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Extractive spectrophotometric method for the determination of Memantine

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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 Bromocresol Green (BCG: λmax 415 nm) and Bromothymol Blue (BTB : λmax 420 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.

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INTRODUCTION

Memantine(MEM)which is chemically 1-Amino-3,5-imethyltricyclo [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 BCG and BTB. Extractable complexes showed absorption maximum at 415and 420 nm respectively. Beers law is obeyed in the concentration ranges of 4-12 µg/ml and 2-6 µg/ml respectively. The results of analysis for the two methods have been validated statistically andbyrecoverystudies[1-9].

EXPERIMENTAL

Preparation of reagents:

1. Bromocresol Green Solution: 0.5 g of BCG dye was dissolved in 100 ml of distilled water
2. Bromothymol Blue Solution: 0.1 g of BTB dye was dissolved in 100 ml of distilled water.
3. 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.

ASSAY PROCEDURES

Method A

Aliquots of working standard solution of MEM ranging from 0.4-1.2 ml were transferred into a series of 125 ml separating funnels. To these 2 ml of BCG 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 415 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 0.2 -0.6 ml were transferred into a series of 125 ml separating funnels. To these 2 ml of BTB 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 420 nm against reagent

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blank and the amount of MEM present in the sample solution was computed from its calibration curve

RESULTS AND DISCUSSION

The optimum conditions for each method were established by varying one parameter at a time and keeping the others fixed and observing the effect produced on the absorbance of colored species and incorporated in the procedure. 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.

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)	415	420
Beer's law limit(µg/mL)	4-12	2-6
Sandell's sensitivity(µg/cm^2/0.001 abs. unit)	0.013	0.0099
Molar absorptivity(litre.mole^{-1}.cm^{-1})	1.29× 10^4	1.988 × 10^4
Regression equation(Y*)		
Slope(b)	0.0562	0.1155
Intercept(a)	0.0496	0.0286
Correlation coefficient(r)	0.9990	0.9995
%Relative standard deviation**	1.15	1.19
%Range of error		
0.05 significance level	0.846	0.984
0.01 significance level	0.921	1.042

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

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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)

REFERENCES

[1] The Merck Index, 13th ed., Merck Research laboratories, Merck and Co., INC-Whitehouse station, NJ, Pg.1041(2001).
[2] Martindale The Extra Pharmacopoeia, 31st ed., Reynolds, J. E. F., ed., Royal Pharmaceutical Society (London, UK: 1996), p. 1165.
[3] Kornhuber J et al. J Neural Transm Suppl 1994;43;91-104.
[4] Nankai M et al. Prog Neuropsychopharmacol Biol Psychiatry 1998;22(1):35-64.
[5] Sunil K Dubey, Anil Patni. E-Journal of Chemistry, 2009:6(4):1063-1070.
[6] G Devala Rao, S Vijaya Saradhi. Acta Ciencia Indica 2009;XXXVC (1):101.
[7] Chitra K, Sujatha K, Ghosh A. Indian Drugs 2004; 41(8):478-481.
[8] G Devala Rao, K Ratna Kumari. Acta Ciencia Indica 2009; XXXVC (2):251.
[9] MT Naik, PM Dhadke. Ind J Pharm Sci 1999;61(3):156-157.