A Comparative Study of Spectrophotometric Methods Versus Chemometric Methods; An Application on a Pharmaceutical Binary Mixture of Ofloxacin and Dexamethasone

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Abstract:

Aim: To conduct a comparative study between the smart novel ratio difference spectrophotometric method (RDSM) versus four spectrophotometric methods: first derivative spectrophotometry (D1), first derivative of the ratio spectra (1DD), isoabsorpative point (Aiso), ratio subtraction (RS), and two chemometric techniques based on principal component regression (PCR) and partial least-squares (PLS-1) for the determination of a binary mixture of Ofloxacin (OFX) and Dexamethasone (DXM). Study Design: The results obtained from the proposed methods were statistically compared to the reported HPLC method using student□s t-test, F-test and One way ANOVA. Methodology: (OFX) was determined by the application of direct spectrophotometry, by measuring its zero-order (D0) absorption spectra at its □max = 296.6 nm. (DXM) was determined by (D1) at 227.1 nm. By applying (1DD), (DXM) was determined at 237.3. The total concentration of both (OFX + DXM) was determined at their isoabsorpative point □iso= 238.3 nm, then the concentration of (DXM) in mixtures were calculated by subtraction. (DXM) was determined using the (RS) method at its □max = 239 nm. (DXM) was determined using (RDSM) by measuring amplitude difference at two selected wavelengths (248.4 and 290 nm). A concentration of 10 □g.mL□1 of OFX was used as a divisor. The linearity range was found to be (1-10 □g.mL□1) and (2-14 □g.mL□1) for OFX and DXM respectively. Results: The recovery percentage for OFX was found to be 100.07 ± 0.65 and for DXM was found to be 100.41 ± 0.84, 100.15 ± 0.97, 100.14 ± 0.91, 100.54 ± 0.75 and 100.11 ± 0.66 for the five methods, respectively. Conclusion: The novel method showed advantages over the other proposed methods regarding simplicity, minimal data manipulation and maximum reproducibility and robustness; which enabled the analysis of binary mixtures with overlapped spectra for routine quality control testing with quite satisfactory and in lower cost.

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