SPECTRAL CHARACTERISTICS OF ETHAMBUTOL–COPPER (II) ION COMPLEX AND ITS APPLICATION FOR QUANTITATIVE ANALYSIS

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ABSTRACT

Ethambutol dihydrochloride is a bacteriostatic antimicrobial agent used as a first-line defense against tuberculosis. Ethambutol acts as a chelating agent that disrupts one of several metal-containing enzyme systems in the nucleic acid structure of mycobacteria. Since ethambutol-copper (II) ion complex shows characteristic absorption, this chelating property can be used for quantitative analysis of ethambutol by complexation. The studies of the effect of pH and time on the complexation showed that the complex was formed immediately and stable with maximum absorption in UV region at 260 nm at pH 7. The stoichiometry of ethambutol-copper (II) ion complex, determined by Job's continuous variation method with UV spectrophotometry, was 1:2. The other spectral characteristic of the complex such as circular dichroism spectral property was also determined. Based on the UV spectral character of the complex, ion-pair reversed phase chromatographic methods were developed for quantitative analysis of ethambutol in pharmaceutical formulations. Chromatographic conditions, using C18 column and porous graphite carbon column, tetrahydrofuran as organic solvent, and sodium-1-octane sulphonate as an ion pairing agent, were optimized through the study of the effects of mobile phase composition, copper(II) ion and reagent concentrations, flow rate and column temperature.

Three simple, inexpensive, precise and accurate UV spectrophotometric and HPLC methods for determination of ethambutol in drug formulations were developed by complexation with copper (II) ion. Spectrophotometric, HPLC with C18 column and HPLC with graphite column methods showed linearity over the concentration range of 7.5–37.5, 6.0–250.0 and 3.0–90.0 μg/mL with correlation coefficient of 0.9998, 0.9999 and 0.9997, respectively. These methods were applied for quantitative analysis of ethambutol in tablets. It was found that there were no statistically significantly differences between the ethambutol amounts indicated by both HPLC methods (P = 0.01).

KEY WORDS: ETHAMBUTOL/ COPPER (II) ION/ COMPLEXATION/ UV/ HPLC/ GRAPHITE/ COMBINATION TABLETS

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