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 5 µg/ml. UV scan of 5 µg/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.

Keywords: 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-tetraenoic acid, used for the treatment of comedonal acne and keratosis pilaris. \(^1\) Actualy 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. \(^2\) 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. \(^3\)

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.

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 for these concentrations at 349.2 nm and 427.2 nm by using ethanol as 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 \( (A_{%\text{abs}}) \) were calculated for both wavelengths from absorbance values.

Method 1: 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.

\[
\begin{align*}
A_1 &= E_{1a}C_1 + E_{1b}C_2 \quad (at \ 349.2 \text{ nm}) \\
A_2 &= E_{2a}C_1 + E_{2b}C_2 \quad (at \ 349.2 \text{ nm}) \\
A_3 &= \text{absorbance value of the sample solution at 349.2 nm} \\
A_4 &= \text{absorbance value of the sample solution at 349.2 nm} \\
E_{1a} &= \text{absorptivity of curcumin at 349.2 nm} \\
E_{1b} &= \text{absorptivity of curcumin at 349.2 nm} \\
E_{2a} &= \text{absorptivity of tretinoin at 349.2 nm} \\
E_{2b} &= \text{absorptivity of tretinoin at 349.2 nm} \\
C_1 &= \text{concentration of the curcumin in µg/ml} \\
C_2 &= \text{concentration of tretinoin in µg/ml}
\end{align*}
\]

\[
\begin{align*}
A_1 &= E_{1a}C_1 + E_{1b}C_2 \quad (at \ 349.2 \text{ nm}) \\
A_2 &= E_{2a}C_1 + E_{2b}C_2 \quad (at \ 349.2 \text{ nm}) \\
C_1 &= \text{concentration of the curcumin in µg/ml} \\
C_2 &= \text{concentration of tretinoin in µg/ml}
\end{align*}
\]

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.

\[
C_1 = 4.94\text{µg/ml} \\
C_2 = 5.0\text{µg/ml}
\]

The percentage of Curcumin and Tretinoin recovered 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.

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REFERENCES

Table 1: Absorbance and absorptivity values

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<table>
<thead>
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<tbody>
<tr>
<td>$A_1$</td>
<td>0.5341</td>
</tr>
<tr>
<td>$A_2$</td>
<td>0.6472</td>
</tr>
<tr>
<td>$E_{1a}$</td>
<td>0.1164</td>
</tr>
<tr>
<td>$E_{1b}$</td>
<td>0.0006</td>
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<tr>
<td>$E_{2a}$</td>
<td>0.0002</td>
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<tr>
<td>$E_{2b}$</td>
<td>0.1282</td>
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Table 2: Optical characteristics data and validation parameters

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Tretinoin</th>
<th>Curcumin</th>
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<tr>
<td>$\lambda$ max</td>
<td>349.2 nm</td>
<td>427.2 nm</td>
</tr>
<tr>
<td>Beer law limit (µg/mL)</td>
<td>0-10</td>
<td>0-10</td>
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<tr>
<td>Absorptive*</td>
<td>0.1282</td>
<td>0.1164</td>
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<tr>
<td>Correlation coefficient*</td>
<td>0.999</td>
<td>0.9997</td>
</tr>
</tbody>
</table>

*Average of six determination

Fig 1: Spectrophotometric scan of Curcumin and Tretinoin

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