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# Spectrophotometric Determination of Lansoprazole and Domperidone in Capsule Formulation

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Two simple, sensitive and accurate spectrophotometric methods requiring no prior separations have been developed and validated for simultaneous estimation of lansoprazole and domperidone in pharmaceutical formulations. The methods employed are simultaneous equation method and second derivative method. The method **A** involves formation and solving of simultaneous equation using 287.0 and 294.2 nm as the wavelengths of detection. Method **B** is second derivative method in which 295.2 nm and 268.6 nm were used as wavelengths for estimation of drugs. Both the methods were validated statistically and recovery studies were carried out. Both the drugs obey Beer's law individually and in mixture within the concentration range of 5-50 µg/mL. Linearity for lansoprazole and domperidone were in the range of 24-36 and 8-12 µg/mL, respectively. The methods were found to be accurate, precise and specific and can be utilized for routine analysis of lansoprazole and domperidone from capsule formulation.

**Key Words: Lansoprazole, Domperidone, Simultaneous estimation, Spectrophotometery.**

## INTRODUCTION

Lansoprazole (LAN), chemically 2-[[[3-methyl-4-(2,2,2-trifluoroethoxy)-2-pyridinyl]methyl] sulfinyl]-1H-benzimidazole is a proton pump inhibitor and has been demonstrated to be effective in treatment of peptic ulcers, gastro esophageal reflux diseases and Zollinger Ellison syndrome[1,2]. It has been determined in biological samples and in pharmaceutical formulations by different methods like HPLC[3,4], HPTLC[5], spectrophotometry[6], LC-MS-MS[7], *etc*. Domperidone (DOM), 5-chloro-1-[1-[2,3-dihydro-2-oxo-1H-benzimidazole-1-yl]propyl]-4-piperidyl]-2,3-

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dihydro-lH-benzimidazol-2-one is a dopamine antagonist and indicated as antiemetic and antinauseant[8]. Several methods such as HPLC, HPTLC, spectrophotometry[9,10], titrimetry[8], *etc*. are reported in literature for determination of DOM in dosage form and in biological samples. A fixed dose combination containing LAN and DOM is available commercially in the market as capsule dosage form and is indicated in acid related disorders. This communication describes two simple spectrophotometric methods for simultaneous estimation of these drugs from their combined formulation.

## EXPERIMENTAL

Reference standard of LAN was obtained from Dr. Reddy's Laboratories Ltd., Medak and DOM was obtained from Aurobindo Pharma Ltd., Hyderabad. All the reagents/chemicals were of AR/spectroscopy grade. All the solutions were freshly prepared with double distilled water. Spectral and absorbance measurements were made with Shimadzu UV-2401 double beam spectrophotometer with 1 cm matched quartz cell.

Standard stock solution of LAN and DOM were prepared in a mixture of methanol and 0.1 M NaOH (70:30 v/v). The stock solutions were further diluted and mixed standard solutions were prepared containing 30 µg/mL of LAN and 10 µg/mL of DOM. The resulting solutions were scanned in the range of 400-200 nm. The UV absorption overlain zero order spectrum for LAN and DOM is depicted in Fig. 1.

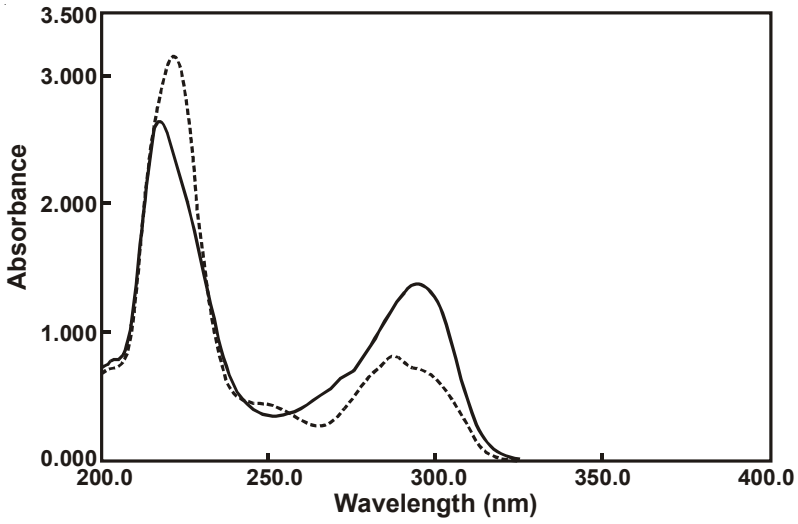


Fig. 1. UV absorption zero order overlain spectra of lansoprazole (—) and domperidone (-----)

In method **A**, wavelengths 287.0 and 294.2 nm ($\lambda_{max}$ of DOM and LAN, respectively) were selected for formation of simultaneous equation. The stock standard solutions were diluted to obtain concentration range of 10-100 µg/mL for each drug. The absorbances were recorded at selected wavelengths and calibration curves were plotted. Both the drugs obey Beer's law individually and in laboratory mixture within the concentration range 5-50 µg/mL. The absorptivity values (A 1 %, 1 cm) for each drug at both the wavelengths were determined. The concentration of drugs in laboratory mixture was determined by substituting the absorbance and absorptivity values in the following equation

$$Cx = A_2\, ay_1 - A_1\, ay_2/ax_2ay_1 - ax_1\, ay_2 \text{ and } Cy = A_1ax_2 - A_2\, ax_1/ay_1ax_2 - ay_2ax_1$$

where, Cx and Cy are the concentration of LAN and DOM respectively, $A_1$, and $A_2$ are the absorbance at 287.0 and 294.2 nm, respectively; $ax_1$ and $ax_2$ are absorptivities of LAN at 287.0 and 294.2 nm, respectively; $ay_1$ and $ay_2$ are absorptivity values of DOM at 287.0 and 294.2 nm, respectively.

Method **B** is based on second order derivative spectroscopy to overcome spectral interference from other drug. It was observed that simultaneous analysis is possible with second order derivative with $\Delta\lambda = 4$. The wavelengths selected for estimation of LAN and DOM by second derivative method were 295.2 nm showing zero $d^2A/d\lambda^2$ for DOM but significant $d^2A/d\lambda^2$ for LAN and 268.6 nm showing zero $d^2A/d\lambda^2$ for LAN but significant $d^2A/d\lambda^2$ for DOM, respectively. The stock standard solutions were diluted to obtain concentration range of 10-100 µg/mL for each drug. The absorbances were recorded at selected wavelengths and calibration curves were plotted. Both the drugs obey Beer's law individually and in laboratory mixture within the concentration range 5-50 µg/m1. 5 Laboratory mixtures (samples) and one as standard were prepared from stock solutions and absorbance of these solutions were measured at selected wavelengths. The % estimation of each drug was calculated using the following equation

$$\% \text{ Estimation} = A_s/A_{std} \times W_{std}/W_s \times 100$$

where, $A_s$ and $A_{std}$ are the absorbance of sample and standard respectively, $W_s$ and $W_{std}$ are the weight of sample and standard respectively.

For analysis of commercial formulation 20 capsules were weighed, contents removed and finely powdered. The capsule powder equivalent to 30 mg of LAN and 10 mg of DOM was weighed accurately and taken in a 100 mL volumetric flask. The contents were dissolved and volume made up to the mark. It was passed through 0.45 µ membrane filter. An aliquot of filtrate was pipetted and diluted appropriately to obtain a final concentration of 30 µg/m/ of LAN and 10 µg/m/ of DOM. The absorbances of these solutions were measured at 287.0 and 294.2 nm for method **A** and 268.6

and 295.2 nm for method **B**. The absorbance values were substituted in the respective equations to obtain concentration of each drug in capsule formulation.

## RESULTS AND DISCUSSION

The recovery studies were carried out at different level of concentration by spiking a known concentration of standard drug to the pre-analyzed sample and contents were reanalyzed by proposed methods. The results of marketed formulation analysis and recovery studies are depicted in Table-1. The methods were validated statistically as per ICH/USP guidelines for parameter like accuracy, precision, ruggedness, stability of analytical solution, linearity and range. Accuracy was ascertained on the basis of recovery studies. Precision was studied by analyzing 5 replicates of sample solution and concentrations were calculated. Ruggedness was established by carrying out experiment at different time within a day (intraday), different day (interday) and by different analyst. Stability of analytical solutions was ascertained by analyzing it periodically. Linearity and range were determined by analyzing 80-120 % of test concentrations of each drug.

TABLE-1
RESULTS OF COMMERCIAL SAMPLE ANALYSIS AND RECOVERY STUDY

| Method | Drug | Labeled drug (mg/cap) | Amount obtained (mg) | Drug obtained (%) | ± SD | Recovery (%) | ± SD |
|---|---|---|---|---|---|---|---|
| A | LAN | 30 | 29.89 | 99.65 | 0.7913 | 99.63 | 0.6318 |
| | DOM | 10 | 10.03 | 100.38 | 0.9802 | 99.81 | 0.7084 |
| B | LAN | 30 | 30.10 | 100.03 | 0.1727 | 99.64 | 0.8650 |
| | DOM | 10 | 10.00 | 100.26 | 0.4566 | 99.97 | 0.3025 |

The overlain spectra of LAN and DOM shows substantial overlap over the wavelength range 400-200 nm. Hence, it was thought necessary to develop a derivative method of analysis as derivative method overcomes the interference due to spectral overlap by selecting a suitable order of derivatization. Second order derivative with $\Delta\lambda = 4$ was found suitable for simultaneous analysis of drugs. The wavelengths selected for estimation of LAN and DOM by this method was 295.2 and 268.6 nm, respectively (Fig. 2). The proposed method was successfully used to estimate LAN and DOM in marketed capsule formulation. The assay value was in good agreements with the corresponding labeled claim. The recovery study shows accuracy of the method. On observing the validation parameters both the

methods were found to be accurate, precise and specific. Hence the methods can be employed for routine analysis of capsule containing LAN and DOM.

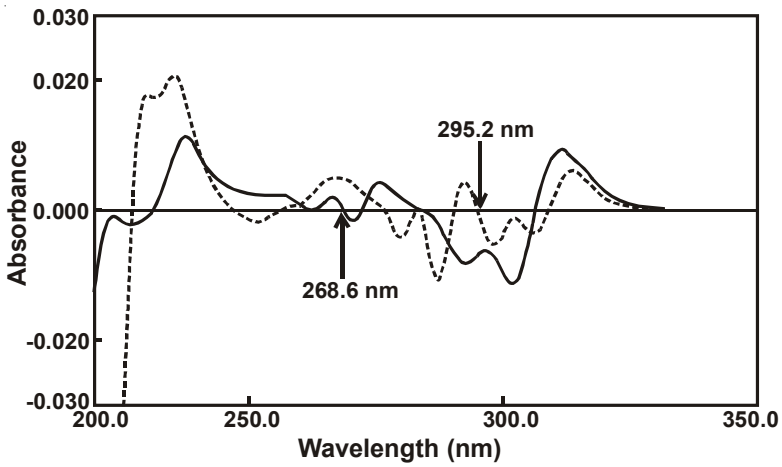


Fig. 2. UV absorption second derivative spectra of lansoprazole (—) and domperidone (-----)

## REFERENCES

1. S.C. Sweetman, Martindale, The Complete Drug Reference, Pharmaceutical Press, edn. 33, p. 1224 (2002).
2. The United States Pharmacopoeia XXVI, Asian Edn., US Pharmacopoeial Convention, Rockville, MD, p. 2972 (2003).
3. T. Unoa, F.N. Yasui, T. Takahata, K. Sugawara and T. Tateishi, *J. Chromatogr. B. Anal. Technol. Biomed. Life Sci.*, **816**, 309 (2005).
4. A. Avgerions, T. Karida, C. Potsides and S. Axarlis, *Eur. J. Drug Metab. Pharmacokinet.*, **23**, 329 (1998).
5. K.K. Pandya, V.D. Mody, M.C. Satia, A. Mody, R.K. Mody, B.K. Chakravarthy and T.P. Gandhi, *J. Chromotogr., B. Biomed. Sci. Appl.*, **693**, 199 (1997).
6. A.A. Wahbi, A.R. Omatna, A. Azzig, M. Hada and S.M. Matwa, *J. Pharm. Biomed. Anal.*, **30**, 1133 (2002).
7. H. Celso, E.B.A. Rafael, A. Edurado, D.M. Gustavo, R.S. Debora, N. Gilberto, *J. Chromato. B*, **783**, 453 (2003).
8. British Pharmacopoeia, Addendum, British Pharmacopoeia Commission Office, p. 1767 (1996).
9. C. Vinodhini, V. Vaidhyalingam, A. Ajithadas and A. Shantha, *Indian Drugs*, **39**, 491 (2002).
10. A.S. Amin and G.S. Ragab, *Anal. Sci.*, **19**, 745 (2003).

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