizing). Figure 4 show the results of the thermo gravimetric analysis performed on the Palmyra sprout fibres, respectively. The results indicated slight differences between the evolution profiles of the thermal degradation TGA of the sample. ***Figure: 3*** explains the thermo gram of the manual retting Palmyra sprout fiber shows a single step degradation process (shown as slopes in the Figure 1)The first step 30ºC-100 ºC weight loss occurred due to moisture evaporation and then weight loss occurred due to the dehydration of light materials like cellulose at 100 ºC -250 ºC while the weight loss 250 ºC -350 ºC takes place due to decomposition of heavy material like lignin of the manual retting Palmyra sprout. After the removal of the free water, the degradation process began in the cellulose and lignin constituents. In the temperature range of 350 ºC -500 ºC increase in ash content and as a result residual mass of 21.31% at 498.2 ºC.

IV. CONCLUSION:

This study presents the thermal behavior of Palmyra sprout fibres characterized by Thermograviemetric analysis. Studying the thermal stability of cellulose fibres from Palmyra sprout fiber showed differences in their thermal degradation, decomposition and also differences in the weight loss were observed. Investigation of the thermal properties of the natural fibres is important in order to gauge their applicability for the processing of biocomposite.

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