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SIMULTANEOUS ESTIMATION OF TELMISARTAN, CHLORTHALIDONE AND CILNIDIPINE BY ABSORBANCE CORRECTION METHOD USING UV SPECTROPHOTOMETRY

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Abstract:

A new, simple, sensitive and accurate UV spectrophotometric absorption correction method has been developed for simultaneous determination of telmisartan, chlorthalidone and cilnidipine in combined tablet dosage form. The wavelengths selected for the analysis were 325 nm, 225 nm and 350 nm for telmisartan, chlorthalidone and cilnidipine respectively. Beer's law obeyed the concentration range of 10 - 80 µg/ ml, 3.12 – 25 µg/ ml and 5 - 40 µg/ ml for telmisartan, chlorthalidone and cilnidipine, respectively. Methanol is used as solvent. The mean percentage recovery was found in the range of 100% to 100.6% for TEL, 98.6% to 101.3% for CHL and 100% to 101.3% for CLD. The developed method was validated statistically. The % RSD value was found to be less than 2. Thus the proposed method was simple, precise, economic, rapid, accurate and can be successfully applied for simultaneous determination of telmisartan, chlorthalidone and cilnidipine in combined tablet dosage form.

Keywords: *Telmisartan, Chlorthalidone, cilnidipine.*

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INTRODUCTION:

The alternative title for this is Electronic spectroscopy since it involves the promotion of electrons from ground state to the higher energy state. It is very useful to measure the number conjugated double bonds and also aromatic conjugation within the various molecules. For visible and ultraviolet spectrum, electronic excitation occurs in the range 200 - 800nm and involves promotion of electrons to the highest energy molecular orbital. Substance absorbing in the visible range will appear coloured to the human eye. The wavelength of particular radiation absorbed can also be expressed in terms of frequency or energy in kcal mole-1.
The UV-Visible spectrum can be divided into three regions:

- Far or vacuum ultraviolet region (10-200nm)
- Near or quartz ultraviolet region (200-400nm)
- Visible region (400-800nm).

DRUG PROFILE

Telmisartan:
STRUCTURE:
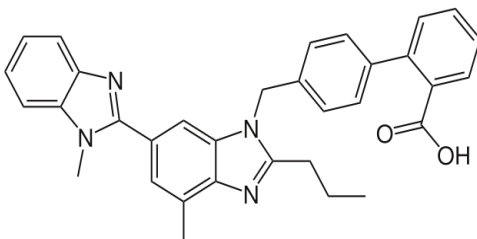
TRADE NAME : Telmikind,Ozotel
CHEMICAL FORMULA : $C_{33}H_{30}N_4O_2$
IUPAC NAME : [4-[[4-methyl-6-(1-methylbenzimidazol-2-yl)-2-propylbenzimidazol-1-yl]methyl] 1,1 ' biphenyl] – 2 carboxylic acid

Chlorthalidone:
STRUCTURE:
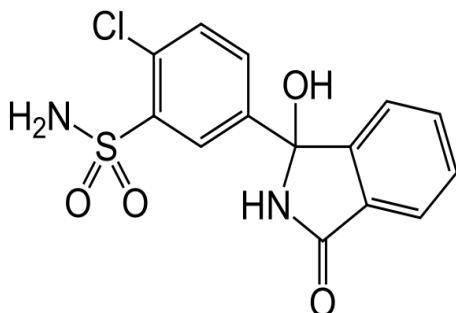
TRADE NAME : Thalizide, Chlohat
CHEMICAL FORMULA : $C_{14}H_{11}ClN_2O_4S$
IUPAC NAME : (RS)-2-chloro-5-(1-hydroxy-3-oxo-2,3-dihydro-1H-isoindol-1-yl)benzene-1-sulfonamide

CILNIDIPINE:

STRUCTURE:
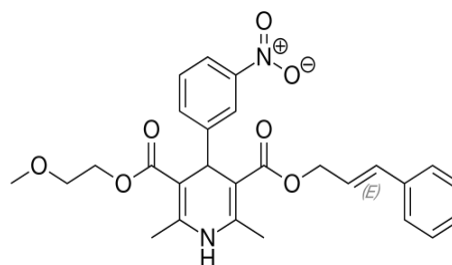
TRADE NAME: Duocard, Cildip

CHEMICAL FORMULA: $C_{27}H_{28}N_2O_7$

IUPAC NAME : 3-(E)-3-Phenyl-2-propenyl 5-2-methoxyethyl 2,6-dimethyl-4-(m-nitrophenyl)-1,4-dihydropyridine-3,5-dicarboxylate

COMBINED TABLET FORMULATION:

TRADE NAME: Macsart CC
COMPOSITION:
Telmisartan-40mg, Chlorthalidone-12.5mg, Cilnidipine-10mg

MATERIALS AND METHODS:

INSTRUMENTATION:

The present work was carried out on LASANY - 2802 double beam UV - Visible spectrophotometer with pair of 10 mm matched quartz cells. Glassware's used were of 'A' grade rinsed thoroughly with double distilled water and dried in hot air oven.

REAGENTS:

Table 1:Reagents

Reagents	Grade
Methanol	AR

CHEMICALS:

Table 2: Chemicals

Chemicals	Obtained from
Telmisartan	KP Labs
Chlorthalidone	KP Labs
cilnidipine	kp labs

Experimental condition:
According to the solubility characteristics, the common solvent for the three drugs was found to be methanol. Hence the stock solution was prepared in methanol.

Preparation of Standard Stock Solution:
40 mg of TEL, 12.5mg of CHT and 10mg of CLD were accurately weighed and transferred in to 10 ml volumetric flasks separately. Dissolved in methanol and made up to the volume to 100 ml with the same. These solutions were observed to contain 100 μg/ ml of TEL, CHT and CLD, respectively.

**STUDY OF SPECTRAL AND LINEARITY CHARACTERISTICS:**

The standard stock solutions of TEL, CHT and CLD were further diluted with methanol to get the concentration of 10 µg/ml of each and the solutions were scanned between the range 200 - 400 nm in 1cm cell against distilled water as blank and the overlain spectra was recorded.

From the overlain spectrum of TEL, CHT and CLD in methanol was observed that TEL and CHL have zero absorbance at 350 nm, where as TEL has substantial absorbance. Thus CLD was estimated directly at 350 nm without interference of TEL and CHT. At 325 nm, CHT it has zero absorbance. For estimation of TEL, the absorbance of TEL was measured at 325 nm using standard solution of TEL (10 µg/ ml). The contribution of TEL was deducted from the total absorbance of sample mixture at 325 nm. The calculated absorbance was called as corrected absorbance for TEL. At 225 nm, these three drugs were showed the absorbance. To estimate the amount of CHT, the absorbance of TEL and CLD were corrected for interference at 225 nm by using absorptivity values. A set of three equations were framed using absorptivity coefficients at selected wavelengths.

WAVE-LENGTH SCANE OF THREE DRUGS:
Graph no1:-
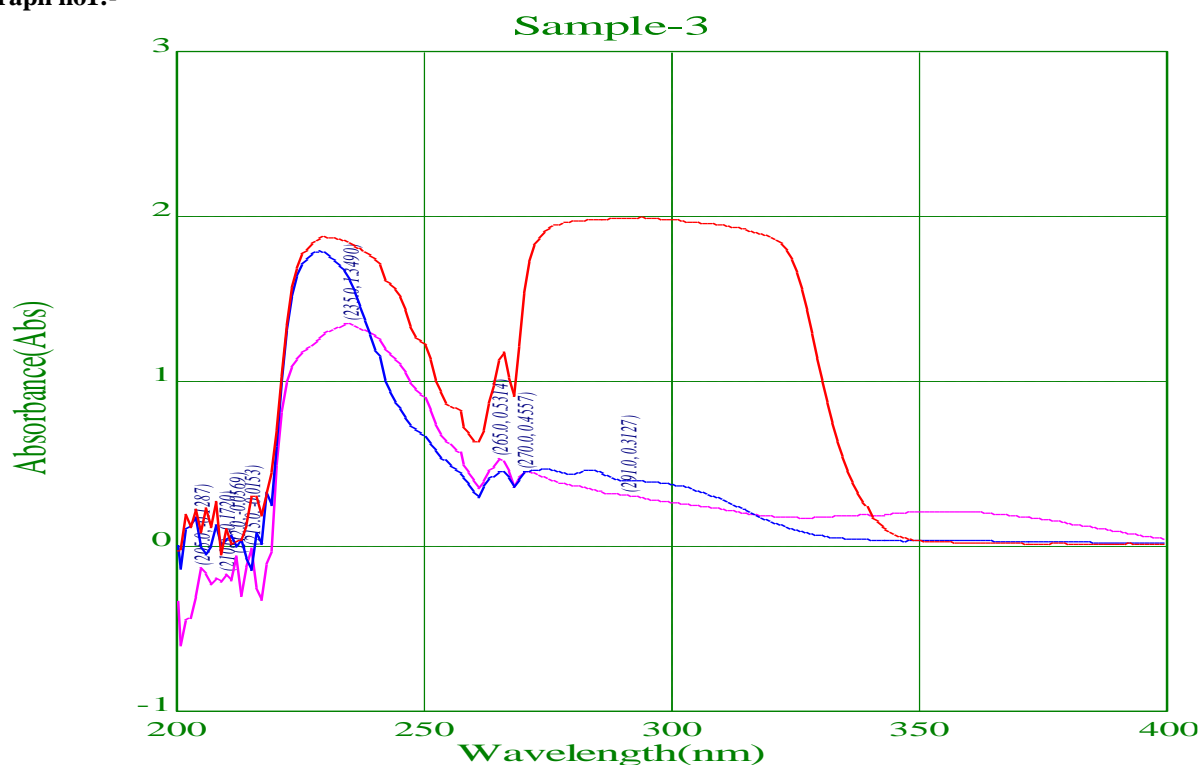
Where:
Red colour is Telmisartan
Blue colour is Chlorthalidone
Pink colour is Cilnidipine

cx = A1 /ax1
cy = A2– ax2 cx / ay2
cz = A3– (ax2 cx + ay3cy) / az3
Where,
 A1, A2 and A3 are absorbance of sample solution at 350 nm, 325 nm and 225 nm, respectively.
 ax1, ax2 and ax3, absorptivity coefficients of CLD at 350 nm, 325 nm and 225 nm, respectively.
 ay2 and ay3,absorptivity coefficients of TEL at 325 nm and 225 nm, respectively. az3, absorptivity coefficient of CHT at 225 nm.
 cx, cY and cz are concentrations of CLD, TEL and CHT, respectively in mixture.

The aliquot portions of standard stock solution of CLD, TEL and CHT were transferred into 10 ml volumetric flasks individually and made up to the volume with methanol. The absorbance of different concentration solutions were measured at 350 nm, 325 nm and 225 nm for CLD, 325 nm and 225 nm for TEL and 225 nm for CHT. The calibration curves for TEL,CHT and CLD were prepared in the concentration range of 10 - 50 μg/ ml, 3.1- 25 μg/ ml and 5 - 40 μg/ ml, respectively at their respective wavelengths by diluting aliquot portions of standard stock solution of each drug.

Analysis of tablet formulation:
Ten tablets were weighed and average weight was found. The tablets were triturated to a fine powder. An accurately weighed quantity of powder equivalent to 40 mg of TEL was transferred in to 10 ml volumetric flask and added a minimum quantity of methanol to dissolve the substance and made up to the volume with the same. The solution was sonicated for 15 minutes, and filtered through Whatmann filter paper No. 41. From the clear solution, further dilutions were made by diluting 1.0 ml into 10 ml with methanol to obtain 10 μg/ ml solution of CHT which is also contains 1 μg/ ml of TEL and 10 μg/ ml of CLD theoretically. The absorbance of sample solution was measured at all selected wavelengths. The content of TEL, CHT and CLD in sample solution of tablet was calculated. This procedure was repeated for six times.

Validation of Methods:
The method was validated with respect to linearity, precision, and accuracy.

According to ICH guidelines for the qualitative test or assay procedure LOD, LOQ parameters are not required.

Linearity:
Linearity was checked by diluting standard stock solution at six different concentrations. TEL was linear with the concentration range of 10-80μg/ ml at 325, 225 nm. CHT showed the linearity in the range of 3.1 – 25 μg/ ml at 225 nm. CLD was linear in the concentration range of 5 - 40 μg/ ml at 350, 325 and 225 nm and Calibration curves (n =5) were plotted between concentration and absorbance of drugs.

Precision:
For checking precision of the method, repeatability and intermediate precision were performed. Six replicates of the same concentration were used for determining the repeatability. Inter-day and intra-day analysis was performed in triplicates for the same concentration, on the same day and for the successive three days for the determination of intermediate precision. Percentage relative standard deviation was calculated.

Accuracy:
To check the accuracy of the developed method and to study the interference of formulation excipients, analytical recovery experiments were carried out by using standard addition method in three different concentrations. From the total amount of drug found, the percentage recovery was calculated. This procedure was repeated for three times for each concentration. The % RSD was calculated.

RESULTS AND DISCUSSION:

Table 3:Spectral and linearity characteristics data

Parameters	Telmisartan	Chlorthalidone	Cilnidipine
λmax(nm)	325	225	350
Linearity range (μg/ ml)	10-80	3.12-25	5-40
Correlation coefficient (r2)	0.997	0.996	0.996
Slope (m)	0.034	0.020	0.020
Intercept (c)	0.452	0.512	0.512
Regression equation (y = mx +c)	y = 0.034x + 0.452	y = 0.020x + 0.512	y = 0.020x + 0.512

Table 4:Results of analysis of tablet formulation

Parameters	TEL	CHL	CLD
Label Claim (mg)	40	12.5	10
% Assay[*]	100.3	100.7	100.1
Standard Deviation	0.669	1.316	1.250
%RSD	0.66	1.306	1.248

Table 5: Intermediate Precision of the method

Parameters	% Label Claim Estimated (Mean ±%R.S.D.))		
Chemicals	TEL	CHL	CLD
Intraday Precision (n=6)	100.3 ± 1.175	101.4 ± 0.804	99.6 ± 1.064
Inter day Precision (n=6)	99.8 ± 1.22	100.1 ± 1.858	99.8 ± 1.162

Table 6: Recovery studies/ Accuracy

Sample	Concentration (%)	Mean Recovery (%)	STDEV	% RSD
TEL	20	100	1	1
	40	100	2	2
	60	100.6	2.08	2.06
CHL	6.25	101.3	0.57	0.56
	12.5	101	1	0.99
	18.75	98.6	0.57	0.57
CLD	10	100	1	1
	20	101.3	0.57	0.56
	30	100	1	1

CONCLUSION:

From validation, the developed method was found to be simple, rapid, economical, precise, accurate and rugged. Hence the proposed method could be effectively applied for the routine analysis of TEL, CHL and CLD in bulk and in combined tablet dosage form.

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