

# Extractive Spectrophotometric Method for Determination of Carvedilol in Tablets

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**A sensitive and rapid extractive spectrophotometer method has been developed for the assay of carvedilol in pharmaceutical formulations. The method is based on the formation of a chloroform soluble ion-pair complex between carvedilol and bromocresol green in an acidic medium. The complex shows absorption maximum at 415 nm and the system obeys Beer's law in the concentration range of 5-25 µg/ml. The results obtained by the proposed method were validated statistically and by recovery studies.**

Carvedilol is chemically 1-(9H-carbazol-4-yloxy)-3-[[2-(2-methoxyphenoxy) ethyl]amino]-2-propanol<sup>1</sup>. It is a non-cardioselective beta-blocker and also has vasodilating properties that are attributed mainly to its blocking activity at alpha<sub>1</sub> receptors<sup>2</sup>. Carvedilol is official in European pharmacopoeia<sup>3</sup>.

The method is based on the formation of a chloroform soluble ion-pair complex between carvedilol and bromocresol green in an acidic solution<sup>4</sup>. The amino groups bind the proton more strongly than water molecules and that is the main driving force for the extraction. Different acids show very different degrees of extraction under similar conditions and hence extraction also depends upon the anion<sup>5</sup>.

Literature survey revealed that several methods such as spectrophotometry<sup>6-8</sup>, voltammetry<sup>9</sup> and HPLC<sup>10</sup> in biological samples for the drug have been reported. A new sensitive extractive spectrophotometric method was developed for the estimation of carvedilol in pharmaceutical dosage forms.

All spectral measurements were made on a Jasco spectrophotometer-V530 with a 1 cm matching quartz cell. All chemicals used were of analytical reagent grade. Standard solution of carvedilol was prepared by dissolving 12.5 mg of pure drug in methanol and diluting to 100 ml with methanol. A 20 ml aliquot of this solution was diluted to 50 ml with distilled water.

Twenty tablets were weighed and powdered. An amount of the powder equivalent to 12.5 mg of the drug was weighed, transferred into a 100 ml volumetric flask, dissolved and diluted to 100 ml with methanol. It was sonicated for ten minutes and filtered through Whatman filter paper No. 42. A 20 ml aliquot of the filtrate was pipetted out and diluted to 50 ml with water.

An aliquot of 10 ml each of the standard and sample preparation was transferred to 125 ml separating funnel followed by 2 ml 0.1 N HCl, 3 ml of bromocresol green solution and rest water to make the volume to 25 ml. The solution was extracted three times successively with 10, 5, 5 ml portions of chloroform and filtered through anhydrous sodium sulphate into 25 ml volumetric flask and diluted to 25 ml with chloroform. A reagent blank was prepared in a similar manner without adding the drug.

The absorbance of yellow coloured chromogen was measured at 415 nm against the reagent blank. The drug content of the formulation and recovery studies were conducted. The results of such studies are presented in Table 1. Carvedilol reacts with bromocresol green in acidic solution to give chloroform soluble yellow coloured ion-association complex, which exhibits an absorption maximum at 415 nm. The optimum reaction conditions for the quantitative determination of the ion-pair complex were established through a number of preliminary experiments.

The optimum concentration of the reagent was studied. It was observed that 3 ml of 0.05% bromocresol green solution was sufficient for maximum colour development of the complex. The effect of pH was studied by

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**TABLE 1: ASSAY AND RECOVERY OF CARVEDILOL**

Dosage form Tablet	Labeled Amount (mg)	*Amount found (mg)	*Percentage Recovery (%)	
A	12.5	12.36	98.86	99.45
B	12.5	12.35	98.78	99.40
C	12.5	12.54	100.35	100.65

Market samples of carvedilol in tablet dosage form used in this investigation were: A. Tablet Carloc, Label claim: Each film coated tablet contains 12.5 mg carvedilol. Manufactured and marketed by Cipla Ltd. Mumbai. B. Tablet Carvas, Label claim: Each film coated tablet contains 12.5 mg carvedilol. Manufactured and marketed by: Medley Laboratories Ltd. Mumbai. And C. Tablet Cardivas, Label claim: Each film coated tablet contains 12.5 mg carvedilol. Manufactured and marketed by: Sun Pharmaceuticals Ltd. Ahmedabad. \*Each value is an average of five readings.

extracting the coloured complex in presence of various acid solutions and buffers. The maximum and constant colour intensity was observed when 0.1 N HCl was used. Several organic solvents such as methylene dichloride, chloroform and carbon tetrachloride were tried for extraction of the coloured complex from the aqueous phase. However, chloroform was found to be the most suitable solvent. The absorbance of the complex was found to be stable for more than 12 h. The proposed method of determination of carvedilol shows molar absorptivity of  $1.8 \times 10^4$ . Linear regression of absorbance with concentration gave a correlation coefficient of 0.9995 and RSD was found to be less than two. The method developed in the present work was found to be sensitive, accurate, precise and reproducible and can be

used for routine determination of carvedilol in bulk and in dosage forms.

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