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Original Research Paper

Pharmacy

"SOLID AS SOLVENT"- NOVEL SPECTROPHOTOMETRIC DETERMINATION OF PIROXICAM IN SOLID DOSAGE FORM USING SOLIDS (EUTECTIC LIQUID OF PHENOL AND PARACETAMOL) AS SOLUBILIZING AGENTS (MIXED SOLVENCY CONCEPT)

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ABSTRACT

In proposed research, novel method for spectrophotometric estimation of piroxicam in tablet dosage form was developed and validated as per ICH guidelines. The main objective behind research is to explore applications of mixed solvency concept in analysis of various poorly soluble drugs. Generally in spectrophotometric analysis of poorly water soluble drugs, class II and III organic solvents are used which are very toxic to humans as well as nature. The present study deals with novel spectrophotometric estimation of piroxicam in solid dosage form using eutectic liquid of phenol and paracetamolin 4:1 ratio (PPl41) as solubilising agents. As per the statement of Maheshwari, each substance (gas, liquid or solid) possessessolubilising power. PPl41possesses significant large solubilizing power for piroxicamand having solubility more than 110 mg per ml whereas aqueous solubility of piroxicam is 0.4 mg/ml. Calibration curve of piroxicam was plotted by recording the absorbance of standard solutions (5,10,15,20 and 25µg/ml) of piroxicam which were made by diluting the stock solution of piroxicam(50 mg) in PPl41 (10ml) with distilled water. The absorbances were recorded at 358 nm against respective reagent blanks.The percent label claims were found very close to 100 (98.66 ± 1.761 and 99.33 ± 0.904) indicating accuracy of the proposed method. The accuracy and reproducibility of the proposed method was further confirmed by recovery studies. Percent recoveries estimated by the proposed method are close to 100 (99.86 ± 1.878 to 101.65 ± 1.444). The low values of standard deviation, percent coefficient of variation and standard error, validate the method.Thus, it may be concluded that proposed method is simple, safe and precise and exclude use of toxic organic solvents. Phenol does not interfere above 300 nm and paracetamol does not interfere above 315 nm in spectrophotometric analysis.

KEYWORDS : Mixed Solvency, Spectrophotometric Analysis, Eutectic Liquid, Phenol, Paracetamol

INTRODUCTION

Majority of drugs show the problem of poor solubility, whether in the case of their analytical estimations or in the field of liquid dosage forms in the form of solutions. Commonly used organic solvents for spectrophotometric analysis of water insoluble drugs include methanol, ethanol, chloroform, benzene, dichloromethane, dimethyl formamide, acetonitrile, ethyl acetate, toluene, carbon tetrachloride, acetone, hexane etc. The main drawbacks of organic solvents include high cost, toxicity and pollution. Organic solvents have innumerous adverse effects caused by single exposure like dermatitis, headache, drowsiness, nausea, eye irritation and long term exposure causes serious effects such as neurological disorders, chronic renal failure, liver damage, necrosis, mutagenesis disorder. They should be replaced by other ecofriendly alternative sources. The researchers are doing much work to give eco-friendly solutions for this challenge. Maheshwari[1-3] has given a nice concept, known as mixedsolvency concept. As per Maheshwari all substances present on earth possess solublizing power whether it is solid, liquid or gas. Any substance is a good solvent for some and bad solvent for another. By application of this concept, innumerable solvent systems can be developed. He has given several eco-friendly methods in the area of drug estimations and formulations precluding the use of toxic organic solvents. The solubility of a large number of poorly soluble drugs has been enhanced by mixed solvency concept. [1-21]The present investigation is an attempt to show that solids can also be wisely used to act as solvent precluding the use of organic solvents. The main objective of the present study is to demonstrate the solvent action of solids.

The concept of mixed solvency is an emerging field which can serve as a milestone for solubility enhancement and therefore deserves an urgent attention of the scientific community to assess its efficiency and applicability. As per Maheshwari all substances present on earth possess solublizing power whether it is solid, liquid or gas. Any substance is a good solvent for some and bad solvent for another.

MATERIAL AND METHOD

Piroxits DT (Piroxicam dispersible tablets) of Intas Pharmaceuticals Limited, Ahmedabad was purchased from local market. Gift sample of Paracetamol was obtained by Shree Pharmaceuticals, Indore and Phenol of analytical grade was used.The instrument used was Shimadzu UV-visible spectrophotometer (model UV-160A) with 1 cm matched silica cells.

EXPERIMENTAL METHOD

Solubility Studies - By approx solubility method at 28±1°C, more than 11% w/v solubility was observed (more than 110 mg piroxicam goes in solution form in 1ml of Ppl41).

Calibration curve - Stock solution of standard drug piroxicam was prepared by dissolving 50 mg in 10 ml PPl41 in 500 ml volumetric flask. Then 400 ml of DM water was added and shaken for 5 min and further diluted to 500 ml with DM water. Using this stock solutionof 500µg/ml, standard solutions of 5, 10, 15, 20 and 25 µg/ml were prepared in DM water. Then, the absorbances of standard solutions were recorded at 358 nm against respective reagent blanks to obtain the calibration curve.

Analysis of commercial tablet - Twenty tablets were weighed and crushed to obtain a fine powder. Tablet powder equivalent to 50 mg of piroxicam was transferred to a 500 ml volumetric flask and 10 ml PPl41 was added and shaken for 10 min. Then 400 ml of DM water was added and shaken for 5 min and further diluted to 500 ml with DM water. Whatmann filter paper was used for filtration to remove the tablet excipients and 5 ml of filtrate was transferred to a 50 ml volumetric flask. Then volume was made up to 50 ml with DM water and absorbance of resulting solution was recorded at 358 nm against reagent blank. The drug content was determined using calibration curve.

Recovery Studies - Recovery studies taking 15 mg and 30 mg of pure drug as spiked drug together with pre-analysed tablet powder (equivalent to 100 mg) were performed using the same proposed method.

RESULTS AND DISCUSSION

The linearity range was found to be 5-25 µg/ml with regression equation y= 0.044x-0.0033 (r^2= 0.9998). The percent label claim were found very close to 100 (98.66 ± 1.761 and 99.33 ± 0.904) indicating accuracy of the proposed method. Percent recoveries estimated by the proposed methods are close to 100 (99.86 ± 1.878 to 101.65 ± 1.444) with low values of standard deviation, percent coefficient of variation and standard error which further validated the proposed method for its accuracy. It was found that proposed method was specific because both phenol and paracetamol do not show any interference above 315 nm and drug was estimated at 358 nm.

TABLE 1: Analysis Of Commercial Tablets Of Piroxicam With Statistical Evaluation (n=3)

Tablet formulation	Label claim per tablet (mg)	% Label claim estimated (mean ± SD)	% Coefficient of variation	Standard error
I	20	98.66±1.761	1.785	1.017
II	20	99.33±0.904	0.910	0.522

TABLE 2: Results of Recovery studies with statistical evaluation (n=3)

Tablet Formulation	Drug present in preanalyzed tablet powder taken (mg)	Pure drug added (spicked)(mg)	% Recovery estimated (mean ± SD)	% Coefficient of Variation	Standard error
I	50	15	99.90 ±1.111	1.112	0.641
I	50	30	100.55 ±1.662	1.653	0.960
II	50	15	101.65 ±1.444	1.421	0.834
II	50	30	99.86 ±1.878	1.88	1.083

CONCLUSION:

It may be concluded that mixed solvency concept can be successfully employed in analytical estimation of various drugs. A large number of poorly water soluble drugs having absorption maxima above 315 nm (PPI4 did not show any absorbance above 315 nm) can be tried for estimation by this method. Such eutectic combinations can be tried in place of costlier and toxic organic solvents.

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