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NOTE

Spectrophotometric Determination of Ascorbic Acid in Pharmaceutical Preparations

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Conditions were developed for the determination of ascorbic acid using tris(4,7-dihydroxy-1,10-phenanthroline) iron(III) as reagent. The method was applied to the determination of ascorbic acid in pure form and in pharmaceutical preparations. The method is sensitive (0.20 to 3.6 μg/mL of ascorbic acid) and rapid, and tolerates the presence of common ingredients.

Vitamin C is an important constituent in many pharmaceutical preparations. A number of methods have been proposed for the assay of ascorbic acid, based on its reducing property. Most of the reported indirect methods are based upon the reduction of iron(III)[1–3] or periodate[4, 5] or copper(II)[6, 7] by ascorbic acid to the corresponding reduced forms. The latter react with appropriate chromogenic reagents producing coloured species which are determined spectrophotometrically. The present paper describes a direct, simple, rapid and sensitive method for the determination of ascorbic acid using tris(4,7-dihydroxy-1,10-phenanthroline) iron(III) [$(DHP)_3$-iron(III)] as reagent. This method is successfully applied to the determination of ascorbic acid in pure form and in pharmaceutical preparations.

A Perkin-Elmer Lambda 15 UV/VIS Spectrophtometer was used for the absorbance measurements with matched cells of 1 cm path length. A digital pH meter (Dalal, India) was used to measure the pH values.

0.1 g of pure ascorbic acid was dissolved in 1000 mL of distilled water to obtain 100 μg/mL of solution. A working solution was prepared by appropriate dilution. 0.016% $(DHP)_3$-iron(III) solution was prepared as reported[8]. 0.1 M hydrochloric acid solution was prepared. Solutions of pharmaceutical preparations were prepared[4] and subsequently diluted to the working range.

Recommended procedure: Aliquots containing 5 to 90 μg of ascorbic acid were mixed with the 2 mL of $(DHP)_3$-iron(III) reagent. The pH of the solution was adjusted to 1 to 4 in over all 25 mL by adding requisite amount of dilute hydrochloric acid solution (0.1 M). A red coloured product having a λ_{max} at 525 nm was formed. The absorbance read against reagent as blank was found to be linear to the concentration of ascorbic acid.

The colour reaction between ascorbic acid and $(DHP)_3$-iron(III) was studied in solutions of different pH. According to the experimental results, the colour of

the formed product was stable upto 10 min in 1 to 4 pH medium. Attempts to use acetate-acetic acid buffer were not favourable. The red colour is probably due to the reduction of $(DHP)_3$-iron(III) complex by ascorbic acid to $(DHP)_3$-iron(II) complex. The results for the determination of ascorbic acid in pure form and in pharmaceutical preparations are shown in Table-1. The calculated molar absorptivity is found to be 2.4×10^4 l mol^{-1} cm^{-1} at 525 nm.

TABLE-1
DETERMINATION OF ASCORBIC ACID IN PHARMACEUTICAL PREPARATIONS

Ascorbic acid	Recovery		Coefficient of variation*
	Standrad method	Proposed method	
Pure form	99.68	99.72	(0.36)
Tablets			
Sample 1	99.84	99.88	(0.45)
Sample 2	98.44	98.94	(0.30)
Sample 3	101.05	101.16	(0.89)
Sample	100.25	100.04	(0.59)
Syrup			
Sample	100.6	99.42	(1.05)

*Values are obtained from five determinations for each product.

The usually associated ingredients such as chloride, bromide, tartarate, oxalate, citrate, thiamine, pyridoxine and cyanocobalamine do not interfere even in 1000-fold excess. 100-fold excess of reducing agents such as hydroxylamine, semicarbazide, hydrazine and glucose do not interfere with the determination. However, sulphide, sulphite, thiosulphate, iodide, iron(II), and ferrocyanide interfere seriously

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