

# Physical and Chemical Properties of *Borassus Flabellifer* 'BF'

Phadke Sushil<sup>1,\*</sup>, Shrivastava B. D<sup>2</sup>, Dagaonkar N<sup>2</sup>, Mishra Ashutosh<sup>3</sup>

<sup>1</sup>Department of Physics Govt. Girls College, Dhar (M.P.), India

<sup>2</sup>Government P.G.College Dhar (M.P.), India

<sup>3</sup>School of Physics, Devi Ahilya University Indore (M.P.), India

**Abstract** *Borassus Flabellifer* 'BF' stand in the socio-economy of the human race, apart from their significant contribution to beautify the urban landscapes as horticulture ornamentals because the use of BF in different manner in medicine and industries for different purposes. India is veritable emporium of medicinal and aromatic trees. It has been estimated those trees occurring in India are commonly useful. Neera natural liquid is useful for different purpose like in bio-medical, chemical industries etc. Ultrasonic velocity has proved to be useful in understanding the physicochemical behaviour of the particular system. Toddy (natural liquid of palm tree *Borassus flabellifer*) is chemically alcoholic behaviour on fermentation. It is used medicinally as a detersive astringent in intestinal troubles. Neera natural liquid is considered as a nutritious drink as containing a number of minerals salts and high in protein. It also contains acids like ascorbic acid, nicotinic acid and riboflavin. Neera syrup is produced when fresh Neera is heated and concentrated into syrup. This is used as a healthy drink in connection with Aurveda and other systems of medicine. Each liquid has a different ultrasonic velocity and angle of specific rotation; it's depending on content and concentration of the liquid. The change in the wavelength of ultrasonic waves in different medium is due to the elastic properties and the induced particles vibrations in the medium. The study of propagation of ultrasonic wave in liquid systems and solids is now rather well established. Dielectric properties of wood have both theoretical and industrial applications. They also provide a better understanding of the molecular structure of wood and wood-water interactions. Dielectric properties of wood were affected significantly by moisture content for all anisotropic directions. All the study was done by using NDT technique. The Sample were taken from District Dhar (M.P.) India

**Keywords** Ultrasonic Velocity, Specific Rotation, Elastic, Dielectric, Non Destructive Technique (NDT), *Borassus Flabellifer* 'BF'

## 1. Introduction

Asia is endowed with the world's greatest palm biodiversity, and also possesses the highest diversity of palm utilization[1]. Palms *Borassus Flabellifer* 'BF' has a long history of management for both subsistence and commercial products, many of which are deeply embedded in local cultures. In Asia, traditional technologies of exploiting wild and semi wild palm *Borassus Flabellifer* 'BF' populations, as well as processing techniques associated with many of the palm products, are generally more advanced than in the Neotropics, Native Asian palms *Borassus Flabellifer* 'BF' currently provide significant quantities of food, beverage, giber, rattan, construction material and other products. This article surveys edible products from 61 Asian palm *Borassus Flabellifer* 'BF' species. Using these examples from Asia, suggestions are made as to how Neothropical palms could be

managed and valorized for food and other useful products.

Palm *Borassus Flabellifer* 'BF' shell[2] obtained from coastal part of southern India was studied for the removal for the adsorption of Hg (II) ions. Batch adsorption experiments were carried out as a function of pH, concentration of Hg (II) ions, time, temperature and adsorbent dose.

There are innumerable medicinal uses for all parts of the Palmyra palm *Borassus Flabellifer* 'BF'. Briefly, the young plant is said to relieve biliousness, dysentery, and gonorrhoeal. Young roots are diuretic and anathematic, and a decoction is given in certain respiratory diseases. The ash of the spadix is taken to relieve heartburn and enlarged spleen and liver. The bark decoction, with salt, is used as a mouth wash, and charcoal made of the bark serves as a dentifrice. Sap from the flower stalk is prized as a tonic, diuretic, stimulant, laxative and anti phlegmatic and amebicide. Sugar made from this sap is said to counteract poisoning, and it is prescribed in liver disorders. Candied, it is a remedy for coughs and various pulmonary complaints. Fresh toddy, heated to promote fermentation, is bandaged onto all kinds of ulcers. The cabbage, leaf petioles, and dried male flower spikes all have diuretic activity. The pulp of the mature fruit

\* Corresponding author:

sushilphadke5@gmail.com (Phadke Sushil)

Published online at <http://journal.sapub.org/materials>

Copyright © 2013 Scientific & Academic Publishing. All Rights Reserved

relieves dermatitis.

### 1.1. Description of *Borassus Flabellifer* 'BF' Tree

Palmyra palm *Borassus Flabellifer* 'BF' is a native of tropical Africa but cultivated and naturalized throughout India. The Palmyra palm *Borassus Flabellifer* 'BF' is a large tree up to 30m high and the trunk may have a circumference of 1.7m at the base. There may be 25-40 fresh leaves. Leaves are leathery, gray green, fan-shaped, 1-3 m wide, folded along the midrib; are divided to the centre into 60-80 linear- lanceolate, 0.6-1.2 m long, marginally spiny segments. Their strong, stalks, 1-1.2 m long, are edged with hard spines. In India, it is planted as a windbreak on the plains. It is also used as a natural shelter by birds, bats and wild animals. The flowers are produced in big clusters of long, white string-like inflorescences. The coconut-like fruits are three-sided when young, becoming rounded or more or less oval, 12-15 cm wide, and capped at the base with overlapping sepals. When the fruit is very young, this kernel is hollow, soft as jelly, and translucent like ice, and is accompanied by a watery liquid, sweetish and potable. The chief product of the Palmyra *Borassus Flabellifer* 'BF' is the sweet sap (toddy) obtained by tapping the tip of the inflorescence, as is done with the other sugar palms and, to a lesser extent, with the coconut. The toddy ferments naturally within a few hours after sunrise and is locally popular as a beverage. Rubbing the inside of the toddy-collecting receptacle with lime paste prevents fermentation, and thereafter the sap is referred to as sweet toddy, which yields concentrated or crude sugar (gur in India; jaggery in Ceylon); molasses, palm candy, and vinegar. Palmyra palm jaggery (gur) is much more nutritious than crude cane sugar. Traditionally, the Indian 'Nadar' community are the people who make their living from this tree using its wood, fruits, sap, stems, petioles and leaves to process a variety of food products, beverages, furniture, building materials, and handicrafts.

Palmyra palm *Borassus Flabellifer* 'BF' jaggery (gur) is much more nutritious than crude cane sugar, containing 1.04% protein, 0.19% fat, 76.86% sucrose, 1.66% glucose, 3.15% total minerals, 0.861 % calcium, 0.052% phosphorus; also 11.01 mg iron per 100 g and 0.767 mg of copper per 100 g. The fresh sap is reportedly a good source of vitamin B complex.

Ultrasonic velocities have been very widely used to study binary liquid mixture to obtain structure and interactions present in the liquid systems[3]. It is known for a long time that ultrasonic frequency offers unique features for characterizing liquid based food products in their intact state, with no sample preparation and no sample destruction. It can be used for on-line process control, which makes it even more attractive. However, it is used still mostly in research environment, except perhaps a single industrial application for monitoring alcohol content.

The specific rotation of a liquid material is defined as the

observed angle of optical rotation when plane polarized light is passed through a sample. The specific rotation of a pure material is an intrinsic property of that material. In liquids and solutions, the optical activity[4], is due to molecular structure.

The anisotropic materials are widely used for many structural applications, the determination of mechanical properties is critical for ensuring reliable performance[5]. The knowledge of complete elastic stiffness is essential for ensuring reliable performance. The knowledge of complete elastic stiffness is essential for modelling and evaluating the mechanical behaviour of materials under severe loading conditions. Ultrasonic techniques are however qualified for non destructive measurement of all of the elastic constants of such materials.

The main aim of the present study is that untreated wood had higher dielectric constant than their polymer composites [6]. Electric conductivity of wood is an important property. For good electric insulating property a substance should be porous, good strength properties on the other hand demand a compact structure.

Characterization of BF liquid toddy was done by FTIR, the preferred method of infrared spectroscopy. In IR spectroscopy, IR radiation is passed through a sample. Some of the infrared radiation is absorbed by the sample and some of it passed through. The resulting spectrum represents the molecular absorption and transmission, creating a molecular fingerprint of the sample.. Like a finger print no two unique molecular structures produce the same infrared spectrum. This makes infrared spectroscopy useful for several types of analysis.

## 2. Material and Method

The material was used in all the measurement and calculation were collected from Kukshi, District Dhar (M.P.), India. All the measurement of ultrasonic velocity, specific rotation and elastic constant were recorded in our laboratory. Other details are given in our communication Sushil Phadke et. al. 2009[7]. The value of dielectric constant was found at UGC-DAE Consortium for Scientific Research Centre Indore (M.P.) India. The details of dielectric constant were given in our publication Phadke Sushil et. al. 2010 and 2011[6]. The chemical analysis and identification by IR[8] done at Choksi laboratory, Indore (M.P.), India.

## 3. Result and Discussion

Table 1 shows the mechanical, thermodynamic, optical and electrical values measured and calculated by the author in their previous communications and publications. **Table 1.** Earlier reported values of different physical properties of BF by the author.

Table two shows the various substances was present in the chemical analysis of BF toddy.

**Table 1.** Earlier reported values of different physical properties of BF by the author

S.No.	Physical property	Values in MKS Units
1	Density	$0.9802 \times 10^3$
2	Viscosity	$0.486 \times 10^{-3}$
3	Surface tension	$5.8328 \times 10^{-2}$
4	Ultrasonic velocity	1571.6 m/s
5	Adiabatic compressibility	$4.1305 \times 10^{-10}$
6	Isentropic compressibility	$4.2 \times 10^{-10}$
7	Acoustic impedance	$1.5405 \times 10^6$
8	Inter molecular free length	$0.4294 \times 10^{-10}$
9	viscous relaxation time	$0.2766 \times 10^{-12}$
10	Gibb's energy	$0.1844 \times 10^{-20}$
11	Specific rotation	4.03 at 10%
12	Dielectric Constant	40.9 at 1.0 Hz
13	Elastic constant Female	$3.355 \text{ to } 8.552 \times 10^9$
14	Elastic constant Male	$2.513 \text{ to } 7.259 \times 10^9$

**Table 2.** Chemical analysis of BF natural liquid toddy

S.No.	Description	Result
1	Alcohol	28.21%
2	Riboflavin	Not found
3	Niasin	Not found
4	Ascorbic acid	Not found
5	Thiamine	Not found
6	Moisture	96.91%
7	Protien	0.28%
8	Crude fibre	Nil
9	Fat	Nil
10	Carbohydrates	2.57%
11	Calories	11.40 Kcal/100 gm
12	Potassium, as K	0.08%
13	Iron	24.23 ppm
14	Phosphorous	46.90 ppm

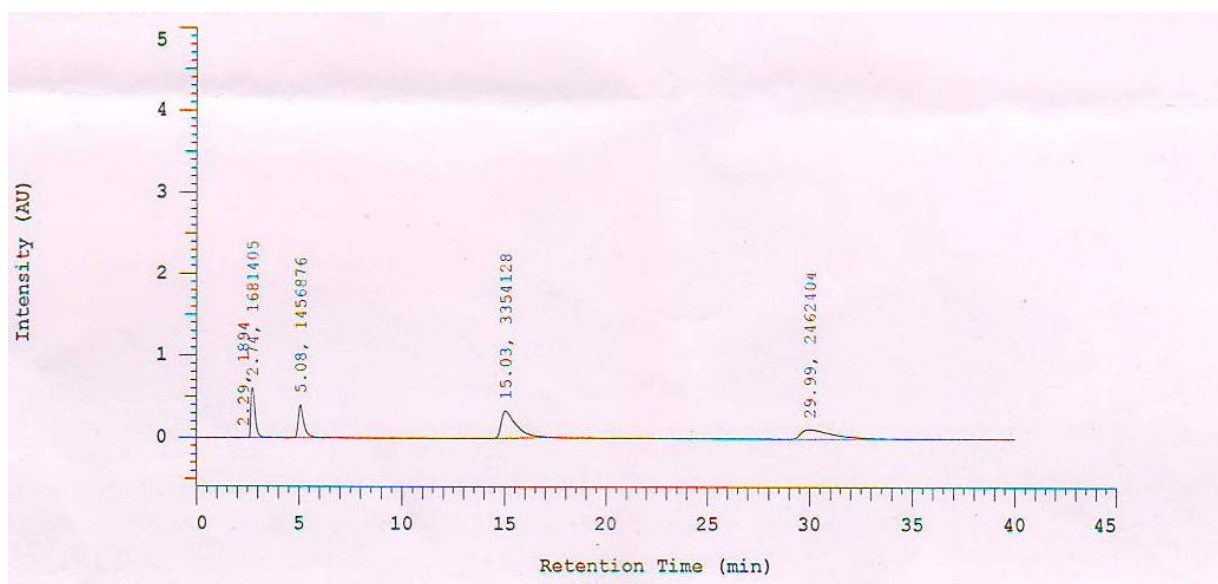
The result of IR spectroscopy for Vitamin -C, B<sub>1</sub>, B<sub>2</sub>, and B<sub>3</sub> and for natural liquid of BF toddy was shown in table 4. Figure 1 shows the retention time and intensity in AU for Vitamin-C, B<sub>3</sub>, B<sub>2</sub>, and B<sub>1</sub>. and figure 2 shows the value of retention time and intensity in mV for Natural liquid toddy of BF.

**Table 3.** IR for Vitamin-C, B<sub>3</sub>, B<sub>2</sub>, B<sub>1</sub>

S.No.	Name	Retention time	Area	Area %
1		2.29	1894	0.021
2	Ascorbic Acid	2.74	1681405	18.773
3	Niacin	5.08	1456876	16.266
4	Vitamin-B2	15.03	3354128	37.448
5	Vitamin-B1	29.99	2462404	27.492

**Table 4.** IR for Natural liquid toddy of BF

S.No.	Name	Retention time	Area	Area %
1	Ethanol	0.03	5347	0.16
2	Ethanol	0.78	225513	6.728
3	Ethanol	3.83	3120848	93.112

**Figure 1.** IR graph of table

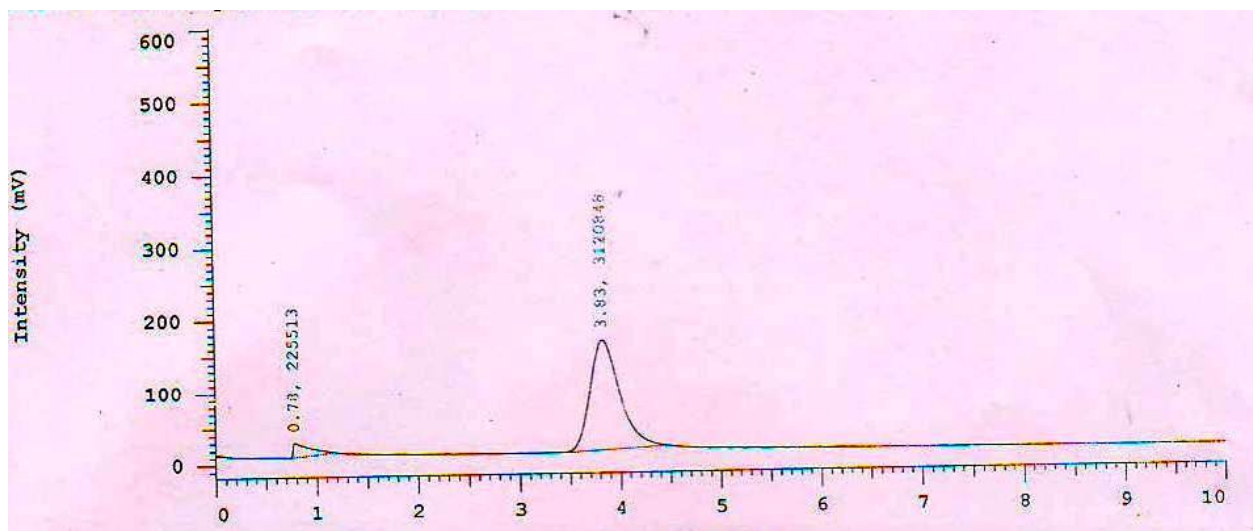


Figure 2. IR graph of table 4

## 4. Conclusions

From the previous study and according to the characterization of the BF natural liquid, we can use BF liquid and solid for the following purposes:

1. Industrial use of BF. 2. Medical use of BF. 3. Constructional purpose of BF. 4. To give financial support to tribal's 5. To reduce crime rate in tribal backward area

## ACKNOWLEDGEMENTS

One of the authors (Sushil Phadke) is highly thankful to University Grants Commission, New Delhi for awarding a Minor Research Project. Our sincere thanks to Dr. T. P. Vyas, Principal Govt. P.G. College, Dhar (MP) India and Dr. S.N. Mandloi, Principal Govt. Girls College Dhar (MP) India for providing facility to bring samples from Dist. Dhar (M.P.) India. We are very thankful to Mr. Ritusing Kalesh of Dist. Dhar (M.P.) India for providing sample. We are also thankful of Dr. A.M. Awasthi and Dr. S. Bharadwaj for providing their lab facility to measure dielectric constant at UGC-DAE Consortium for Scientific Research Centre Indore (M.P.) India.

## REFERENCES

- [1] Johnson D., Palm Utilization and Management in Asia: (2) Examples for the Neotropics, Bull. Inst. etudes and Ines. , 21pp727-740, (1992).
- [2] Kushwaha Shilpi, Sodaye Suparna, Padmaja P.P., Equilibrium, Kinetics and Thermodynamic studies for adsorption of Hg (II) on palm shell powder, World academy of science and technology (43) , pp 600-606 (2008) .
- [3] Phadke Sushil, Shrivastava B.D. & Mishra Ashutosh, Ultra Scientist Physical Sciences (ISSN 0970-9150) Vol. 21 Number (3) pp 499-504 (Dec 2009)
- [4] Phadke Sushil, Shrivastava B.D. & Mishra Ashutosh, Comparative study of natural liquid "Neera" (Borassus Flabellifier 'BF') with sucrose at different concentration.
- [5] Phadke S., Shrivastava B.D. and Mishra A. Some investigation of the elastic. Constants for Borassus Flabellifier (BF) crystals by ultrasonic technique, BVS II National Conference at Devi Ahilya University, Indore. (M.P.) India, (PH-94) (Des.2009).
- [6] Phadke Sushil, Shrivastava B.D., Mishra A., Acoustics and Dielectric properties of Borassus Flabellifier 'BF' with frequency at 308K, Proceedings of 20th International Congress on Acoustics, ICA 2010 Sydney, Convention Centre Sydney, New South Wales, Australia 23-27 August 2010, CD- ROM , ISBN: 978-0-646-54052-8, (2010).
- [7] Phadke Sushil, Shrivastava B.D. & Mishra Ashutosh, binary Liquid mixtures of Borassus flabellifier and ethanol, (ISBN: 978-81-8424-555-4) NSU-XVIII conference held at VIT University Vellore (TN) (21-23), pp. 119-123 (Des. 2009).
- [8] Abbas O., Rebufa C., Dupuy N., Kister J.F. FTIR- multivariate curve resolution monitoring of photo-fanton degradation of phenolic aqueous solution by Talanta, (77)pp 200-209 (2008).