Simultaneous Spectrophotometric Estimation of Gatifloxacin and Ornidazole in Tablet Dosage Form

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Three simple, accurate and economic methods multicomponent, two wavelength and simultaneous equations using area under curve have been described for the simultaneous determination of gatifloxacin and ornidazole in tablet dosage form. Gatifloxacin shows absorption maximum at 287.5 nm and ornidazole shows absorption maximum at 319.5 nm in distilled water. Beer's law was obeyed in the concentration range of 2-20 µg/ml for gatifloxacin and 10-60 µg/ml for ornidazole. The methods allow rapid analysis of binary pharmaceutical formulation with accuracy. Results of analysis for three methods were validated statistically and by recovery studies and were found satisfactory.

Gatifloxacin (GF) and ornidazole (OZ) are available in the tablet dosage form in the ratio of 2:5. GF, a fluoroquinolone derivative has antibacterial activity1-3. OZ, a 5-nitroimidazole derivative has antiprotozoal and antiamoebic activity1-3. Literature survey revealed that, HPLC4-7 and UV8-11 methods for analysis of GF and OZ as single component systems have been reported. An attempt has been made to estimate GF and OZ simultaneously by spectrophotometric method.

A Shimadzu UV/Vis spectrophotometer, model 1601 was employed (spectral bandwidth of 2 nm) with a pair of 1 cm quartz cells. Standard gift samples of GF and OZ were obtained from Emcure Pharmaceuticals Ltd., Pune. Distilled water was used as solvent in the study. The stock solutions (100 µg/ml) of GF and OZ were prepared by dissolving accurately 10 mg of drug in double distilled water separately. The maximum absorbance of GF and OZ was obtained at 287.5 nm and 319.5 nm respectively. GF and OZ show linearity in the concentration range of 2-20 µg/ml and 10-60 µg/ml at their respective wavelength maxima.

For all three methods, same mixed standards in the linearity range for each drug in the ratio of 2:5 from 4-20 µg/ml of GF and 10-50 µg/ml of OZ were prepared by diluting appropriate volumes of standard stock solutions. The scanning of solutions of GF and OZ was carried out in the range of 400 to 200 nm.

For multicomponent analysis using inbuilt software of instrument, two sampling wavelengths 287.5 nm and 319.5 nm were selected for the estimation two drugs. The concentrations of mixed standard solutions were entered in the multicomponent mode. The absorbance spectra of mixed standards and sample solutions were measured at selected wavelengths as shown in fig.1. The instrument gives individual concentration of drug present in the sample solutions directly.

For estimation of one component by two-wavelength method, two wavelengths were selected, where the absorbances of other component were same. Therefore the difference in the absorbances in the mixed spectra at corresponding wavelengths will be directly proportional to the concentration of that component. For GF, 245.0 nm (λ1) and 356.0 nm (λ2) and for OZ, 267.0 nm (λ1) and 343.0 nm (λ2) were selected. All the mixed standards concentrations of mixed standard solutions were entered in the multicomponent mode. The absorbance spectra of mixed standards and sample solutions were measured at selected wavelengths as shown in fig.1. The instrument gives individual concentration of drug present in the sample solutions directly.

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were scanned at these selected wavelengths separately using quantitative mode of the instrument. The difference in the absorbance at selected wavelengths; \( \lambda_1 \) and \( \lambda_2 \) were plotted against the respective concentration to obtain the calibration curves. The sample solutions were scanned at selected wavelengths for GF and OZ. From the absorbance difference values, the concentration of each component was obtained from the calibration curves of the respective drugs.

In the simultaneous equation using AUC method, the ‘X’ values of each of the two drugs were determined at the selected wavelength ranges, 275.0 to 295.0 nm and 303.0 to 340.0 nm. The ‘X’ values were determined as, \( X = \) Area under curve of component (from 275.0 to 295.0 nm or 303.0 to 340.0 nm)/ concentration of the component in g/l ... (1). A set of two simultaneous equations framed using these ‘X’ values are as follows, \( A_1 = 1366.9C_1 + 290.0C_2 \) (2) and \( A_2 = 1189.3C_1 + 1112.5C_2 \) (3), where, \( C_1 \) and \( C_2 \) are the concentrations of GF and OZ, respectively in g/l in the sample solution; \( A_1 \) and \( A_2 \) are the area under curve of sample solutions at the wavelength range, 275.0 to 295.0 nm and 303.0 to 340.0 nm, respectively; 1366.9 and 290.0 are the ‘X’ values at 275.0 to 295.0 nm of GF and OZ, respectively, while 1189.3 and 1112.5 are the ‘X’ values at 303.0 to 340.0 nm, respectively. The ‘X’ values reported are the mean of six independent determinations. By applying Cramer’s rule and matrices in equations (2) and (3), concentrations \( C_1 \) and \( C_2 \) can be obtained.

Average weight of twenty tablets was determined and these tablets were crushed to fine powder. The powder sample equivalent to 10 mg of GF and 25 mg of OZ was weighed and transferred in 100 ml volumetric flask and dissolved in distilled water. The content was kept in ultrasonicator for 20 min. Finally the volume was made up to the mark with distilled water and filtered through Whatmann’s filter paper No. 41. The filtered solution was suitably diluted to obtain mixed standards in the Beer-Lambert’s range for each drug in the ratio of 2:5 from 4-20 \( \mu \)g/ml of GF and 10-50 \( \mu \)g/ml of OZ. Mixed sample solutions were scanned using proposed methods as discussed above and the results were obtained and reported in Table 1. Recovery studies were carried out at 80%, 100% and 120% level of the label claim. The percentage recovery of GF and OZ in the sample mixture were determined and reported in Table 1.

The coefficient of correlation was found to be 0.9996 for GF and 0.9985 for OZ. The results of tablet analysis and recovery studies obtained by proposed methods were validated by statistical evaluation. The percentage coefficient of variation for both drugs was found to be less than 2%. All the developed methods were found to be simple, rapid, precise, economical and accurate for routine simultaneous estimation of GF and OZ in tablet dosage form. The recovery was close to 100% indicating the reproducibility and accuracy of the methods. The multicomponent method is rapid and easy because it does not require manual calculations. The other methods like two wavelength and simultaneous equations using area under curve are simple and economical but require few simple calculations.

**ACKNOWLEDGEMENTS**

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**REFERENCES**


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**TABLE 1: RESULTS OF TABLET ANALYSIS**

<table>
<thead>
<tr>
<th>Method</th>
<th>Tablet sample</th>
<th>Label claim (mg/tab)</th>
<th>Label claim (%)</th>
<th>Standard deviation*</th>
<th>% mean recovery*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>GF(OZ)</td>
<td>GF(OZ)</td>
<td>GF(OZ)</td>
<td>GF(OZ)</td>
</tr>
<tr>
<td>A</td>
<td>T1</td>
<td>200(500)</td>
<td>99.92(100.36)</td>
<td>0.38(0.20)</td>
<td>100.54(100.30)</td>
</tr>
<tr>
<td></td>
<td>T2</td>
<td>200(500)</td>
<td>99.91(100.22)</td>
<td>0.60(0.36)</td>
<td>99.98(100.32)</td>
</tr>
<tr>
<td>B</td>
<td>T1</td>
<td>200(500)</td>
<td>99.63(99.57)</td>
<td>1.02(0.50)</td>
<td>100.05(99.86)</td>
</tr>
<tr>
<td></td>
<td>T2</td>
<td>200(500)</td>
<td>99.65(97.0)</td>
<td>1.28(0.56)</td>
<td>99.68(99.57)</td>
</tr>
<tr>
<td>C</td>
<td>T1</td>
<td>200(500)</td>
<td>99.86(99.90)</td>
<td>0.66(0.39)</td>
<td>100.02(99.96)</td>
</tr>
<tr>
<td></td>
<td>T2</td>
<td>200(500)</td>
<td>100.30(99.39)</td>
<td>1.18(0.63)</td>
<td>99.67(99.68)</td>
</tr>
</tbody>
</table>

A is multicomponent method, B is two-wavelength method and C is simultaneous equations using area under curve method. \( T_1 \) and \( T_2 \) are two different brands of tablet formulations. * denotes \( n = 6 \), average of six estimations. GF and OZ denotes gatifloxacin and ornidazole, respectively.
Saccharin is very sweet in dilute solution but is bitter in concentrated solution. It is used in place of sugar by diabetic patients and dieting persons. It is one of the widely used artificial sweeteners in some countries. It is about 400-500 times sweeter than sucrose. A number of methods for the determination of saccharin have been reported in literature, such as gas chromatography, thin layer chromatography, high performance liquid chromatography, ultraviolet spectrophotometry, infrared spectrophotometry, and flow injection analysis. This method is simple, sensitive, reproducible and free from interferences of common ions and ingredients commonly present in food and pharmaceutical products. The artificial sweetener is a weak bladder carcinogen and a cause of risk to humans and animals. It has been extensively used in medicines and in a variety of food products such as canned fruit juices, vegetables, cookies, bakery products, beverages, jams, jellies and salad dressings. It can be found in some medicines, foods, and soft drinks at levels of 5-110 parts per million. The method is based on bromination of saccharin to form N-bromo derivative, which on reaction with potassium iodide liberates iodine, imparting yellow colour to the solution. On addition of surfactant cetyl trimethyl ammonium bromide, the intensity of yellow colour increases, which on extraction gives maximum absorbance. The determination of saccharin is based on this principle. The method is sensitive and has been applied for the determination of saccharin in food and pharmaceutical products.


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