

*Original Article*

## QUANTITATIVE ESTIMATION OF BENZOIC ACID IN BULK SAMPLE USING SODIUM BENZOATE AND SODIUM SALICYLATE AS HYDROTROPIC SOLUBILIZING AGENT

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### **ABSTRACT**

In the present investigation, benzoic acid (a widely used antifungal and antibacterial drug) has been selected as a poorly water soluble model drug. There were more than 14 fold enhancements in aqueous solubility of benzoic acid in 2.0 M sodium benzoate and more than 28 fold enhancements in 2.0 M sodium salicylate solution (hydrotropic solutions). These hydrotropic agents were employed to solubilize the benzoic acid from the bulk drug for titrimetric analysis. The proposed method is new, simple, accurate, environmentally friendly and reproducible. Statistical data proved the accuracy, reproducibility and the precision of the proposed method. The results of titrimetric analysis by use of hydrotrophy compared very well with the results of Pharmacopoeial method.

**Keywords:** RP-HPLC, Lansoprazole, Blood serum, Method validation, Tablet dosage form

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## 1.0 INTRODUCTION

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 and sodium citrate are the most popular examples of hydrotropic agents which have been used to solubilize a large number of poorly water-soluble compounds<sup>1-19</sup>. Hydrotropic solutions of sodium benzoate and sodium salicylate were employed as solubilizing agent to analyze a poorly water-soluble drug, benzoic acid by titrimetric estimation.

There was tremendous increase in solubility of benzoic acid (a widely used antifungal and antibacterial drug) in 2.0 M sodium benzoate and sodium salicylate solutions. Therefore, it was thought worthwhile to solubilize this drug in hydrotropic solutions to carry out the titrations.

## 2.0 MATERIALS AND METHODS

All chemicals and solvents used were of analytical grade. Benzoic acid bulk drug sample was purchased from local market.

### 2.1 Preliminary solubility studies of drug:

Solubility of benzoic acid was determined in distilled water and different concentrated solutions of hydrotropic agents at  $27\pm 1^\circ\text{C}$ . Enhancement in the solubilities of benzoic acid in 2.0 M sodium benzoate and 2.0M sodium salicylate was more than 14 fold and 28-fold, respectively (as compared to its solubility in aqueous distilled water).

### 2.2 Analysis of benzoic acid bulk sample by Indian Pharmacopoeial method<sup>20</sup>:

About 1gm. of benzoic acid bulk sample was accurately weighed and dissolved in 15ml of warm ethanol (95%) previously neutralized to phenolphthalein solution, 20ml of water was added and titrated with 0.5M sodium hydroxide solution using phenolphthalein solution as indicator. (Each ml of 0.5M sodium hydroxide is equivalent to 0.06106gm. of benzoic acid).

### 2.3 Analysis of benzoic acid bulk drug sample by the proposed methods:

### 2.3.1 Sodium Benzoate method:

Accurately weighed 0.2 gm. of benzoic acid bulk drug sample was transferred to a conical flask. After adding 20 ml of 2.0 M sodium benzoate solution (which was previously neutralized to phenolphthalein solution) the flask was shaken for about 5 minutes to solubilize the drug and titrated with 0.1 M sodium hydroxide solution using phenolphthalein solution as indicator. (Each ml of 0.1 M sodium hydroxide is equivalent to 0.01221 gm. of Benzoic acid). The results are shown in Table- 1.

### 2.3.2 Sodium Salicylate method:

Accurately weighed 0.2 gm. of benzoic acid bulk drug sample was transferred to a conical flask. After adding 20 ml of 2.0 M Sodium salicylate solution (which was previously neutralized to phenolphthalein solution) the flask was shaken for about 5 minutes to solubilize the drug and titrated with 0.1 M sodium hydroxide solution using phenolphthalein solution as indicator. (Each ml of 0.1 M sodium hydroxide is equivalent to 0.01221 gm. of benzoic acid). The results are shown in Table-1.

**TABLE -1**

#### **ANALYSIS DATA OF TITRIMETRIC ANALYSIS OF BENZOIC ACID BULK DRUG SAMPLE WITH STATISTICAL EVALUATION**

Amount of bulk drug sample taken (mg)	Method of analysis	Percent drug estimated (mean $\pm$ S.D.)	% Coefficient of variation	Standard error
1000	I.P.method	99.04 $\pm$ 1.331	1.344	0.768
200	S.B.method	98.42 $\pm$ 1.862	1.892	1.075
200	S.S.method	99.26 $\pm$ 0.862	0.868	0.498

I.P. Method - Indian pharmacopoeial method

S.B. Method- Sodium benzoate method

### 3. RESULTS AND DISCUSSION

Results of solubility studies of benzoic acid revealed that enhancement in solubility by 2.0 M sodium benzoate and 2.0 M sodium salicylate solution were more than 14-fold and 28-fold, respectively (as compared to solubility in distilled water).

It is evident from Table-1 that the percent benzoic acid estimated in bulk sample by Indian Pharmacopoeial method was  $99.04 \pm 1.331$ . In the proposed method of analysis, the amount of benzoic acid estimated by use of 2.0 M sodium benzoate and 2.0 M Sodium salicylate were  $98.42 \pm 1.862$  and  $99.26 \pm 0.862$ , respectively. The results of analysis by the proposed method are very close to the results of analysis by standard method (Indian Pharmacopoeial method). Validation of the proposed method is further confirmed statistically by low values of % coefficient of variation and standard error (Table-1).

### 4. CONCLUSION

It is, thus, concluded that the proposed method is new, simple, environment friendly, accurate and reproducible. The proposed methods can be successfully employed in the routine analysis of benzoic acid in bulk drug sample. There is a good scope for other poorly water-soluble drugs which may be tried to get solubilized by suitable hydrotropic agents to carry out their titrimetric analysis precluding the use of costlier and unsafe organic solvents.

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