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Research Article

SPECTROPHOTOMETRIC ANALYSIS OF AN ANTIPYRETIC DRUG FOR SOLUBILITY DETERMINATION**Surya Pratap Singh*, Gohel kishorsinh ranjitsinh, Satish Jaiswal,****Mahaveer Prasad Khinchi**

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Received: 05 December, 2013**Revised and Accepted: 04Jan 2014****ABSTRACT**

The solubility of a substance becomes especially important in the pharmaceutical field because it often represents a major factor that controls the bioavailability of a drug substance. Moreover, solubility and solubility-related properties can also provide important information regarding the structure of drug substances, and in their range of possible intermolecular interactions. For these reasons, a comprehensive knowledge of solubility phenomena permits pharmaceutical scientists to develop an optimal understanding of a drug substance, to determine the ultimate form of the drug substance, and to yield information essential to the development and processing of its dosage forms.

KEY WORDS: Solubility, Development, Pharmaceutical Field, Drug Substance.

INTRODUCTION

Solubility is defined as the maximum quantity of a substance that can be completely dissolved in a given amount of solvent, and represents a fundamental concept in fields of research such as chemistry, physics, food science, pharmaceutical, and biological sciences. Paracetamol is chemically 4'-Hydroxyacetanilide. It is an analgesic antipyretic agent. It is effective in treating mild to moderate pain such as headache, neuralgia and pain of musculoskeletal origin. Its action is similar to aspirin, and is the most commonly used in pediatrics. Paracetamol alone or in combination with other drugs is reported to be estimated by spectrophotometric method.

Paracetamol is soluble in alcoholic solvent as compared to the water (less soluble). Solubility is defined as the maximum quantity of a substance that can be completely dissolved in a given amount of solvent, and represents a fundamental concept in fields of research such as chemistry, physics, food science, pharmaceutical, and biological sciences.^[5]

MATERIALS AND METHODS

A double-beam Shimadzu-1800 UV-Visible spectrophotometer, with spectral bandwidth of 2 nm, wavelength accuracy ± 0.5 nm and a pair of 1-cm matched quartz cells was used to measure absorbance of the resulting solution. Chemicals which are used in the spectrophotometric analysis are; Solvent- Methanol, Ethanol, Chloroform, Distilled water, and Paracetamol in powdered form, that is the gift sample of Aldoc pharmaceutical Pvt.Ltd. Kota, Rajasthan.

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Method: (Shake flask method)

- Clean all glass ware using detergent and dried well.
- Weigh accurately about 10 mg drug sample of paracetamol powder.
- Measure 20 ml of methanol solution and dissolve the drug sample in methanol.
- In the same way,prepare four solvent solutions of drug sample using 20-20 ml of ethanol,chloroform and distilled water.
- Allow all the all mixture solvent solution of drug solution for shaking.
- Allow all solutions for proper mixing of drug sample by using incubator shaker for 48 hours.
- After 48 hours the samples are removed from shaker.
- Take one by one of the solvent and λ max. observed by using u.v. spectrophotometer.
- Take the dilutions if needed of the respective sample solution in the sample cell and find the absorbance at measured wavelength.^[4]

Determination of λ max

Firstly prepared the stock solutions of Paracetamol (1 mg/ml) by using distilled water,Chloroform,methanol and ethanol.For the determination of λ max, 10 μ g/ml solution of Paracetamol was prepared from the stock solutions.With the help of UV spectrophotometer, the maximum absorption of Paracetamol in above solvent solutions was determined by wavelengths scanning at 200-400 nm. The maximum absorption a particular wavelength taken as λ max value for a given drug.^[2]

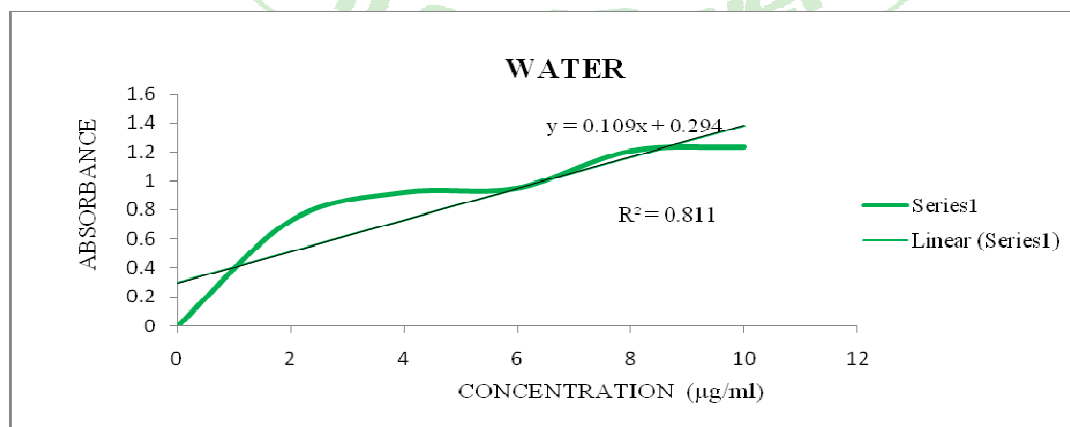
Preparation of standard curve of paracetamol with distilled water

Make different Concentration of paracetamol 2,4,6,8 and 10 μ g/ml and take absorbance of each sample with the help of UV spectrophotometer at 243 nm. Such drug concentration is lies that obey Beers' lamberts law. The absorbance at different wavelength are as following in Table-1.

In the same way, determine of the each solvent solution and prepare the standard curve of each solvent sample of paracetamol.

Table-1 Preparation of Standard Curve for distilled water:-

S. No.	Concentration (μ g/ml)	Absorbance
1	2	0.726
2	4	0.921
3	6	0.949
4	8	1.206
5	10	1.233

**Fig: 1. Standard Curve of distilled water**

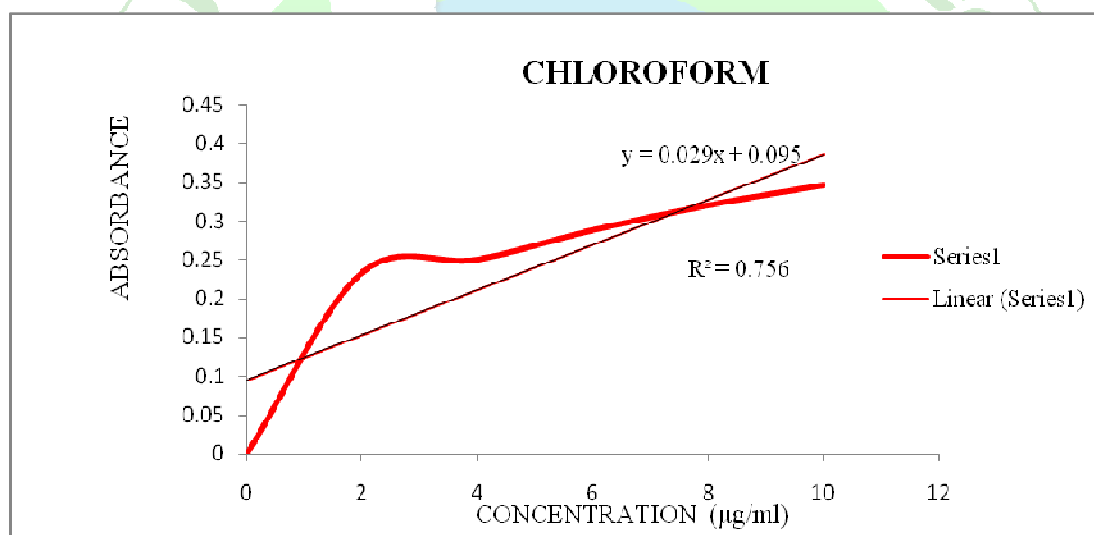
Preparation of standard curve of paracetamol with chloroform

Make different Concentration of paracetamol 2,4,6,8 and 10 µg/ml and take absorbance of each sample with the help of UV

spectrophotometer at 211 nm which was measured by wavelength scanning. Such drug concentration is lies that obey Beers' lamberts law. The absorbance at different wavelength are as following in Table-2.

Table-2 Preparation of Standard Curve for chloroform:-

Sr No.	Concentration (µg/ml)	Absorbance
1	2	0.234
2	4	0.251
3	6	0.289
4	8	0.321
5	10	0.347

**Fig: 2. Standard Curve of chloroform****Preparation of standard curve of paracetamol with methanol**

Make different Concentration of paracetamol 2,4,6,8 and 10 µg/ml and take absorbance of each sample with the help of UV

spectrophotometer at 204 nm which was measured by wavelength scanning. Such drug concentration is lies that obey Beers' lamberts law. The absorbance at different wavelength are as following in Table-3.

Table-3 Preparation of Standard Curve for methanol:-

Sr No.	Concentration (µg/ml)	Absorbance
1	2	0.720
2	4	0.794
3	6	0.804
4	8	0.883
5	10	0.924

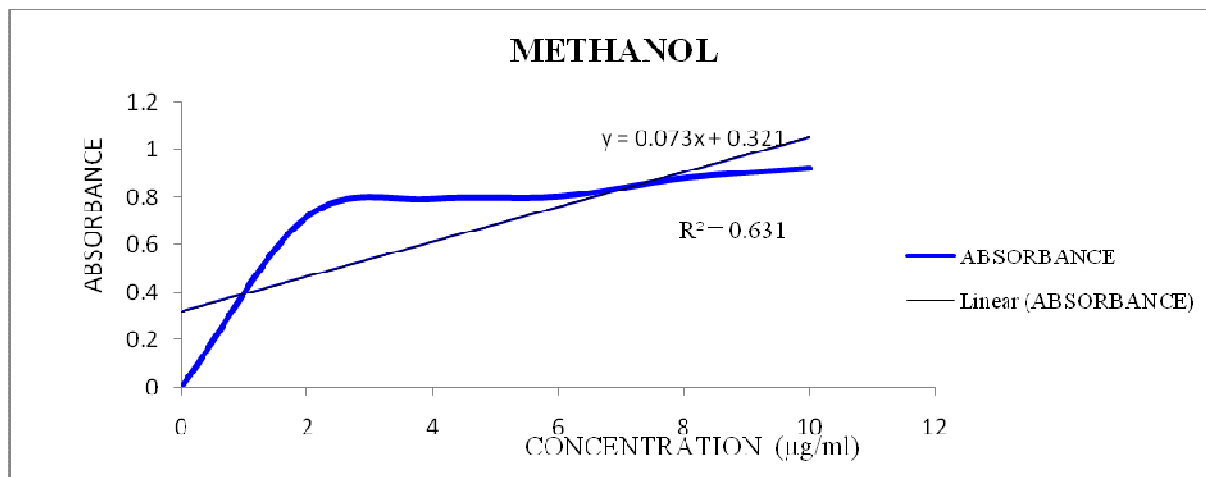


Fig: 3. Standard curves of methanol

Preparation of standard curve of paracetamol with ethanol

Make different Concentration of paracetamol 2,4,6,8 and 10 µg/ml and take absorbance of each sample with the help of UV

spectrophotometer at 202 nm which was measured by wavelength scanning. Such drug concentration is lies that obey Beers' lamberts law. The absorbance at different wavelength are as following in Table-4.

Table-4 Preparation of Standard Curve:-

Sr No.	Concentration (µg/ml)	Absorbance
1	2	0.536
2	4	0.723
3	6	0.984
4	8	0.996
5	10	1.005

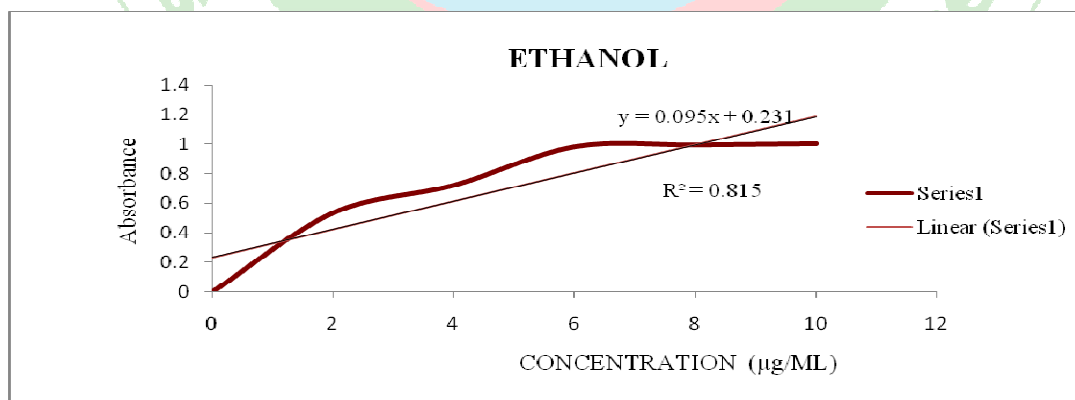


Fig: 4. Standard curves of ethanol-(Graph)

RESULT AND CONCLUSION

The sample of paracetamol drug was freely soluble in the methanol and ethanol, soluble in

chloroform, and sparingly soluble in distilled water shown in table-6. The solubility of given sample of an anti-pyretic drug which is paracetamol by using different solvents was

found to be maximum for ethanol solvent. Thus, it may be concluded that the proposed method is improved, simple and may prove to

be of great importance in pharmaceutical analysis.

Table-5 Absorbance of drug (10µg/ml) in different solvents from shake flask method

S.No.	Solvent	Absorbance
1	Ethanol	8.05
2	Methanol	7.31
3	Chloroform	3.69
4	Distilled Water	0.99

Table-6 Resulting solubility of paracetamol in different solvents

S.No.	Solvent	Solubility
1	Ethanol	Freely Soluble
2	Methanol	Freely Soluble
3	Chloroform	Soluble
4	Distilled Water	Sparingly Soluble

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