

**ESTIMATION OF SUMATRIPTAN SUCCINATE IN BULK AND  
FORMULATIONS BY VISIBLE SPECTROPHOTOMETRY USING  
AROMATIC ALDEHYDES**

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**ABSTRACT:** Two simple and sensitive visible spectrophotometric methods (A and B) have been developed for the determination of sumatriptan succinate in bulk and tablet dosage forms. Methods (A and B) are based on the reaction of drug with aromatic aldehydes such as Vanillin or Para dimethyl amino cinnamaldehyde (PDAC) in the presence of sulphuric acid in non aqueous medium and formed purple red colored condensation products with an absorption maximum of 565nm for method A and 560nm for method B. The Beer's law obeyed in the concentration range of 10-50µg/ml for method A and 20-60µg/ml for method B. The proposed methods are applied to commercial available tablets and the results are statistically compared with those obtained by the reference method and validated by recovery studies.

**Key words:** Sumatriptan, vanillin, Para dimethyl amino cinnamaldehyde, visible spectrometry

**INTRODUCTION**

The Sumatriptan succinate (SUM) is the most frequently prescribed anti- migraine drug of triptan class. It is chemically known as 3-[2-(Dimethylamino) ethyl] -N-methyl-1H indole -5-methane sulphonamide succinate <sup>[1]</sup> (1:1). SUM is a specific and selective 5- hydroxyl tryptamine receptor (5-HT<sub>1D</sub>) agonist with no effect on the other 5HT receptor (5HT<sub>2-5</sub> HT<sub>7</sub>) sub types. It is used widely for prophylaxis and acute relief of migraine attack with or without aura. The drug is official in EP <sup>[2]</sup> and USP <sup>[3]</sup> where chromatographic methods for determination of SUM in and bulk and tablet formulation were reported. Several analytical techniques like HPLC <sup>[4-9]</sup>, HPLC-MS-MS <sup>[10-13]</sup>, HPLC- ECD <sup>[14-15]</sup>, HPLC-coulometry <sup>[16]</sup>, capillary LC-MS-MS <sup>[17]</sup>, HPTLC <sup>[18]</sup>, spectrophotometric and HPTLC <sup>[19]</sup>, RP-HPLC and colorimetric method <sup>[20]</sup>, UV <sup>[21]</sup> and voltametry <sup>[22]</sup> have been reported in the literature. Even though there are two spectrophotometric methods for the determination of the drug they are tedious, less sensitive and the results are often uncertain and most of the methods involve sophisticated equipments which are costly and pose problems of maintenance. Hence they are not in the reach of most laboratories and small scale industries. So the authors have made some attempts in developing visible spectrophotometric methods and succeeded in developing two methods (A&B) using aromatic aldehydes <sup>[23,24]</sup> such as vanillin (method A) or PDAC (method B) ) in the presence of sulphuric acid in non aqueous medium and purple colored condensation products are formed and stable for 30 minutes.

**MATERIALS & METHODS (EXPERIMENTAL)**

Systronics UV/Visible spectrophotometer model -2203 with 10mm matched quartz cells was used for all spectral measurements. All the chemicals used were of analytical grade. Sulphuric acid (14M), Vanillin (BDH, 0.4%, w/v  $2.63 \times 10^{-2}$ M), PDAC (E.Merck, 0.1% w/v  $6.31 \times 10^{-3}$ ) in methanol was prepared.

**Standard drug solution**

About 100mg of SUM was dissolved in 100ml of methanol to get 1mg/ml stock solution. It was further diluted with the same solvent to get working standard solution (200µg/ml) for both the methods (A&B).

### Sample solution

About 20 tablets were pulverized and the powder equivalent to 100mg of SUM was weighed, dispersed in 25ml of IPA, sonicated for 30 minutes and filtered through Whatman filter paper No 41. The filtrate was evaporated and the residue was dissolved in 100 ml of methanol (1mg/ml). It was used as stock sample solution and was further diluted with the same solvent to get working standard solution.

### Assay/Procedure

**Method A:** Aliquots of standard drug solution in methanol (0.5-2.5ml, 200 $\mu$ g/ml) were placed in a series of 10ml calibrated tubes and volume of each test tube adjusted to 3.0ml with methanol. To each of these test tubes 1.0 ml of Vanillin (2.63x 10<sup>-2</sup>M) and 1.0 ml of concentrated sulphuric acid (14M) were added, while cooling under a tap with constant shaking and kept in water bath at 60 $^{\circ}$ c for 10min. cooled and diluted to the mark with methanol. The absorbance was measured at 565nm against the reagent blank within 10 minutes. The amount of drug in a sample was computed from Beer's law plot.

**Method B :** Aliquots of standard drug solution in methanol (1.0ml -3.0 ml, 200 $\mu$ g/ml) were placed in a series of 10ml calibrated tubes and volume of each test tube adjusted to 3.0ml with methanol. To each of these test tubes 1.0 ml of PDAC(6.31x 10<sup>-3</sup>M) and 1.0 ml of concentrated sulphuric acid (14M) were added, while cooling under a tap with constant shaking and kept in water bath at 60 $^{\circ}$ c for 10min. cooled and diluted to the mark with methanol. The absorbance was measured at 560nm against the reagent blank within 10 minutes. The amount of drug in a sample was computed from Beer's law plot.

## RESULTS AND DISCUSSIONS

The optical characteristics such as Beer's law limits, Sandell's sensitivity, molar extinction coefficient, percent relative standard deviation, (calculated from the eight measurements containing 3/4<sup>th</sup> of the amount of the upper Beer's law limits ), were calculated for all the methods and the results are summarized in table-1. Regression characteristics like standard deviation of slope (Sb), standard deviation of intercept (Sa), standard error of estimation (Se), % range of error (0.05 and 0.01 confidence limits) were calculated for both the methods and are shown in Table-1.

Commercial formulations containing SUM were successfully analyzed by the proposed methods. The values obtained by the proposed and reference methods for formulations were compared statistically by the t-and f-test and found not to differ significantly. As an additional demonstration of accuracy, recovery experiments were performed by adding a fixed amount of the drug to the preanalyzed formulations at three different concentration levels (50%, 75% and 100%) These results are summarized in Table-2. The ingredients usually present in formulations of SUM did not interfere with the proposed analytical methods. Among the four aromatic aldehydes (vanillin, PDAC, PDAB and anisaldehydes) tried, all of them responded. But, Vanillin and PDAC were preferred as they were found to be better sensitivity in the assay of SUM. In conclusion the proposed visible spectrophotometric methods for the estimation of SUM are possess reasonable precision .accuracy, simple, sensitive, and can be used as alternative methods to the reported ones for the routine determination of SUM depending on the need and situation.

**Chemistry of colored species:** In proposing the nature of colored species formation with vanilion(method-A) or PDAC to form schiff base as SUM behave like aromatic secondary amine due to presence of cyclic imino group in indole portion. The formation of colored species with these reagents may be assigned through above analogy as shown in Schemes-1& 2.

**TABLE 1: OPTICAL CHARACTERISTICS, PRECISION AND ACCURACY OF PROPOSED METHODS.**

Parameter	Method A	Method B
$\lambda_{max}$	565	560
Beer's law limit( $\mu\text{g/ml}$ )	10-50	20-60
Sandell's sensitivity( $\mu\text{g/cm}^2/0.001$ abs. unit)	0.09836066	0.11976048
Molar absorptivity (Litre/mole/cm)	4203.91667	3452.725
Regression equation (Y)*		
Intercept (a)	-0.003	-0.109
Slope(b)	0.010	0.011
%RSD	0.5568	0.7106
% Range of errors(95% Confidence limits)		
0.05 significance level	0.5844	0.7459
0.01 significance level	0.9165	1.1698

\*Y = a+bx, where Y is the absorbance and x is the concentration of sumatriptan in  $\mu\text{g/ml}$

**TABLE-2 ANALYSIS OF SUMATRIPTAN SUCCINATE BY PROPOSED AND REFERENCE METHODS.**

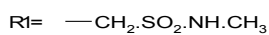
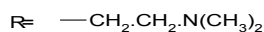
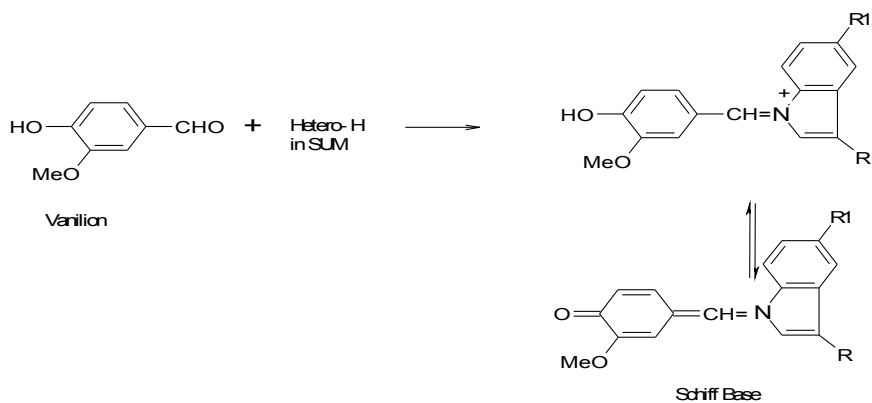
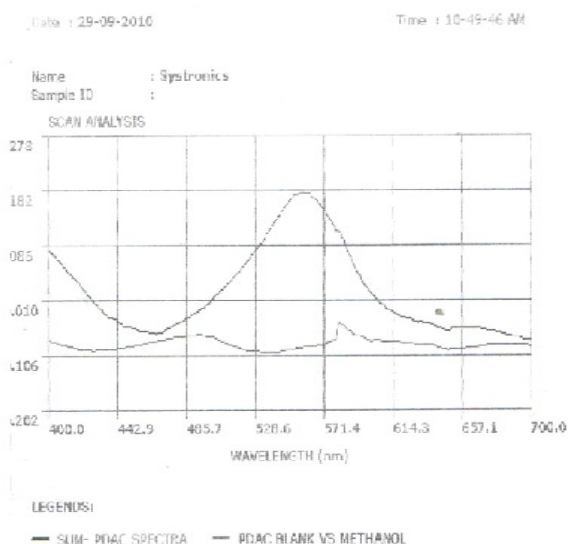
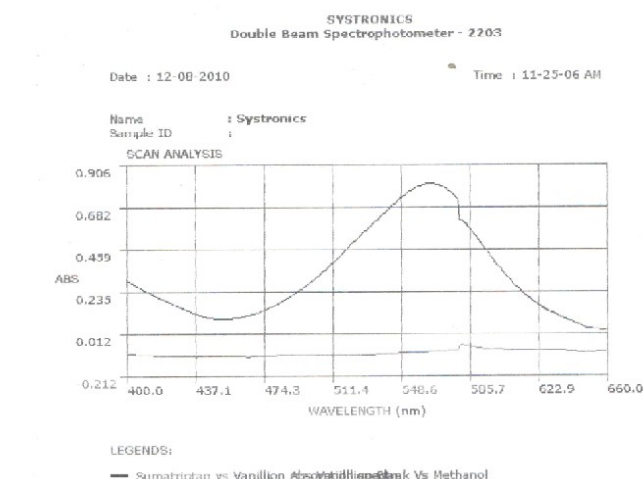
Method	*Formulations	Labeled Amount (mg)	Found by Proposed Methods			Found by Reference Method $\pm$ SD	#% Recovery by Proposed Method $\pm$ SD
			**Amount found $\pm$ SD	t	f		
A	Tablet-1	25	24.79 $\pm$ 0.057	1.815	1.415	24.78 $\pm$ 0.048	99.15 $\pm$ 0.229
	Tablet-2	25	24.84 $\pm$ 0.082	0.694	2.032	24.83 $\pm$ 0.058	99.369 $\pm$ 0.329
B	Tablet-1	25	24.83 $\pm$ 0.05	0.375	1.09	24.78 $\pm$ 0.048	99.31 $\pm$ 0.2004
	Tablet-2	25	24.87 $\pm$ 0.085	0.541	2.167	24.83 $\pm$ 0.058	99.473 $\pm$ 0.339

\* Different batches from two different companies (Sun Pharmaceuticals, Dabur Pharmaceuticals)

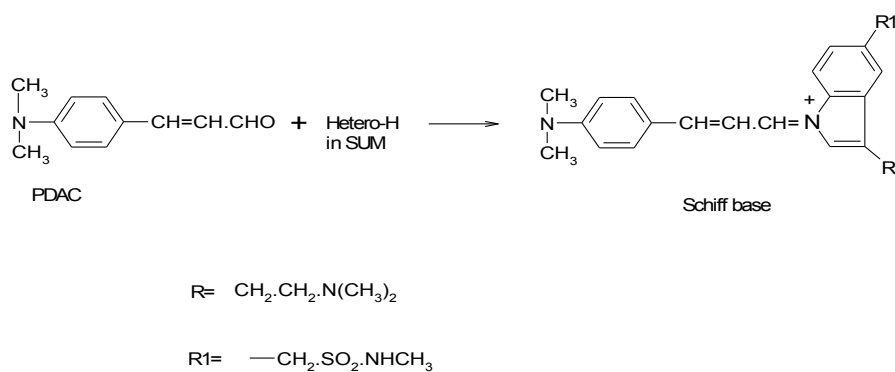
\*\*Average  $\pm$  Standard deviation of eight determinations, the t- and f-values refer to comparison of the proposed method with reference method. (UV). Theoretical values at 95% confidence limits t =2.57 and f = 5.05.

# Recovery of 10mg added to the preanalyzed sample (average of three determinations).

Reference method (reported UV method) using distilled water ( $\lambda_{max}$ =220nm).



Scheme-1



Scheme-2

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