SHORT COMMUNICATIONS

Determination of Hostacycline and Doxycycline using Thorium (IV) as Spectrophotometric reagent

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A rapid, simple and sensitive method for the spectrophotometric determination of Hostacycline and Doxycycline is developed. The method is based on a fast colour reaction between these drugs and thorium (IV). This method has been successfully applied for determination of the metal as well as the drugs in pharmaceutical formulations.

HOSTACYCLINE (HTC) and Doxycycline (DC) belong to a group of antibiotics which are characterised by the formation of stable complexes with many metal ions[1,2,3]. So also recent reports on antibiotics suggest their wide use in modern agricultural production. Oxytetracycline, tetracycline, chlorotetracycline and doxycycline are used very frequently in veternary medicine, animal nutrition and as feed additives.[4] More than 60% of antibiotics used in Japan[5] for animal are tetracyclines. Hence, monitoring of tetracycline is an important aspect of animal medicine and nutrition.

A variety of techniques[6-9] have been developed to detect antibiotics especially in clinical samples. These methods are microbiological as well as non-microbiological. The chemical methods[10,11] available for the formation of these formulations are based on the formation of complexes with different metals. However, these methods suffer from various disadvantages like requirement of elevated temperatures, high acid concentrations and time consuming procedures. We have previously reported methods for the determination of various pharmaceutical formulations.[12-14]

Thorium (IV) is used as a spectrophotometric reagent for the determination of organic compounds.[15-18] There has been no reports on the determination of tetracyclines using thorium (IV) as a complexing metal. Hence an attempt has been made to develop a sensitive method for the determination of tetracyclines based on their colour reaction with thorium (IV).

Spectra and absorption measurements were made on a shimadzu-160 spectrophotometer. The pH measurements were made on an ELICO pH meter (Hyderabad). Reagents and samples employed in these studies are of analytical grade. Double distilled water is employed in these investigations for the preparation of solutions.

Three ml of the HTC solution, 10 ml of buffer solution of required pH and 2 ml of 0.01 M thorium (IV) solution were taken in a 25 ml volumetric flask, and the volume was made up with distilled water. A blank solution was prepared in a similar manner without the metal ion. The spectra are recorded at different pHs against the respective blank. The wavelength range used for this purpose is 350 - 450 nm. For quantitative studies a typical pH 4 was selected

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based on the nature of spectrum, stability and reproducibility.

The absorption spectra of HTC and thorium (IV) mixture solution were recorded in the pH range 3 to 9. On addition of thorium (IV) to the HTC solution an yellow colour was developed. The wavelength maximum was 398 nm at pH 3 and this value shifted with increase in pH. In solutions of pH 9 the λ max value was 415 nm, thus indicating a shift of 17 units in λmax. However the absorbance values decreased with increase in pH. This may be due to the dissociation of the complex at higher pH.

Absorbance measurements were made at 399 nm of solutions containing 2-16 x 10^{-4} M thorium (IV). A linear graph was obtained between the metal ion concentration and absorbance. This observation suggests that, thorium (IV) can be determined in the range 40 - 200 μg per ml.

Similar studies were performed with the Doxycycline - Thorium (IV) system. The detailed investigations were carried out pH 5 on this system and the λmax was found to be 398 nm. The metal ion concentration that could be determined using this drug is 30-100 μg per ml. The drug concentration that could be determined employing this method is in the range 0.01-0.08 mg per 25 ml. The colour formation in the case of both the drugs is almost immediate in the media used. It is further noticed that the complex is stable for over a period of 2 hrs. It is also observed that metal ions such as Mo (VI), U (VI), W (VI), Co (II), Ni (II) offer no interference in the determination of either the drugs or thorium (IV), even when they are present at 50 fold higher concentrations. Chloride, sulphate, nitrate, oxalate, acetate and fluoride present to the extent of 200 fold high concentrations do not interfere. The method has been successfully applied for samples containing tetracycline such as, resticline, idilin, linemette. The data is presented in the following table.

	Theoretical	Found	% Recovery
1. Resticline	500 mg	498 mg	99.6
2. Idilin	250 mg	245 mg	98.0
3. Linemette	500 mg	490 mg	98.0

In conclusion, a simple method was developed for the determination of tertracyclines, based on the colour reaction with thorium (IV) in acidic solutions. The range of determination of HTC and DC is 0.01 to 0.08 mg/25 ml in both the cases. Metal ion can also be determined in the range 30 to 100 μg/ml.

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Comparison of Individual Calibration Curve Method and Single Point Internal Standard Method in the Determination of Carbazole Alkaloids by GLC

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Quantitative determination of Carbazole alkaloids (from Crude plant extracts) was carried out by GLC using individual calibration curve method and a new single point internal standard method and the results compared.

GLYCOSMIS PENTAPHYLLA (family: rataceae), an Indian medicinal plant, has been reported to elaborate carbazole alkaloids[1,2]. This paper reports comparison of the two GLC methods reported earlier[3] to determine the concentration of the alkaloids.

A stock solution of 1mg.ml^{-1} in chloroform of each of the following carbazole alkaloids was prepared:

1. Carbazole
2. 3-Methylcarbazole
3. Glycozoline
4. Glycozolidine (internal standard)

Appropriate working concentrations were prepared by suitable dilutions of the stock solutions. Heptazolidine (1mg.ml^{-1}) in chloroform was used as internal standard. The plant extract (unknown solution) was prepared by first drawing a drop (23 mg) from the light petroleum extract with a clean glass rod into a sample bottle. This was then extracted with 5 ml of chloroform. The internal standard was added to the solutions prior to analysis (500 μg.ml^{-1}). All samples were chromatographed on a Pye Unicam Series 204 Gas Chromatograph equipped with Flame Ionization Detector (FID) and a temperature programmer. Calibration curve was prepared by spiking a range of concentration (0-50 μg.ml^{-1}) in increasing order of each of the standard solution with the internal standard and the peak-height ratios were used against concentrations to plot the curves.

In the case of single point internal standard, the following formula 4 [Cu = (Rux Cs)/Rs] was used.

Cu = Concentration of unknown (ug.ml^{-1})
Cs = Concentration of standard (ug.ml^{-1})
Ru = Peak-height ratio of substance in unknown solution
Rs = Peak-height ratio of substance in standard solution

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