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COMPARATIVE STUDIES OF ACOUSTIC PARAMETERS OF JATROPHA CURCAS LEAVES EXTRACT IN ALCOHOL AT DIFFERENT CONCENTRATION

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ABSTRACT

In recent years, medicinal plants gain much attention to maintain human health because of its less side effect. The therapeutic properties of traditional plants depends on phytochemical metabolites. In present paper ultrasonic parameter of leaves extract of *Jatropha Curcas* in methanol and ethanol studied respectively. The variation of ultrasonic velocity and related parameter like viscosity, acoustic impedance, adiabatic compressibility, intermolecular free length, relaxation time, throw light upon the structural changes associated with molecular interaction in liquid mixture.

KEYWORDS

Interferometer, Acoustic parameters, Molecular interaction, *Jatropha Curcas* and Alcohol.

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INTRODUCTON

According to WHO report 80% of total population of developing countries including India depends on medicines derived from traditional plant[1]. Herbal medicines have gain great attention because of their less toxicity and practically null side effect[2]. *Jatropha Curcas* multipurpose plant of *Euphorbiaceae* family considered as renewable source of seed oil for biodiesel production[3,4]. The study of literature about leaves extract of *J.Curcas* revealed it antitumor and antimicrobial potential activities[5]. It also provided information regarding extraction, phytochemical and biological analysis of plant extract. Our aim was to carry out the

ultrasonic studies of leaves extract of *J.Curcas* in both ethanol and methanol to investigate the nature of molecular interaction.

Ultrasonic method gives idea about the physiochemical properties of liquid mixture[6] by analysis the molecular interaction[7]. The structural arrangement of liquid mixture affected by mutual interaction of particles in solution mixture[8]. Alcohol (ethanol, methanol) were used as solvent for this purpose because of its industrial value and extraction properties[9].

MATERIAL AND METHODS

Sample Collection and preparation of solvent Extract

The plant material were collected from it natural habitat of Dhar (M.P). The collected sample washed under running tap water, shaded dried, homogenised into coarse powder using grinder and stored separately in air tight container for extraction[10]. 20gm of coarse powder of leaves was Soxhlet extracted firstly with 150ml methanol then ethanol for 4hrs[11]. The extract solution prepared was allowed to cool and filtered through Whatman filter paper and concentrated to obtain dry extract for experiment[12].

Experimental Set Up

Ultrasonic interferometer were used to determine ultrasonic velocity with high

Accuracy and least count of ±0.01m/s[13]. Ultrasonic Velocity can be determine as-

Ultrasonic Velocity = Frequency × Wavelength

$U = f \times \lambda$

$U = f \times (d/2)$

Where d = distance between two successive maxima or minima measured by interferometer[14]. The density of liquid mixture was measured using gravity bottle and electronic balance[15], Viscosity were measured by Ostwald viscometer and digital stop watch[16]. Using standard formula, acoustic parameter have been calculated.

1. Acoustic Impedance Z = Velocity ×Density
2. Adiabatic Compressibility β/ Isentropic Compressibility

   $\beta_S = 1/\{(\text{Velocity})^2 \times \text{Density}\}$
3. Intermolecular Free Length

$Lf = K\sqrt{}$ (Adiabatic Compressibility)

K=Jacobson's Constant= $(93.875+0.375T) \times 10^{-8}$

Where T = temperature in Kelvin

4. Viscous Relaxation Time (τ) = [(4×Adiabatic Compressibility × Viscosity)/3][17,18].

RESULTS AND DISCUSSION

All experiments conduct at room temperature (296K) and 2MHz frequency. The parameter measured ultrasonic velocity (U), viscosity (η) and density (ρ) of pure liquid and mixture are shown in Table No.1 and Table No.2 represent the calculated acoustic parameters.

Figure No.1-3 present the variation of velocity, density, and viscosity, respectively with concentration. Figure No.1 shows the velocity increase with increase in concentration and decrease at highest concentration. This trend is similar for both the solvents. An increase in velocity with increasing concentration proves the cohesion in the said system increase.

Figure No.2 shows that density increase with increase with concentration for both ethanol and methanol. It is observed from Figure No.3 that variation of viscosity with concentration is different from ideal behavior of liquid mixture. It is seen in Figure No.4 that variation of acoustic impedance is ideal in ethanol but shows derivation in methanol. Increasing value acoustic impedance with increasing concentration indicate poor complex formation. It is observed from Figure No.5 value of adiabatic compressibility first decrease then increase with increasing concentration. This concluded that the molecules held closer to each other in ethanolic mixture. Figure No.7 shows the variation of relaxation time with concentration shows similar change found in viscosity thus viscose force influenced the relaxation process.

Table No.1: Measurement for U, ρ, η of different sample of *J. Curcas* leaves extract in Ethanol and Methanol

S.No	Sample	Ultrasonic Velocity U (m/s)		Density (ρ) (Kg/m^3)		Viscosity η (Pa.s $\times 10^{-3}$)	
		Ethanol	Methanol	Ethanol	Methanol	Ethanol	Methanol
1	Pure solvent	1223.4	1136.4	890	864	2.9316	1.4478
2	2.5% w/v Solution	1229.8	1181.6	888	854	2.3011	1.4274
3	5.0% w/v solution	1256.8	1183.2	901	859	2.1668	1.5714
4	7.5% w/v Solution	1271.4	1169.5	911	863	1.9553	1.3835
5	10% w/v Solution	1268.0	1161.4	914	870	1.7293	1.2709

Table No.2: Calculation of Z, β, Lf, τ for different concentration of *Jatropha Curcus* leaves extract in Ethanol and Methanol

S.No	Sample	Acoustic Impedance $Z \times 10^5$		Adiabatic Compressibility $\beta \times 10^{-10}$		Inter Molecular Free Length $Lf \times 10^{-11}$		Relaxation Time $\tau \times 10^{-12}$	
1	unit→ conc.↓	$Kgm^{-2}s^{-1}$		$Kg^{-1}ms^2$		Å		sec	
2		Methanol	Ethanol	Methanol	Ethanol	Methanol	Ethanol	Methanol	Ethanol
3	Pure Solvent	9.8185	10.8883	8.9624	7.507	5.8946	5.3948	1.7300	2.9343
4	2.5%	10.0908	10.9206	8.3869	7.4460	5.7023	5.3729	1.5961	2.2845
5	5.0%	10.1637	11.3238	8.3155	7.0266	5.6780	5.2194	1.7422	2.0295
6	7.5%	10.0928	11.5824	8.4721	6.7908	5.6438	5.1310	1.5628	1.7704
7	10%	10.1042	11.5895	8.5219	6.8048	5.7480	5.1363	1.4440	1.5689

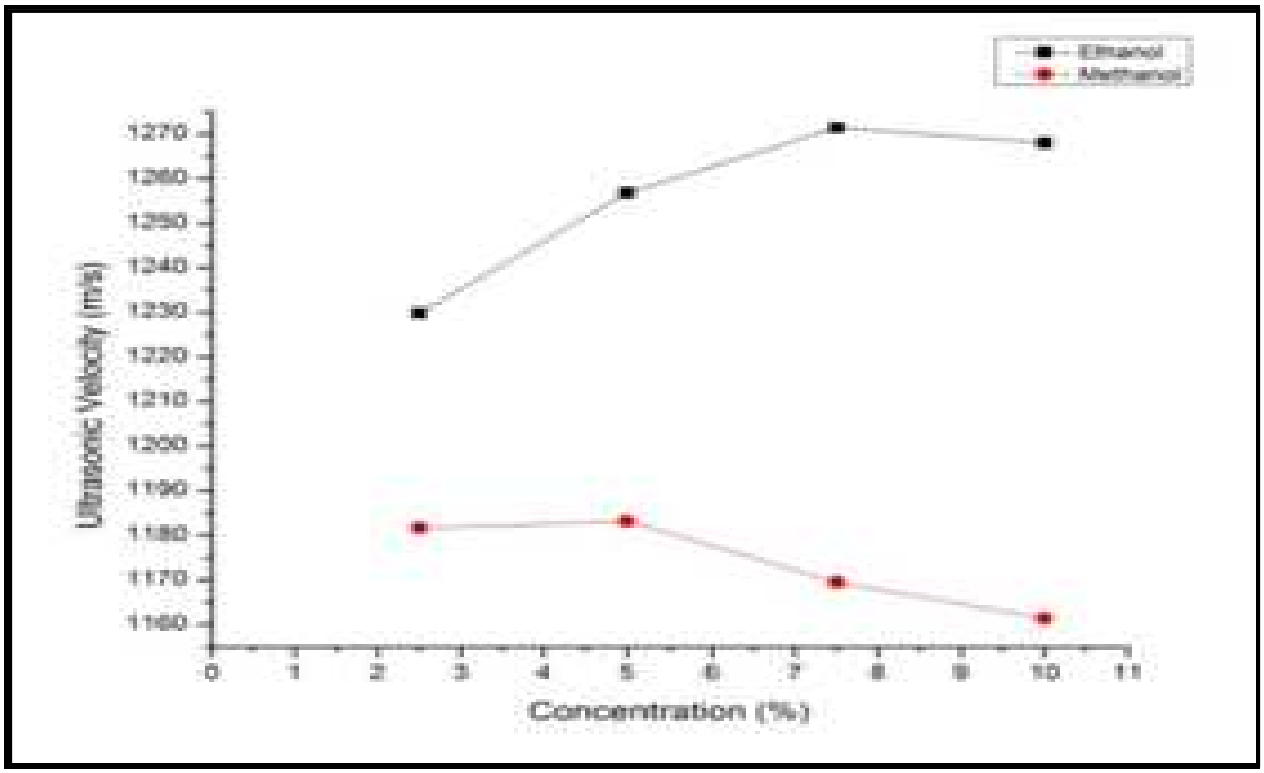

Figure No.1: Ultrasonic Velocity

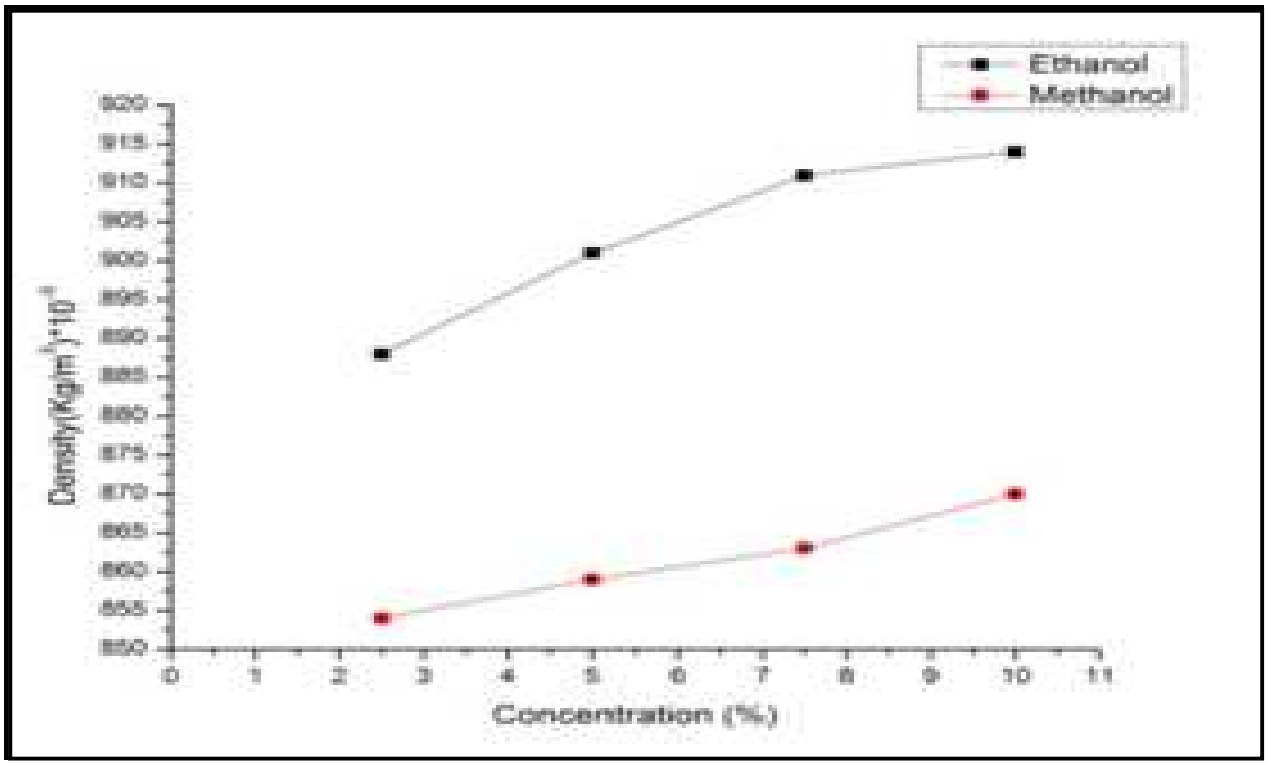

Figure No.2: Density

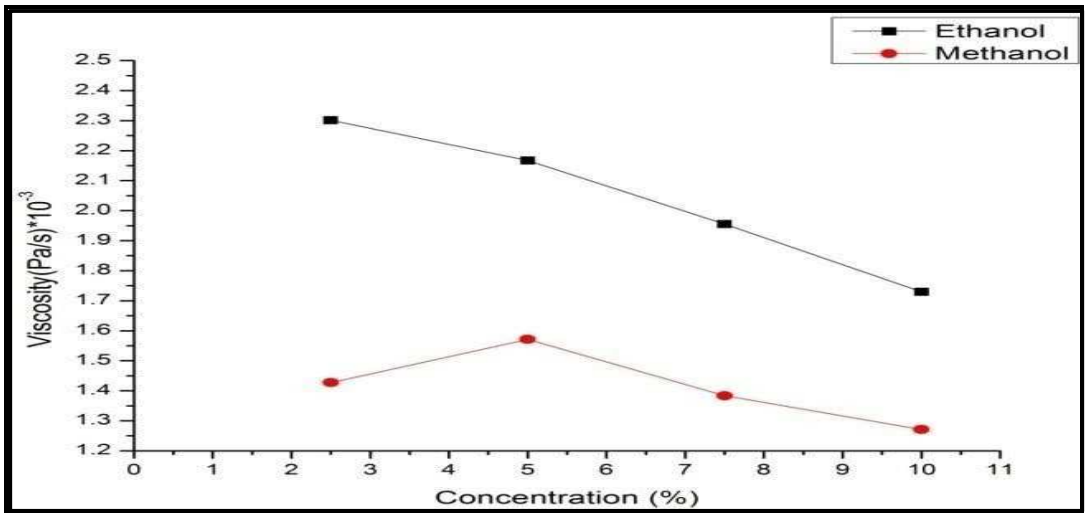

Figure No.3: Viscosity

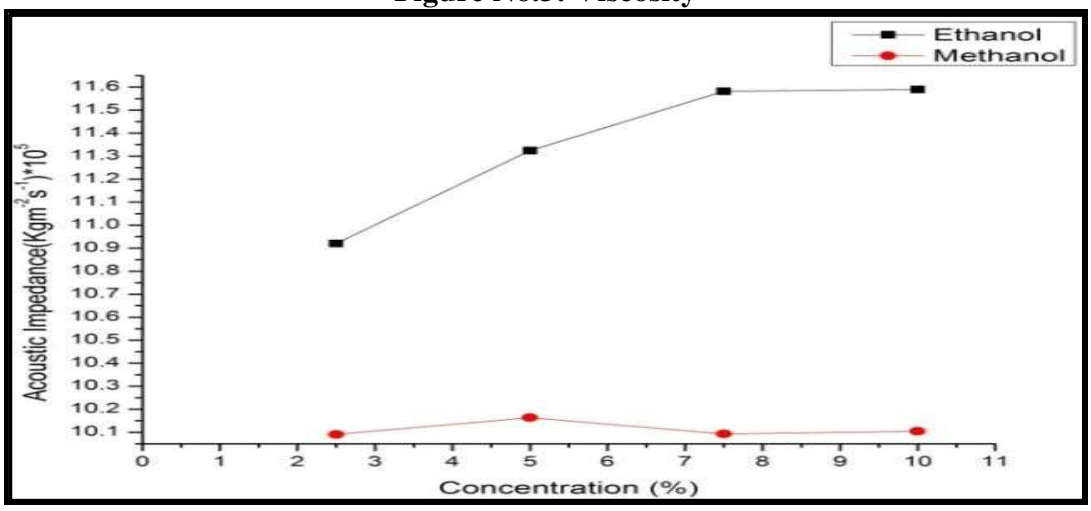

Figure No.4: Acoustic Impedance

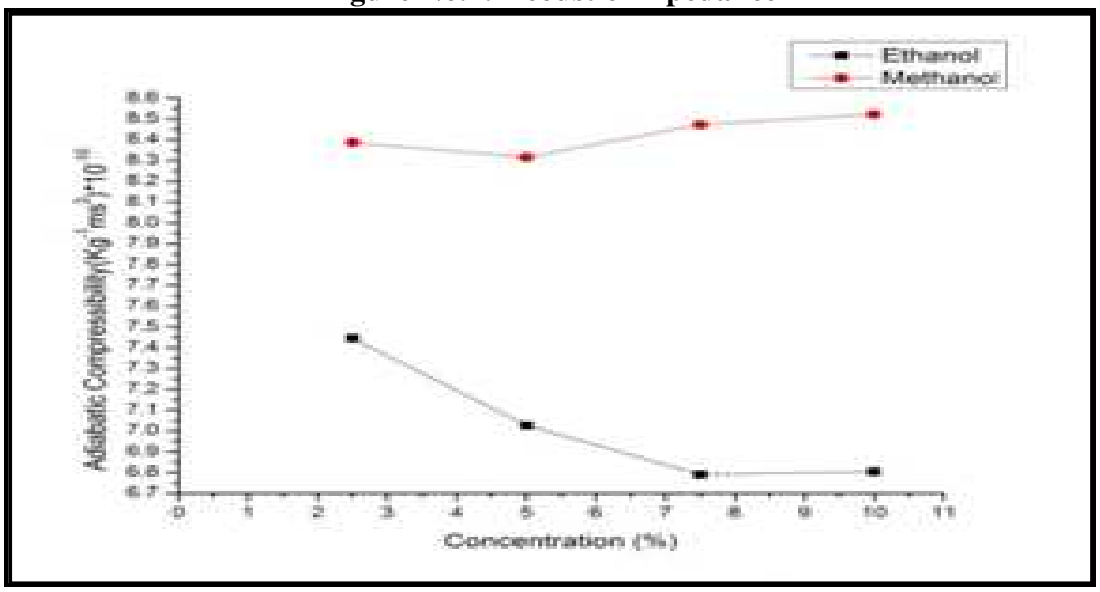

Figure No.5: Adiabatic Compressibility

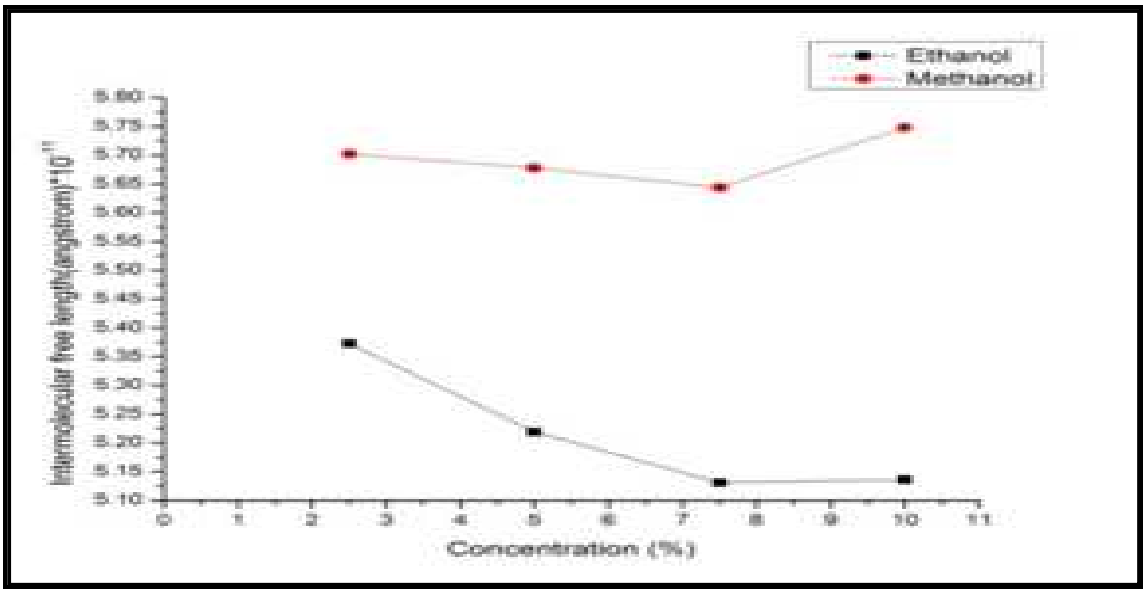

Figure No.6: Intermolecular Length

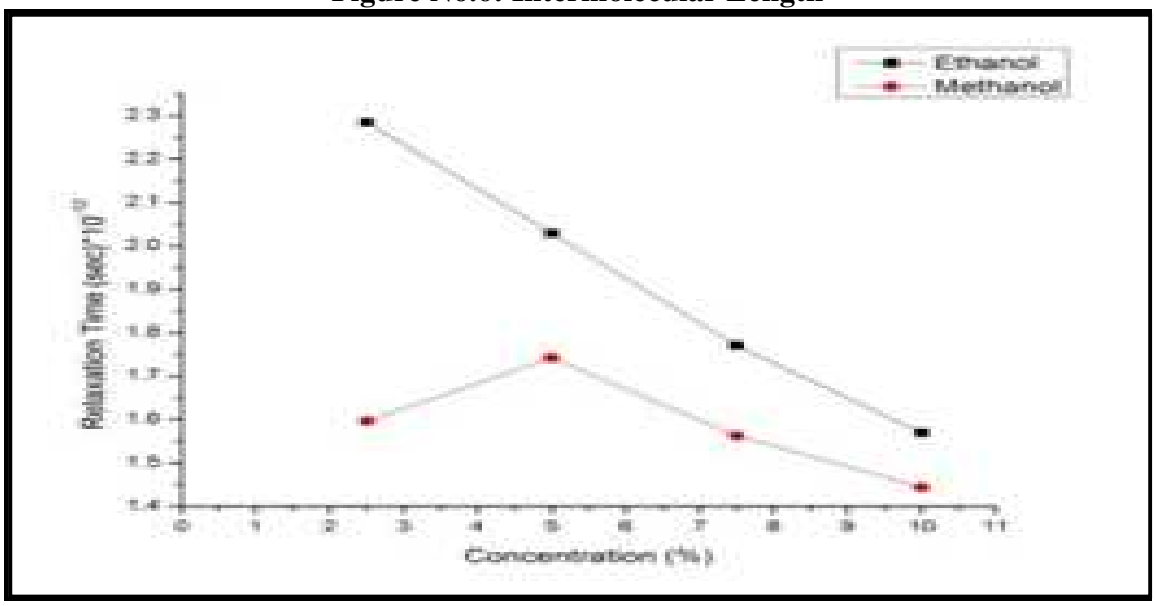

Figure No.7: Retention Time

CONCLUSION

The deviation of experimental values from theoretical value shows that the molecular interaction exist in solution. The variation of adiabatic compressibility with concentration indicate that force of attraction is stronger in ethanol mixture than in methanol.

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

BIBILIOGRAPHY

1. Shaikh Arshad Ahmed. *Euphorbia Nerifolia* Linn: A phytopharmacological review, *IRJP,* 2(5), 2011, 41-48.
2. Prabhavathi R M, Prasad M P, Jayaramu M. Studies on Qualitative Phytochemical Analysis of *Cissus quadrangularis*, *Pelagia Research Library,* 7(4), 2016, 11-17.
3. Ehsan Oskoueian, Norhani Abdullah, Syahida Ahmad,Wan Zuhainis Saad, Abdul Rahman Omar, Yin Wan Ho. Bioactive Compounds and Biological Activities of *Jatropha Curcas* L. kernal meal extract, *Int. J. Mol. Sci,* 12(9), 2011, 5955-5970.
4. Laura Soto Armenta, Julio Sacramento-Rivero, Azucenagonzalez-Coloma, Pablo Acereto Escoffie, Erick A. Aguilera-Cauich, Gregorio Martinez-Sebastian, J. Antonio Roch-Uribe. Extraction and bioactivity from *jatropha curcas* L. leaves by steam distillation, *PJB,* 51(2), 2019, 567-572.
5. Ashish Ku. Nayak, Kunjabihari Satapathi, Sabuja Sahoo. Comparative studies on the phytochemistry, antimicrobial and antioxidant activities of Jatropha species (*J. Curcas L.* and *J.gossypifolia* L.) of Odisha, *IJPPR,* 8(10), 2016, 1614-1624.
6. Anuradha S, Prema S and Rajagopal K. Ultrasonic studies on molecular interaction inbinary mixture of acetonitrile with carbonyl molecules, *J. Pure. Appl. Ultrason,* 27(2-3), 2005, 49-54.
7. Thenmozhi P A and Krishnamurthi P. Ultrasonic studies of molecular interactions of N- alcohols with dimethyl ketone in non - polar solvents, *RJC,* 8(1), 2015, 24-32.
8. Senthamil Selvi C, Ravichandran S, Thillaiyadi Valliammai C, Thenmozhi C and Kannappan V. Acoustic studies of ternary mixture at different temperature, *RJC,* 7(4), 2014, 325-332.
9. CH. Kavitha, Ratnakar A, Narendra K. Molecular interaction studies in ternary liquid mixtures of quinoline at varying temperature, 4(2), 2013, 412-419.
10. Saxena Mamta, Saxena Jyoti. Phytochemical screening of *Acorus Calamus* and *Lantana Camara*, *IRJP,* 3(5), 2012, 324-326.
11. Madhu M, Sailaja V, Satyadev TNVSS, Satyanarayana M V. Quantitative phytochemical analysis `of selected medicinal plant species by using various organic solvents, *JPP,* 5(2), 2016, 25-29.
12. Sandhyarani G and Praveen Kumar K. Insecticidal activity of ethanolic extract of leaves of *Euphorbia Nivulia*, *EJPT,* 1(1), 2014, 23-25.
13. Pankaj K. Singh and Bhatt S C. Investigation of acoustical Parameters of Polyvinyl acetate, *APR,* 2(1), 2010, 35-45.
14. Sunita R. Dandwate. Study of velocity of Ultrasonic Waves in binary mixtures of liquidat room temperature, *IJPAP,* 6(4), 2010, 489-494.
15. Parthasarathy S. Determination of ultrasonic velocity in 52 organic liquids, *Indian Academy of Sciences,* 2(5), 1935, 497-511.
16. Patil S R, Deshpande U G and Hiray A R. Molecular interaction studies of binary liquid mixtures of hexanol and 1-heptanol with nitrobenzene as a common solvent, *RJC,* 3(1), 2010, 66-73.
17. Aswale S R, Aswale S S and Gowardipe V N. Ultrasonic investigation of molecular interaction in herbal extract pomegranate solution at different frequencies, *IJRB,* 1, 2015, 208-211.
18. Sushil Phadke, Shrivastava B D, Dagaonkar N and Ashutosh Mishra. Comparative study of natural liquid neera (borassus flabellifier 'BF') with sucrose at different concentration, *JERD,* 5(3), 2011, 591-596.

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