International Journal of Basic and Applied Research
Vol. 02 Issue-2 (December 2012) (81-83)
ISSN - 2249-3352

Synthesis and Study of Anti-Fungal Activity of 2-Mercaptosubstituted Pyrimidine Using Thermodynamic Parameter by Ultrasonic Technique

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Key-words:
2-Mercapto pyrimidine,
Interferometer,
Adiabatic compressibility.

Abstract: In the recent year,propagation of ultrasonic waves,through the solution is useful to study some physical ,thermodynamic parameter which are needed in the medicinal application.

The paper described the synthesis of 2-Mercapto substituted pyrimidine and its physio-chemical behavior.The interaction between molecule in the solution of 2-Mercapto substituted pyrimidine can be analysed by ultrasonic interoferometer at 1MHz frequency at room temperature.The Velocity and density were calculated and it is used to evaluate the adiabatic compressibility at different concentrations.The adiabatic compressibility increases with decrease in the concentration of solution.The higher value of adiabatic compressibility, lower the activity against fungus.

1.INTRODUCTION:-

The ultra-sonic technique is extensively used in scientific research(1).In this ,direct interaction of the wave with the material takes place .This plays a vital role in the study of molecular interactions,material charecterisation etc.which plays an important role in the development of molecular sciences(2-3).

The biological importance of pyrimidine derivatives has prompted considerable attention to the synthesis of substituted pyrimidines for this reason many approaches to the pyrimidine nucleus are available.Pyrimidines and their derivatives have found to possess various biological, antibacterial and antifungal properties(4-6).

2.MATERIALS AND METHODS:-

Literature survey reveals the significance of diketone as an important starting material for the synthesis of heterocyclic compound and their wide varieties of applications.

Novel methods have been reviewed for the synthesis of 2-mercapto substituted phenyl pyrimidine derivatives using diketone as a starting material on treatment with thiourea respectively in DMF solvent on waterbath at 75-90^{0}C for one hour.(7)

Double distilled water was used for making dilutions of different concentrations.Densities were measured with the help of digital densitometer and velocity was measured by using ultrasonic interferometer with accuracy of 0.03% and frequency

1MHz.The densities and ultrasonic velocities of solvent water and 0.01,0.02….0.05 dilutions of 2-mercapto pyrimidine were measured at room temperature.The antifungal activity of novel 2-mercapto substituted phenyl pyrimidine was also found in literature.(8)

The biological activities are significantly shown by N-heterocyclic nucleus which incorporated with-SH in pyrimidines are found to have antifungal activity.The disc-diffusion method was employed to study the preliminary antifungal activity of pyrimidine against three pathogenic organism. Aspergillusniger, Aspergillusflavus, Curvularialunata.

Potato dextrose agar (PDA) medium was employed to study the preliminary antifungal activity of the 2-mercapto substituted pyrimidine against above three fungus.

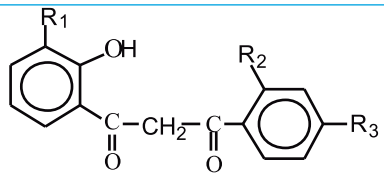
The petridisc for the inoculation of fungal organism were sterilized. 0.01,0.02….0.05 dilutions of organic compound about 1ml (2-mercapto pyrimidine)was mixed with potato dextrose agar medium and this medium was poured in sterilized petri disc for inoculation of fungal organisms.The petri disc were incubated at room temp for 4-days (at 37^0C) for antifungal activity.Zone of inhibition produced by each compound by fungus was measured

THEORY/CALCULATION:-

In the present investigation, measurements of densities and ultrasonic velocities of solvent water and dilutions of an organic compound 2-Mercapto pyrimidine have been given in Table-1.The adiabatic compressibility (β) values with molar solution values are given in Table-2.

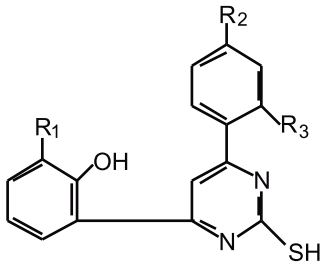
Adiabatic compressibility:- Adiabatic compressibility is the fractional decrease of volumes per unit increase of pressure when no heat flows in or out.It can also be calculated from the speed of sound (U) and the density of the medium (ρ) using the equation of Newton Laplace as

$$\beta = 1/\rho U^2$$



DIKETONE

THIOUREA | DMF SOLVENT,1 hr



2-MERCAPTO PYRIMIDINE

Where R^1,R^2,R^3=Cl.

MOLAR SOLUTION	DENSITY (?) in kg/m^3	VELOCITY (U) in m/sec
0.01M	0.790	1022
0.02M	0.800	1102
0.03M	0.802	1144
0.04M	0.803	1206
0.05M	0.805	1242

TABLE-1

MOLAR SOLUTION	ADIABATIC COMPRESSIBILITY(ß) in 10^{-10} m^2
0.01M	12.1
0.02M	10.2
0.03M	9.50
0.04M	9.10
0.05M	8.05

TABLE-2

RESULT AND DISCUSSIONS:-

From table-1 it is noted that density and ultrasonic velocity increases with increase in molar solution. The increase in velocity is due to the decrease in adiabatic compressibility of the liquid solution. The adiabatic compressibility are the deciding factors of the ultrasonic velocity in the liquid solution which directly relates with the anti-fungal activity of that compound against fungus.The more the concentration of solution more active is the compound towards fungus hence as the concentration increases activity increases which relates with the effect of adiabatic compressibility of the compound.Hence adiabatic compressibility values is inversely proportional to the molar solution concentration.

CONCLUSIONS:-

The computed acoustical parameters and their values point to the presence of relation between molar concentration and adiabatic compressibility values which inversely relates with antifungal activity of 2-Mercapto pyrimidine molecule. Hence it may be concluded that the higher value of adiabatic compressibility, lower the activity against fungus.

ACKNOWLEDGEMENT :-

I am thankful to Department of Science & Technology, New Delhi for availing the financial assistance (Inspire Scholarship) for this research work.

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