ASSAY OF MEMANTINE BY EXTRACTIVE SPECTROPHOTOMETRY

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ABSTRACT

Two simple and sensitive extractive spectrophotometric methods have been developed for the estimation of Memantine(MEM) in pure and pharmaceutical dosage forms. These methods are based on the formation of ion-pair complexes of the drug with acidic dyes Solochrome black T (SBT : λ_{max} 510 nm) and Methyl Orange (MO : λ_{max} 445 nm). The absorbance of the chloroform extracts is measured against the corresponding reagent blanks. These methods have been statistically evaluated and found to be precise and accurate.

1.INTRODUCTION:

Memantine(MEM) which is chemically 1-Amino-3,5-dimethyl tricyclo[3.3.1.1(3.7)] decane hydrochloride is an NMDA (N-methyl-D-aspartate) receptor antagonist used to slow or reverse the neuro-degenerative process of Alzheimer's disease. A number of methods such as UPLC, LCMS were reported for the estimation of MEM. Literature survey reveals that visible spectrophotometric methods have not been reported for its quantitative determination in its pure form and pharmaceutical formulations. In the present investigation two simple and sensitive extractive spectrophotometric methods have been developed for the determination of MEM. The developed methods involve the formation of colored chloroform extractable complexes with SBT and MO. Extractable complexes showed absorption maximum at 510 and 445nm respectively. Beers law is obeyed in the concentration ranges of 5-25µg/ml and 8-16µg/ml respectively. The results of analysis for the two methods have been validated statistically and by recovery studies.

2.EXPERIMENTAL:

Preparation of reagents:

1. Solochrome Black T Solution: 0.5 g of SBT dye was dissolved in 100 ml of distilled water.
2. Methyl Orange Solution: 0.1 g of MO dye was dissolved in 100 ml of distilled water.
3. Acid phthalate buffer pH 2.2 [I.P]
4. Standard drug solution: About 100mg of Memantine was accurately weighed and dissolved in 100 ml of water to obtain a stock solution of 1 mg/ml. This solution was further diluted with distilled water to get working standard solution of 100 µg/ml.

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ASSAY PROCEDURES:

Method A: Aliquots of working standard solution of MEM ranging from 0.5-2.5 ml were transferred into a series of 125 ml separating funnels. To these 1 ml of buffer solution (pH 2.2) and 1 ml of SBT dye were added. The total volume of aqueous phase was adjusted to 10 ml with distilled water and 10 ml of chloroform was added. The contents were shaken for 2 minutes. The two phases were allowed to separate and the absorbance of the Pink colored chromogen was measured at 510 nm against reagent blank and the amount of MEM present in the sample solution was computed from its calibration curve.

Method B: Aliquots of working standard solution of MEM ranging from 0.8-1.6 ml were transferred into a series of 125 ml separating funnels. To these 1 ml of MO dye was added. The total volume of aqueous phase was adjusted to 10 ml with distilled water and 10 ml of chloroform was added. The contents were shaken for 2 minutes. The two phases were allowed to separate and the absorbance of the yellow colored chromogen was measured at 445 nm against reagent blank and the amount of MEM present in the sample solution was computed from its calibration curve.

3.RESULTS AND DISCUSSION: The optical characteristics such as beers law limits, Sandell's sensitivity, molar extinction coefficient, percent relative standard deviation, percent range of error(0.05 and 0.01 confidence limits) were calculated for both the methods and results are summarized in Table 1. The values obtained for the determination of MEM in Pharmaceutical formulations (Tablets) by the proposed methods are presented in Table 2. Studies reveal that the common excipients and other additives usually present in the Tablets did not interference in the proposed methods.

4.CONCLUSION: The proposed methods are applicable for the assay of drug MEM and have an advantage of wider range under Beers law limits. The proposed methods are simple, selective and reproducible and can be used in the routine determination of MEM in pure form and formulations with reasonable precision and accuracy.

Table-1: Optical characteristics, precision and accuracy of the proposed method

Parameters	Method A	Method B
λ_{max} (nm)	510	445
Beer's law limit(? g/ml)	5-25	8-16
Sandell's sensitivity(? g/cm^2/0.001 abs. unit)	0.0331	0.0314
Molar absorptivity(litre.mole^{-1}.cm^{-1})	5.53×10^3	6.24×10^3
Regression equation(Y*)		
Slope(b)	0.0231	0.0495
Intercept(a)	0.073	0.145
Correlation coefficient(r)	0.9993	0.9994
%Relative standard deviation**	1.062	1.13
%Range of error		
0.05 significance level	0.892	0.923
0.01 significance level	1.301	1.348

*Y = a + bx, where 'Y' is the absorbance and x is the concentration of Memantine in ¼g/ml

**For six replicates

Table-2: Estimation of Memantine in Pharmaceutical Formulations

Formulations (Tablets)	Labelled amount(mg)	Amount found* by proposed method		% recovery** by proposed method	
		Method A	Method B	Method A	Method B
Tablet 1	5	4.82	4.88	99.15	99.34
Tablet 2	5	4.84	4.90	99.25	99.46
Tablet 3	10	9.78	9.85	98.85	99.32
Tablet 4	10	9.84	9.92	99.10	99.48

* Average of six determinations

**Recovery of amount added to the pharmaceutical formulation (Average of three determinations)

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