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Research Article

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Unique UV spectrophotometric method for reckoning of dapagliflozin in bulk and pharmaceutical dosage forms

[1]Karuna Priya Chitra*, [2]M. China Eswaraiah and M. V. Basaveswara Rao

[1]Center for Research Studies, Krishauniversity, Machilipatnam
[2]Department of Pharmaceutics, Anurag Pharmacy College, Ananthagiri (V), Kodad (M), Nalgonda (Dt), Andhra Pradesh, India
[3]Special Officer, Krishna University, Dr. MRAR Campus, Nuzvid

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ABSTRACT

Dapagliflozin (DAP) is indicated for the management of diabetes mellitus Type 2, and functions to improve glycemic control in adults when combined with diet and exercise1. DAP is an inhibitor of sodium-glucose cotransporter 2 (SGLT2) responsible for the majority of the reabsorption of filtered glucose from the tubular lumen. By inhibiting SGLT2, DAP reduces reabsorption of filtered glucose and lowers the renal threshold for glucose, and thereby increases urinary glucose excretion2. In present work, a selective, specific, sensitive and economical UV spectroscopic method has been developed for the estimation of Dapagliflozin in Bulk and its pharmaceutical dosage forms. An absorption maximum was found to be at 233.65 nm. Dapagliflozin obeyed Beer's law in the concentration range from 10-35 µg / ml. Proposed method was validated according to ICH guidelines and values of accuracy, precision and other statistical analysis were found to be in good accordance with the prescribed values with correlation coefficient of 0.9998. The percentage recovery of Dapagliflozin ranged from 99.7 in pharmaceutical dosage form. Results of the analysis for accuracy, precision, LOD, LOQ and were found to be satisfactory. The proposed method is simple, rapid and suitable for the routine quality control analysis.

Key words: Dapagliflozin, UV spectrophotometry, Tablets, estimation.

INTRODUCTION

Dapagliflozin (BMS-512148) is a potent, competitive, reversible, highly selective and orally active inhibitor of the human sodium-glucose co-transporter 2 (SGLT2), the major transporter responsible for the renal glucose reabsorption. It improves glycaemic control in patients with T2DM by reducing renal glucose reabsorption leading to urinary glucose excretion (glucuresis). The chemical structure of Dapagliflozin is shown Fig-1.

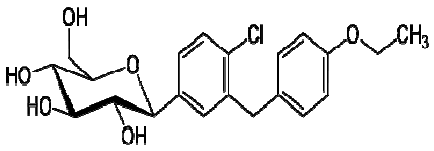

Fig-1: Chemical structure of Dapagliflozin

Dapagliflozin is soluble in Organic Solvents such as ethanol,DMSO, and Dimethyl formamide. The Solubility of Dapagliflozin in these sovents is 30mg/ml[3]. Literature survey reveals that few analytical methods were reported like liquid chromatography-mass spectrometry method in biological fluids, reversed-phase high-performance liquid chromatography (RP-HPLC) methods and spectrophotometric methods in alone or in combination with other drugs in pharmaceutical dosage forms.[5]. To the best of our knowledge, there is less significant work in the literature reported about the Spectrophotometric method for the analysis of Dapagliflozin in bulk and Pharmaceutical Dosage Form[6]. Therefore, it was thought worth wile to carry out Spectrophotometric estimation.

EXPERIMENTAL SECTION

Instrumentation

Spectrophotometer used was Double beam UV- Visible spectrophotometer with 10mm matched quartz cell Model-UV-1700 PHARMASPEC**.** Make – shimadzu, Japan and Analytical balance: shimadzu, Japan AX 200.

Chemicals and reagents

Dapagliflozin Purchased from Shanghai Send Pharmaceutical Technology Co.,Ltd, No.300 ChuanTu Rd, Pudong Area, Shanghai 201202, China. All the reagents and chemicals used were of Analytical grade.

METHOD DEVELOPMENT

Preparation of standard stock solution and calibration curve:

Standard stock solution of Dapagliflozin 100µg /ml was prepared using a mixture of 1:1 solution of Ethanol: Phosphate Buffer Solution (Ph 7.2) to attain maximum solubility.

From this stock solution, appropriate dilution was made and scanned in the uv range 200-400 nm against the blank. The absorbance of Dapagliflozin was found to be 233.65nm. Aliquots in the range of 10-35 µg /ml were prepared with the same solvent and scanned under Photometric mode for Absorbance at 233.65 nm. A calibration curve was plotted taking an absorbance on Y-axis against concentration of standard solution on X-axis . The method was applied for Test sample solution and was found to be satisfactory for the analysis of Tablet dosage forms.

METHOD VALIDATION[4]

The method was validated for different parameters like Linearity, Accuracy and Precision.

Linearity:

Fresh aliquots were prepared from the stock solution (100µg/ml) ranging from 10-35 µg/ml. The samples were scanned in UV-Visible spectrophotometer. It was found that the selected drug shows linearity in the range of 10-35µg/ml.

Accuracy:

Accuracy of the method confirmed by studying recovery at 3 different concentrations for 80, 100, and 120% of these expected, in accordance with ICH guidelines, by replicate analysis. Standard drug solution was added to a pre analyzed sample solution and percentage drug content was measured. The results from study of accuracy were reported . %Recovery = [(ct –cu)/ ca] × 100. Where ct is the total conc. of the analyte found; cu is the conc. of the analyte present in formulation; and ca is the conc. of the pure analyte added to the formulation.

Precision:

Precision (intra-day precision) of the method was evaluated by carrying out the five independent test samples of Irbesartan. The intermediate precision (inter-day precision) of the method was also evaluated using two different analyst, and different days in the same laboratory. The percent relative standard deviation (%RSD) and assay values obtained by two analysts were found to be good .

RESULTS AND DISCUSSION

From the optical characteristics of the proposed method, Dapagliflozin was shown its λ max at 233.65 nm in the solvent mixture with a good correlation coefficient 0.9998. The percentage purity and relative standard deviation from the Assay of the tablet dosage forms were found to be within the limits. The accuracy data of the drug was

shown good percentage recovery and %RSD with the range of 99.4 -101.2 and 0.2-0.4 respectively. The Inter-day and Intra-day precision values were found to be 0.81 and 0.63 respectively.

Table-1. Optical characteristics of the proposed method

Parameter	Value
Absorption Maxima(nm)	233.65nm
Beers Law Limit(µg/ml)	10-35 µg/ml
Correlation coefficient(r)	0.9998
Regression Equation(Y=mx+c)	Y=0.0686x-0.1062
Slope (m)	0.0341
Intercept (c)	0.1042
Standard Deviation	0.0064
LOD (µg/ml)	1.24
LOQ (µg/ml)	3.62

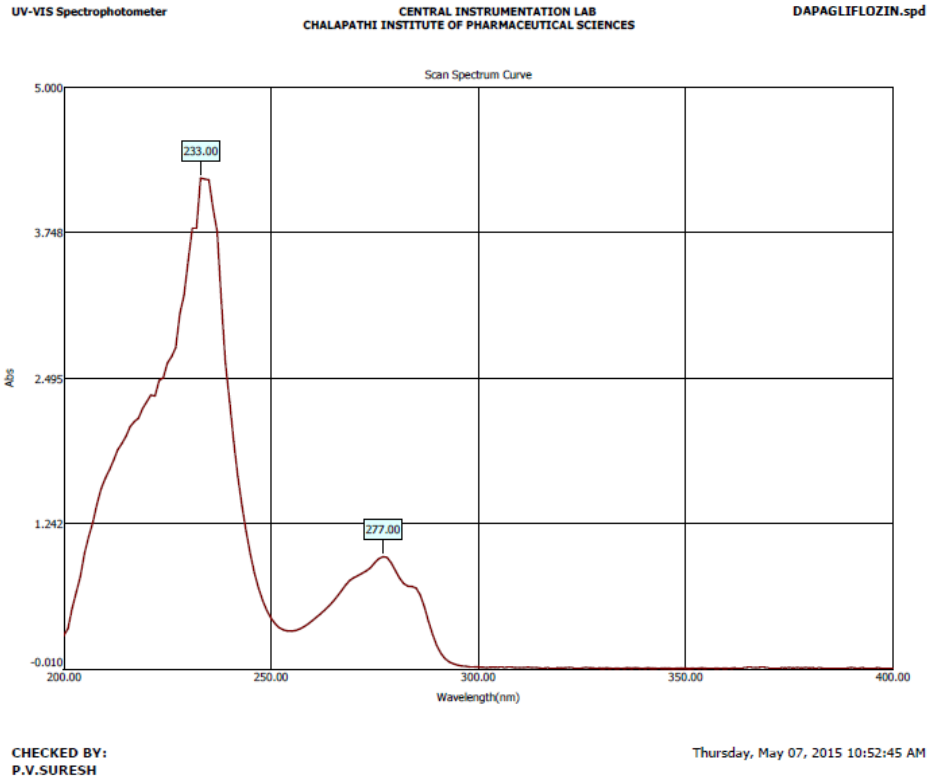

Figure 2: UV Spectrum of Dapagliflozin

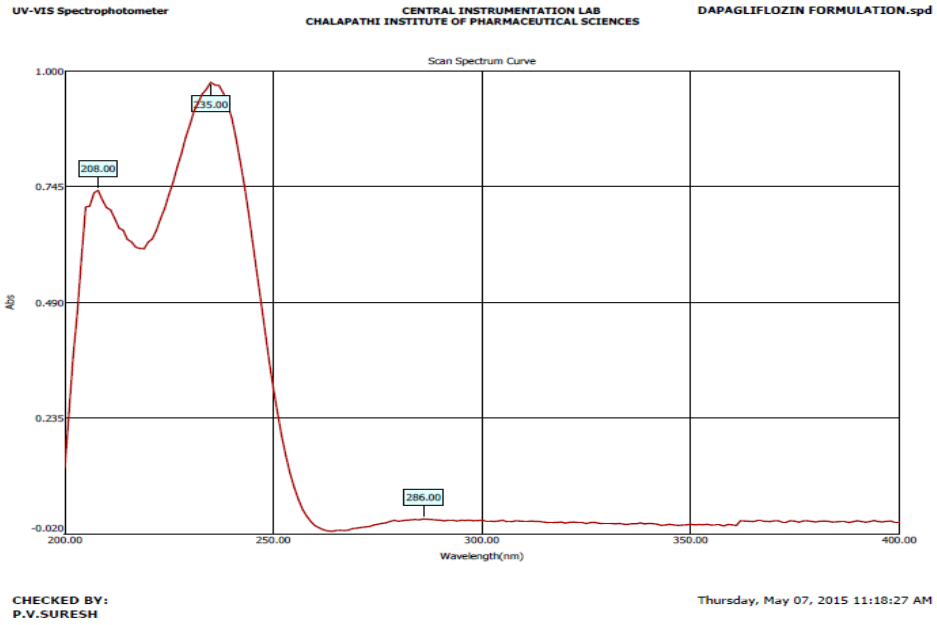

Figure 3: UV Spectrum of Dapagliflozin

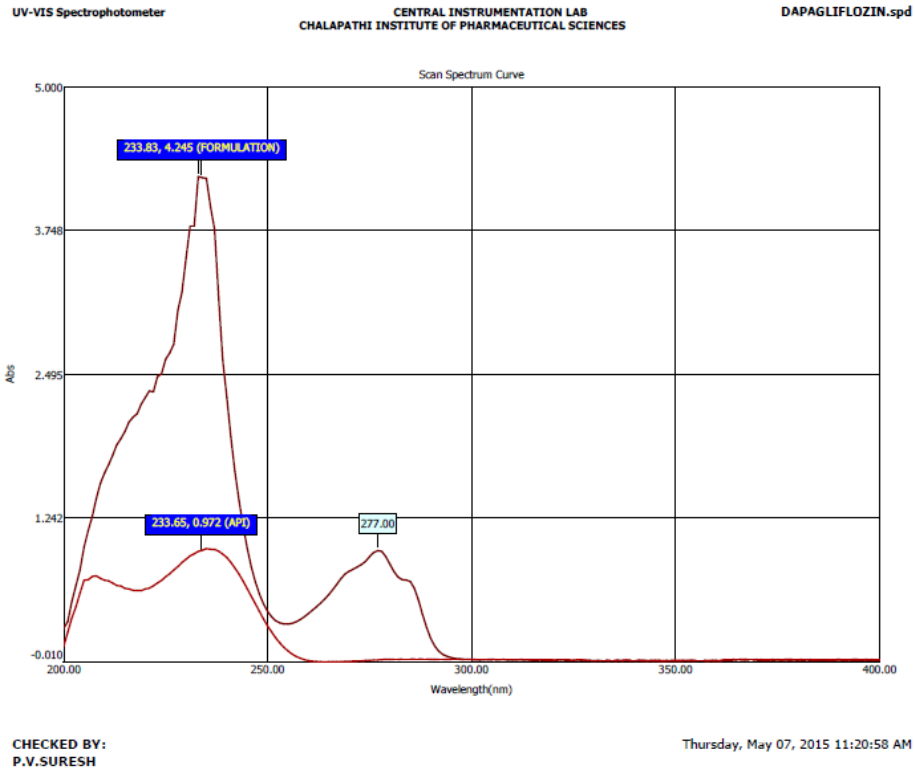

Figure 3: UV Spectrum of Combined (API+Formulation)

Table -2 Assay of Dapagliflozin tablets

Dosage form	Label claim (mg)	Amount found* ± SD
Forxiga	5	5.03 ± 0.062

** An average of three samples for each concentration.*

Table -3 Accuracy data of the drug

Sample ID	Concentration µg /ml		(%)Recovery* ± S.D	RSD (%)
	Pure Drug drug	Formulation		
80%	80	100	101.2±0.308	0.305
100%	100	100	99.4±0.387	0.408
120%	120	100	99.8±0.234	0.236

** An average of three samples of each concentration*

Table -4 Precision of the Dapagliflozin working standards

Assay of Dapagliflozin as percent of labeled amount		
Sample no	Intra-day precision	Inter-day precision
1	99.78	100.32
2	101.52	101.32
3	100.36	99.88
4	101.24	100.22
5	99.87	99.98
Mean	100.54	100.34
%RSD	0.79	0.57

CONCLUSION

The proposed method for the estimation of Dapagliflozin was found to be simple, sensitive and reliable with good precision and accuracy. The method is specific while estimating the commercial formulations without interference of excipients and other additives.

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