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Research Article

NEW QUANTITATIVE ESTIMATION OF SALICYLIC ACID BULK SAMPLE USING CALCIUM DISODIUM EDETATE AS HYDROTROPIC SOLUBILIZING AGENT

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ABSTRACT

In the present investigation, hydrotropic solubilization technique has been employed to solubilize the poorly water-soluble, keratolytic drug, salicylic acid (by 1.0 M calcium disodium edetate solution), for its titrimetric analysis. There was more than 45 fold enhancement in aqueous solubility of salicylic acid in 1.0 M calcium disodium edetate solution as compared to the solubility in distilled water. The hydrotropic agent did not interfere in the analysis. The proposed method is new, simple, accurate and reproducible. Statistical data proved the accuracy, reproducibility and precision of the proposed method.

Key Words: Hydrotropy, Salicylic acid, Calcium disodium edentate, Titrimetry

INTRODUCTION

Increasing the aqueous solubility of insoluble and slightly soluble drug is of major importance. Hydrotropy refers to the ability of a concentrated solution of a chemical compound to increase the aqueous solubility of another compound (usually a sparingly soluble organic compound). Compounds that have this property are called 'hydrotropes'. Sodium benzoate, sodium salicylate, sodium acetate, sodium ascorbate, niacinamide, sodium citrate, urea are the most popular examples of hydrotropic agents which have been used to solubilize a large number of poorly water-soluble compounds.[1-20] Hydrotropic solution of calcium disodium edetate was employed as solubilizing agent to analyze a poorly water-soluble drug, salicylic acid, by titrimetric and spectrophotometric estimation.

There was tremendous increase in solubility of salicylic acid (a widely used keratolytic agent) in 1.0 M calcium disodium edetate solution. Therefore, it was thought worthwhile to solubilize the drug with the help of calcium disodiun edetate solution to carry out the estimations.

MATERIALS AND METHODS

Salicylic acid was obtained as gift sample from Alkem Lab. Ltd., Mumbai. All other chemicals and solvents used were of analytical grade. A Shimadzu UV-Visible spectrophotometer (Model-UV 160A) with 1 cm matched silica cells was used for spectrophotometric analysis.

Preparation of calibration curve of salicylic acid

100.0 mg of salicylic acid standard drug was accurately weighed and transferred to a 100ml volumetric flask. To this, 10 ml of 1.0 M calcium disodium edetate solution was added and flask was shaken to solubilize the drug. The volume was made up to the mark with distilled water. This stock solution (1000 µg/ml) was further diluted with distilled water to obtain various dilutions containing 10, 20, 30, 40, 50, 60 µg/ml of drug. Absorbance was noted at 296 nm against reagent blanks to get calibration curve.

Preliminary solubility studies of salicylic acid : Solubility of salicylic acid was determined in distilled water and 1.0 M calcium disodium edetate solution at 27 ± 1^0C. Solubility was found to be increased by more than 45 fold in 1.0 M

calcium disodium edetate solution, as compared to the solubility in distilled water.

Analysis of salicylic acid bulk sample by I.P. (1996) method:[21] Accurately weighed (0.3 g) salicylic acid bulk sample was dissolved in 50 ml of ethanol (95%) and was titrated with sodium hydroxide solution (0.1 M) using phenol red solution as indicator. Necessary blank determination was adjusted to get drug content (Table-1).

Analysis of salicylic acid bulk sample by proposed titrimetric method: In the proposed method, accurately weighed (0.3 g) salicylic acid bulk sample was solubilized in 25 ml of calcium disodium edetate solution (1.0 M) in a conical flask by shaking for about 5 min and titrated with sodium hydroxide solution (0.1 M) using phenolphthalein solution as indicator. Necessary correction was done by conducting blank determination and amount of salicylic acid was calculated (Table -1).

Analysis of salicylic acid bulk sample by proposed spectrophotometric method: 300.0 mg of salicylic acid bulk sample was accurately weighed and transferred to a 100 ml volumetric flask. To this 25 ml of 1.0 M calcium disodium edetate solution was added and flask was shaken to solubilize the drug. The volume was made up to the mark with distilled water. The flask was shaken to mix the contents. Then, the solution was diluted sufficiently with distilled water and analyzed on UV-spectrophotometer against reagent blank. Drug content of bulk sample was then calculated (Table-1)

TABLE 1: Analysis data of salicylic acid bulk sample with statistical evaluation (n=3)

S. No.	Method of analysis	Amount of drug taken (mg)	Percent drug estimated (mean ± sd)	Coefficient of variation (%)	Standard error.
1.	I.P.M.	300.0	99.08 ± 1.119	1.129	0.646
2.	P.T.M.	300.0	98.33 ± 1.622	1.649	0.936
3.	P.S.M.	300.0	98.81 ± 0.944	0.955	0.545

I.P.M. = Indian Pharmacopoeial Method.
P.T.M. = Proposed Titrimetric Method.
P.S.M. = Proposed Spectrophotometric Method.

RESULTS AND DISCUSSION

Results of solubility studies of salicylic acid revealed that enhancement in solubility in 1.0 M calcium disodium edetate solution was more than 45 fold as compared to its solubility in distilled water.

It is evident from Table -1 that the values of mean percent drug (salicylic acid) estimated by Indian Pharmacopoeial, proposed titrimetric and proposed spectrophotometric methods are 99.08, 98.33 and 98.81, respectively. The results of analysis by the proposed titrimetric and proposed spectrophotometric method are very comparable to the results obtained from a standard pharmacopoeial method. The amounts of drug estimated by Indian pharmacopoeial and proposed titrimetric methods (Table -1) are very close to each other and very near to 100.0, indicating the accuracy of the proposed method of analysis. This indicates the accuracy of the proposed methods. Low values of standard deviation, percent coefficient of variation and standard error (Table-1),

further validated the proposed titrimetric and proposed spectrophotometric methods.

Conclusion

It was, thus, concluded that the proposed method is new, simple cost effective, accurate, safe and precise and can be successfully employed in the routine analysis of salicylic acid in bulk drug sample. No organic solvent were employed. There is good scope for other poorly water-soluble drugs which may be tried to get solubilized in 1.0 M calcium disodium edetate solution (as hydrotropic agent) to carry out their titrimetric and/or spectrophotometric analysis excluding the use of costlier and unsafe organic solvents. The proposed methods are worth adopting in the respective pharmacopoeia.

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