Summary

The present thesis comprises three chapters:

Chapter (1)

Contains the introduction which includes two parts : the first part gives an idea about the drugs under consideration, a discussion about the definitions, actions, chemical structures and chemical names, characters of the studied drugs (Norfloxacin, Ciprofloxacin. and Ofloxacin) are also given. The second part involves a literature survey of the previous studies for the analysis of the studied drugs including spectrophotometric, UV/Vis spectrophotometric, capillary electrophoresis, high performance liquid chromatography (HPLC), electroanalytical and chromatographic methods, and oscillopolarographic titration methods. Chemical structures, chemical names and a literature survey of the acid dyes used Calcon carboxylic acid (Calc.), Eriochromeblack T (EBT) and Alizarin red S (Aliz.) .

Chapter (2)

Contains the experimental part which includes apparatus used for measurement, procedures for preparation of the drug solutions reagents and methods of some companies taken from different pharmacopoeia for determination of the studied drugs in pure forms or in the pharmaceutical forms which are analysed. It also contains the proposed spectrophotometric methods for determination of the drugs under

considerations in pure forms and in dosage forms. Also, it contains the official methods for analysis of the studied drugs.

Chapter (3)

Contains the results and discussion which include the spectrophotometric procedures for determination of the studied drugs using acid dyes reagents Calcon carboxylic acid (Calc.), Eriochromeblack T (EBT) and Alizarin red S (Aliz.) .

The proposed methods are based on coloured ion pair complex formation between the acid dyes and drugs which is extracted with an organic solvent (chloroform) in case of Eriochromeblack T (EBT), Alizarin red S (Aliz.) and Calconcarboxylic acid (Calc.), and determination of the concentration by measuring the absorbance of the extracted complex after dilution in acetone against a blank (acetone). The following experimental variables were investigated.

1 - Effect of pH.
2- Effect of shaking time.
3- Effect of the polarity of extracting solvent.
4- Effect of reagent concentration.
5- Molar ratio of the complex.
6- Suggested mechanism.
7-Interference.
8- Evaluation of the stability constants of the ion-pair complexes .

1- Using Calc.

Beer's law is obeyed within the concentration ranges (0.033 – 3.3 µg/ml) for norfloxacin , ciprofloxacin and ofloxacin in case of Calcon-carboxylic acid (Calc.), For more accurate results, the Ringbom optimum

concentration ranges were determined Molar absorptivity, Sandell sensitivity, detection and quantification limits are calculated. The stoichiometric ratios of the studied drugs with Calconcarboxylic acid (Calc.), are established using the mole ratio and continuous variation methods and was found to be 1: 1 ratio for all the drugs under consideration with Calc. In order to determine the accuracy and precision of the studied drugs sample solutions containing three different concentrations were prepared and analysed in six replicates. The recovery, relative standard deviation, relative error and confidence limits are calculated

The proposed methods can successfully be applied to determine the pure form of the studied drugs and in their dosage forms. The results obtained are compared statistically by student's t-value and variance ratio F-test with the official methods at 95% confidence level. The results showed that the t- and F-values are less than the critical value indicating that there is no significant difference between the proposed and official methods. Thus, the proposed spectrophotometric methods can be applied for the determination of the studied drugs in pure and dosage forms. Also the studied drugs were determined in urine samples and the results showed that no interferences occur between the studied drugs and urine can occur.

2- Using EBT

Beer's law is obeyed in the concentration ranges (0.11 – 2.65 µg/ml) for norfloxacin , ciprofloxacin and ofloxacin in case of Eriochromeblack T (EBT), For more accurate results, the Ringbom optimum concentration ranges are determined. Molar absorptivity, Sandell sensitivity, detection and quantification limits were calculated. The stoichiometric ratios of the studied drugs with (EBT) are established using the mole ratio and continuous variation methods and found to be

1:1 ratio for all the drugs under consideration with (EBT), In order to determine the accuracy and precision of the proposed methods, solutions containing three different concentrations of the studied drugs are prepared and analysed in six repiicates. The recovery, relative standard deviation, relative error and confidence limits are calculated.

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3- Using Aliz.

Beer's law is obeyed in the concentration ranges (0.17 – 3.3 µg/ml) for norfloxacin, for ciprofloxacin and ofloxacin in case of Alizarin red S (Aliz.), for more accurate results, the Ringbom optimum concentration ranges were determined. Molar absorptivity, Sandell sensitivity, detection and quantification limits are calculated. The stoichiometric ratios of the studied drugs with (Aliz.) are established using the mole ratio and continuous variation methods and found to be 1:1 ratio for all the drugs under consideration with (Aliz.). In order to determine the accuracy and precision of the proposed methods, solutions containing three different concentrations of the studied drugs were prepared and analysed in six replicates. The recovery, relative standard deviation, relative error and confidence limits are calculated. The proposed

methods can be successfully used to determine the pure and dosage forms of the studied drugs. The results obtained are compared statistically by student's t value and variance ratio F-test with the official methods at 95% confidence level. The results showed that the t- and F-values are less than the critical value indicating that there is no significant difference between the proposed and official methods. Thus, the proposed spectrophotometric, methods can be applied for the determination of the studied drugs in pure and in dosage forms. In addition, the studied drugs were determined in urine samples and the results showed that no interferences between the studied drugs and urine could occur.

4- Type of formed complex

Formation of some sort of ion pairs between the anion of one component and the cation of the other leads to appearance of new bands, attributed to the occurrence of a charge transfer between the two components of the ion pair ,this appear from the ionization potentials of the two components of the ion pair (CT complex), and to confirm this point, energy of charge transfer and electron affinity are calculated.

5- IR support

From IR spectra of the solid complexes in comparison to those of their components, we find that:-

1- γ_{CH} bands of the donor shifted to higher wave number and the other of the acceptor shifted to lower wave number.

2- C=O bands of the CT formed complexes shifted to lower wave number than that of drugs.

This reflects that the charge transfer interaction are from the reagent to the drug molecule and the donor center is

1- hydroxynaphthyl moiety of E.B.T.

2- benzene ring carrying the two hydroxyl group of Aliz.

3- Hydroxycarboxynaphthyl moiety of Calcon.

Acceptor center is

4- benzquinolone moiety of acceptor drugs

6- ESR support

The ESR spectra of the ion pair complexes gave obvious signals with g_{eff} at (2.149) and (1.9616). The signal has a rather broad appearance with doubled peaks, a behavior which is very identical to the ESR spectra of charge transfer complexes involving $\pi \rightarrow \pi^*$charge transfer interaction.