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Colorimetric estimation of few pharmaceutical agents miglitol, carvedilol and alverine citrate in pure and tablet dosage forms using MBTH

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ABSTRACT

The objective of the present work is to develop simple, precise and accurate colorimetric methods for the estimation of miglitol (MIG), carvedilol (CRV) and alverine citrate (ALV) using MBTH reagent. The method was developed on Perkin Elmer LAMBDA 25 UV-VIS spectrophotometer with 1cm quartz cells. MBTH (3-methyl benzothiazolin-2-one-hydrazone), in the presence of acidified ferric chloride for MIG and CRV; ceric ammonium sulphate for ALV undergoes oxidative coupling and forms electrophilic intermediate; active coupling species. The drugs reacts with the active coupling species to give greenish blue coloured solution with maximum absorbance measured at 623 nm for MIG; 635 nm for ALV, blue coloured solution monitored at 561 nm for CRV. The order of addition followed is CRV followed by oxidizing agent and MBTH and MIG/ALV followed by MBTH and oxidizing agent. The linearity was assessed and found to be in 10-30 µg/mL for MIG, 20-100 µg/mL for CRV and 50-250 µg/mL for ALV, respectively. The colorimetric methods were extensively validated as per ICH guidelines and all the parameters were within the acceptance criteria with correlation of 0.999 and percentage RSD less than 2 for all the three methods. The methods were proved to be more accurate, simple, precise and rapid by statistical analysis.

Key words: Miglitol (MIG), carvedilol (CRV), alverine citrate (ALV), MBTH (3-methyl benzothiazolin-2-one-hydrazone), ferric chloride and ceric ammonium sulphate (CAS).

INTRODUCTION

Miglitol, chemically is ((2R,3R,4R,5S)-1-(2-hydroxyethyl)-2-(hydroxymethyl) piperidine-3,4,5-triol, used in curing type II diabetes mellitus. Carvedilol is chemically known as (±)-[3-(9H-carbazol-4-yloxy)-2-hydroxypropyl][2-(2-methoxyphenoxy)ethyl]amine, a nonselective beta-adrenoreceptor blocking agent used in the treatment of hypertension

Literature survey of these drugs revealed that there are methods for the determination of MIG^[1-3], CRV^[4-14] and ALV^[15-17] by LC and spectrophotometry. The purpose of this work is to develop a method in economic point of view and for regular analysis. Effort was put to develop a novel, simple, rapid, economic, precise, efficient colorimetric methods for quantitative analysis of miglitol, carvedilol and alverine citrate and to validate the methods according to ICH guidelines.

MATERIALS AND METHODS**Equipment**

Double-beam Perkin Elmer (LAMBDA 25) UV-Vis spectrophotometer was used for spectral measurements and ELICO pH meter was used for pH measurements.

Reagents and standards

MIG, CRV and ALV were obtained as a gift sample from Aurobindo pharma Ltd, Hyd., methanol, Triple distilled water 3-Methyl-2-Benzothiazolinone Hydrazone (MBTH), Ferric chloride solution and ceric ammonium sulphate were used for the experimental work. **Preparation of solutions**

Preparation of standard solution of MIG

50 mg of MIG was weighed and transferred to a 50 ml volumetric flask, dissolved in 25 ml of water and diluted to volume with the same. The resulting solution has a concentration of 1mg/ml. Working standard solutions of 100 µg/mL were further prepared using stock solution.

Preparation of stock solutions for estimation of CRV

50 mg of carvedilol was weighed and transferred to a 50 ml volumetric flask, dissolved in 25 ml of methanol and diluted to volume with the same. The resulting solution has a concentration of 1mg/ml. Working standard solution was further prepared using stock solution.

Preparation of standard solution of ALV

50 mg of ALV was weighed and transferred to a 50 ml volumetric flask, dissolved in 25 ml of methanol and diluted to volume with the same. The resulting solution has a concentration of 1mg/ml. Working standard solution of 10µg/mL was further prepared using stock solution.

Preparation of 0.3% MBTH

300 mg of MBTH was dissolved in distilled water and made to 100 mL.

Preparation of 0.5% MBTH

500mg of MBTH was dissolved in distilled water and made to 100mL.

Preparation of MBTH (0.2%):

200 mg of MBTH was dissolved in distilled water and made up to 100 ml with distilled water.

Preparation of 0.5% FeCl₃:

500 mg of ferric chloride was dissolved in 0.1N HCl and made to 100 mL

Preparation of FeCl₃ solution (0.3%):

300 mg of ferric chloride was dissolved in distilled water and made up to 100ml with distilled water.

Preparation of 0.1M Ceric Ammonium Sulphate

6.5 g of ceric ammonium sulphate was weighed and transferred into a 100 mL volumetric flask, 3 mL of sulphuric acid as added and mixed well and diluted upto the mark with distilled water.

Procedure for MIG with MBTH: Aliquotes of MIG was transferred into a series of clean 10 ml volumetric flask., 2 ml of MBTH and 2.5 ml of FeCl₃ were added mixed well and made to volume with water. The absorbance of the resulting solutions was measured at 623 nm.

Procedure for CRV with MBTH: Aliquotes of CRV was transferred into a series of clean 10 ml volumetric flask, 1 ml of MBTH and 1 ml of FeCl₃ were added mixed well and made to volume with water. The absorbance of the resulting solution was measured at 561 nm.

Procedure for ALV with MBTH

Aliquotes of ALV was transferred into a series of clean 10 ml volumetric flask, 1 ml of MBTH and 1 ml of ceric ammonium sulphate was added mixed well and made to volume with water. The absorbance of the resulting solutions was measured at 635 nm.

RESULTS AND DISCUSSION

Method development

The method was optimised by selecting order of addition, the proper concentration of the reagent, the selection of the wavelength, stability of the coloured product and the effect of temperature. The parameters were mentioned in table 1.

Table 1 Order of addition and concentration of reagents

MIG + 2 mL (0.3% w/v) MBTH + 2.5 ml (0.3%) w/v FeCl ₃
CRV + 1 mL (0.2 % w/v) MBTH + 1 ml (0.3%) w/v FeCl ₃
ALV + 1 ml (0.5% w/v) MBTH + 1 ml (0.1M) Cerric Ammonium Sulphate

Method of validation

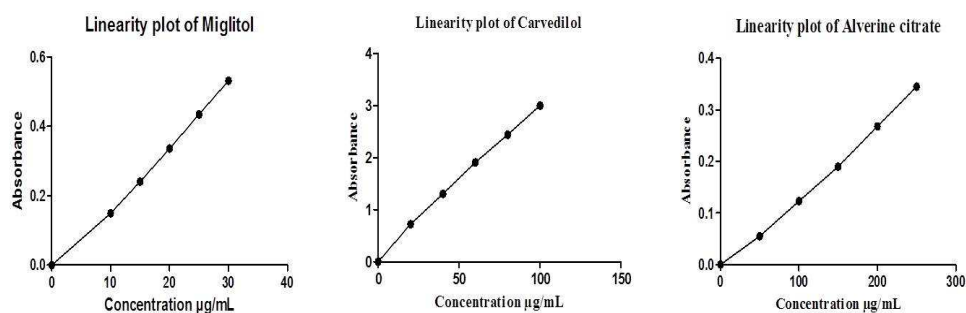
MIG, CRV and ALV were validated for accuracy, precision, linearity, LOD, LOQ, ruggedness and robustness and the results were found to be satisfactory. Regression parameters were presented in table 2.

Table-2 Optical and regression parameters of MIG,CRV and ALV.

Parameters	MIG	CRV	ALV
Beer's law range ($\mu\text{g/mL}$)	10-30	20-100	50-250
Molar extinction coefficient ($\text{L.mole}^{-1}.\text{cm}^{-1}$)	0.81	0.78	0.026
Sandell's sensitivity ($\mu\text{g/cm}^2/0.001$ absorbance unit)	0.02	0.06	0.15
LOD, $\mu\text{g/mL}$	0.28	6.516	24.42
LOQ, $\mu\text{g/mL}$	1.12	19.7	74.6
Slope(m)	0.018	0.03028	0.0013
Intercept(b)	-0.015	0.10009	0.0061
Correlation coefficient(r)	0.9998	0.9997	0.9996
% RSD	0.51	1.22	0.46

Linearity and range

Linearity was assessed by performing single measurement at several analyte concentrations of MIG, CRV and ALV and showed good correlation between concentration range of 10-30 $\mu\text{g/mL}$ for MIG, 20-100 $\mu\text{g/mL}$ for CRV and 50-250 $\mu\text{g/mL}$ for ALV, respectively. The results were reported in table 3 and shown in fig. 1.

Fig.1 Linearity plot for the developed methods**Table 3. Linearity of MIG, CRV and ALV**

MIG		CRV		ALV	
Conc.($\mu\text{g/mL}$)	Absorbance	Conc.($\mu\text{g/mL}$)	Absorbance	Conc.($\mu\text{g/mL}$)	Absorbance
10	0.1496	20	0.722	50	0.0550
15	0.2408	40	1.306	100	0.1230
20	0.3385	60	1.910	150	0.1900
25	0.4345	80	2.44	200	0.2680
30	0.5312	100	2.896	250	0.3452

Precision

Precision of the method was determined by repeatability. Absorbances of the solution prepared was measured and % RSD was calculated and reported in table 4.

TABLE 4. Results showing Precision of Carvedilol

Parameter	MIG		CRV		ALV	
	Inter day*	Intra day*	Inter day*	Intra day*	Inter day*	Intra day*
Conc, µg/mL	20		60		150	
Mean abs	0.337	0.1385	1.324	1.332	0.190	0.192
SD	0.51		0.0065		0.00054	
% RSD	0.50		0.49		0.46	

*Mean of six determinations

Robustness

Robustness study was checked by making small change in the optimized parameters and the % RSD was found to be < 2.

Ruggedness

System to system/ analyst to analyst/ variability study was conducted on different colorimeters and the results were satisfactory.

Limit of detection (LOD) and limit of quantification (LOQ)

LOD and LOQ were determined by analyzing progressively lower concentrations of standard solution using optimized conditions and the results were given in table-2.

CONCLUSION

The proposed colorimetric methods were simple and sensitive with reasonable precision, accuracy and constitute better alternative to the existing ones for the determination of MIG, CRV and ALV in bulk and pharmaceutical formulation.

REFERENCES

- [1] Telny TC, Padmanabha R, Devanna N, *Res. J. Pharm. Bio chem. Sci.* **2011**, 2, 3, 807-813.
- [2] Seema MD, Pramod BK and Nikhil DA, *J. Pharm.Res.*, **2013**, 7, 7, 595-599.
- [3] Sejal RP, Prachi VK, Ritu VK, Ravikiran M and Nargund LVG, *J. Applied Pharm. Sci.*, **2001**, 2, 6, 22-229.
- [4] Jelena S, Sote V, Valentina M, Dragan V and Predrag S, *J. Serb. Chem. Soc.*, **2007**, 72, 37-44.
- [5] Haggag RS, Shaalan RA, Belal BS, *J Liquid Chromatogr Related Tech.* **2011**, 34: 421-435.
- [6] Masako S, Junichi K, Tetsuro O, Masahiro K, Kiyoshi M. *J Chromatogr B.* **2006**, 843, 73-77.
- [7] Macek J, Ptáček P, Klima J. *J Chromatogr B*, **2003**, 782, 405-410.
- [8] Divya NS and Narayana B. *Int Scholarly Res Network.* **2012**, 1-6.
- [9] Patel SA and Patel NJ. *Int. Res. J. Pharm.*, **2011**, 2, 7, 171-175.
- [10] Verma JK, Syed HA. *Indian J. Pharm. Sci.*, **2007**, 69, 2, 303-304.
- [11] Navneet V, *J. Pharm. Sci. Res.*, **2010**, 1, 12, 188-190.
- [12] Cardoso SG, Ieggli CV and Pomblum SC. *National Center for Biotech. Info.*, **2007**, 62, 1, 34-37.
- [13] Theivarasu C, Santanu G and Indumathi T. *Asian J.Pharm.Clinical Res.*, **2010**, 3, 4, 64-68.
- [14] Desai DC and Karkhanis VV. Simple spectrophotometric estimation of Carvedilol phosphate in bulk and tablet dosage forms. **2012**; 3:2, 414-416.
- [15] Rahul CG, Ketan KN, Ashok MK, Mitesh RP, Satish GP And Prafullakumar K. *e-J Chem.* **2011**, 8, 1, 201-211.
- [16] Niraimathi V, Oval N, Suresh AR. *Res J Pharm Tech*, **2013**, 6,4, 360.
- [17] Oval N, Niraimathi V, Suresh AR. *Res J Pharmacy Tech.* **2013**, 6, 5.