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SPECTROPHOTOMETRIC ESTIMATION OF ACELOFENAC BY USING DIFFERENT HYDROTROPS

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Abstract

Acelofenac is a non-steroidal anti-inflammatory drug(NSAID) that exhibit analgesic,antipretic and anti-inflammatory activities. It is poorly water soluble drug. In the present study, the effect of various hydrotropes such as sodium citrate,sodium Salicylate and pH on the solubility of acelofenac was investigated. The solubility enhancement of acelofenac by the hydrotrope was observed in decreasing order as sodium salicylate>Sodium citrate. The result of solubility studies at different pH indicated that acelofenac was more soluble at alkaline pH than acidic pH. Each solubilized product was characterized by ultraviolet ,infrared, mass spectroscopy, nuclear magnetic resonance techniques.There are about thirty fold increase in solubility of acelofenac by Sodium Salicylate.

Keywords: - : Acelofenac,Hydrotrops,Hydrotropy solublization techniques

Introduction

Increasing the water solubility of insoluble and slightly soluble drugs is of major concern. Addition of hydrotropes or hydrotropic agents is one aqueous solublization technique and the term hydrotropic agents was first introduced by neuberg**[1]** to designate anionic organic salts which at high concentrations considerably increase the aqueous solubility of poorly soluble solutes. This is in contrast to normal solution behavior since addition of a second compound especially at high concentration generally causes precipitation of the less soluble solutes. Saleh and El-khordagui**[2]** extended the definition of the term hydrotropic agents to include cationic and non-ionic organic compounds bearing the essential structural features of neuberg's hydrotrope.

At present it seems clear that hydrotropy differs from micellar solublization and from the salting in effect promoted by some in organic salts**[3].** However the molecular mechanism of hydrotropic solubliaztaion has not been completely explained yet. Earlier studies seems to indicate that the planar structure that the aromatic ring confer to the hydrotrope molecule and their tendencys to self-aggregation at high concentration are essential for the hydrotropic action.**[4]** Some authors has proposed the formation of soluble molecular cosmplexes through weak molecular interaction between the hydrotrope and the solute as a mechanism for the hydrotropic effect.**[5]** Others have suggested that these complxation should include salting in mechanism at higher hydrotrope concentration.**[6]** Bawdan et al described experiments showing that electrostatic force of the donar-acceptor type should be very important for the hydrotropic solublization.**[7]** More recently, Friberg and Chiv proposed the hydrotrope increases surfactant solubility because they prevent the formation of association structures and the subsequent face sepration from aqueous solutions. **[8]** However that considering other molecules that do not necessiarly form crystals phases like dyes or drugs also are solublised by hydrotropes this observation seems to be another aspect of the hydrotropic effect rather than its molecular mechanism.Aceclofenac is poorly water soluble drug having poor bioavailability**[9].**Chemically it is 2-[2-[2-[(2,6-dichlorophenyl) amino] phenyl] acetyl] oxyacetic acid.**[10].** It is used as a is a non-steroidal anti-inflammatory agent and It is used for the relief of pain and inflammation in rheumatoid arthritis, osteoarthritis and ankylosing spondylitis. The dose is 100 mg twice daily.

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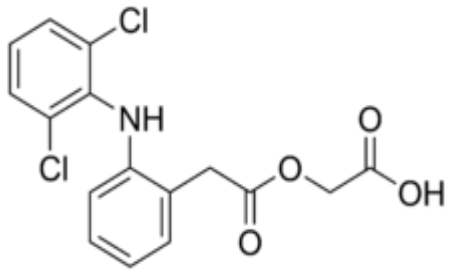
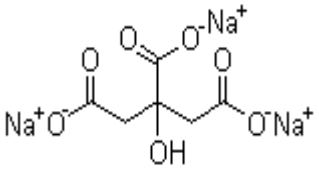
Material and Methods: -

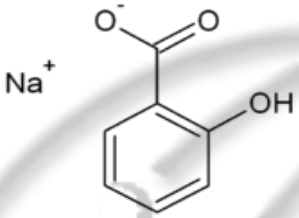
Acelofenac bulk drug sample was supplied as a gift smple by Alkem Laborateris, Mumbai, India. Other like sodium Citrate and Sodium Salicylate were of analytical grade.



Acelofenac(354.184)



Sodium citrate(294.10)



Sodium Salicylate(160.11)

Chemical Structure of Acelofenac, Sodium citrate, Sodium Salicylate.

Preperation of The Calibration curve Of Acelofenac: -

1. Hundered milligram of acelofenac standard drug was accurately weighed and transferred to a 100 ml Volumetric flask. To this 5ml of sodium Citrate having two different conc. 2.0 M and 0.5 M was added and the flask was shaken to solublise the drug. The volume was made up to mark with distilled water. The stock solution was further diluted with distilled water to obtain various dilution containing 10,20,30,40,50µg of drug. The beers lamberts range was 3-50 µg for acelofenac. Absorption was obtained at 273nm against reagent blanks to get the calibration curve. The equation for the calibration curve of acelofenac was obtained as:

1. Conc. 2M= y=0.0309.x=0.0116.
2. Conc. 0.5M= y=0.0233.x= 0.0011

2. Hundered milligram of acelofenac standard drug was accurately weighed and transferred to a 100 ml Volumetric flask. To this 5ml of sodium Salicylate having two different conc. 2.0 M and 0.5 M was added and the flask was shaken to solublize the drug. The volume was made up to mark with distilled water. The stock solution was further diluted with distilled water to obtain various dilution containing 10,20,30,40,50µg of drug. The beer- lambert range was 3-50 µg for acelofenac. Absorption was obtained at 264nm against reagent blanks to get the calibration curve. The equation for the calibration curve of acelofenac was obtained as: -

1. Conc. 2M= y=0.0382.x=1.4403
2. Conc. 0.5M= y=0.0444.x= 0.06217.

Normal solubility studies of Acelofenac: -

In this Studies Hundered milligram of acelofenac standard drug was accurately weighed and transferred to a 100 ml Volumetric flask. To this 5ml of sodium citrate having two different conc. 2.0 M and 0.5 M was added and the flask was shaken to solublize the drug. The volume was made up to mark with distilled water. The stock solution was further diluted with distilled water to obtain various dilution containing 10,20,30,40,50µg of drug and also the same hydrotrope conc were made and absorption was abtained at 273 nm. There is one thing in this process is that quick dilution and absorption was done.

In this Studies Hundered milligram of acelofenac standard drug was accurately weighed and transferred to a 100 ml Volumetric flask. To this 5ml of sodium Salicylate having two different conc. 2.0 M and 0.5 M was added and the flask was shaken to solublize the drug. The volume was made up to mark with distilled water. The stock solution was further diluted with distilled water to obtain various dilution containing 10,20,30,40,50µg of drug and also the same hydrotrope conc were made and absorption was abtained at 264 nm. There is one thing in this process is that quick dilution and absorption was done.

Determination of equilibrium solubility

For equilibrium solubility determination at room temperature, the excess solute method was employed. Sufficient excess amounts of drug were added to screw capped 10 mL glass vials containing distilled water, solutions of individual hydrotropic agents, solution containing Different conc. of of hydrotropic agents and buffers of pH 7.4, 6.8, 5.8,1.2 and 3.0 separately. The vials were shaken mechanically for 12 h at room temperature in an orbital flask shaker (Khera Instruments Pvt. Limited, Delhi, India). The solutions were allowed to equilibrate for the next 24 h and then transferred into Eppendorf tubes and centrifuged for 30 min at 2000 rpm (Remi Instruments Limited, Mumbai,India). The supernatant of each vial was filtered through Whatman filter paper. Filtrates of saturated solutions of aceclofenac were analyzed by spectrophotmetric method using a double beam UV-visible spectrophotometer (Shimadzu®160A), measuring the absorbance of appropriately diluted solutions against the respective reagent blanks at 273 nm. Enhancement

ratio in solubility was determined by the following formula:

Enhancement ratio =Solubility of drug in hydrotropic/Solubility of drug in distilled water

Optical Characterstic of UV Spectrophotometric Detemination of Drugs Using Different Solvents Systems.

Drug	Solvent system	Wavelength Used (nm)	Beer's range (µg/ml)	Regression Equation	R
Acelofenac	DW	273	10-50	Y=0.009 x=0.0001	0.998
Acelofenac	DW+SS (2M)	264	10-50	Y=0.0382 X=1.440	0.9989
Acelofenac	DW+SS (0.5M)	264	10-50	Y=0.0444 X=0.6217	0.992
Acelofenac	DW+SC(2M)	273	10-50	Y=0.0309 X=0.0116	0.9998
Acelofenac	DW+SC(0.5M)	273	10-50	Y=0.0011 X=0.0233	0.9995

DW- Distilled water, SS- Sodium salicylate, SC- Sodium citrate.

Drug	Solvent system	Wavelength Used (nm)	Beer's range (µg/ml)	Regression Equation	R
Acelofenac	DW+PH 7.4	273	10-50	Y=0.0281 X=0.0108	0.9996
Acelofenac	DW+PH 6.8	273	10-50	Y=0.0215 X=0.0408	0.9988
Acelofenac	DW+PH 5.8	273	10-50	Y=0.0141 X=0.0393	0.9978
Acelofenac	DW+PH 3.0	273	10-50	Y=0.0016 X=0.0203	0.9985
Acelofenac	DW+PH 1.2	273	10-50	Y=0.0016 X=0.0438	0.9974

DW-Distilled water.

Equilibrium solubility studies data: -

Solvent	Solubility (µg/ml)	Solubility enhancement ratio
DM WATER	0.036	------
SODIUM SALICYLATE(2M)	1.103	30.63
SODIUM SALICYLATE(0.5M)	0.638	10.12
SODIUM CITRATE(2M)	0.436	12.02
SODIUM CITRATE(0.5M)	0.196	5.44
Ph 7.4	1.115	30.97
Ph 6.8	1.420	39.44
Ph 5.8	0.669	18.58
Ph 3.0	0.124	3.44
Ph 1.2	0.099	2.75

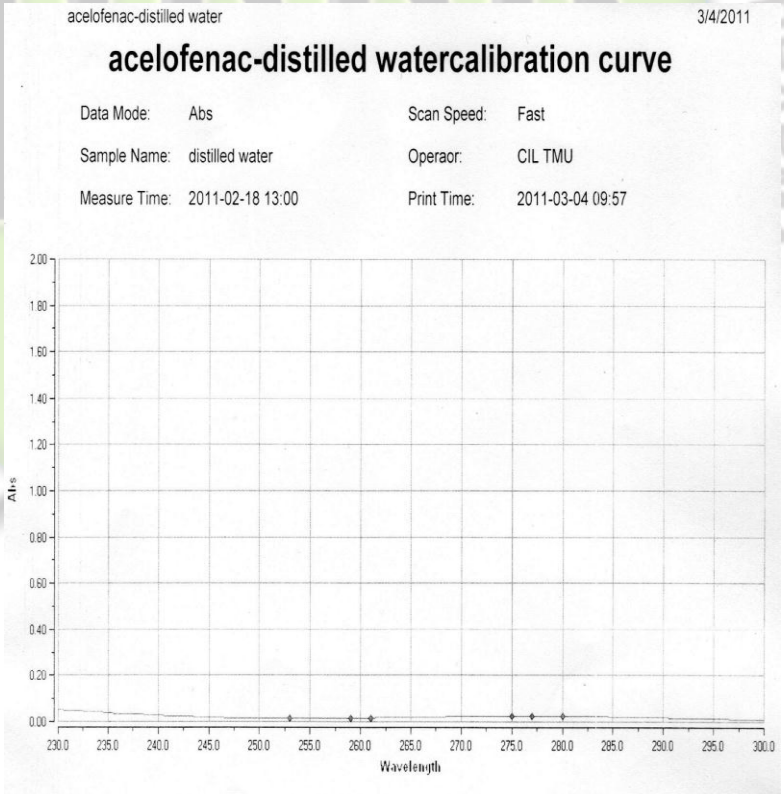


Fig:-UV- Spectrum of Acelofenac in Distilled water.

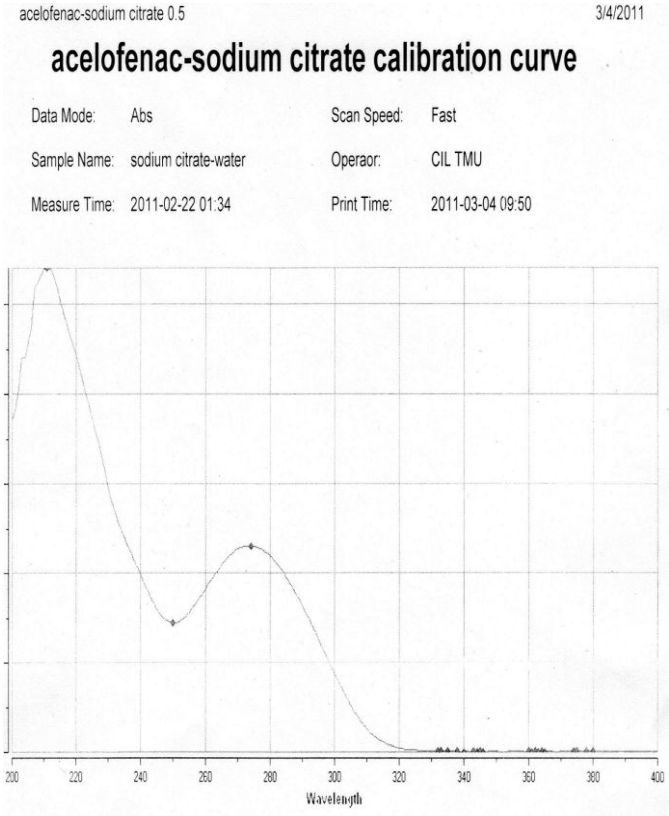


Fig:-UV- Spectrum of Acelofenac in Sodium Citrate.

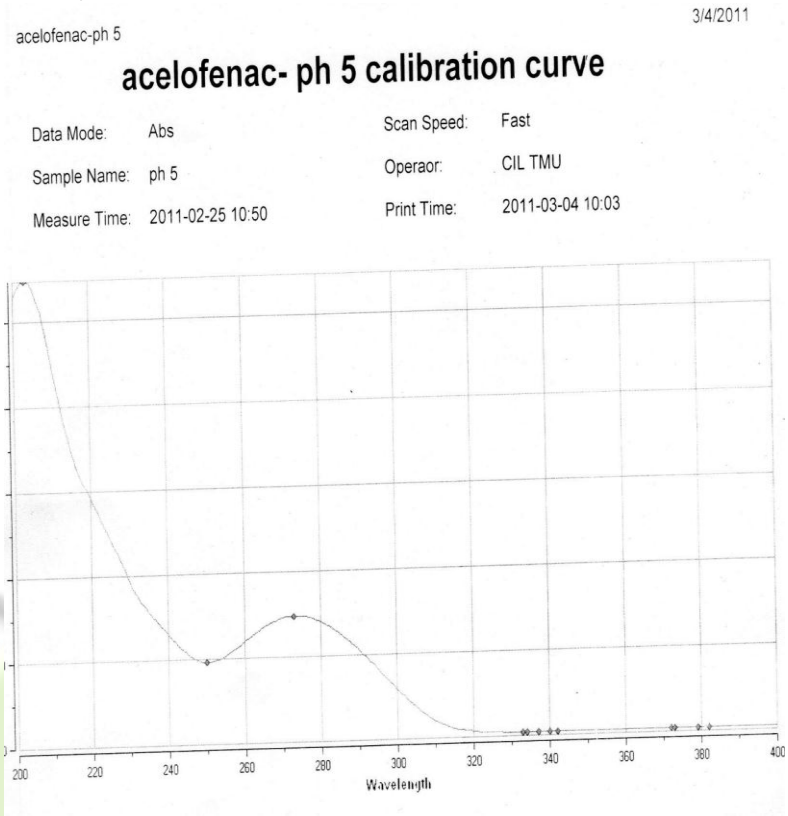


Fig:-UV- Spectrum of Acelofenac in Alkaline Buffer Ph 5

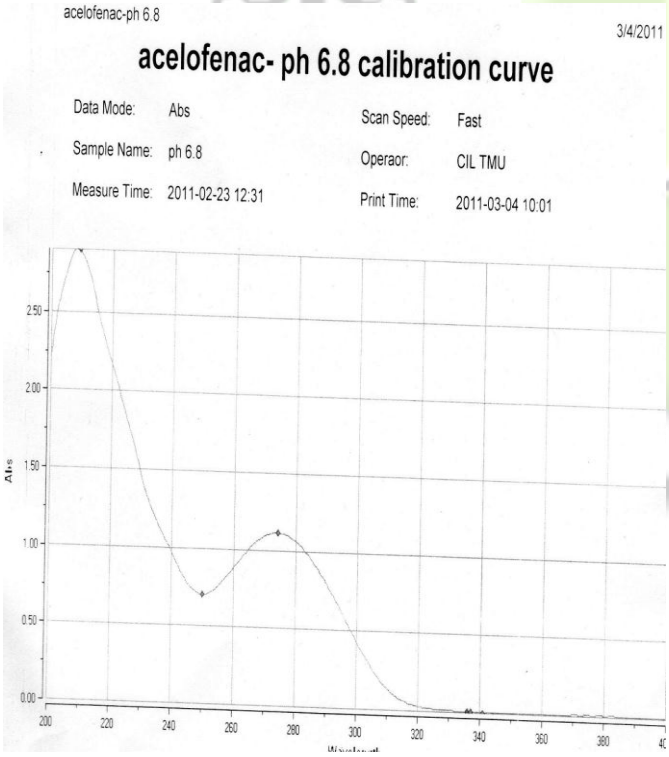


Fig:-UV- Spectrum of Acelofenac in Alkaline Buffer Ph 6.8

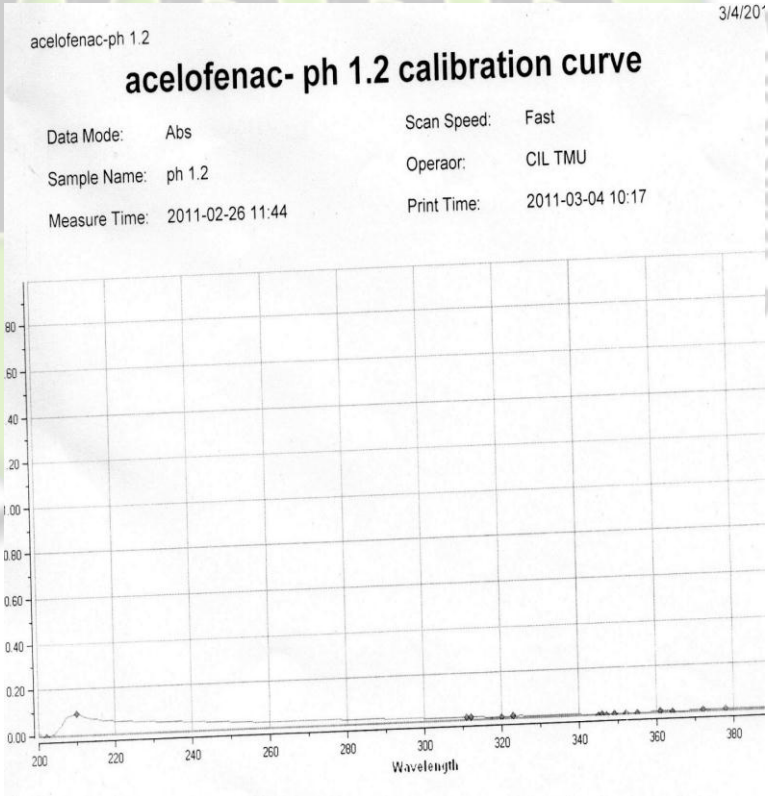


Fig:-UV- Spectrum of Acelofenac in Acidic Buffer Ph 1.2

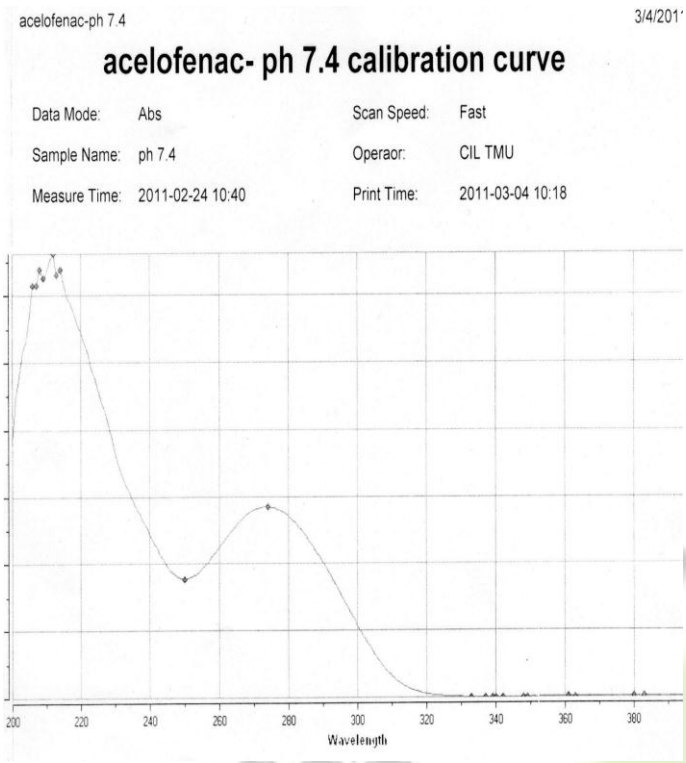


Fig:-UV- Spectrum of Acelofenac in Alkaline Buffer 7.4

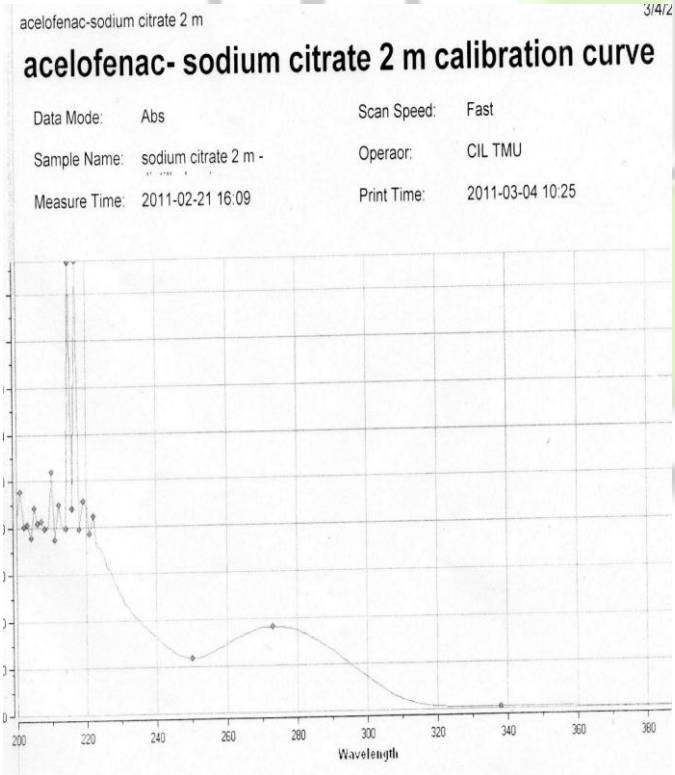


Fig:-UV- Spectrum of Acelofenac in 2m sodium citrate

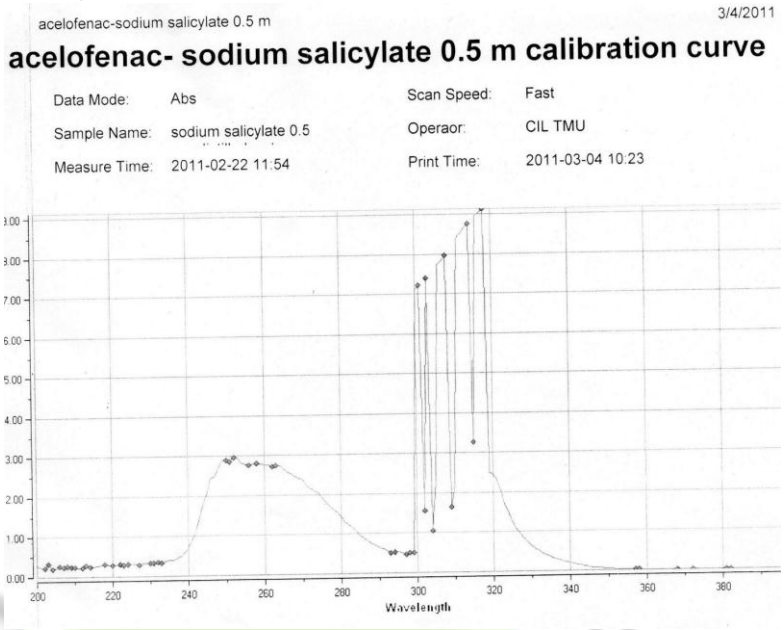
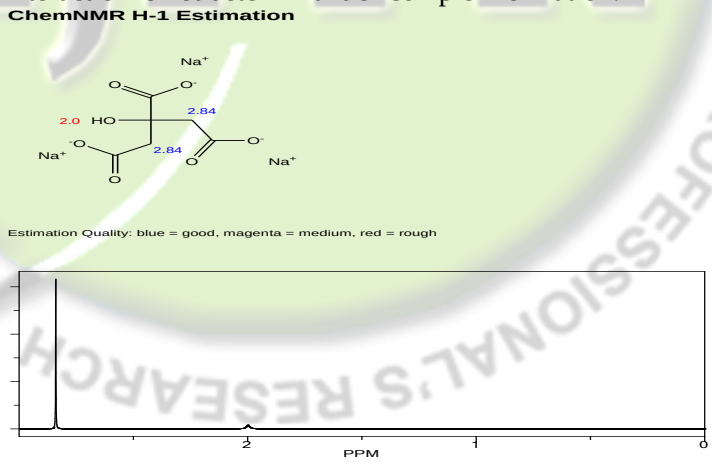


Fig:-UV- Spectrum of Acelofenac in 0.5 M Sodium Salicylate.

UV- Spectrum of (a) Acelofenac in Distilled water, (b,c,d,e,f,g,h) with various hydrotropes and different buffer systems.

Result And Discussion: -

The result of solubility studies at different pH indicated that acelofenac was more soluble at alkaline pH than acidic pH that will be shown in fig 3. This may be due to the acidic nature of the acelofenac.There are about 30 fold increase in the solubility of acelofenac with sodium salicylate(2M) as compared to the sodium citrate.The result of spectrum study suggest charge transfer interaction is not determinant of complex formation.

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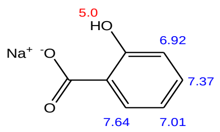
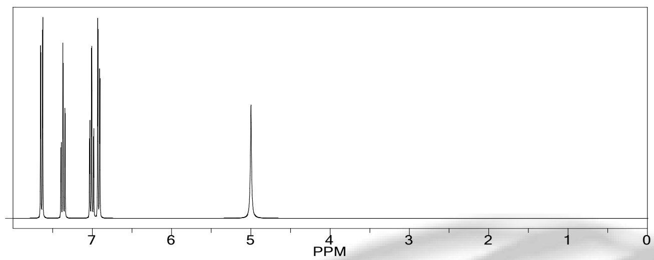
Protocol of the H-1 NMR Prediction:
Node      Shift     Base + Inc.    Comment (ppm rel. to TMS)
 CH2       2.84          1.37      methylene
                         1.07      1 alpha -C=O
                         0.15      1 beta -O
                         0.29      1 beta -C=O
                        -0.04      1 beta -C
  OH       2.0           2.00      alcohol
 CH2       2.84          1.37      methylene
                         1.07      1 alpha -C=O
                         0.15      1 beta -O
                         0.29      1 beta -C=O
                        -0.04      1 beta -C
```

(a) NMR spectrum of Sodium Citrate.

ChemNMR H-1 Estimation



Estimation Quality: blue = good, magenta = medium, red = rough

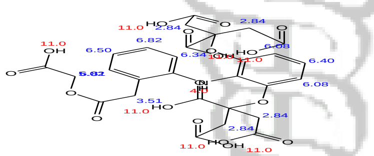


Protocol of the H-1 NMR Prediction:

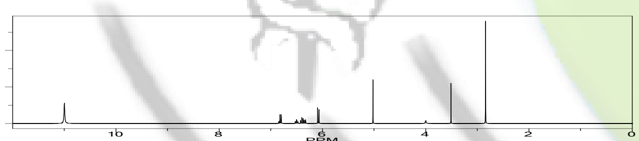
Node	Shift	Base + Inc.	Comment (ppm rel. to TMS)
OH	5.0	5.00	aromatic C-OH
CH	6.92	7.26	1-benzene
		0.19	1 -C=O
		-0.53	1 -O
CH	7.37	7.26	1-benzene
		0.28	1 -C=O
		-0.17	1 -O
CH	7.01	7.26	1-benzene
		0.19	1 -C=O
		-0.44	1 -O
CH	7.64	7.26	1-benzene
		0.55	1 -C=O
		-0.17	1 -O

b) NMR spectrum of sodium salicylate.

ChemNMR H-1 Estimation



Estimation Quality: blue = good, magenta = medium, red = rough

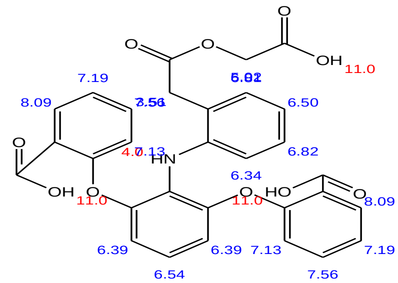


Protocol of the H-1 NMR Prediction:

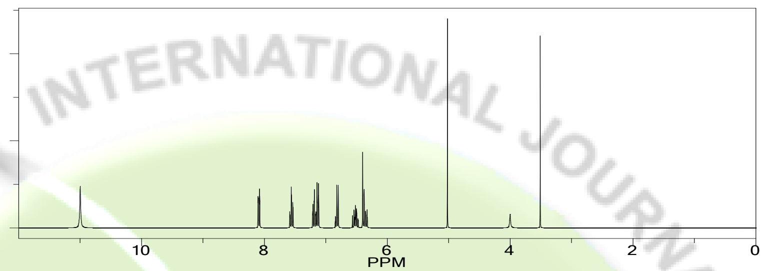
Node	Shift	Base + Inc.	Comment (ppm rel. to TMS)
CH	6.08	7.26	1-benzene
		-0.49	1 -O-C
		-0.25	1 -N
		-0.44	1 -O-C
CH	6.40	7.26	1-benzene
		-0.11	1 -O-C
		-0.64	1 -N
		-0.11	1 -O-C
CH	6.08	7.26	1-benzene
		-0.44	1 -O-C
		-0.25	1 -N
		-0.49	1 -O-C
NH	4.0	4.00	aromatic C-NH
CH	6.34	7.26	1-benzene
		-0.80	1 -N
		-0.12	1 -C
CH	6.81	7.26	1-benzene
		-0.25	1 -N
		-0.20	1 -C
CH	6.82	7.26	1-benzene
		-0.25	1 -N
		-0.19	1 -C
CH	6.50	7.26	1-benzene
		-0.64	1 -N
		-0.12	1 -C
CH2	3.51	1.37	methylene
		1.22	1 alpha -1:C*C*C*C*C*C*1
		0.92	1 alpha -C(=O)O-C
CH2	5.02	1.37	methylene
		2.75	1 alpha -OC(=O)-C
		0.90	1 alpha -C(=O)O
OH	11.0	11.00	carboxylic acid
CH2	2.84	1.37	methylene
		0.90	1 alpha -C(=O)O
		0.38	1 beta -O-1:C*C*C*C*C*C*1
		0.23	1 beta -C(=O)O
		-0.04	1 beta -C
CH2	2.84	1.37	methylene
		0.90	1 alpha -C(=O)O
		0.38	1 beta -O-1:C*C*C*C*C*C*1
		0.23	1 beta -C(=O)O
		-0.04	1 beta -C
CH2	2.84	1.37	methylene
		0.90	1 alpha -C(=O)O
		0.38	1 beta -O-1:C*C*C*C*C*C*1
		0.23	1 beta -C(=O)O
		-0.04	1 beta -C
CH2	2.84	1.37	methylene
		0.90	1 alpha -C(=O)O
		0.38	1 beta -O-1:C*C*C*C*C*C*1
		0.23	1 beta -C(=O)O
		-0.04	1 beta -C
OH	11.0	11.00	carboxylic acid
OH	11.0	11.00	carboxylic acid
OH	11.0	11.00	carboxylic acid
OH	11.0	11.00	carboxylic acid
OH	11.0	11.00	carboxylic acid
OH	11.0	11.00	carboxylic acid

c)NMR spectrum of Sodium Citarte And Acelofenac.

ChemNMR H-1 Estimation



Estimation Quality: blue = good, magenta = medium, red = rough



Protocol of the H-1 NMR Prediction:

Node	Shift	Base + Inc.	Comment (ppm rel. to TMS)
CH	6.39	7.26	1-benzene
		-0.34	1 -O-1:C*C*C*C*C*C*1
		-0.25	1 -N
		-0.28	1 -O-1:C*C*C*C*C*C*1
CH	6.54	7.26	1-benzene
		-0.04	1 -O-1:C*C*C*C*C*C*1
		-0.64	1 -N
		-0.04	1 -O-1:C*C*C*C*C*C*1
CH	6.39	7.26	1-benzene
		-0.28	1 -O-1:C*C*C*C*C*C*1
		-0.25	1 -N
		-0.34	1 -O-1:C*C*C*C*C*C*1
NH	4.0	4.00	aromatic C-NH
CH	6.34	7.26	1-benzene
		-0.80	1 -N
		-0.12	1 -C
CH	6.81	7.26	1-benzene
		-0.25	1 -N
		-0.20	1 -C
CH	6.82	7.26	1-benzene
		-0.25	1 -N
		-0.19	1 -C
CH	6.50	7.26	1-benzene
		-0.64	1 -N
		-0.12	1 -C
CH2	3.51	1.37	methylene
		1.22	1 alpha -1:C*C*C*C*C*C*1
		0.92	1 alpha -C(=O)O-C
CH2	5.02	1.37	methylene
		2.75	1 alpha -OC(=O)-C
		0.90	1 alpha -C(=O)O
OH	11.0	11.00	carboxylic acid
CH	7.13	7.26	1-benzene
		-0.34	1 -O-1:C*C*C*C*C*C*1
		0.21	1 -C(=O)O
CH	8.09	7.26	1-benzene
		-0.04	1 -O-1:C*C*C*C*C*C*1
		0.87	1 -C(=O)O
CH	7.56	7.26	1-benzene
		-0.04	1 -O-1:C*C*C*C*C*C*1
		0.34	1 -C(=O)O
CH	7.19	7.26	1-benzene
		-0.28	1 -O-1:C*C*C*C*C*C*1
		0.21	1 -C(=O)O
CH	7.13	7.26	1-benzene
		-0.34	1 -O-1:C*C*C*C*C*C*1
		0.21	1 -C(=O)O
CH	8.09	7.26	1-benzene
		-0.04	1 -O-1:C*C*C*C*C*C*1
		0.87	1 -C(=O)O
CH	7.56	7.26	1-benzene
		-0.04	1 -O-1:C*C*C*C*C*C*1
		0.34	1 -C(=O)O
CH	7.19	7.26	1-benzene
		-0.28	1 -O-1:C*C*C*C*C*C*1
		0.21	1 -C(=O)O
OH	11.0	11.00	carboxylic acid
OH	11.0	11.00	carboxylic acid

d)NMR spectrum OF Acelofenac And Sodium Salicylate.

FIG 6: - NMR spectrum of acelofenac and Two hydrotropes Sodium Salicylate And Sodium Citrate.

Mass Spectrum Of Acelofenac.

1. $C_{14}H_{11}CL_2NO_4^{\cdot\cdot}$ – 327.007.
   - **1.1** $C_2H_2^{\cdot\cdot}$ - 26.0157.
2. $C_{13}H_{11}CLNO_4^{\cdot\cdot\cdot}$ - 280.03.
   - **2.1** $C_3H_2CL^{\cdot\cdot\cdot}$ - 72.98.
3. $C_{12}H_{10}CLNO_4^{\cdot\cdot\cdot}$ - 267.03.
   - **3.1** $C_4H_3CL^{\cdot\cdot\cdot\cdot}$ - 85.99.
4. $C_{10}H_8CLNO_4^{\cdot\cdot\cdot\cdot\cdot\cdot\cdot}$ - 241.014.
   - **4.1** C_2H_2 - 26.01.
   - **4.2** $C_4H_3CL^{\cdot\cdot\cdot\cdot}$ -85.99.
5. $C_7H_7NO_4^{\cdot\cdot\cdot\cdot}$ - 169.03.
   - **5.1** C.CL- 46.9.
   - **5.2** $C_5H_3CL^{\cdot\cdot\cdot\cdot}$ -97.9.
   - **5.3** $C_3H_3^{\cdot\cdot\cdot\cdot}$ - 39.02.
6. $C_{11}H_8CLN^{\cdot\cdot\cdot\cdot}$ - 189.03.
   - **6.1** $CL^{\cdot}$ -34.96.
   - **6.2** $C_4H_4O_2^{\cdot\cdot\cdot\cdot}$ - 84.02.
   - **6.3** $O^{\cdot\cdot}$ - 15.9949.
   - **6.4** $CHO^{\cdot\cdot\cdot}$ - 29.50.
7. $C_{12}H_8CLN^{\cdot\cdot}$ - 201.035.
   - **7.1** $C_4H_5O_4^{\cdot}$ - 117.019.
   - **7.2** $CL^{\cdot}$ - 34.9689.

Mass Spectrum Of Sodium Citrate

1. $C_6H_5O_4^{\cdot\cdot\cdot\cdot\cdot}$ – 141.02.
   - **1.1** $O^{\cdot\cdot}$ – 15.9955.
   - **1.2** $O^{\cdot}$ – 15.9949.
2. $C_5H_5O_4^{\cdot\cdot\cdot}$ - 129.02.
   - **2.1** $CO_2^{\cdot}$ – 43.994.
   - **2.2** $O^{\cdot\cdot}$ – 15.9949.
3. $C_3H_3O_3^{\cdot\cdot}$ – 87.0088.
   - **3.1** 3.1 $CO_2^{\cdot}$ – 43.994.
   - **3.2** $O^{\cdot\cdot}$ – 15.9949.
   - **3.3** $CO^{\cdot\cdot}$ - 27.9955.
4. $C_6H_5O_5^{\cdot\cdot\cdot}$ - 157.015.
   - **4.1** 4.1 $O^{\cdot\cdot}$ – 15.9955.
   - **4.2** $O^{\cdot}$ – 15.9949.
5. $C_5H_4O_3^{\cdot\cdot\cdot}$ - 112.017.
   - **5.1** $O^{\cdot\cdot}$ – 15.9955.
   - **5.2** $CO^{\cdot\cdot}$ - 27.9955.
   - **5.3** $OH^{\cdot}$ – 17.06299.
6. $C_2H_2O_2^{\cdot}$ – 58.006.
   - **6.1** CH_2 – 14.0157.
   - **6.2** $O^{\cdot\cdot}$ – 15.9949.
   - **6.3** $CO^{\cdot\cdot\cdot}$ - 27.9955.
   - **6.4** $C_2HO_3^{\cdot\cdot}$ – 72.9931.

Mass Spectrum Of Sodium Salicylate

1. $C_4H_2O_3^{\cdot\cdot\cdot}$ - 98.0009.
   - **1.1** $C_3H_3^{\cdot\cdot\cdot}$ - 39.0235.
2. $C_3HO_3^{\cdot\cdot\cdot\cdot}$ – 84.9931.
   - **2.1** $C_4H_4^{\cdot\cdot\cdot\cdot}$ – 52.0313.
3. $C_6H_5O^{\cdot}$ – 93.034.
   - **3.1** $O^{\cdot}$ – 15.9955.
   - **3.2** $CO^{\cdot\cdot}$ – 27.9949.
4. $C_6H_4^{\cdot\cdot}$ – 76.0313.
   - **4.1** $CO_2^{\cdot}$ – 43.9904.
   - **4.2** $OH^{\cdot}$ – 17.0027.
5. $C_4H_2O_2^{\cdot\cdot\cdot\cdot\cdot}$ – 82.006.
   - **5.1** $O^{\cdot\cdot}$ – 15.9949.
   - **5.2** C_3H_3 - 39.0235.

Mass Spectrum Of Sodium Citrate and Acelofenac.

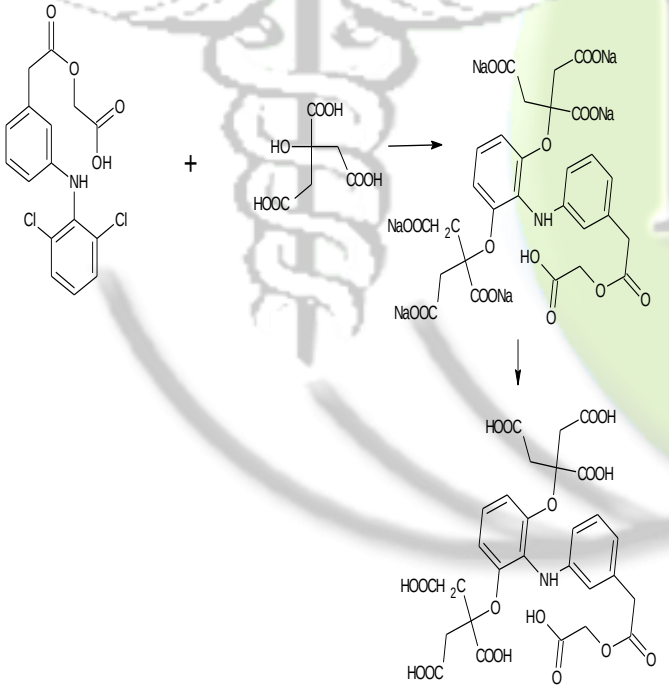
1. $C_{27}H_{26}NO_6^{\cdot}$ – 620.125.
   - 1.1 $CHO_2^{\cdot}$ – 44.9977.
2. $C_{26}H_{24}NO_{16}^{\cdot}$ – 606.11.
   - 2.1 $C_2H_3O_2^{\cdot}$ – 59.0133.
3. $C_{24}H_{21}NO_{14}^{\cdot\cdot}$ – 547.096.
   - 3.1 $C_2H_3O_2^{\cdot}$ – 59.0133.
   - 3.2 $CHO_2^{\cdot}$ – 44.9977.
   - 3.3 $CH_2^{\cdot\cdot\cdot}$ - 14.0517.
4. $C_{21}H_{19}NO_{11}^{\cdot\cdot\cdot\cdot}$ – 461.096.
   - 4.1 $C_2HO_2^{\cdot\cdot\cdot}$ - 56.9977.
   - 4.2 $CH^{\cdot\cdot\cdot}$ - 13.6078.
   - 4.3 $O^{\cdot\cdot}$ – 15.9949.
   - 4.4 $CH_2^{\cdot\cdot}$ – 14.0157.
   - 4.5 $CHO_2^{\cdot}$ – 44.9977.
   - 4.6 $C_2H_3O_2^{\cdot}$ – 59.0133.
5. $C_{20}H_{18}NO_{11}^{\cdot\cdot\cdot\cdot\cdot}$ – 448.088.
   - 5.1 $C_2HO_2^{\cdot\cdot\cdot}$ - 56.9977.
   - 5.2 $C_2H_2^{\cdot\cdot\cdot\cdot}$ – 26.0157.
   - 5.3 $O^{\cdot\cdot}$ – 15.9949.
   - 5.4 $CH_2^{\cdot\cdot}$ – 14.0157.
   - 5.5 $CHO_2^{\cdot}$ – 44.9977.
   - 5.6 $C_2H_3O_2^{\cdot}$ – 59.0133.
6. $C_{19}H_{18}NO_{11}^{\cdot\cdot\cdot}$ - 436.008.
   - 6.1 $C_2HO_2^{\cdot\cdot\cdot}$ - 56.9977.
   - 6.2 $C_2H_3O_2^{\cdot}$ – 59.0133.
   - 6.3 $CH_2^{\cdot\cdot}$ – 14.0157.
   - 6.4 $CHO_2^{\cdot}$ – 44.9977.
   - 6.5 $C_2H_3O_2^{\cdot}$ – 59.0133.
7. $C_{18}H_{17}NO_{11}^{\cdot\cdot}$ – 423.08.
   - 7.1 $CHO_2^{\cdot}$ – 44.9977.
   - 7.2 $C_9H_5O_5^{\cdot\cdot\cdot\cdot}$ – 197.045.

Mass Spectrum Of Sodium Salicylate And Acelofenac.

1. $C_{29}H_{22}NO_8$ – 512.135
   1.1 CHO_2 – 44.9977.
2. $C_{29}H_{22}N$- 444.125
   2.1 O_9 – 26.31.
   2.2 CH- 13.0078.
   2.3 O- 15.9949.
3. $C_{27}H_{21}NO_8$ - 487.127.
   3.1 $C_3H_3O_2$ – 70.0055.
4. $C_{18}H_{13}NO_3$ - 291.09.
   4.1 $C_8H_5O_3$ – 149.024.
   4.2 C_2H_2O – 42.016.
   4.3 $C_2H_3O_3$ – 75.0082.
5. $C_{19}H_{14}NO_5$ – 336.087.
   5.1 $C_7H_5O_3$ – 137.024
   5.2 C_3H_3 – 39.0235.
   5.3 CHO_2 – 44.9977

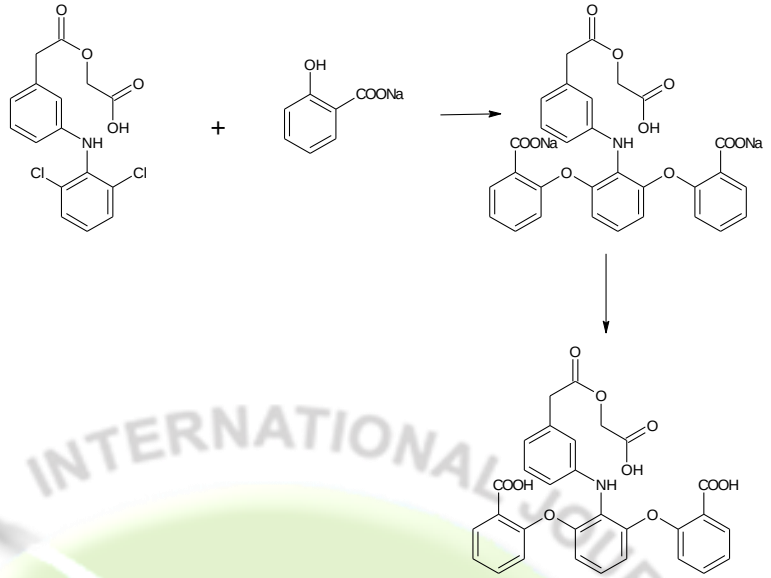
FIG 7: - Mass spectrum of acelofenac(drug), Two hydrotropes And Drug+Hydrotropes.

Reaction Carry out Between Acelofenac And Sodium Citrate.



Reaction Carry out Between Acelofenac And Sodium Salicylate.

FIG 8 : - Possible interaction between the Drug And Hydrotropes



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