SPECTROPHOTOMETRIC METHOD FOR SIMULTANEOUS ESTIMATION OF TRETINOIN AND CURCUMIN COMBINATION IN PURE FORM

Mallik Santanu[1]*, Kshirsagar M. D.[2], Saini Vipin[3]

[1]Translam Institute of Pharmaceutical Education & Research, Meerut, India

[2]P. Wadhwani College of pharmacy, Yavatmal, Maharastra, India

[3]Maharishi Markandeshwar University, Mullana, Haryana, India

*Email: santanu.mallik@gmail.com

ABSTRACT

The present study is very optimistic towards the development in dosage forms loaded with synthetic and herbal drug combination. The simultaneous estimation was done by using spectrophotometric method, using ethanol as solvent. Stock solutions of Tretinoin and Curcumin were diluted to final concentration of 5µg/ml. UV scan of 5µg/ml solution of both drugs combination showed the absorption maxima at 349.2 nm and 427.2 nm. respectively by using ethanol as blank. Simultaneous estimation method also indicates the interference between both the drugs at their respective λ max of one another. By replacing A_1, A_2, E_{1a}, E_{1b}, E_{2a} and E_{2b} values in simultaneous equation, C_1 and C_2 were calculated and found 4.94 µg/ml and 5.0 µg/ml respectively. The method developed was found suitable as percentage recovery was 99% and 100% for Curcumin and Tretinoin respectively indicating no interference between both the drugs.

Key words: Spectrophotometry, Curcumin, Herbal drug, Tretinoin

INTRODUCTION

According to chemical structure, Tretinoin is 3, 7-dimethyl-9-(2, 6, 6-trimethyl-1-cyclohexenyl)-nona- 2,4,6,8-tertaenoic acid, used for the treatment of comedonal acne and keratosis pilaris.[1, 2] Actually it is the acid form of vitamin A and also often termed as all- *trans* retinoic acid. Tretinoin is the first generation retinoid, developed for topical application.(Castaigne S, 1990) Whereas Curcumin is (1E, 6E)-1,7-bis (4-hydroxy-3-methoxyphenyl) -1,6- heptadiene-3,5- dione and used to treat various skin disorder and mild to moderate inflammatory acne.[3,4]

MATERIAL AND METHODS

Materials

UV-visible double beam spectrophotometer, Shimadzu Model 1700 with spectral bandwidth of 1 nm, wavelength accuracy of ± 0.3 nm and a pair of 10 mm matched quartz cells was used. Tretinoin is obtained from Shalaks Pharmaceuticals Private Limited, New Delhi and Curcumin is gift sample obtained from RYM Exporters, New Delhi.

Selection of common solvent

After exhaustive solubility study of both drugs in different solvents, ethanol was confirmed as common solvent for developing spectral characteristics.

Preparation of standard stock solution

Tretinoin (100mg) was transferred to a volumetric flask (100ml) having reasonable quantity of ethanol and mixed properly. The volume was made up to 100 ml with ethanol to have concentration of 1000 µg/ml. Ten ml of above solution was diluted to 1000 ml to give concentration of 10 µg/ml. The same was designated as stock solution and was reserved for preparation of aliquots of various concentrations.[5]

1, 2, 3, 4, 5, 6, 7, 8, 9 ml aliquots of stock solution was taken in a volumetric flask (10 ml) and the volume was made up to 10 ml with ethanol to have concentration of 1, 2, 3, 4, 5, 6, 7, 8, 9 µg/ml. The absorbance was recorded for these concentrations at 349.2 nm and 427.2 nm by using ethanol as a blank.

Drug:drug interference study

Standard stock solution (5µg/ml) of Tretinoin and Curcumin was prepared separately in ethanol by serial dilution technique. The absorbance values for Curcumin and Tretinoin were recorded at 349.2 nm and 427.2 nm respectively using ethanol as blank. Absorptivity values ($A_{1\%}^{1cm}$) were calculated for both wavelengths from absorbance values.

Method I: Two wavelength spectrophotometry

From the standard stock solutions, 5ml of both the solutions were taken and made it to final concentration of 5µg/ml. Absorbance was measured at both the wavelengths (349.2 nm and 427.2 nm) by using ethanol as blank. The readings were taken in triplicate. Absorbance of both the drugs was recorded at both the wavelengths. The concentration of each component was determined by using simultaneous equation method:[6, 7]

$A_1 = E_{1a}C_1 + E_{2a}C_2$ ---------- (at 427.2 nm)

$A_2 = E_{1b}C_1 + E_{2b}C_2$ ---------- (at 349.2 nm)

A_1 = absorbance value of the sample solution at 427.2 nm

A_2 = absorbance value of the sample solution at 349.2 nm

E_{1a} = absorptivity of curcumin at 427.2 nm

E_{1b} = absorptivity of curcumin at 349.2 nm

E_{2a} = absorptivity of tretinoin at 427.2 nm

E_{2b} = absorptivity of tretinoin at 349.2 nm

C_1 = concentration of the curcumin in µg/ml

C_2 = concentration of tretinoin in µg/ml

$A_1 = E_{1a}C_1 + E_{2a}C_2$ ---------- (at 427.2 nm)

$A_2 = E_{1b}C_1 + E_{2b}C_2$ ---------- (at 349.2 nm)

RESULTS AND DISCUSSION

The individual concentration range for beer-Lambert was found 0-10 µg/mL for both Tretinoin and Curcumin at 349.2 and 427.2 nm with coefficient of correlation 0.999 and 0.9999 respectively shown in Figure 1 and Table 2.

UV scan of 5µg/ml solution of Tretinoin and Curcumin combination again showed the absorption maxima at 349.2 nm and 427.2 nm. The simultaneous estimation was done to check the interference between both the drugs at the λmax of one another.

By substituting absorbance and absorptivity values of Table 1 in simultaneous equation, C_1 and C_2 were calculated.

C_1= 4.94µg/ml

C_2= 5.0µg/ml

The percentage of Curcumin and Tretinoin recoverd after the combination was found to be 99% and 100% respectively indicating no interference between both the drugs

CONCLUSION

The proposed UV spectrophotometric method was found very simple, rapid accurate, reproducible and economic. Therefore it can be implemented for routine analysis of tretinoin and curcumin. However, another most important outcome of the simultaneous estimation study is that we can formulate both the drugs in

combination for any suitable dosage form in a very safe and effective way.

REFERENCES
1. Krautheim A., Gollnick HP. Acne: Topical treatment. Clin Dermatol. 2004; 22: 398-407.
2. Patel R, Singh SK, Singh S, Sheth NR, Gendle R. Development and characterization of Curcumin loaded transfersome for transdermal delivery, Pharm. Sci. Res., 2009; 1(4): 71-80.
3. Guy FW, Acne vulgaris: A Clinical Review. Br Med J. 2002; 32: 475-79.
4. Tabbakhian M, Sharifian A, Shatelebi MA. Preparation and *in vitro* characterization of Tretinoin containing microspheres suited for dermatological preparations. R.P.S. 2008; 3: 31-40.
5. Abdellatef H. Kinetic spectrophotometric determination of tramadol hydrochloride in pharmaceutical formulation, J. Pharm. Biomed. Anal. 2002;29:835-842.
6. Narayan S, Kumar P, Sindhu R, Tiwari A, Ghosh M. Simultaneous analysis of paracetamol and tramadol – Analytical method development and validation, Der Pharma Chemica. 2009; 1(2): 72-78.
7. Simultaneous estimation of domperidone and pantoprazole in solid dosage form by UV spectrophotometry, E. J. Chem. 2001; 3(12): 142-145 .

Table 1: Absorbance and absorptivity values

A_1	0.5341
A_2	0.6472
E_{1a}	0.1164
E_{1b}	0.0006
E_{2a}	0.0002
E_{2b}	0.1282

Table 2: Optical characteristics data and validation parameters

Parameters	Values	
	Tretinoin	Curcumin
λ max	349.2 nm	427.2 nm
Beer law limit (µg/mL)	0-10	0-10
Absorptive*	0.1282	0.1164
Correlation coefficient*	0.999	0.9999

*Average of six determination
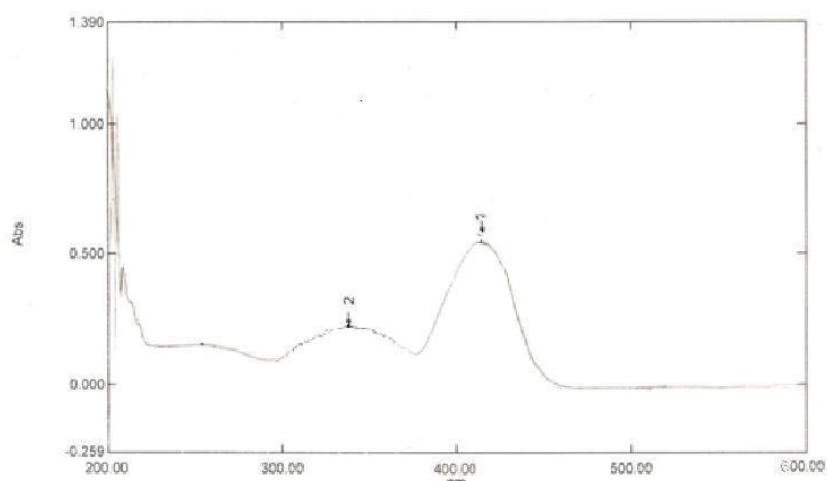
Fig 1: Spectrophotometric scan of Curcumin and Tretinoin