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STUDY FOR MOLECULAR INTERACTION OF EUPHORBIA NIVULIA BUCH HAM. LEAVES EXTRACTS IN ETHANOL AT DIFFERENT CONCENTRATION

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Abstract:

In last few decades, use of medicinal plants as remedial agents gain attention. The remedial properties of any plant or plant products based on their phytochemical constituents.The study of that phytochemical serve as a source of new drug development.The present paper provides information is for the first time about the investigation of Ultrasonic acoustic parameters of Ethanolic extract of leaves of Euphorbia Nivulia. Euphorbia Nivulia is thorny, xerophytic, succulent plant belong to spurge family, Euphorbiaceae. Ultrasonic studies provide valuable information about the nature of molecular interaction in binary or ternary liquid mixture. For these purpose Ultrasonic velocity, density, viscosity measured for pure liquid and its mixture with leaves extract of Euphorbia Nivulia. The acoustic parameter have been calculated from experimental data to analyse certain physiochemical properties of plant extract.

Key words: Ultrasonic velocity, *Euphorbia Nivulia*, Ethanol , Molecular Interaction, Acoustic parameters.

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1. Introduction

In recent era it has been observed that the use of medicinal plant and plant based medicines are serve as therapeutic agent to combat human disease [1]. The medicinal value of any plant depends up their phytochemical constituents. The study of that bioactive component play a key role in development of molecular science [2].The process of drug designing requires knowledge about molecular interaction. Therefore aim of the present study is to investigate ultrasonic acoustic parameters of extract of *Euphorbia Nivulia* leaves in ethanol.

Euphorbia Nivulia is a wild thorny, xerophytic and succulent plant belongs to the spurge family, Euphorbiaceae. The earlier reviews on plant provide information regarding its phytochemical and biological activities [3]. Ultrasonic study of plant extract have not been presented in earlier report.The nature and strength of molecular interaction exist in multi component system has been measured by ultrasonic studies[4]. Ultrasonic method are extensively used to study physiochemical properties assess the binding forces in pure liquid as well as in liquid mixture[5].The solvent used for ultrasonic study is of industrial significance [6].Alcohols are self associated organic liquids so used as the basic organic compound [7].Ethanol being polar protic solvent is involved in strong interaction with other organic compounds[8].

2. Model and Method

2.1 Collection and processing of plant material:

The fresh leaves of plant were collected from their natural habitat of Dhar (M.P). The collected plant part was carefully washed, shaded dried and homogenized to coarse powder and stored in a airtight container for further use.

2.2 Preparation of plant extract:

20 gm of dried powder of leaf loaded into soxhlet extractor and extracted with 150 ml of ethanol for 4 hours. Finally the extract prepared were filtered through whatman filter paper and concentrated to dryness. The dry extract thus obtained used for the experiment[1, 9].

2.3 Experimental Set- Up

Ultrasonic interferometer were used to measure the ultrasonic velocity of liquid mixture[10]. The principle of ultrasonic interferometer is based on wavelength determination. The least count for measuring wavelength is ±.001mm . All the experiments were conducted at room temperature(296K) and 2MHz frequency[11].The liquid mixtures of several known concentration prepared from plant extract and ethanol to determine ultrasonic velocity, density, and viscosity.The density was measured using density bottle of 10 ml and electronic digital balance with accuracy of ± 0.01 mg. Viscosity was measured using Ostwald viscometer and digital stop watch with accuracy of ±0.01s.[12].

By using the measured value following acoustic parameter are calculated.

1. Acoustic Impedance (Z) = $U\rho$

   where, U = Ultrasonic velocity
   ρ = Density

2. Adiabatic compressibility (β) = $1/(U^2\rho)$

3. Intermolecular free length (L_f) = $K\sqrt{\beta}$

   K= Jacobson's constant
   = $\{93.875+(0.375T)\} \times 10^{-8}$.
   T = Temperature in Kelvin

4. Relaxation time (τ) = $4\beta\eta/3$

   Where η = Viscosity

5. Isentropic Compressibility (β_s) = $1/(U^2\rho)$[13,14]

3 Result and discussion

Ultrasonic velocity (U), viscosity(η) and density(ρ) of ethonolic extract of leaf of *Euphorbia Nivulia* were measured at 296K and 2 MHz frequency which are shown in table 1. Acoustic parameters Z, β, L_f , τ, β_s have been calculated by using formulae based on experimental values and result are presented in table 2.

Table 1. Measurement for U ,ρ , η of different sample of Euphorbia Nivulia leaves extract in Ethanol

Sample	Ultrasonic Velocity U (m/s)	Density ρ ($Kg/m^{3)}$)	Viscosity η ($(Pa.s)\times10^{-3}$)
Distilled Water	1245	997.490	.8937
Pure ethanol	1223.4	890	2.5907
2.5% w/v of extract in ethanol	1260.6	901	1.9877
5.0% w/v of extract in ethanol	1270.4	902	1.7959
7.5 % w/v of extract in ethanol	1271.8	903	1.6931
10 % w/v of extract in ethanol	1242.0	905	1.4862

Table 2: Calculation of Z , β , L_f , τ , β_s for different concentration of Euphorbia Nivulia leaves extract in Ethanol.

Sample	Acoustic Impedance $Z\times10^5$	Adiabatic Compressibility $\beta\times10^{-10}$	Inter Molecular Free Length $L_f\times10^{-21}$	Relaxation Time $\tau\times10^{-12}$	Isentropic Compressibility $\beta_s\times10^{-10}$
Unit→ Conc.↓(mg/ml)	$Kgm^{-2}s^{-1}$	$Kg^{-1}ms^2$	m	Sec	$Kg^{-1}ms^2$
Pure Ethanol	10.8883	7.5070	5.6135	2.5931	7.5070
2.5% solution	11.3580	6.9842	5.4145	1.8510	6.9842
5.0% solution	11.4590	6.8691	5.3697	1.6448	6.8691
7.5%solution	11.4844	6.8465	5.3608	1.5455	6.8465
10%solution	11.2401	7.1633	5.4835	1.4194	7.1633

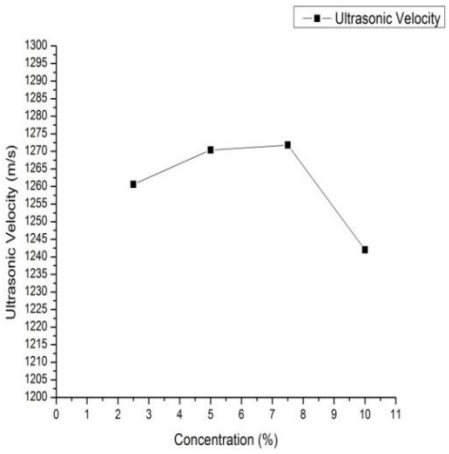


Figure 1

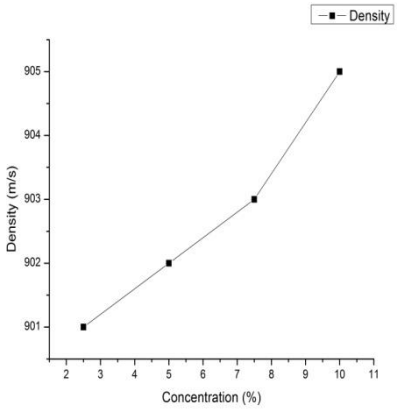


Figure 2

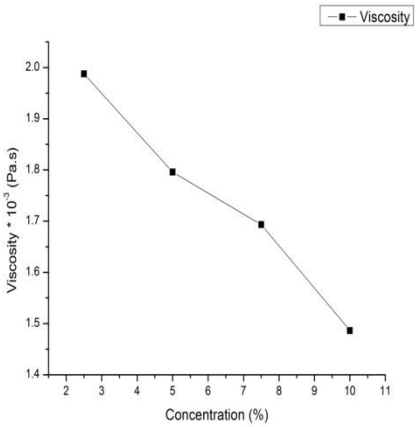


Figure 3

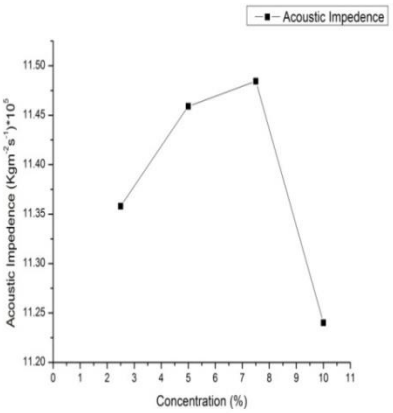


Figure 4

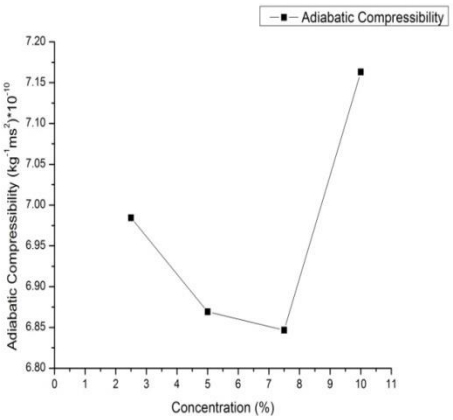
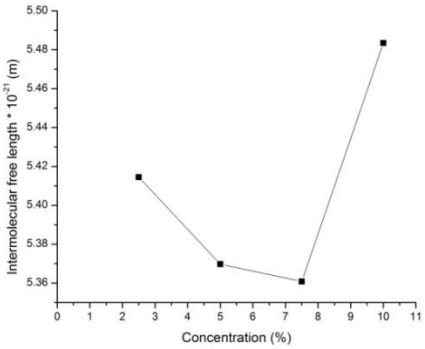


Figure 5



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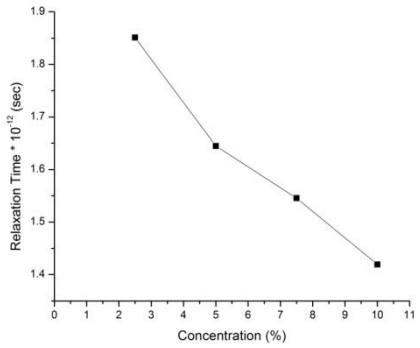

Figure 7

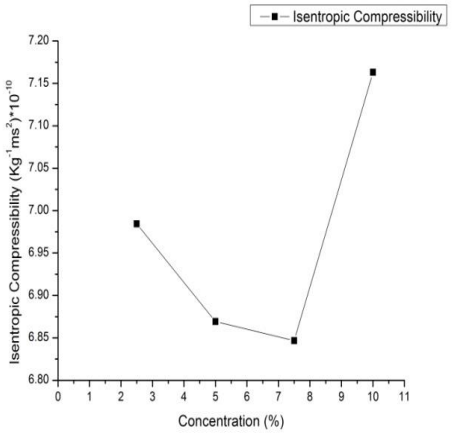

Figure 8

The variation of calculated parameters with concentration are shown in figures given above.

Fig.1 shows that velocity increases with increase in concentration and suddenly decrease at highest concentration Table 1 present that density increase with increase concentration and variation shown in fig.2.It is observed from fig. 3 that viscosity decrease with increasing concentration . This behavior is different from ideal mixture behavior.It is seen in fig.4 that Acoustic Impedance is increase with increase concentration and suddenly decrease at concentration 10% , due to a modification of interaction nature.Fig.5 and Fig.6 present the β and L_f decrease with inrease with velocity, due to the effect of H- bonding which result in strong molecular interaction between the unlike molecule.The variation of relaxation time with concentration is present in Fig.7 shows that relaxation time decease with increase concentration. This is similar change found in viscosity proves that viscous force plays an important role in the relaxation process.

Conclusion

The deviation of experimental values from theoretical value shows that solute solute interaction may also take place in liquid mixture at concentration of deviation point. An analysis of acoustic parameters suggest that strong molecular interaction in liquid mixture which may be due to hydrogen bond..

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