International Journal of
Life Sciences
International Peer Reviewed Open Access Refereed Journal

Special Issue A 12: March 2018:55-57
UGC Approved Journal No 48951

Original Article Open Access

Effect of temperature on molecular interaction of extract Brayophallum leaves

Bedare GR and Dhote AB

N. S. Sc. & Arts College, Bhadrawati, Dist, Chandrapur
Email: gr.bedare@gmail.com,dhotea@rocketmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Bedare GR and Dhote AB (2018) Effect of temperature on molecular interaction of extract Brayophallum leaves, *Int. J. of. Life Sciences*, Special Issue, A12: 55-57.

ABSTRACT

Presence of electron donor and electron acceptor group changes the relative strength of intermolecular interaction present in the liquids. Phytochemicals are naturally occurring in the medicinal plants, leaves, vegetables and roots that have defense mechanism and protect from various diseases. Extraction of brayophallum leaves in water was carried out using soxhelt extractor and its ultrasonic velocity, density and viscosity were measured at different temperatures. The data obtained from ultrasonic propagation parameters such as ultrasonic velocity, adiabatic compressibility, acoustic impedance, free length and their variation with temperature is useful in understanding the nature of molecular interaction in terms of physical parameters.

Keywords: ultrasonic, adiabatic compressibility, molecular interaction, extraction, brayophallum

INTRODUCTION

The ultrasonic study of liquid is most important in understanding the nature and strength of molecular interactions. The biological activity of drug molecules and the activation energy of the metabolic process basically depend on the type and strength of the intermolecular interactions. From the literature, the nature and degree of molecular interactions in different solutions depend upon the nature of solvent, the structure of solute molecule and extent of solutes taking place in the solution (Vasantharani *et al*. (2009), Kaur and Juglan (2015), Kolhe and Bhosale (2017), Dhote and Bedare (2017). Medicinal plants besides therapeutic agents are also a big source of information for a wide variety of chemical constituents which could be developed as drugs with precise selectivity. The most important of these bioactive constituents of plants are alkaloids, tannins, flavonoids and phenolic compounds (Doss, 2009). Medicinal plants contain some organic compounds which provide definite physiological action on the human body and the bioactive substances include tannins, alkaloids, carbohydrates, terpenoids, steroids and flavonoids Edoga *et al*. (2005), Mann (1978).

In the present study we were extracted Bryophyllum leaves using soxhelt extractor in the solvents water. The ultrasonic velocity, density and viscosity of waterextract is measured at different temperatures. From experimental data acoustic parameters were calculated and effect of temperatures on molecular interaction of water extract of brayophallum leaves was predicted.

METHODS AND MATERIALS:

The leaves of Brayophyllum leaves were collected. The powdered plant samples were extracted successively with water using Soxhlet apparatus at 55-85 °C for 8-10 hour in order to extract the polar and non-polar compounds. For each solvent extraction, the powdered pack material was air dried and then used.

The ultrasonic velocity (U) in liquid mixtures which prepared by taking purified AR grade samples, have been measured using an ultrasonic interferometer (Mittal type, Model F-81) working at 2MHz frequency and at temperature 303K. The accuracy of sound velocity was ±0.1 ms-1. An electronically digital operated constant temperature water bath has been used to circulate water through the double walled measuring cell made up of steel containing the experimental solution at the desire temperature. The density of pure liquids and liquid mixtures was determined using pycknometer by relative measurement method with an accuracy of ±0.1Kgm-3.

RESULTS AND DISCUSSION

Using the experimental data of ultrasonic velocity (U), density (ρ), viscosity (η), various acoustical parameters such as adiabatic compressibility (βa), intermolecular free length (L_f), Acoustic impedance (Z) at different temperatures were calculated by the following equation

$\beta a = (U2\rho)-1$ ….. (1)

$Lf = K\beta a$ ½ ….. (2)

$Z = U \rho$ …… (3)

$\tau = 4/3\eta\beta a$ …… (4)

The decrease in ultrasonic velocity and density with increase in temperature shows decreasing cohesive forces. When temperature increases it has two opposite effects namely increase in molecular interaction and destruction of structure formed previously. When the thermal energy is more than the interaction energy, it causes the destruction of previously formed structure Godhani *et al*. (2012). Thus, the increase in temperature favors the increase in kinetic energy and volume expansion and hence, results in the decrease in density and ultrasonic velocity. It shows that with increasing temperature less interaction between the constituent of Brayophyllum leaves in water solvent.

Adiabatic compressibility is a measure of intermolecular association or dissociation or repulsion. The adiabatic compressibility should beindependent of temperature and pressure for unassociated and weakly associated molecules and determines the orientation of the solvent molecules around the liquid molecules (Singh *et al*., 1991). The structural arrangement of the molecule affects the adiabatic in the present investigation it shows that with increase in temperature adiabatic compressibility increases indicating that there is a weak interaction between content of Brayophyllum leaves in water. The free length is the distance between the surfaces of the neighboring molecules.

Generally, when the ultrasonic velocity increases,the value of the free length decreases and vice versa. The increase in intermolecular free length indicates the weak interaction between the solute and solvent molecules with increasing temperature.

Table 1:Acoustic parameters of extract of Brayophyallum leaves at different temperatures

Temperature K	Ultrasonic velocity (m/s)	Density (Kg/m^3)	viscosity $\eta x10^{-3}$ (NSm^{-2})	Adiabatic compressibility $\beta x10^{-10}$	Intermolecular free length	Acoustic Impedance $Zx10^4$	Relaxation Time $T x x10^{-11}$
301.15	1785.50	1057.4	0.9868	3.068	0.0110	185.626	4.288
303.15	1715.50	1053.1	0.9373	3.225	0.0112	180.720	4.0303
308.15	1695.45	1049.8	0.8608	3.313	0.0114	177.983	3.464

Acoustic impedance decreases with increasing temperatures indicates weak interaction in the solution. As temperature increases, excitation energy increases and hence relaxation time decreases.

CONCLUSION

With increasing temperature ultrasonic velocity of extract of brayophallum leaves decreases while adiabatic compressibility, free lengthincreases while acoustic impedance and relaxation time decreases which shows weak molecular interaction in the solution.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Vasantharani P, Kalaimagal P, Kannappan AN (2009) Molecular Interaction Studies on Some Organic Liquid Mixtures at Different Temperatures usingUltrasonic Technique. Asian J Applied Sciences, 2009; Vol. 2:96-100.

Kaur K and Juglan K (2015) Studies of MolecularInteraction in the Binary Mixture of Chloroform and Methanol by Using Ultrasonic Technique, *Der Pharma Chemica*,7(2):160-167.

Kolhe RK and Bhosale BB (2017) Study of temperature change on ultrasonic velocity andsome acoustic parameters of binary liquid mixture ofDMSO+ Chlorobenzene*, Int. Res. J. of Science & Engineering*, 2017; Special Issue A1 : 99-102 ISSN: 2322-0015.

Dhote AB, Bedare GR (2017) Acoustic parameters of Streptomycin solution at different concentration, *International Journali of Advance Research in Science and Engineering*, 2(3), 548-550.

Dhote AB, Bedare GR, (2017) Study of molecular interaction of Streptomycin drug at 303K temperatureand 2MHz, *International Journal Science, Engineering and Manegement*, 2(3), pp 52-54, March 2017.

Doss A (2009) Preliminary phytochemical screening of some Indianmedicinal plants. AncSci Life 2009; 29:12-16.

Edoga, H.O., Okwu, D.E., Mbaebie, B.O. (2005) Phytochemicals constituents of some Nigerian medicinal plants. *Afr. J. Biotechnol*., 4(7): 685-688.

Mann J (1978) Secondary Metabolism. Oxford University press,London, pp. 154.

Godhani R, Dobariya, B, Sanghani A and Mehta P (2012) Thermodynamic properties of binary mixtures of1,3,4-oxadiazole derivative with chloroform, NNdimethylformamide303.15-313.15 Kandatmosphericpressure. Arabian Journal of Chemistry.doi:10.1016/arabjc/2012.10.002.)

Singh DP, Kalsh SC (1991) *Acoustics Letters*, 14(10):206.