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Original Article

COMPRESSIBILITY, MOLECULAR FREE LENGTH, RELATIVE ASSOCIATION OF LEMONGRASS LEAVES EXTRACTS IN TWO DIFFERENT SOLVENTS

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Abstract:

Ultrasonic velocity, density viscosity measured experimentally for the mixture of leaves extract of lemongrass in doubly distilled H2O & fifty percent ethanol with a number of concentration at twenty five, thirty, thirty five degree Celsius taking constant frequency of 3 MhZ. Factors compressibility, free length, relative association, relaxation time, acoustic impedance proves useful in forecast and check the molecular interactions, these have been conclude by quantifying the velocity, density & viscosity of ready solution.

Keywords: Ultrasonic Velocity, Compressibility, Acoustic Impedance, Lemongrass Extract, Molecular Interactions.

Introduction:

Ayurveda is the science of life. Ayur means health and veda means knowledge. Along with the progression of human's aptitude, medicine has also improved. In the ancient time people used plants, herbs to cure various diseases. This resulted in the advancement of a system of medicine for the benefit of human life. A principle characteristic of Ayurveda remains in its proficiency to figure out and define the fine vitalities and intellect running in our bodies. We can see allopathic medicines do give quick and fast results but the patient later on starts to feel the side effects. Unlike allopathic medicines herbal medicines do not give fast results but it works on root cause of disease and also makes immune system stronger. Herbal medicines can really prove to be a game changer in today's world, the only thing is we must remember that 'natural' and safety are not synonyms and herbal medicines can become a mainstream medicine only after it go through quality control and standardization.

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In recent times, ultrasonics is engaged in varied arenas in exploring countless organic solutions, polyers and their mixes, drugs, aqu. & nonaqueous electro-lyte solutiions. It shows an central part in accepting the phsico-chemica conducts of liq. [1-8] Ultrasonic velo. extents and supplementary acoust. feature of liquids combinations are the commanding system in the considerate of chemical environment and the molecular connections [8-9]. Voluminous researchers prefered ultrasonic velo. extent for learning solute solvent collaboration in a numeral of scheme comprising organic liquid, dilute solutions [10] . As we know transferable diseases are the main reason for the demise of large number of people across the globe. The potency of many drugs is under risk because of the ability of pathogens to evolve and to show resistance to the action of drugs. So the need of today's world is to produce new drugs and plants are excellent source to obtain new drugs. Recently researchers have drawn their attention more towards the antifungal medications that's why antifungal herbal extracts are undertaken for the present study[11-14].

Psidium guajava is a small herb belonging to the family of myrtaceae. It is very well known for its delicious fruits. It is used for inflammation, diabetes, hypertension, caries, wounds, pain, relief, fever, diarrhea, rheumatism, lung diseases, and ulcers[15-21].

Methodology:

The leaves extract involved during study was of investigative range. Fifty percent ethanol and pure distilled H_2O solvent was castoff for the preparation of solution. Thermostatic water bath arrangement was done to uphold persistent heat. One percent, zero point five percent, zero point twenty five percent, zero point one hundred and twenty five percent solutions of leaf extracts of lemongrass was equipped by compelling perfect weightiness on automated balance. The ultrasonic velocity of One percent, zero point five percent, zero point twenty five percent, zero point one hundred and twenty five percent the solutions of leaf extracts of lemongrass was dignified with the ultrasonic Multi-frequency interferometry at 3 Mhz freq. with an accuracy of $\pm$ 1 m/s. Entirely the readins were engaged at 25^0 c, 30^0 c, 35^0 c. Viscosity evaluated by by means of Ostwald apparatus & the density of the extract solution was dignified via Numeral density meter.

Computation:

Subsequent acoustic parameters are calculated.

Adiabatic compressibility -

$\beta=1/(v)^2\ d$

Inter molecular free length -

$L_f = K\sqrt{\beta}\ s$

Specific acoustic impedance -

$Z = v \times d_s$

Relative association -

$R_A = d\ s / d_o\ [v_o / v\ s\ ]\ 1/3$

Relaxation time -

$\tau = 4/3\ \beta\ s \times \eta$eta

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Outcome and Discussion:

Table A: Density Viscosity and Velocity of Cymbpogon leaves extract solutions.

Sr. No.	Concentration (%)	Tem. K	Density	Velocity	Vis. E^{-4}
1)	1%	298.15	1000	1494.1	9.163
		303.15	999.3	1352.4	7.018
		308.15	999.1	1369.2	7.950
2)	0.5%	298.15	998.6	1424.4	9.218
		303.15	998.3	1380.0	6.375
		308.15	998.0	1439.8	8.317
3)	0.25%	298.15	998.0	1422.0	8.736
		303.15	995.9	1487.1	6.875
		308.15	995.1	1404.0	7.890
4)	0.125%	298.15	997.9	1448.0	7.974
		303.15	996.4	1495.0	6.412
		308.15	994.5	1553.2	7.091

Table B: Acou. Para. of Lemongrass leaves extract sol. in distilled H2O at 3 Mhz.

Ser. No.	Conce. (%)	Tem. (K)	Adiabatic Compressibility (E^{-10})	Acoustic Impedance kg M^{-2} S^{-1}	Inter molecular free length E^{-11}	Relative Association E^{-1}	Relaxation time E^{-13}
1.	1%	298.150	4.480	1494200	4.331	2.758	5.473
		303.150	5.471	1351318	4.842	4.169	5.107
		308.150	5.350	1365092	4.844	3.707	5.657
2.	0.50 %	298.150	4.935	1422405	4.560	2.890	6.050
		303.150	5.261	1377240	4.563	4.081	4.460
		308.150	4.832	1438792	4.604	3.530	5.345
3.	0.250%	298.150	4.955	1419156	4.578	2.946	5.998
		303.150	4.540	1481002	4.442	3.933	4.497
		308.150	5.097	1397120	4.728	3.608	5.172
4.	0.1250%	298.150	4.786	1443961	4.4996	2.841	5.075
		303.150	4.490	1489618	4.3981	3.761	3.829

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Table C: Density, viscosity and velocity of lemongrass leaf extracts solution in fifty percent ethanol.

Sr. No.	Conce. (%)	Tmp. (K)	Den.	Vel.	Visc. E^{-4}
1)	1%	298.15	931.5	1557	20.52
		303.15	929.1	1524	11.30
		308.15	939.3	1501	16.96
2)	0.5%	298.15	932.6	1483	20.55
		303.15	930.8	1422	22.22
		308.15	929	1651.6	14.75
3)	0.25%	298.15	923	1466.4	22.70
		303.15	924.6	1410	22.78
		308.15	922.9	1445	16.36
4)	0.125%	298.15	935.3	1475	21.81
		303.15	929.6	1450	20.09
		308.15	924.3	1402	14.25

Table D: Acous. Factors of Lemongrass extract solution in fifty percent ethanol at 3MHz

Ser. No.	Con. (%)	Tem. (K)	Compressibility (E^{-10})	Spec. Acou. Impedance Kg M^{-2} S^{-1}	Inter molecular free length (E^{-11})	Relative Association (E^{-1})	Relaxation time (E^{-12})
1.	1%	298.1	4.485	1359803	4.616	3.480	1.375
		303.1	4.634	1298881	4.720	3.403	0.821
		308.1	4.725	1363393	4.671	3.236	1.133
2.	0.5%	298.1	4.871	1383679	4.539	3.422	1.338
		303.1	5.311	1323820	4.783	3.314	1.567
		308.1	3.946	1534336	4.160	2.813	0.771
3.	0.25 %	298.1	5.038	1353487	4.617	3.416	1.520
		303.1	5.439	1303759	4.840	3.357	1.641
		308.1	5.189	1300121	4.770	3.194	1.125
4.	0.125 %	298.1	4.914	1379567	4.550	3.458	1.425
		303.1	5.502	1564516	4.772	2.826	1.633
		308.1	5.504	1423422	4.916	3.001	0.864

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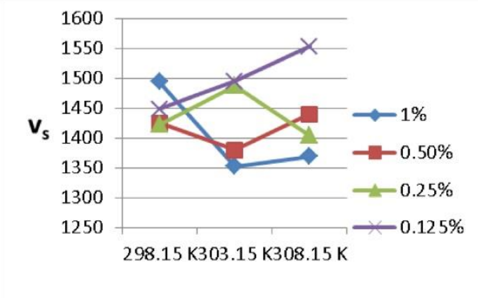


Figu.A.a. Varition of ultrasonic velo….

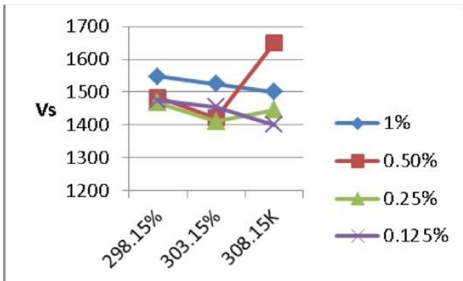
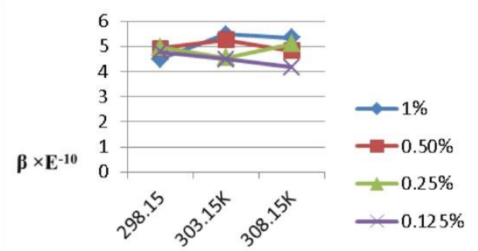
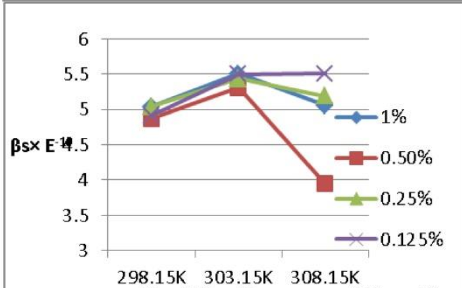


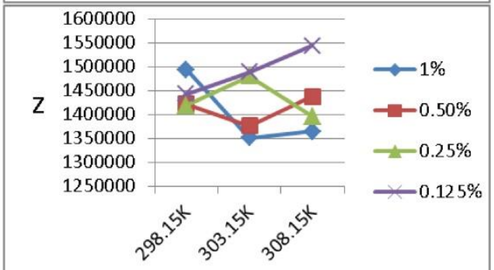
Fig.A.b. Variation of ultra. velo. with conce. at dif. tem. in 50% Ethhy al.



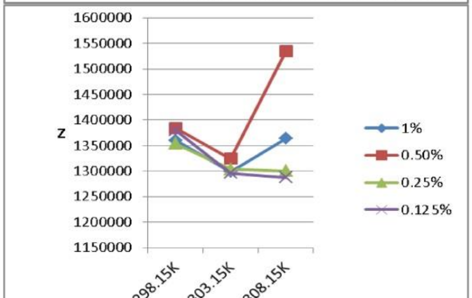
Figu. B.a adia. compresibility with conce. at dif. tem. in dist. H_2o solvent



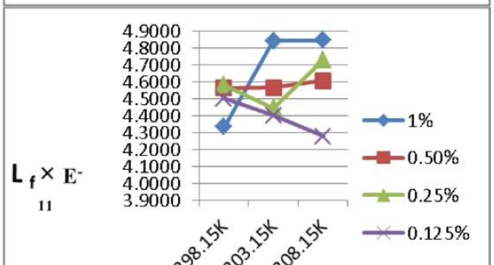
Figu.B.b. adia. compresibility with conce. at dif. tem. in 50 % Ethanol sol….



Figu.C.a. acou. impedance…



Figu.C.b. acous. impe. with conce. at dif. tem. in 50% Ethanol sol.



Figu. D.a. intermolecularfree length…

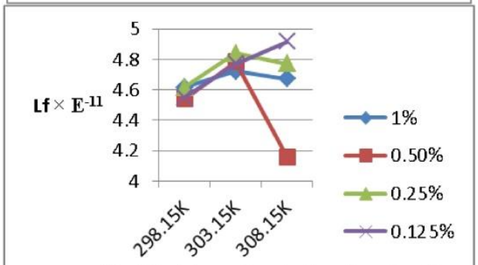
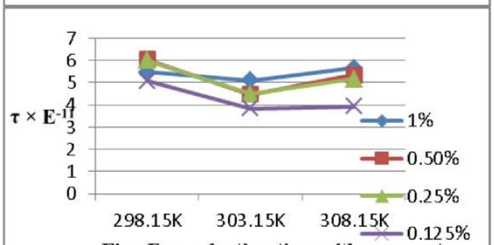
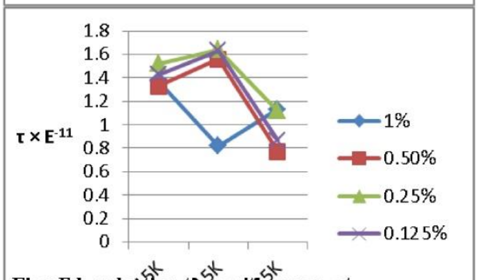


Fig.D.b. intermolecularfree length with conce. at dif. tem. in 50 % Etol Sol.



Figu.E.a. relaxtion time with conce. at dif. tem. in dist. water sol.



Figu E.b relaxtion time with conce. at dif. tem. in 50% Ethanol sol.

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From fig. A.a & A.b, its witnessed the ultrasonic velocity declines per upsurge in concentrations for Cymbopogon Citratus leaves extract in distilled water solvent. This is because of formation of closed packed structure, while in 50 % Ethanol solvent its perceived that ultrasonic velocity upturns with intensification in conce. Specifying solid solute-solvent collaboration in alcoholic solvent.

"The adiabatic compressibility is the fractional decrease of volume per unit increase of increase, when no heat flows in or out." The adiabatic compressibility values shows exactly reverse trend to the trend shown by ultrasonic velocity. The adiabatic compressibility values for in Cymbopogon Citratus leaves extract in distilled water solvent rises with growth in concentration this is due to decreasing compressible molecules. In case of lemongrass leaves extract in fifty ethyl alcohol solvent, the adiabatic compressibility values surges with diminutions in conce. Which can be ascribed to increase in number of compressible molecules.

Specific acous. impedance is opposition shown by altogether the constituents of a mixt.to the propagation of ultrasonic waves. From fig. C.a & C.b it can be seen that impedance increases with rise in concentration for leaves extract in 50 % ethanol solvent. The increase in Specific acoust. impedance values with surge in concentration is due increase in molecular packing of the medium. Lf is very useful in explaining molecular interactions taking place in the solution. From fig. D.a & D.b it can be witnessed that the intermolecular free length surges with escalation in concentration for aqueous solvents while declines for leaves extract in alcoholic solvent. Intermolecular free length is increasing with increase in concentration because of presence of bulky molecules and the repulsion existing between these molecules. The reduction in intermolecular free length with upsurge in conce. points towards the fact that as concentration rises one solute molecule & two solvent molecules arrange themselves in such a manner which results in formation of closed packed structure.

The fig. E.a & E.b it is observed that for both the systems there is cut in relaxation time with rise in temperature indicating that viscous forces have no effect on it.

Conclusion:

The ultrasonic velocity upturns with rise in conc. for lemongrass leaves extract in fifty percent ethanol solvnt owing to the salvation process of solute by two unlike solvent molecules like H_2O and ethanol. Appraisal of adiabatic compressibility, acous. impedance, relative asso., relaxation time, inter molecular free length visibly displays solid solute–solvent interaction. Tougher solute –solvent interaction is observed in alcoholic system than in aqueous system indicating higher reactivity of solute in alcoholic solvent.

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