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Research Article

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Quantitative analysis of ten (10) different brands of chllorpheniramine tablet marketed in maiduguri metropolitan council (MMC)

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ABSTRACT

The experiment involves quality analysis of ten (10) samples of chlorpheniramine tablets using ultra violet spectrophotometer in the range of (200 – 400nm) in which the samples were dissolved in NaOH and their various absorbance and wavelength determined and compared with that of the standard, wavelength of the maximum absorbance at 223nm was determined so as to note if it was within the acceptable range of (90 – 110%) for those that passed the test or if it was below or above the range for samples that are substandard or highly concentrated. The amount of chlorpheniramine base in each sample was determined and compared with the actual content (4mg). It was observed that only seven (7) samples Banbiz, Bond, Dana, Emzor, Evans, Juhel and vitabiotics, met the british pharmaceutical codex range of 90 – 110% while the other three (3) samples Nasdmu, New devine and Sam, failed the test with values below the acceptable range.

Keyword: chlorpheniramine tablets, HPLC, U.V. Spectroscopy

INTRODUCTION

Pharmaceutical analysis refers to the chemical analysis of drug molecules or medicinal agents and their metabolites. It consists of the estimation of the quality and quantity of drugs and fine chemicals which are used in pharmaceutical preparation

Chlorpheniramine is a first generaration alkylamine antihistamine used in the prevention of the symptoms of allergic conditions such as rhinitis and urticaria[1]. The halogenated alkylamine antihistamine all exhibit optical isomerism and chlorpheniramine in the indicated products is a racemic chlorpheniramine maleate, where as dexchlorpheniramine is the dextrorotatory stereoisomer.

Chlorpheniramine was developed in the 1950's and now one of the over the counter antihistamine, its a potential example of a drug that may have possible indications hidden by market and other forces that distort the therapeutics.

The Nobel Prize winner Arvid Carlsson did not totally hide that this drug had selective serotonin reuptake inhibitive properties but went on to help develop the first SSRI to the market[2] Actually its only in the last two years that clinical trials have shown antidepressant action in mice[3] and its anxiolitic actions in man(or rather pregnant women) has been suggested as potentially important[4] It has been suggested that the association between panic attacks and hay fever may be due to patients changing from a chlorpheniramine to a non sedating antihistamine which does not protect against anxiety[5]

Its sedative effects are relatively weak compared to other first generation antihistamines. Chlorpheniramine is one of the most commonly used antihistamines. In small animal vetinary practice as well. Although not generally approved as an antidepressant or anti-anxiety medication, chlorpheniramine appears to have these properties as well (healyprozac.com)

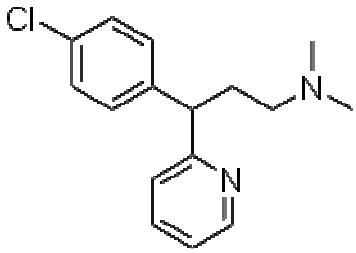
A study conducted by Yakugaku Zasshi (1996) on the quantitative analysis of chlorpheniramine maleate in cough and cold drugs by ion-pair Hplc for the simultaneous determination of chlorpheniramine and maleate concluded that calibration graph for Cp and MA showed good linearity in the range of 0.5-10nmol (0.195-3.9 microgram) per20 microliters injection, respectively and the method was successfully applied to the simultaneous determination of CP and MA, [6]

A study conducted by A. Gorcia et al on poly (exyleneglycol) column determination of acetaminophen, phenylephedrine and chlorpheniramine maleate in pharmaceutical formulation concluded that the validation parameter permit the cinsidration of the method suitable[7]

Another study performed by khoshayand M.A, Abdollahi H, Ghaffari A, Shariatpenali M, ForzaneganH, on simultaneous spectrophotometric determination of paracetamol, phenyl ephedrine and chlorpheniramine in pharmaceuticals using chemometric approaches at the department of drug and food control, faculty of pharmacy and pharmaceutical science, research center, Tehran university of medical science, Tehran university of chemistry, institute for advance studies and basic science zenjan chemidarous pharmaceutical company, Tehran, Iran. Concluded that the proposed methods are simple and rapid requiring no separation step and can be easily used as an alternative in the quality control of drugs[8].

CHEMICAL DATA
Formular $C_{16}H_{19}ClN_2$
Molar Mass 274.788g/mol

STRUCTURE



Systemic (Iupac) Name
3-(4-chlorophenyl)-N,N-dimethyl,1-3-pyridine-2-yl-propan-1-amine.

PHARMACOKINETICS
The classical H1 antihistamines are well absorbed from oral and parenteral routes. Metabolised in the liver and excreted in urine. They are widely distributed in the body and enter the brain. The newer compounds penetrate the brain poorly. Duration of action of most agent is 4-6hours [9]

EVALUATION OF A GOOD TABLET
The following test are carried out for a good quality of a tablet
i. Diameter, size and shape of tablet
ii. Thickness of tablets
iii. Uniformity of weight

iv. Percentage of medicament
v. Rate of disintegration
vi. Mechanical strength
vii. Friability test [10]

EXPERIMENTL SECTION

Ten(10) different brands of Chlorpheniramine 4mg tablets were used for the study
Distilled water
0.1M sodium hydroxide
All reagents used were obtained from NAFDAC Office, Maiduguri

METHODS

Chlorpheniramine can be assayed by quantitative estimation using UV spectrophotometry in 0.1N sulphuric acid Max at 265nm (E1%, 1cm=212) in 0.1N NaOH, Max at 222nm (E1%, 1cm=818 and 263nm (E1%, 1cm=142) (the PC, 11th Edition)

PRACTICAL METHOD

The methods employed for the purpose of this study are the UV visible spectrophotometer and high performance liquid chromatographic methods.

PRACTICAL PROCEDURE

UV PROCEDURE

The tablets were assayed spectrophotometrically using the following procedures. The average weight of the tablets from each sample was determined by weighing ten(10) tablets and dividing the results gotten by ten to obtain the average weight.

From the valve gotten the equivalent weight of each brand was weighed accurately and transferred into different 100ml volumetric flasks. All the 10 samples were labelled using a pen and a masking tape.

To each volumetric flask, 100ml of 0.1M NaOH was poured and sonicated for few minutes to dissolve the drug molecule.

The mixture in each flask was then mixed well and filtered through a filter paper into clean beakers. The UV spectrophometer was put at zero by running a baseline (200 – 400) using 0.1M NaOH solution as blank. The absorbance of each sample was determined at the peak wavelength by putting small amount of the sample into a cuvette, and the cuvette was put back into the machine.

The same procedure was repeated for the standard using 4mg of the powdered standard and the absorbance determined and from which the % content and mg content was determined as followed:

% content = Absorbance of sample *100

Absorbance of standard

Mg content = % content * manufactures claim(4mg)
100

HPLC PROCEDURE

The tablets were assayed by high performance liquid chromatography, using the following procedure:

The mobile phase containing methanol and water in the ratio of 20:80 was prepared. This was done by measuring 300ml of methanol and 1200ml of distilled water into a 200ml measuring cylinder, and put onto a sonicator for ten(10) minutes. This was then removed and filtered using a membrane filter and a vacuum pump.

From the powdered drug samples, each powder containing the equivalent weight of each brand of chlorpheniramine was weighed and tranfered into a 50ml volumetric flask each and labelled. 50ml of 0.1N NaOH (sodium hydroxide) was measured and added to each of the volumetric flask and put onto a sonicator for five(5) minutes, for the drugs molecules to dissolve. After sonicating for five minutes the solutions were filtered through a filter paper into clean beaker. From the filterate a small portion of each was then put into different chromatographic sample vail, and labelled. The vials were put into the machine.

The machine was put on and the settings were made to select the vial to be run. i.e from sample 1 – 10. The connected computer displays the result of the analysis on the screen(i.e the chromatogram) and these were printed out.

The same procedure was carried out using 4mg of the standard chlorpheniramine powder and the result was used to calculate the percentage content and content of each sample in mg.

RESULTS AND DISCUSSION

The table below shows the result of UV spectrophometer which is used to calculate the percentage content and the milligram content of different brands of chlorpheniramine. The results are shown below

UV-SPECTROPHOTOMETRY

TABLE 1: UV absorbance of chlorpheniramine at a wavelength of 223 (E1%)

Sample	Absorbance (A)
Banbiz	2.840
Bond	2.725
Dana	2.660
Emzor	2.837
Evans	2.647
Juhel	2.645
Nasdmu	2.520
New devine	2.10
Sam	2.482
Vitabiotics	2.910

Percentage and millgram content of UV – Spectrophotometry

Banbiz

$$\% \text{ content} = \frac{2.840 \times 100}{2.840} = 100\%$$

$$\text{mg content} = \frac{100\ \% \times 4}{100} = 4.00\text{mg}$$

Bond

$$\% \text{ content} = \frac{2.725 \times 100}{2.840} = 95.95\%$$

$$\text{mg content} = \frac{95.95\ \% \times 4}{100} = 3.84\text{mg}$$

Dana

$$\% \text{ content} = \frac{2.660 \times 100}{2.840} = 93.66\%$$

$$\text{mg content} = \frac{93.66\ \% \times 4}{100} = 3.75\text{mg}$$

Emzor

$$\% \text{ content} = \frac{2.837 \times 100}{2.840} = 99.89\%$$

$$\text{mg content} = \frac{99.89\ \% \times 4}{100} = 3.99\text{mg}$$

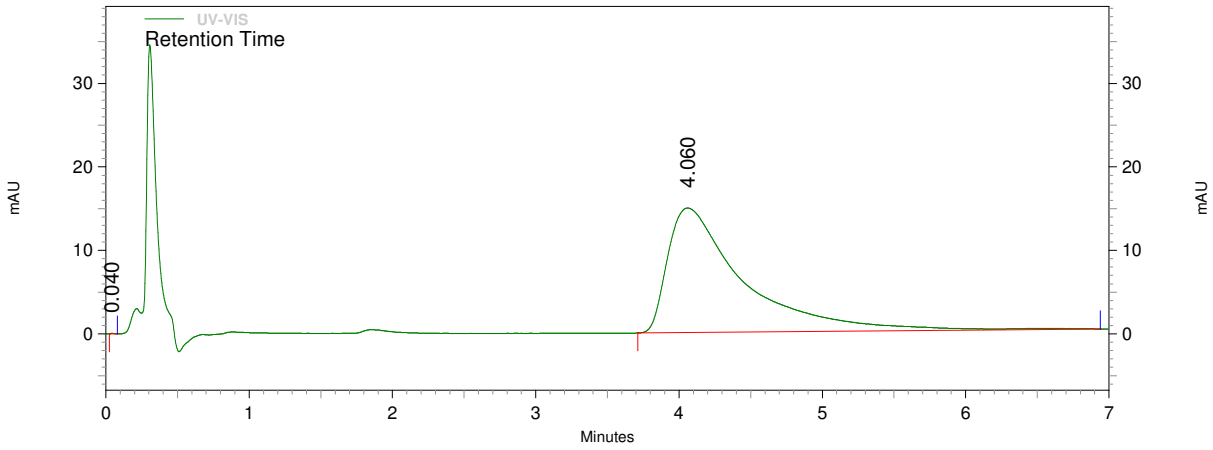
Evans
% content = 2.647 x 100 = 93.20%
2.840
mg content = 93.20 % x 4 = 3.72mg
100
Juhel
% content = 2.645 x 100 = 93.13%
2.840
mg content = 93.13 % x 4 = 3.72mg
100
Nasdmu
% content = 2.520 x 100 = 88.73%
2.840
mg content = 88.73 % x 4 = 3.54mg
100
New devine
% content = 2.10 x 100 = 73.94%
2.840
mg content = 73.94 % x 4 = 2.95mg
100
Sam
% content = 2.482 x 100 = 87.39%
2.840
mg content = 87.39 % x 4 = 3.49mg
100
Vitabiotics
% content = 2.910 x 100 = 102.46%
2.840
mg content = 102.46 % x 4 = 4.09mg
100

TABLE 2: Percentage content and milligram content of different brands of Chlorpheniramine using UV Spectroscopy

Sample	% content	Mg content
Banbiz	100	4.0
Bond	95.95	3.84
Dana	93.66	3.75
Emzor	99.89	3.99
Evans	93.20	3.72
Juhel	93.13	3.72
Nasdmu	88.73	3.54
New devine	73.94	2.95
Sam	87.39	3.49
Vitabiotics	102.46	4.09

HPLC RESULT
The calculation below shows the result gotten from the HPLC method of analysis
% content = Peak area of sample x 100
Peak area of standard
mg content = % content x standard claim
100

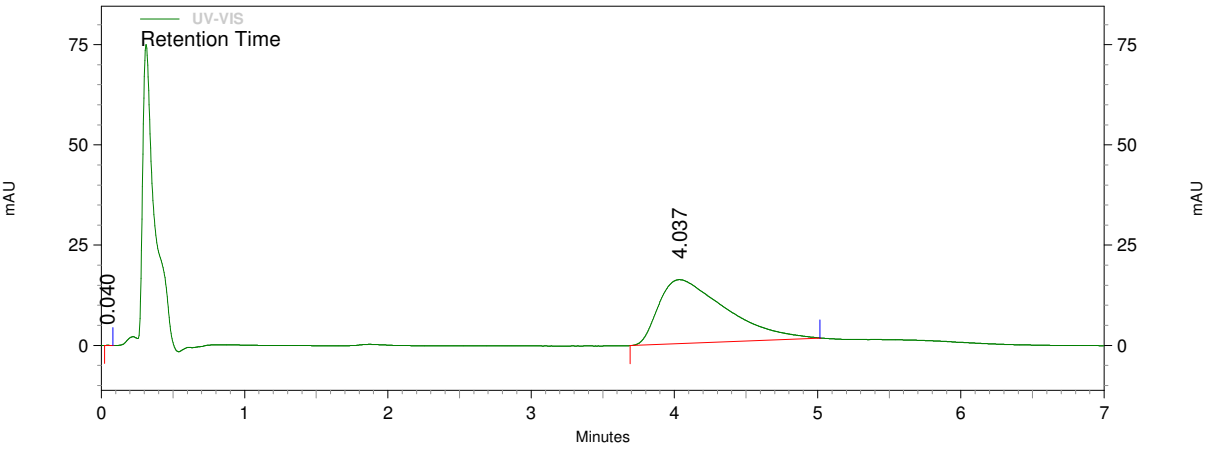
Analyst: LAB MANAGER
Sample ID: STD CHLORPHENIRAMINE MALEATE 0.12W
Vial: 200 Injection Volume: 20



UV-VIS Results

Name	Retention Time	Area	Area Percent	Integration Codes
	0.040	366	0.017	BI
	4.060	2190366	99.983	mm
Totals		2190732	100.000	

Sample 1
Bandbiz
Analyst: LAB MANAGER
Sample ID: BANBIZ- CHLORPHENIRAMINE MALEATE 0.12W
Vial: 80 **Injection Volume: 20**



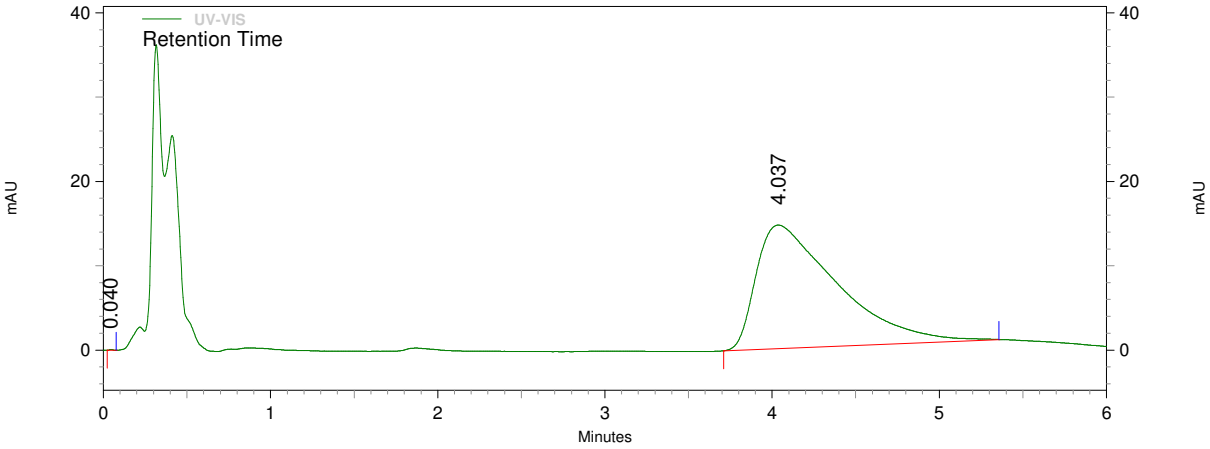
UV-VIS Results

Name	Retention Time	Area	Area Percent	Integration Codes
	0.040	289	0.014	BI
	4.037	2073170	99.986	MM
Totals		2073459	100.000	

% content = 2073170 x 100 = 99.62%
2081061
mg content = 99.62 % x 4 = 3.98mg
100
Sample 2
Bond

Analyst: LAB MANAGER
Sample ID: BOND CHLORPHENIRAMINE MALEATE 0.12W
Vial: 40 Injection Volume: 20

Analyst: LAB MANAGER
Sample ID: BOND CHLORPHENIRAMINE MALEATE 0.12W
Vial: 40 Injection Volume: 20



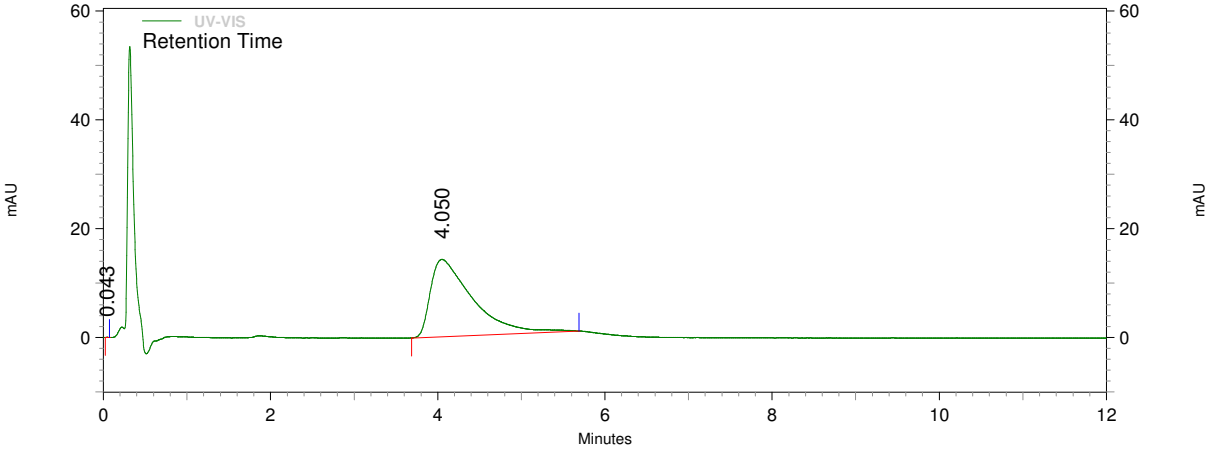
UV-VIS Results

Name	Retention Time	Area	Area Percent	Integration Codes
	0.040	364	0.019	BI
	4.037	1964044	99.981	mm
Totals		1964408	100.000	

% content = 1964044 x 100 = 94.38%
2081061
mg content = 94.38 % x 4 = 3.78mg
100
Sample 3
Dana

Analyst: LAB MANAGER
Sample ID: DANA- CHLORPHENIRAMINE MALEATE 0.12W
Vial: 70 Injection Volume: 20

Analyst: LAB MANAGER
Sample ID: DANA- CHLORPHENIRAMINE MALEATE 0.12W
Vial: 70 Injection Volume: 20



UV-VIS Results

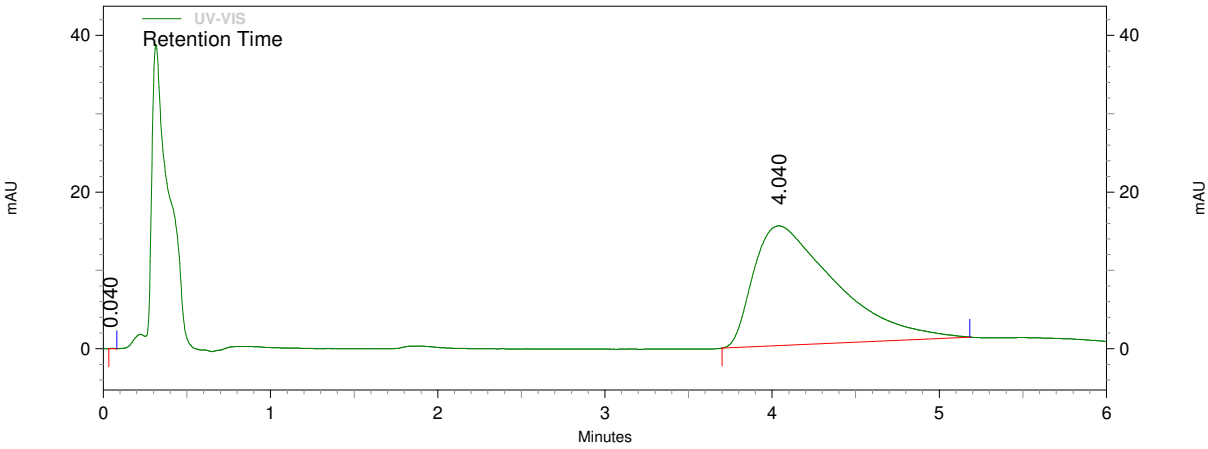
Name	Retention Time	Area	Area Percent	Integration Codes
	0.043	139	0.007	BI
	4.050	1983299	99.993	MM
Totals		1983438	100.000	

% content = 1983299 x 100 = 93.14%
2081061

mg content = 93.14 % x 4 =3.73mg
100

Sample 4
Emzor

Analyst: LAB MANAGER
Sample ID: EMZOR- CHLORPHENIRAMINE MALEATE 0.12W
Vial: 90 Injection Volume: 20



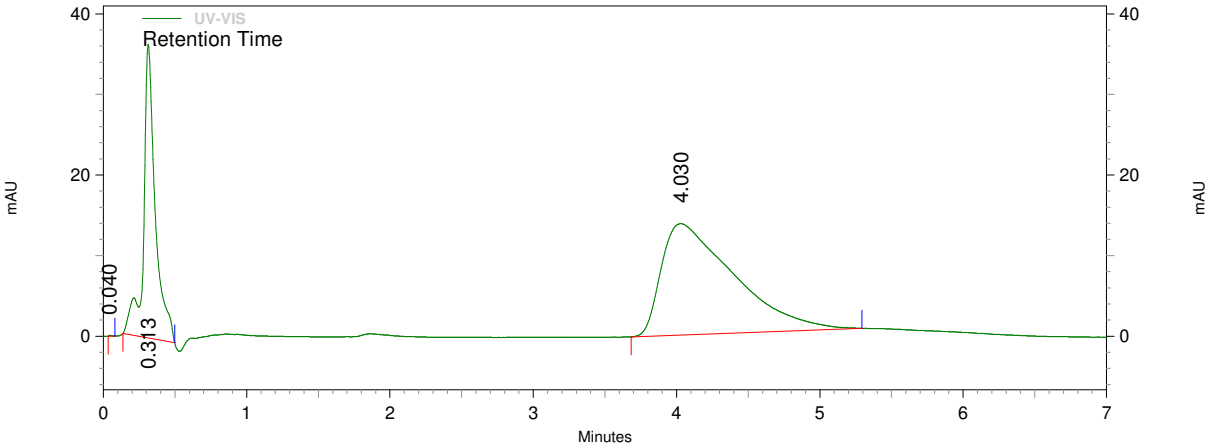
UV-VIS Results

Name	Retention Time	Area	Area Percent	Integration Codes
	0.040	276	0.013	BI
	4.040	2079746	99.987	MM
Totals		2080022	100.000	

% content = 2079746 x 100 = 99.94%

2081061
mg content = 99.94 x 4 = 4.00mg
100

Sample 5
Evans
Analyst: LAB MANAGER
Sample ID: EVANS CHLORPHENIRAMINE MALEATE 0.12W
Vial: 10 **Injection Volume: 20**

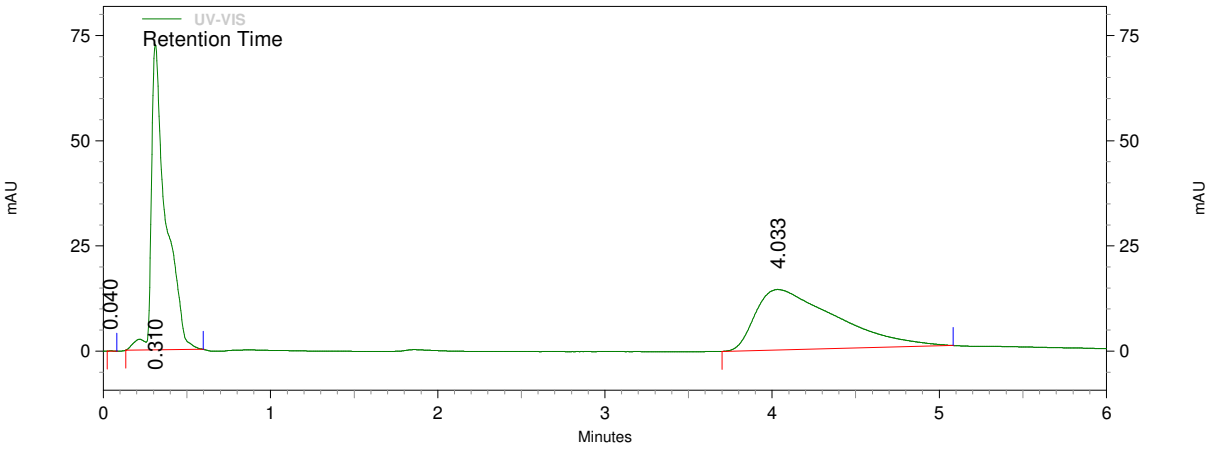


UV-VIS Results

Name	Retention Time	Area	Area Percent	Integration Codes
	0.040	563	0.020	BI
	0.313	824470	29.784	mm
	4.030	1943100	70.195	MM
Totals		2768133	100.000	

% content = 1943100 x 100 = 93.37%
2081061
mg content = 93.37 % x 4 = 3.73mg
100

Sample 6
Juhel
Analyst: LAB MANAGER
Sample ID: JUHEL CHLORPHENIRAMINE MALEATE 0.12W
Vial: 20 **Injection Volume: 20**



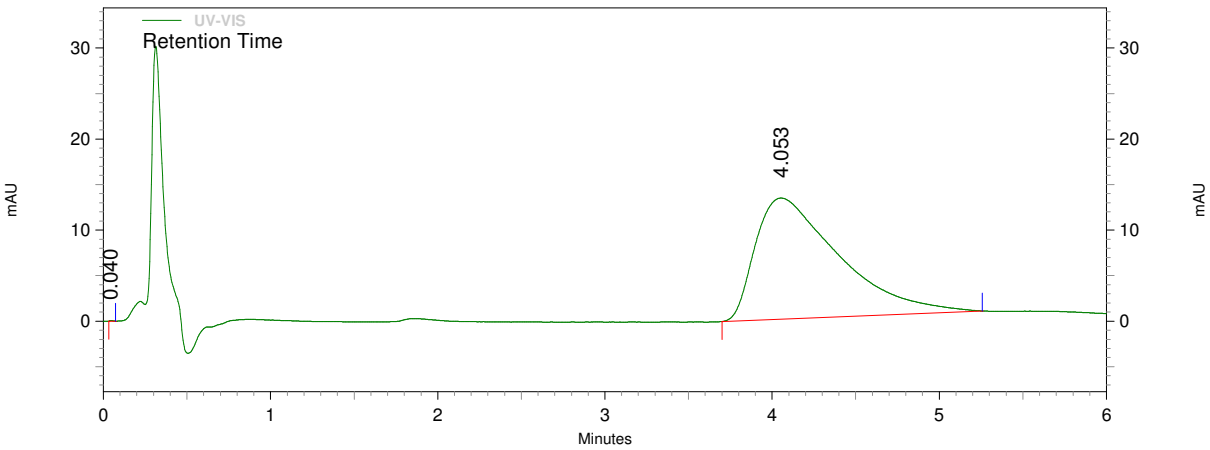
Name	Retention Time	Area	Area Percent	Integration Codes
	0.040	359	0.010	BI
	0.310	1746723	47.604	MM
	4.033	1922162	52.386	MM
Totals		3669244	100.000	

% content = 1922162 x 100 = 92.36%
2081061

mg content = 92.36 % x 4 = 3.69mg
100

Sample 7
Nasdmu

Analyst: LAB MANAGER
Sample ID: NASDMU- CHLORPHENIRAMINE MALEATE 0.12W
Vial: 100 Injection Volume: 20

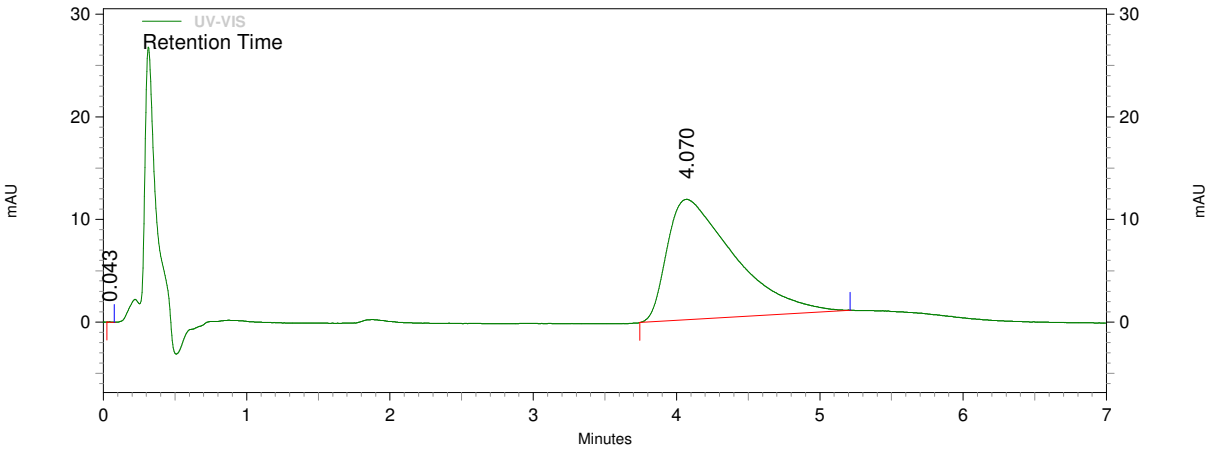


UV-VIS Results

Name	Retention Time	Area	Area Percent	Integration Codes
	0.040	304	0.016	BI
	4.053	1846972	99.984	MM
Totals		1847276	100.000	

% content = 1846972 x 100 = 88.75%
2081061
mg content = 88.75 % x 4 = 3.55mg
100

Sample 8
New devine
Analyst: LAB MANAGER
Sample ID: NEW DIVINE- CHLORPHENIRAMINE MALEATE 0.12W
Vial: 60 Injection Volume: 20

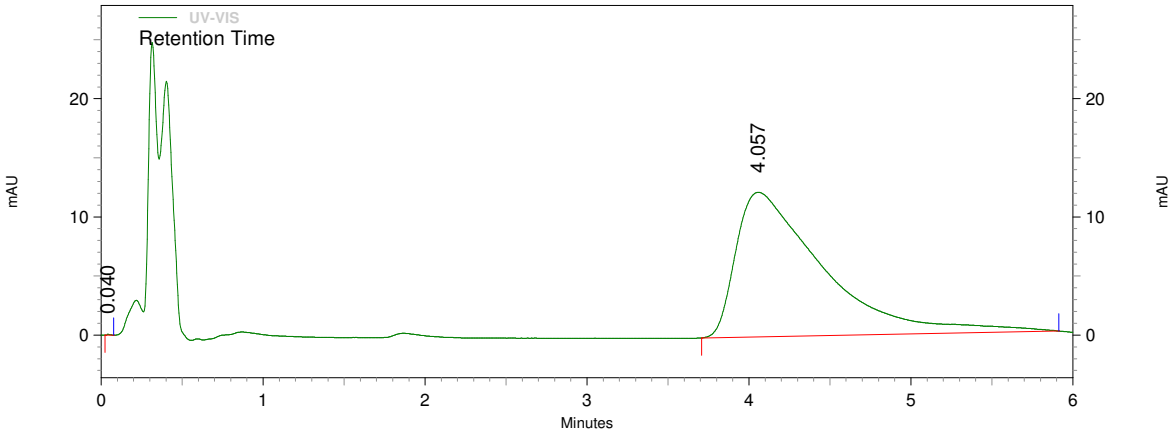


UV-VIS Results

Name	Retention Time	Area	Area Percent	Integration Codes
	0.043	163	0.011	BI
	4.070	1526107	99.989	MM
Totals		1526270	100.000	

% content =1520107 x 100 = 73.33%
2081061
mg content = 73.33 % x 4 = 2.93mg
100

Sample 9
Sam
Analyst: LAB MANAGER
Sample ID: SAM CHLORPHENIRAMINE MALEATE 0.12W
Vial: 30 Injection Volume: 20



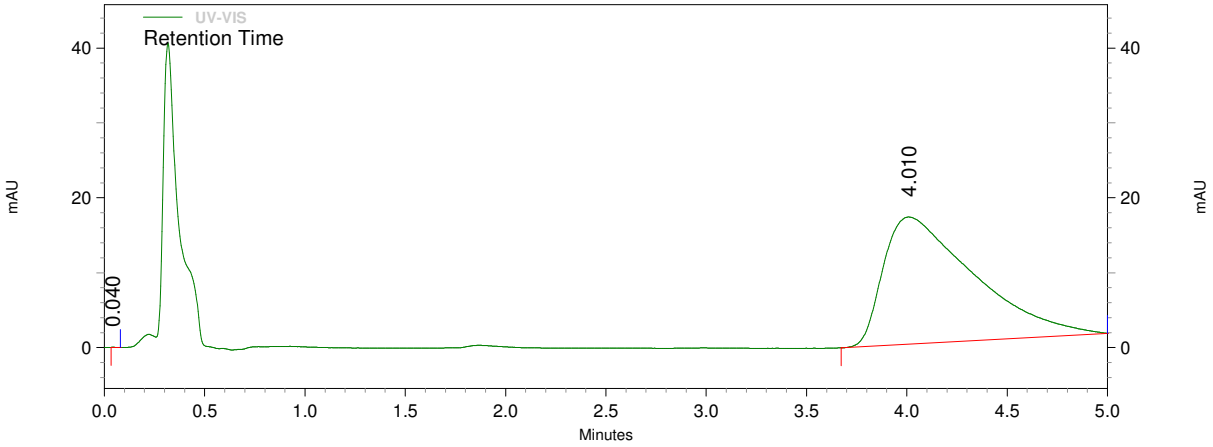
UV-VIS Results

Name	Retention Time	Area	Area Percent	Integration Codes
	0.040	388	0.021	BI
	4.057	1834678	99.979	mm
Totals		1835066	100.000	

% content = 1834678 x 100 = 88.16%
2081061

mg content = 88.16 % x 4 = 3.53mg
100

Sample 10
Vitabiotics
Analyst: LAB MANAGER
Sample ID: VITA-BIOTICS CHLORPHENIRAMINE MALEATE 0.12W
Vial: 50 Injection Volume: 20



UV-VIS Results

Name	Retention Time	Area	Area Percent	Integration Codes
	0.040	239	0.011	BI
	4.010	2129076	99.989	MM
Totals		2129315	100.000	

% content = 2129076 x 100 = 102.3%
2081061
mg content = 102.3% x 4 = 4.09mg
100

TABLE 3: The table below shows the percentage content and milligram content using the HPLC method of analysis

Sample	% content	Mg content
Banbiz	99.63	3.99
Bond	94.38	3.78
Dana	93.14	3.73
Emzor	99.94	4.00
Evans	93.37	3.73
Juhel	92.36	3.69
Nasdmu	88.75	3.55
New devine	73.33	2.93
Sam	88.16	3.53
Vitabiotics	102.3	4.09

DISCUSSION

According to the united state pharmacopoeia[11] A chlorpheniramine tablet should contain not less than 90% and not more than 110% of chlorpheniramine. The standard chlorpheniramine has an absorbance of 2.840 at a wavelength of 223nm.

For, the result obtain using UV – Spectrophotometer, the banbiz has an absorbance of 2.840 at a wavelength of 223nm, percentage content of 100% and a milligram content of 4.00mg, which is consistent with the official limit specified.

The Bond chlorpheniramine has an absorbance of 2.726 at a wavelength of 223nm, percentage content of 95.95% and a milligram content of 3.84mg is said to be within the specified limit likewise the Dana Chlorpheniramine has an absorbance of 2.657 at a wavelength of 223nm, percentage content of 93.66 and a milligram content of 3.75mg is also within the USP specified limit.

The emzor chlorpheniramine has an absorbance of 2.837 at a wavelength of 223nm percentage content of 99.89% and a milligram content of 3.99mg chlorpheniramine is also within the usp limit. The Juhel chlorpheniramine has an absorbance of 2.648 at a wavelength of 223nm percentage content of 93.20% and a milligram content of 3.72mg can also be said to be within the official specified limit (90 – 110%)

The Nasdmu, New divine, and Sam chlorpheniramine has an absorbance of 2.518, 2.083 and 2.487 at a wavelength of 223nm with percentage content of 88.73, 73.94 and 8739% and a milligram content of 3.54, 2.95 and 3.49mg respectively, and they are said to be below the USP specified limit, the Vitabiotics chlorpheniramine has an absorbance of 2.905 at a wavelength of 223nm, percentage content of 102.46% and a milligram content of 4.09mg and is also said to be within the official limit[11] .

In HPLC analysis the percentage content and the milligram content of most of the samples are nearly the same.

The causes of the low quality of the 3 brands that are not within the specified range may be due to the following reasons,

Men (personnel): personnel – related errors are a major source of quality failure or quality variation. Staff must be well trained, with well defined responsibilities and highly motivated. The quality of medicinal products is dependent upon the degree of human excellence and a combination of conductive conditions.

Machines (equipment and facilities): there need to be appropriately designed, constructed and located, clean and suited for the process to be carried out and maintained under perfect working conditions. They must be validated and must prevent cross combination.

Materials (starting materials): starting materials must be of the right quality and from the right source. They must be stored under appropriate conditions, well labelled and properly validated

Method (procedure): inadequately defined operation and the absence of standardized methods of operation can lead to poor quality products. Therefore, properly documented, validated and standardizes operational procedure must be adopted.

Milieu (environment, premises): there is need to provide a clean, dust free, spacious and properly designed environment to minimize the risk of error and permit effective avoid cross contamination. It must be suitable for the purpose for which it is used. (Ajibola A. O, 2005).

CONCLUSION

Based on the USP specification, it can be concluded that Banbiz, Bond, Dana, Emzor, Evans, Juhel and Vitabiotics Chlorpheniramine contains the active drug (chlorpheniramine maleate) within specified limit in both UV – Spectrophotometry and HPLC analyses and they can be said to pass the test, while Nasdmu, New devine and Sam are below the official specification and are said not to pass.

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