UV Spectrophotometric Method Development and Validation of Paracetamol, Ambroxol Hydrochloride, Levocetirizine Dihydrochloride, Pseudoephedrine Hydrochloride in Bulk and in Formulation

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Abstract:- **For the simultaneous quantification of paracetamol, ambroxol hydrochloride, levocetirizine dihydrochloride, and pseudoephedrine hydrochloride in tablet dosage forms, a simple, specific, accurate, exact, and cost-effective UV-method was devised. The analysis was carried out using Cramer's rule and Gauss-Jorden elimination using UV-spectroscopy of paracetamol, ambroxol hydrochloride, levocetirizine dihydrochloride, and pseudoephedrine hydrochloride as the solvent. The absorbtion maximums for the four drugs of 243, 220, 264, and 257 nm were selected wavelenth. With a regression coefficient of 0.999, a linear response between (12ug-72ug/ml) was seen, and the percentage R.S.D. values of 0.7073, 0.6484, 1.6358, and 0.7308 fall within acceptable bounds. Method was approved in accordance with ICH recommendations.**

Keywords:- *Paracetamol, Ambroxol Hydrochloride, Levocetirizine Dihydrochloride, Pseudoephedrine Hydrochloride, UV-Method.*

I. INTRODUCTION

Paracetamol (PARA), Ambroxol Hydrochloride(AMB) ,Levocetirizine Dihydrochloride(LVD), Pseudoephedrine Hydrochloride(PEH) is a cold,allergic,rihinitis agents, chemically it is *N*-(4-hydroxyphenyl) ethanamide , *Trans-4-[2-[4-[(4-chlorophenyl) phenyl] methyl]-cyclohexanol, (R)-2-[2-[4-[(2-Amino-3,5-dibrombenzylamino)] piperazin-1-yl]ethoxy] dihydrochloride of acetic acid, (1s, 2s) - 2-methylamine phenylpropane-1-ol hydrochloride is one.* combination method is for have been reported for its estimation.of uv-method for new approchemently.

Numerous approaches are documented for individual medications and combinations with other pharmaceuticals, according to a thorough literature review, but there isn't a single way so far published for the simultaneous estimation of PARA, AMB,LVD,PHE as a combination dosage. Therefore, efforts have been undertaken to establish three spectrophotometeric procedures that are straightforward,

accurate, specific, and reproducible for the simultaneous estimation of equation is derived for using **Cramer's rule and Gauss jorden elimination** –rule PARA,AMB, LVD, PHE in combined dosage form, using simultaneous equation method.

II. METHOD AND MATERIALS

➤ *Reagent:*

MEDOPHARM Pharmaceuticals Chennai provided standard bulk medication samples of PARA, AMB, LVD, and PHE. A combination dosage form tablet (LV-PLUS) was purchased from a nearby market.

The rest of the reagents were all of analytical grade. The UV/visible spectrophotometer was a Shimadzu model 1700 with matching quartz cells measuring 1 cm. The following software specifications were used to record the spectra: spectral bandwidth of 3 nm, wavelength accuracy of +/- 0.5 nm, and wavelength readability in steps of 0.1 nm.

➤ *Experiment*

• *Method 1: Employing Simultaneous Equations*

Pure drug sample of PARA,AMB,LVD,PHE were dissolved separately in methanol and 0.1 N Hydrochloric acid so as to give several dilutions of standard in the concentration range 10μg/ml of PARA,AMB,LVD,PHE.All dilutions were scanned between 400 and 200 nm in wavelength. The overlapping spectra of four medicines are shown in Fig. 1.

In order to create simultaneous equations, four wavelengths were chosen: 243, 220, 264, and 257 nm (maximum of four medicines, respectively). E (1%, 1 cm) values for PARA at 243, AMB at 220, LVD at 264, and PHE at 257 nm were determined to be 447.34, 195.34, 309.12, and 583.32, respectively.These numbers represent the average of six different measurements.

The concurrent equations that were created were,

At 243 nm
$$A_1 = ax_1c_P + ay_1c_A + az_1c_L + aw_1c_{PS} \text{----------} (1)$$

At 220 nm
$$A_2 = ax_2c_P + ay_2c_A + az_2c_L + aw_2c_{PS} \text{----------} (2)$$

At 264 nm
$$A_3 = ax_3c_P + ay_3c_A + az_3c_L + aw_3c_{PS} \quad (3)$$

At 257 nm
$$A_4 = ax_4c_P + ay_4c_A + az_4c_L + aw_4c_{PS} \text{----------------} (4)$$

Where A_1, A_2, A_3, A_4 are the absorbances of sample solution at 243,220,264,257 nm respectively. C_x to C_z are the concentration of PARA, AMB, LVD, PHE respectively (µg/ml) in sample solution.

Let, L- lambda max

– the absorptivities of Paracetamol at L_1, L_2, L_3 and L_4 be ax_1, ax_2, ax_3 and ax_4, respectively.

– the absorptivities of Ambroxol Hydrochloride at L_1, L_2, L_3 and L_4 be ay_1, ay_2, ay_3 and ay_4, respectively.

– the absorptivities of Levocetirizine Dihydrochloride at L_1, L_2, L_3 and L_4 be az_1, az_2, az_3 and az_4, respectively.

– the absorptivities of Pseudoephiedrine Hydrochloride at L_1, L_2, L_3 and L_4 be aw_1, aw_2, aw_3 and aw_4, respectively

➢ **Method-1**

• **Cramer's Rule:**
Consider the following matrix-multiplication representation of a system of n linear equations for n unknowns to apply Cramer's Rule.

$$Ax = b \quad (5)$$

the n by n matrix A has a nonzero determinant, and the vector $X = (X_1, \ldots, X_n)^T$ is the column vector of the variables.

Then the theorem states that in this case the system has a unique solution,

whose individual values for the unknowns are given by:

$$x_1 = \frac{\det(A_i)}{\det(A)} \quad i = 1, \ldots, n$$

Where,

A_i is the matrix formed by replacing the ith column of A by the column vector b.

$a_{n,2}$ Cramer's Rule 4x4

Solution of 4x4 matrix can be find as same as we find for 2x2 and 3x3 matrices. Find the values of x, y, z and W using Cramer's rule.

$$2x - y + 4z + t = -2 \quad 3x + 2y - t = -3,$$

$$3x + 2y + 2t = 10$$

$$x + y + 2z = 2$$

• **Gauss-Jordan Elimination Method and the Aug Mented Matrix**
The Gauss-Jordan Elimination method works with the augmented matrix in order to solve the system of equations.

✓ **Gauss-Jordan Elimination method is to convert the matrix into this form.**

1	0	0	0			r1
0	1	0	0			r2
0	0	1	0			r3
0	0	0	1			r4

Where,

r1,r2,r3,r4 represent the results of each equation (constant terms)

• **Choosing a Solvent**
According to I.P specifications, the solubility of medicines was assessed in a range of polar and non-polar solvents. For the analysis, Methanol and 0.1N Hydrochloric Acid were discovered to be the most common solvents. For the suggested processes, Paracetamol, Ambroxol Hydrochloride, Levocetirizine Dihydrochloride, and Pseudoephedrine Hydrochloride were also found to be common solvents.

• **Preparation of Standard Stock Solution:**
Standard stock solution Paracetamol, Ambroxol Hydrochloride, Levocetirizine Dihydrochloride and Pseudoephdrine Hydrochloride were prepared by dissolving, 15 mg Paracetamol, Ambroxol Hydrochloride, and Pseudoephedrine Hydrochloride in 10 ml of Methanol, separately to get a concentration of 1500 µg/ml. 4ml, of the above solution, were transferred into 10ml standard flask and made up to the mark with 0.1N Hydrochloride acid to get 240 µg/ml of each drug.

• **Check for Stability**
Stability was studied by measuring the absorbance of each 10 µg/ml solutions of four drugs at different time intervals. It was observed that Paracetamol, Ambroxol Hydrochloride, Levocetirizine Dihydrochloride and Pseudoephedrine Hydrochloride in 0.1N Hydrochloric acid were stable for approximately 5 hours at all selected wavelengths.

• **Standard Stock Solution Preparation:**
Standard stock solution The following compounds were created by independently dissolving 15 mg each of

Paracetamol, Ambroxol Hydrochloride, Levocetirizine Dihydrochloride, and Pseudoephedrine Hydrochloride in 10 ml of Methanol to achieve a concentration of 1500 g/ml. To obtain 240 g/ml of each medication, 4 ml of the aforementioned solution were put into a 10 ml standard flask and brought up to the appropriate volume with 0.1 N hydrochloride acid.

- *Linearity and Calibration*

To obtain a concentration range of each 12 to 72 g/ml of paracetamol, ambroxol hydrochloride, levocetirizine dihydrochloride, and pseudoephedrine hydrochloride, aliquots of standard stock solutions (240 g/ ml) of these drugs were transferred into a series of 10 ml volumetric flasks and made up to the volume with 0.1N hydrochloric acid.At these chosen wavelengths, the absorbances of various concentration solutions were measured, and the calibration curves were shown as concentration against absorbance. Levocetirizine Dihydrochloride, Pseudoephedrine Hydrochloride, Ambroxol Hydrochloride, and Paracetamol all demonstrated linearity with concentration ranges between 12 and 72 g/ml, respectively.

III. ANALYSIS OF TABLET FORMULATION

Twenty tablets were precisely weighed; the average weight was found, and the tablets were then finely pulverized. The average weight of 20 tablets of the formulation (LV-PLUS comprising Paracetamol 500 mg, Ambroxol Hydrochloride 60 mg, Levocetirizine Dihydrochloride 5 mg, and Pseudoephedrine Hydrochloride 30mg) (100:30:1:15) was determined and the pills were then crushed into a fine powder. An amount weighing precisely 15 mg of Paracetamol was extracted from the triturate of 20 tablets and put to a 10 ml volumetric flask.

This raw ingredient was carefully weighed and then added along with 13.2 mg of ambroxol hydrochloride, 14.85 mg of levocetirizine dihydrochloride, and 14.1 mg of pseudoephedrine hydrochloride. It was then dissolved in methanol before being added to more methanol to make up the volume. After being sonicated for around 15 minutes, the solution was filtered using whatmann filter paper no. 41. A theoretical concentration of 24 g/ml of paracetamol, ambroxol hydrochloride, levocetirizine dihydrochloride, and pseudoephedrine hydrochloride was obtained by diluting the filtrate. The absorbances were measured at wavelengths of 243, 220, 264, and 257 nm. This was done six times to ensure the accuracy and repeatability of the method. Levocetirizine Dihydrochloride, Pseudoephedrine Hydrochloride, Ambroxol Hydrochloride, and Paracetamol's absorptivity values were used to solve the equations using Cramer's Rule and Gauss- Jorden Elimination Methods.

- *Recovery Studies*

Recovery studies using the conventional addition method were conducted to examine the suggested methods' accuracy, repeatability, and precision. Recovery study findings were deemed good and provided in The accuracy of the approach was assessed by comparing the findings from Intra Day (n = 3) and Inter Day (n = 3) tests.

IV. CONCLUSION AND RESULTS

For the estimate of, straight forward simultaneous estimation techniques were successfullydevised. PARA, AMB, LVD, PHE- in raw material and combined dosage form.

- *Linearity:*

Table1 provides a summary of the calibration curves that were created for both medications at the chosen analytical wavelengths.This demonstrates that in the concentration range of 12-72 g/ml, PARA, AMB, LVD and PHE obey Beer's law.

- *Accuracy:*

The accuracy of the approach was assessed by looking at the recovery of PARA, AMB, LVD and PHE at three different levels, ranging from 80, 100, and 140% of the nominal concentration. Excellent recoveries are shown by the data as displayed in Table 3.

- *Precision & Repeatability:*

The proposed method was repeated three times in a single day in order to study the method's accuracy and repeatability. The results' average percentage and RSD values were tabulated, and when the experiment was repeated on three different days, the average percentage RSD values for determination were tabulated in Table4. The outcomes support the method's intraday and interday accuracy.

- *Conclusion*

Cramer's rule and Gauss jorden elimination –rule method is a suitable for the reliable analysis for commercial formulations containing combinations of PARA,AMB,LVD,PHE. The techniques are straightforward, exact, quick, and accurate. High percentage recovery demonstrates that formulation-related excipient interference is not present in the procedure.

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Table 1 Optical Characteristics Paracetamol By Simultaneous Equation Method

PARAMETERS	AT 243 nm	AT 220 nm	AT 264 nm	AT 257 nm
Beers law limit (μg/ ml)	12 – 72	12 – 72	12 - 72	12 – 72
Molar absorptivity(L mol^{-1} cm^{-1})	8067.3760	1844-4539	3618.0829	5634.5738
Sandell's sensitivity(μg/cm^2/0.001 A.U)	0.0191	0.0856	0.0420	0.0270
Correlation coefficient (r)	0.9999	0.9999	0.9999	0.9999
Regression equation(Y=mx+c)	0.0523 x +0.0106	y= 0.0116 + 0.0052	= 0.0238 x +0.0012	= 0.0369 x +0.0034
Slope (m)	0.0523	0.0116	0.0238	0.0369
Intercept (c)	0.0106	0.0052	0.0012	0.0034
LOD (μg/ ml)	0.0353	0.0081	0.0076	0.0111
LOQ (μg/ ml)	0.1069	0.0245	0.0232	0.0339
Standard error	0.0149	0.0046	0.0070	0.0133

Table 2 Optical Characteristics of Ambroxol Hydrochloride by Simultaneous Equation Method

PARAMETERS	AT 243 nm	AT 220 nm	AT 264 nm	AT 257 nm
Beers law limit (μg/ ml)	12 – 72	12 – 72	12 - 72	12 – 72
Molar absorptivity(L mol^{-1} cm^{-1})	5328.2842	11217.3717	932.6916	2462.0060
Sandell's sensitivity(μg/cm^2/0.001 A.U)	0.0712	0.0327	0.3963	0.1496
Correlation coefficient (r)	0.9999	0.9999	0.9999	0.9999
Regression equation(Y=mx+c)	y= 0.0140 x + 0.0005	y= 0.0305x+(- 0.0084)	y= 0.0025x+(- 0.0005)	y= 0.0066x+(- 0.0026)
Slope (m)	0.0140	0.0305	0.0025	0.0066
Intercept (c)	0.0005	-0.0084	-0.0005	-0.0026
LOD (μg/ ml)	0.0251	0.0931	0.0719	0.0631
LOQ (μg/ ml)	0.0761	0.2822	0.2179	0.1912
Standard error	0.0039	0.0114	0.0005	0.0024

➤ *Mean of Six Observations*

Table 3 Optical Characteristics of Levocetirizine Dihydrochloride by Simultaneous Equation Method

PARAMETERS	AT 243 nm	AT 220 nm	AT 264 nm	AT 257 nm
Beers law limit (μg/ ml)	12 – 72	12 – 72	12 - 72	12 – 72
Molar absorptivity(L mol^{-1} cm$^{-1)}$)	6131.0547	14257.1678	2959.6707	1937.1685
Sandell's sensitivity(μg/cm^2/0.001 A.U)	0.0722	0.0341	0.1541	0.2376
Correlation coefficient (r)	0.9999	0.9999	0.9999	0.9999
Regression equation(Y=mx+c)	y= 0.0138x+(- 0.0057)	y= 0.0292x + 0.0160	y= 0.0064x +(- 0.0007)	y= 0.0042x+(- 0.0001)
Slope (m)	0.0138	0.0292	0.0064	0.0042
Intercept (c)	-0.0057	0.0160	-0.0007	-0.00013
LOD (μg/ ml)	0.0292	0.0085	0.0096	0.0150
LOQ (μg/ ml)	0.0887	0.0259	0.0293	0.0455
Standard error	0.0055	0.0114	0.0020	0.0015

➤ *Mean of Six Observations*

Table 4 Optical Characteristics of Pseudoephedrine Hydrochloride by Simultaneous Equation Method

PARAMETERS	AT 243 nm	AT 220 nm	AT 264 nm	AT 257 nm
Beers law limit (μg/ ml)	12 – 72	12 – 72	12 - 72	12 – 72
Molar absorptivity(L mol^{-1} cm$^{-1)}$)	85.7945	924.9025	189.0937	216.3112
Sandell's sensitivity(μg/cm^2/0.001 A.U)	2.4034	0.2285	1.0958	0.9669
Correlation coefficient (r)	0.9999	0.9999	0.9999	0.9999
Regression equation(Y=mx+c)	y= 0.0004x + 9.2857	y= 0.0043x + 0.0020	y= 0.00091x + 0.00025	y= 0.001034x + 0.000382
Slope (m)	0.0004	0.0043	0.00091	0.001034
Intercept (c)	9.2857	0.0020	0.00025	0.000382
LOD (μg/ ml)	0.2536	0.3244	0.0401	0.1246
LOQ (μg/ ml)	0.7685	0.9831	0.1216	0.3777
Standard error	0.00015	0.00173	0.00024	0.00037

➤ *Mean of Six Observations*

Table 5 (Paracetamol, Ambroxol Hydrochloride) (by Cramer'sRule)

Drug	SampleNo.	LabeledAmount (mg/tab)	AmountFound (mg/tab)	Percentage Obtained	Average(%)	SD	% RSD	SE
	1	500	497.90	99.58				
	2	500	502.05	100.41				
	3	500	500.62	100.12				
PAR	4	500	504.35	100.87	100.20	0..4978	0.4968	0.0138
	5	500	502.70	100.54				
	6	500	498.50	99.71				
	1	60	60.62	101.03				
	2	60	59.33	98.88				
	3	60	61.04	101.73				
AMB	4	60	60.41	100.69	100.21	1.1066	1.1043	0.0307
	5	60	59.79	99.65				
	6	60	59.58	99.30				

➤ *Mean of Six Observations*

Table 6 (Levocitrizine Dihydrochloride, Pseudoephedrine Hydrochloride) (by Cramer's Rule)

Drug	SampleNo.	LabeledAmount (mg/tab)	AmountFound (mg/tab)	Percentage Obtained	Average(%)	SD	% RSD	SE
	1	5	5.0600	101.20				
	2	5	4.9766	99.53				
	3	5	5.0625	101.25				
LEV	4	5	5.0416	100.80	100.10	1.1203	1.1121	0.0311

	5	5	4.9583	99.16				
	6	5	4.9337	98.67				
	1	30	30.2066	100.68				
	2	30	29.6660	98.88				
PSE	3	30	30.4166	101.71				
	4	30	29.5833	101.38	100.15	1.4649	1.4631	0.0406
	5	30	30.6233	98.61				
	6	30	29.7900	99.30				

➤ *Mean of Six Observations*

Table 7 (LV-Plus) by Cramer's Rule- (Inter Day,Intra Day)

Drug	Amountlabeled (mg/tab)	PercentageObtained*		SD		%RSD	
		Intraday	Interday	Intraday	Interday	Intraday	Interday
PARA	500	100.83	99.61	0.7076	0.6501	0.7073	0.6484
	500	99.63	100.91				
	500	100.41	100.24				
	Mean	100.28	100.25				
AMB	60	99.57	100.46	1.6211	0.7285	1.6358	0.7308
	60	100.44	99.01				
	60	97.30	99.61				
	Mean	99.10	99.73				
LEV	5	101.66	99.61	1.2255	1.1200	1.2205	1.1244
	5	100.37	98.48				
	5	99.21	100.72				
	Mean	100.41	99.60				
PSE	30	100.46	100.12	0.4178	0.0945	0.4178	0.0944
	30	99.96	100.08				
	30	99.63	99.94				
	Mean	100.01	100.04				

➤ *Mean of Six Observations*

Table 8 (by Cramer's Rule)-LV-Plus-Recovery

Drug	Amount Present (µg/tab)	Amount Added (µg/tab)*	Amount Estimated (µg/tab)*	Amount Recovered (µg/tab)*	% Recovered*	SD	% RSD	SE
PARA	12	19.20	31.2461	19.2461	100.24	0.1160	0.1159	0.0072
	12	24.00	36.0048	24.0048	100.02			
	12	28.80	40.8124	28.8124	100.04			
AMB	12	19.20	31.2248	19.2248	100.12	0.1450	0.1448	0.0161
	12	24.00	35.9612	23.9618	99.83			
	12	28.80	407942	28.7942	99.97			
LEVO	12	19.20	31.1811	19.1811	99.90	0.2516	0.2512	0.0279
	12	24.00	36.1041	24.1041	100.43			
	12	28.80	40.8662	28.8662	100.20			
PSE	12	19.20	31.1992	19.1992	99.99	0.0208	0.0208	0.0023
	12	24.00	36.0042	24.0042	100.02			
	12	28.80	40.7994	28.7994	99.98			

➤ *Mean of Three Observations*
  (Paracetamol, AmbroxolHydrochloride)

Table 9 (by Gauss-Jorden Elimination Method)-Paracetamol, Ambroxol Hydrochloride

Drug	SampleNo.	LabeledAmount (mg/tab)	AmountFound (mg/tab)	Percentage Obtained	Average(%)	SD	% RSD	SE
	1	500	501.87	100.37				
	2	500	499.58	99.91				
	3	500	502.50	100.50				
PAR	4	500	504.16	100.83	100.17	0..4724	0.4716	0.0131

	5	500	499.66	99.83				
	6	500	497.91	99.58				
	1	60	60.0833	100.13				
	2	60	59.1666	98.61				
AMB	3	60	61.2500	102.08				
	4	60	60.6033	101.00	100.47	1.3697	1.3632	0.0380
	5	60	59.5866	99.31				
	6	60	61.0400	101.73				

➢ *Mean of Six Observations*

Table 10 (by Gauss-Jorden Elimination Method) (Levocitrizine Dihydrochloride, Pseudoephedrine Hydrochloride)

Drug	Sample No.	Labeled Amount(mg/tab)	Amount Found (mg/tab)	Percentage obtained	Average (%)	SD	% RSD	SE
	1	5	4.9366	98.73				
	2	5	5.0600	101.20				
LEV	3	5	5.0200	100.40				
	4	5	4.9760	99.53	100.11	1.2483	1.2478	0.0396
	5	5	5.0833	101.66				
	6	5	4.9366	98.73				
	1	30	29.5833	98.61				
	2	30	30.8333	102.17				
	3	30	30.4166	101.38				
PSE	4	30	29.5833	98.61	100.11	1.5001	1.4985	0.0416
	5	30	30.2066	100.60				
	6	30	29.7916	99.30				

➢ *Mean of Six Observations*

Table 11 (by Gauss-Jorden EliminationMethod)-LV-Plus-Recovery

Drug	Amount Present (µg/tab)	Amount Added (µg/tab)*	Amount Estimated (µg/tab)*	Amount Recovered (µg/tab)*	% Recovered*	SD	% RSD	SE
	12	19.20	31.2012	19.2012	100.01			
PARA	12	24.00	36.0048	24.1042	100.43	0.2484	0.2481	0.0276
	12	28.80	40.7994	28.7994	99.99			
	12	19.20	31.1990	19.1990	99.99			
AMB	12	24.00	36.1016	24.1016	100.42	0.2930	0.2928	0.0325
	12	28.80	40.7614	28.7614	99.86			
	12	19.20	31.1976	19.1976	99.98			
LEVO	12	24.00	36.0028	24.0028	100.02	0.0305	0.0305	0.0033
	12	28.80	40.7897	28.7897	99.96			
	12	19.20	31.1924	19.1924	99.96			
PSE	12	24.00	36.1010	24.0010	100.42	0.2478	0.2475	0.0275
	12	28.80	40.8107	28.8107	100.03			

➢ *Mean of Three Observations*

Table 12 (LV-Plus)-(by Gauss-Jorden Elimination Method)

Drug	Amountlabeled (mg/tab)	PercentageObtained*		SD		%RSD	
		Intraday	Interday	Intraday	Interday	Intraday	Interday
	500	100.83	99.61				
PARA	500	99.63	100.91	0.7076	0.6501	0.7073	0.6484
	500	100.41	100.24				
	Mean	100.28	100.25				
	60	99.57	100.46				
AMB	60	100.44	99.01	1.6211	0.7285	1.6358	0.7308
	60	97.30	99.61				
	Mean	99.10	99.73				

	5	101.66	99.61				
LEV	5	100.37	98.48	1.2255	1.1200	1.2205	1.1244
	5	99.21	100.72				
Mean		100.41	99.60				
	30	100.46	100.12				
PSE	30	99.96	100.08	0.4178	0.0945	0.4178	0.0944
	30	99.63	99.94				
Mean		100.01	100.04				

➤ *Mean of Six Observations*

- *UV Spectra of Paracetamol (10μg/Ml)*
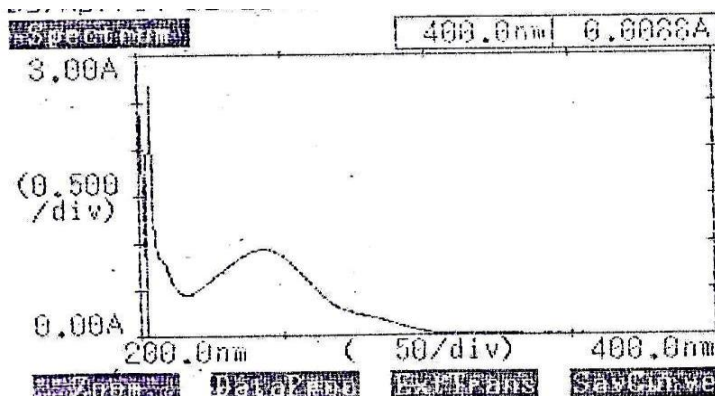
Fig 1 UV- Spectra of Paracetamol (10μg/Ml)

- *UV Spectra of Ambroxol Hydrochloride (10μg/ml)*
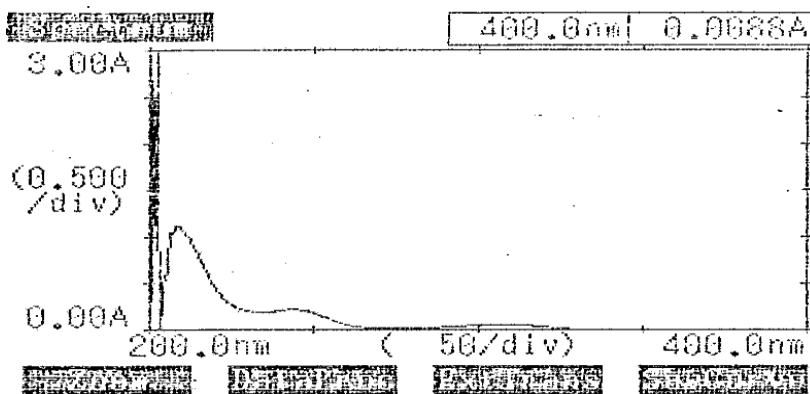
Fig 2 UV- Spectra of AMB

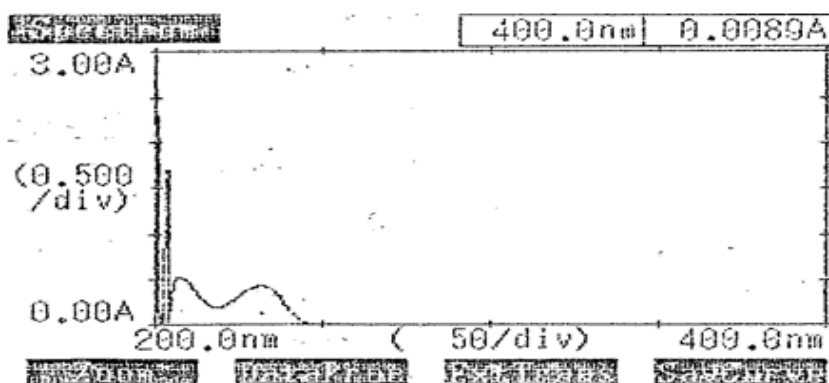- *UV Spectra of Levocetirizine Dihydrochloride (10μg/ml)*

Fig 3 UV- Spectra of LVD

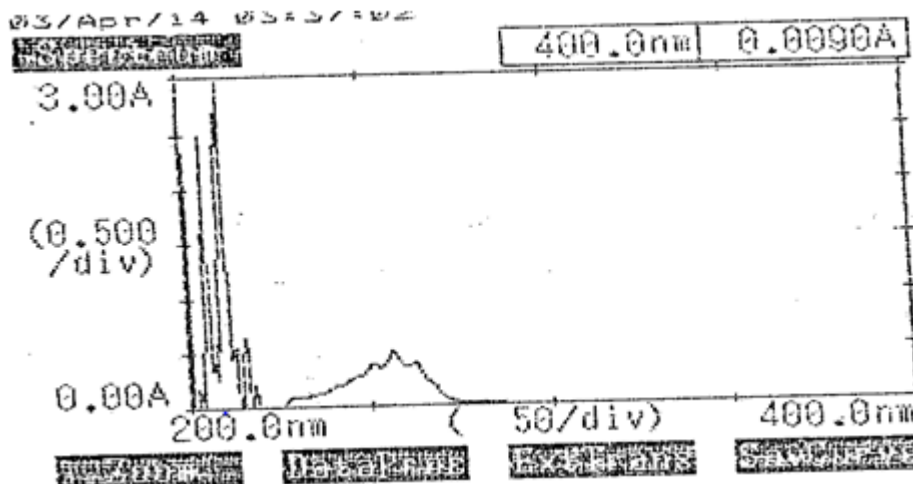- *UV Spectra of Pseudoephedrine Hydrochloride (10µg/ml)*

Fig.4. UV- Spectra of PHE

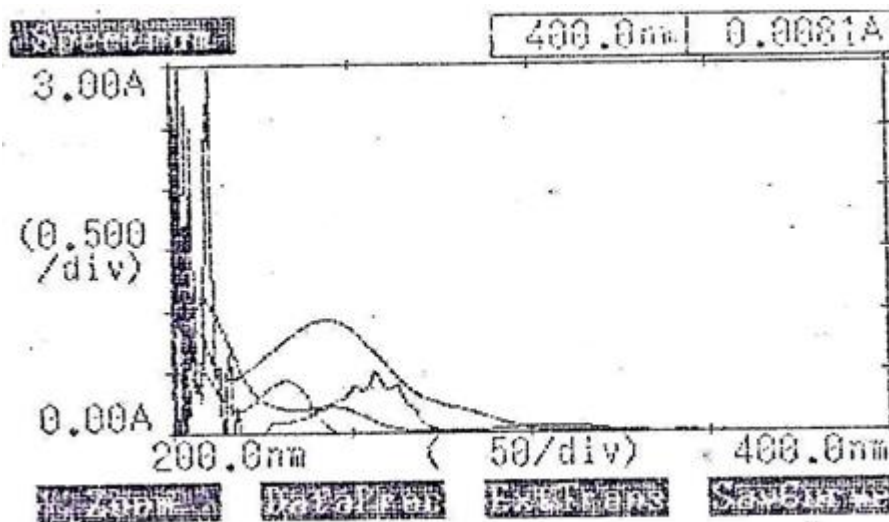- *Overline Specturm of Paracetamol, Ambroxol Hydrocholoride, Levocetirizine Dihydrocholoride and Pseudoephedrine Hrdrochloride*

Fig 5 Overlain Spectra of PARA, AMB, LVD, PHE