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NON-AQUEOUS POTENTIOMETRIC ANALYSIS OF DRUG ACECLOFENAC IN BULK AND SINGLE COMPONENT PHARMACEUTICALS

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Abstract
Non-aqueous potentiometric analysis of drug aceclofenac in bulk and single component pharmaceuticals was worked out using the solvent isopropyl alcohol and the titrant KOH in isopropyl alcohol. The effect of solvent and concentration on potentiometric analysis of drug aceclofenac and its analysis in bulk and single component pharmaceuticals has been carried out using glass-calomel electrode pair. This method was observed to be simple, precise and produced results comparable to Indian Pharmacopoeia (I.P.) method.

Keywords
Non-aqueous, potentiometric, analysis, drug, aceclofenac

Introduction

Non-aqueous potentiometric analysis of different drugs using various electrode pairs was reported earlier1-6. Various methods are reported in the pharmacopoeias for the determination of drugs7-9. In literature, numbers of methods for the determination of drug aceclofenac are reported10-12. Its spectrophotometric and chromatographic analysis has been reported earlier by some workers13,14. Aceclofenac is distinctly acidic and due to its easy hydrolysis it could not be titrated directly with aqueous alkali. Also, the basic titrant is also superior to the alkoxide solvents, which are more susceptible to atmospheric moisture as well as carbondioxide. The aim of given work is to find out easy and simple method of analysis for pharmaceutical drugs. It will help to analyze raw materials and products for speedy check of spurious pharmaceutical drugs that are feared to penetrate the markets. In this paper, non-aqueous potentiometric analysis of drug aceclofenac in bulk and single component pharmaceuticals using the solvent isopropyl alcohol and the titrant KOH in isopropyl alcohol is reported. The effect of solvent and concentration on potentiometric analysis of drug aceclofenac has also been studied.

Results and Discussion

Effect of solvent and concentration on analysis of drug aceclofenac

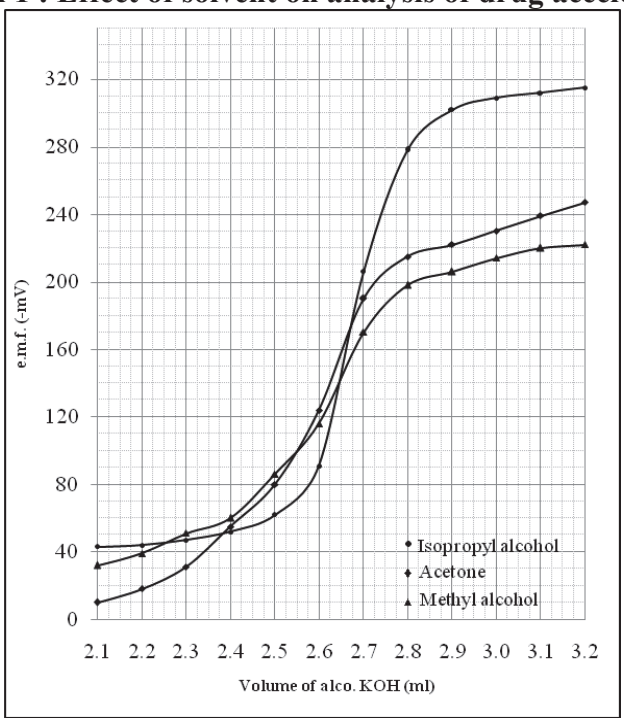
In this study, accuracy of results in non-aqueous potentiometric analysis of drug aceclofenac using different solvents was checked by performing titrations. The required volumes of stock solutions of drug aceclofenac in different solvents were diluted to 20 ml and separately titrated with KOH in isopropyl alcohol. It was observed that, accuracy of result in analysis of aceclofenac using solvent isopropyl alcohol is very good with minimum % error in comparison to other solvents **(Table 1).** The potentiometric break obtained using solvent acetone is smoother one as compared to methanol whereas using isopropyl alcohol it is much more pronounced and prominent with too much potential difference near the equivalence point **(Graph 1).** The dielectric constant of solvent isopropyl alcohol is smaller than solvents methanol and acetone. It permitted a large change in the solvated proton

concentration near end point. The solvent isopropyl alcohol can be purified and made anhydrous very easily as compared to other solvents.

Table 1 : Effect of solvent on analysis of dug aceclofenac

Solvent	Weight Titrated (mg) (±0.5%)	Weight Found (mg)	Error (%)
Acetone	7.0836	7.1206	+ 0.52
Methanol	7.0836	7.0629	– 0.29
Isopropyl alcohol	7.0836	7.1088	+ 0.35

Graph 1 : Effect of solvent on analysis of drug aceclofenac

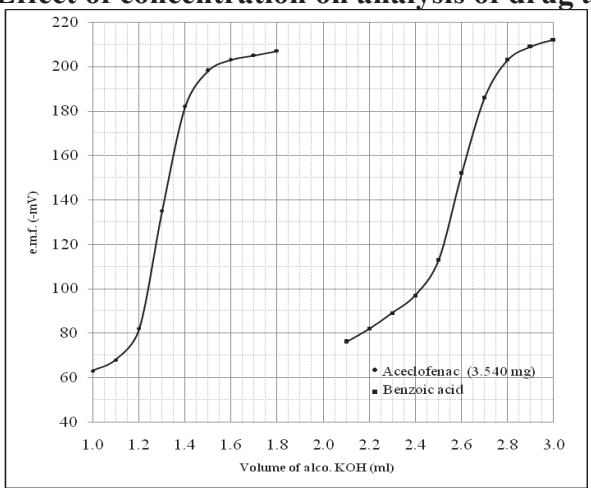


To study the effect of concentration and to determine the suitable concentration range which gives accurate results; different volumes of the stock solution of aceclofenac were diluted to 20 ml with isopropyl alcohol and separately titrated with KOH in isopropyl alcohol. It was observed that, potentiometric analysis gave an accuracy of ±0.7% for the entire range of 3.540 to 35.400 mg. The results obtained are good and more accurate than other methods with positive as well as negative errors **(Table 2).** The non-aqueous potentiometric analysis is observed to be better in respect of indicator error than the visual titration given in pharmacopoeias. The potentiometric breaks obtained are more pronounced **(Graph 2).** The mean, mean deviation and standard deviation values of effect of concentration on potentiometric analysis of aceclofenac are 19.470, 8.850, 10.167 (weight titrated); 19.474, 8.833, 10.167 (weight found) and 0.052, 0.254, 0.334 (% error) respectively.

Table 2 : Effect of concentration on analysis of drug aceclofenac

Weight Titrated (mg)	Weight Found (mg)	Error (%)
3.540	3.551	+ 0.31
7.080	7.102	+ 0.31
10.620	10.554	– 0.62
14.160	14.179	+ 0.13
17.700	17.823	+ 0.69
21.240	21.208	– 0.15
24.780	24.730	– 0.20
28.320	28.295	– 0.08
31.860	31.875	+ 0.04
35.400	35.432	+ 0.09

Graph 2 : Effect of concentration on analysis of drug aceclofenac



Analysis of drug aceclofenac in single component pharmaceuticals

The drug aceclofenac containing ten pharmaceuticals of the same batch were powdered. The required quantity of powder was weighed accurately, extracted with isopropyl alcohol and the volume was made to 100 ml. An aliquot of 10 ml of solution was diluted to 20 ml with isopropyl alcohol and titrated potentiometrically with KOH in isopropyl alcohol. The titrant was standardized potentiometrically using standard benzoic acid in isopropyl alcohol. The weight of aceclofenac present in single pharmaceutical was calculated. Same pharmaceutical was analyzed by I.P. method. The results obtained for three different brands of pharmaceuticals are tabulated and it is found that, the non-aqueous potentiometric analysis gives fairly accurate and comparable results to those obtained by I.P. method **(Table 3).** This method is better, accurate and simple than other methods reported in the literature. It is free from indicator error and interferences. The drug aceclofenac gets hydrolyzed in presence of aqueous alkali but it is avoided in non-aqueous medium. The common additives present in the pharmaceuticals are calcium carbonate, sugars, gum etc. and as these are insoluble in isopropyl alcohol do not affect the results.

Table 3 : Analysis of drug aceclofenac in single component pharmaceuticals

Sample	Label Claim (mg)	Weight Found (mg)	
		I.P. Method	Present Method
A	100.0	101.12	100.33
B	100.0	100.65	100.07
C	100.0	98.64	99.69

Experimental

Titrations were carried out by using potentiometer (EQ-602). The glass and calomel electrodes were used as indicator and reference electrode respectively. For weighing Precisa-310M (±0.001 g) balance was used. The chemicals and solvents used were of A.R. grade. The solvents were purified and made anhydrous using standard methods15,16. Care was taken to protect the titrant from atmospheric moisture and carbon dioxide. The drug aceclofenac used for present work was collected from pharmaceutical laboratories and it is included in pharmacopoeias7-9.

Effect of solvent and concentration on analysis of drug aceclofenac

To study the effect of solvent on non-aqueous potentiometric analysis of drug aceclofenac, its stock solutions (3.541 mg/ml, ±0.5%) were prepared by dissolving it in solvents acetone, methanol and isopropyl alcohol. After that 2 ml of these solutions were diluted to 20 ml with same solvents and titrated separately with KOH in isopropyl alcohol using glass-calomel electrode pair. To study the effect of concentration, stock solution of aceclofenac

(3.540 mg/ml) was prepared by dissolving it in isopropyl alcohol. Different volumes (1 to 10 ml) of the stock solution were diluted to 20 ml with isopropyl alcohol and titrated separately using KOH in isopropyl alcohol by adding titrant in lots of 0.1 ml with stirring using magnetic stirrer. After each addition, the potential developed across two electrodes was measured. To get the potential stabilized, waiting period of about 1 to 2 minutes was allowed. The addition was continued till 0.3 to 0.5 ml excess of titrant was added. At the end point readings were recorded for each addition of 0.02 ml of titrant. The end points were found by plotting the graphs of potential developed against the volume of the titrant.

Analysis of drug aceclofenac in single component pharmaceuticals

In this analysis, drug aceclofenac containing ten pharmaceuticals of the same batch were powdered. The powder containing 100 mg of the drug was weighed accurately, treated with 50 ml of isopropyl alcohol and stirred vigorously to dissolve the active components of drug. The common additives present in pharmaceuticals are calcium carbonate, sugars, gum etc. which are mostly insoluble in isopropyl alcohol. The solution was filtered, residue was washed two to three times with isopropyl alcohol and the volume of solution was made to 100 ml with isopropyl alcohol. An aliquot of 10 ml of solution was diluted to 20 ml with isopropyl alcohol and titrated potentiometrically with 0.1 M of solution of KOH in isopropyl alcohol using glass-calomel electrode pair. The titrant was standardized by potentiometrically with 0.1 M benzoic acid in isopropyl alcohol. The end points were determined by plotting graphs as described earlier; the amount of drug present in titrated weights of pharmaceutical powder was calculated. The amount of active component (drug) present in single pharmaceutical was calculated from the average weight. The same pharmaceuticals were then analyzed by method given in pharmacopoeias and results obtained were compared.

Conclusion

The drug aceclofenac was selected for present work. As it is distinctly acidic, it could not be titrated directly with aqueous alkali because to its easy hydrolysis. The non-aqueous potentiometric analysis of aceclofenac gave better results. The solvent isopropyl alcohol is found to be excellent for all titrations. The basic titrant, KOH in isopropyl alcohol was superior to the alkoxide solvents that are more susceptible to atmospheric moisture and carbondioxide. It gave better potentiometric breaks. The glass-calomel electrode pair gave stable potentials which were quickly attained. The potentiometric breaks obtained using this electrode pair were quite larger. In present work, method developed for analysis of acidic drug aceclofenac is simple, precise and it can be used in common laboratories without use of any sophisticated instrument.

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