

Development and Validation of a Stability-Indicating UV Spectroscopic Method for Amisulpride in Bulk and Formulations

Mote G. D¹, Mullani A. K², Mote S. G³, Saralaya M.G⁴, Jamadar S.D⁵

^{1,2}Assistant Professor, Department of Pharmaceutical chemistry, Annasaheb Dange College of B. Pharmacy, Ashta.

³Assistant Professor, Department of Pharmaceutics, Annasaheb Dange College of B. Pharmacy, Ashta.

⁴Professor, Department of Pharmacology, Annasaheb Dange College of B. Pharmacy, Ashta

⁵Research scholar, Annasaheb Dange College of B. Pharmacy, Ashta.

DOI: <https://doi.org/10.51244/IJRSI.2026.1308000197>

Received: 24 August 2026; Accepted: 29 August 2026; Published: 15 September 2026

ABSTRACT

A straightforward, precise, reliable, and stability-indicating UV-spectrophotometer approach was created to estimate amisulpride. It utilized a Shimadzu model 1800 spectrophotometer with 0.1 N HCl as the solvent and a wave length (λ_{max}) of 227 nm. For amisulpride, linearity was found between 10-9100 $\mu\text{g/ml}$. It was shown that the recovery percentage ranged from 95.00 to 99.6%.

The medication underwent oxidation, dry heat, UV radiation, and photolytic destruction in addition to hydrolysis by acids, alkalis, and neutrals. System appropriateness, specificity, precision, linearity, accuracy, robustness, ruggedness, LOD, and LOQ are all demonstrated by validation trials.

Excipients and other additions did not interfere with the estimation of the commercial formulation. Hence, amisulpride in bulk and its medicinal dose forms may be routinely determined using this method. The stability study approach that was suggested demonstrates that there was a noticeable deterioration in amisulpride under stress conditions.

Key words: Analytical method, validation, amisulpride, degradation, UV Spectroscopy.

INTRODUCTION

The pharmaceutical Amisulpride (AMS), also known as 4-amino-N-((1-ethylpyrrolidin-2-yl)methyl)-5-(ethylsulfonyl)-2-methoxybenzamide (Fig. No. 01), is primarily used as an anti-psychotic or anti-schizophrenia treatment.

Amisulpride (AMS) is used as an antiemetic at higher oral dosages to treat schizophrenia and acute psychotic episodes, as well as at intravenous dosages to prevent and treat postoperative nausea and vomiting. It is typically categorized as an agent of the second generation of antipsychotics. Amisulpride is used to prevent vomiting and nausea following surgery⁵.

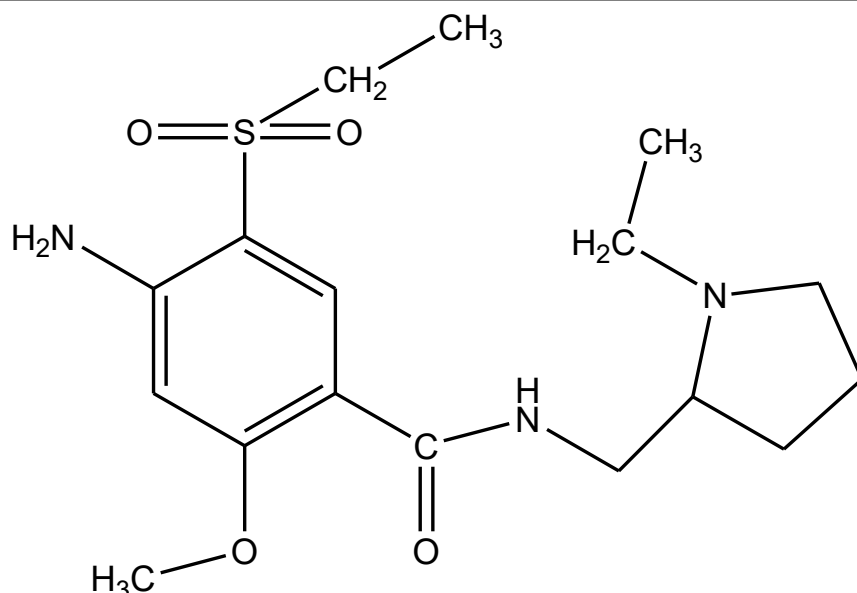


Fig No. 01, Chemical structure of amisulpride

The way amisulpride (AMS) functions is thought to be through inhibiting or opposing the dopamine D₂ receptor, which lowers signals from it. Because AMS blocks presynaptic dopamine D₂ receptors, it is thought to be beneficial in treating dysthymia and the negative symptoms of schizophrenia. Dopamine concentrations in the synapse are increased by AMS because presynaptic receptors control the release of dopamine into the synapse. It is hypothesized that this elevated dopamine concentration acts on dopamine D₁ receptors to alleviate symptoms of depression and negative symptoms associated with schizophrenia.

In accordance with ICH requirements, the UV Spectrophotometric method was designed and verified. The spectrophotometric approach is typically chosen, particularly by small-scale enterprises because it requires less maintenance and has lower equipment costs. The analysis technique measures the absorption of monochromatic light by colourless substances in the near ultraviolet spectrum (200–400 nm)⁶.

The force degrading environments that the API is exposed to include basic, oxidative, and acidic situations. One of the first tasks in the development process should be force degradation to make sure the method can distinguish between degradants and API. Not all stress agents will cause deterioration, depending on the API; nonetheless, each agent must be assessed to ascertain whether degradation occurs.⁴.

In the present study all the reagents and solvents were used of analytical grade. The tablet formulation (Eridanus Healthcare Pvt. Ltd., bhatinda, India) containing 50 mg of amisulpride was procured from local market and used for analysis. The analysis was performed by using an electronic balance (Shimadzu AUX 220) and UV/Vis spectrophotometer (Shimadzu model UV 1800).

METHODOLOGY

Based on the amisulpride solubility investigation, 0.1 N HCl was selected as the solvent for UV analysis. Standard stock solution of amisulpride was made by dissolving 10 mg of bulk medication in 7-8 ml of 0.1 N HCl. After giving it a good shake to dissolve the medication, ethanol was added to the volume to achieve a concentration of 1000 µg/ml. To obtain 10 µg/ml concentrations, an additional 0.1 ml of the stock solution was separated into a 10 ml volumetric flask and its volume was increased with 0.1 N HCl up to 10 ml. The API solution at a specific concentration of 10 µg/ml was scanned within the 200–400 nm wavelength range against 0.1 N HCl, a corresponding blank solvent, to determine its wavelength of maximum absorbance (λ_{max}).

The absorption peak maxima for amisulpride revealed distinctive absorption maxima at 227 nm. (Fig No.2)

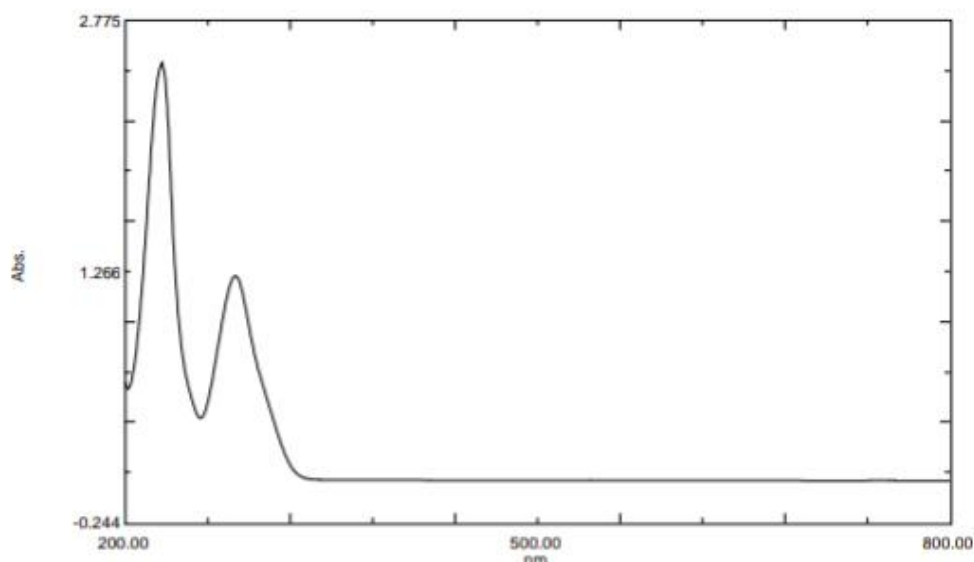


Fig No.02 UV Absorption Spectra of amisulpride.

The stock solutions (0.1, 0.2, 0.4, 0.6, 0.8, and 1 ml) were taken individually and diluted with 10 ml of 0.1N HCl to obtain a working standard solution of 10, 20, 40, 60, 80, and 100 µg/ml in order to construct the calibration curve. (Table 1).

Table No. 01. Linearity of Amisulpride solution

Concentration (µg/ml)	Absorbance	Statistics
10	0.122	Slope: 0.0116 Regression coefficient: 0.992
20	0.244	
40	0.488	
60	0.644	
80	0.894	
100	1.204	

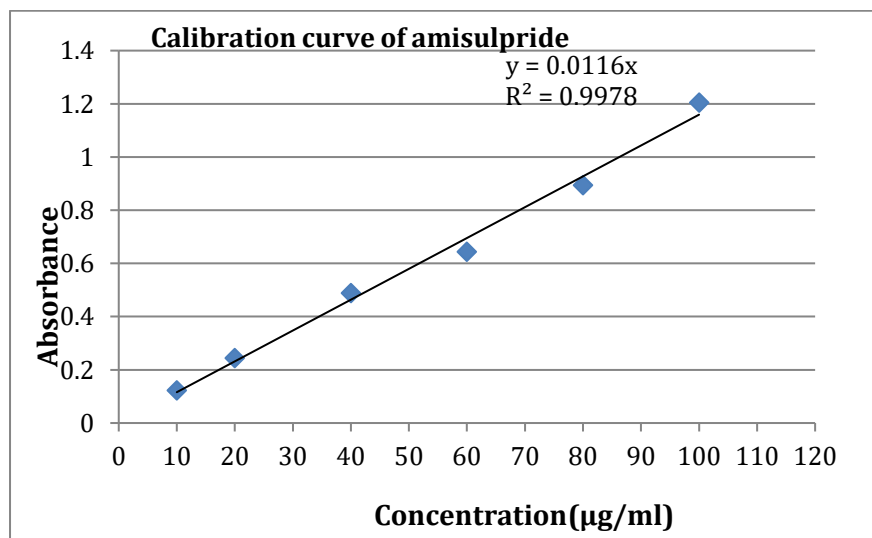


Fig. No. 03. Calibration curve of Amisulpride

At 227 nm, the absorbance of every solution was measured using 0.1 N HCl as a blank. Amisulpride's standard graph was created by plotting the drug's concentration on the X-axis and absorbance on the Y-axis (fig. 3). Between 10 and 100 µg/ml, the medication complied with Beer's law, with an R^2 of 0.992. In Table 2, the optical properties are listed.

Table No. 02. Optical characteristics of amisulpride

Optical characters	Values
Absorbance Maxima	227 nm
Beer's Limit	10-100 µg/ml
% R.S.D.	0.0405
Regression equation ($Y=mx+c$)	0.001529
Slope (a)	0.0116
Intercept (b)	0.0015
Correlation coefficient	0.992
LOD (µg/ml)	0.0342
LOQ (µg/ml)	0.0954

In order to examine commercial formulations, twenty tablets were weighed, ground into a powder, and then the powder, which equated to 10 mg of amisulpride, was put into a 100 ml volumetric flask and dissolved in 100 ml 0.1 N HCl to obtain a concentration of 100 µg/ml. After 10 minutes of sonication, the solution was filtered, and the absorbance at 227 nm was determined. Using the standard graph, it was discovered that each tablet's drug content was 49.2 mg, not the 50 mg stated on the label.

A precisely measured 10 mg bulk medication was added to a 10 ml volumetric flask. After that, the volume was created using 0.1 N NaOH and refluxed at 60° for five hours. Every hour, the absorbance was measured by taking the necessary sample out of the reaction mixture to make a concentration of 100 µg/ml, which was then exposed to UV analysis. Using distilled water as the medium and 0.1 N HCl as the degradation agent, respectively, similar acidic and neutral degradations were carried out and analyzed under the same conditions as before. Precisely 10 milligrams of the bulk drug were weighed; two to three drops of 0.1 N HCl were added to make the drug soluble; and finally, 3% H₂O₂ was used to raise the volume to 10 ml. For twelve hours, the solution mixture described above was stored in the dark. The appropriate concentration was prepared, the absorbance was calculated, and the specified amount of sample was removed every six hours.

About 150 mg of the bulk medication were precisely weighed and stored in the Petridish under direct sunlight for three days in order to facilitate photolytic breakdown. Following a 6-hour delay, the necessary sample was extracted to achieve a concentration of 100 µg/ml using a solvent system, and absorbance was subsequently measured.

To measure heat deterioration, a certain volume of bulk medication was taken in a cleaned Petridish and placed in an oven set to 60°C

RESULT AND DISCUSSION

In order to perform UV degradation, 100 mg of API amisulpride was exposed to UV light. The sample was

removed every 8 hours, and the necessary concentration of 100 µg/ml was prepared in order to measure absorbance in a UV spectrophotometer. Although considerable degradation was observed in every instance, the order of degradation's magnitude was as follows: oxidative, UV, thermal, photolytic, acidic, neutral, and alkaline.

As shown in figs. 4 to 6, amisulpride was found to be extremely sensitive to acidic, neutral, and oxidative degradation conditions. In Table 3, the degradation is summarized.

Table No. 03. Summary of Stress Degradation for amisulpride.

Stress conditions	Time	% Assay of degraded Product	% assay of active substance
Acidic Hydrolysis	5 Hr	15.25	84.75
Alkaline Hydrolysis	5 Hr	4.94	95.06
Neutral Hydrolysis	5Hr	6.25	93.75
Photolytic degradation	12 Hr	15.26	84.74
U.V. degradation	48 Hr	17.34	83.66
Thermal degradation	12 Hr	15.28	84.72
Oxidative degradation(3% H ₂ O ₂)	6 Hr	20.53	79.47

The suggested approach had good precision and accuracy and was straightforward, sensitive, and dependable. When estimating the commercial formulation, the procedure is precise as long as excipients and other additives don't interfere. As a result, amisulpride in bulk and pharmaceutical formulations can be routinely analyzed using it. The stability study approach that has been suggested demonstrates that amisulpride's stress situation exhibits a notable degree of degradation. A novel, straightforward analytical technique was created to assess amisulpride's stability.

REFERENCES

1. Skoog DA, Hollar FJ, Crouch SR. An Introduction to Ultraviolet-Visible Molecular Absorption Spectrometry. In, Principles of Instrumental Analysis, 6th ed, Harayana: Thomson; 2007. p. 336-7.
2. Stenlake JB, Beckett AH. The Basis of Spectrophotometer. Practical pharmaceutical Chemistry, 4th edition, Part.2, New Delhi: CBS Publishers and Distributors; 2007. p. 255-7.
3. Syeda HUMAIRA, Spectrophotometric determination of amisulpride, Turk J. Pharm. Sci. 6 (3), 2009, p. 221-230.
4. K. K. Pradhan, U. S. Mishra, S. Pattnaik¹, C. K. Panda and K. C. Sahu, Development and Validation of a Stability-indicating UV Spectroscopic Method for Candesartan in Bulk and Formulations, Indian Journal of Pharmaceutical Sciences, 2011, P. 693-696.
5. Philippe Nuss, Martina Hummer, Cédric Tessier, The use of amisulpride in the treatment of acute psychosis, Therapeutics and Clinical Risk Management 3(1), 2007: p. 3–11.
6. Pritam S. Jain, Amar J. Chaudhari, Stuti A. Patel, Zarana N. Patel, and Dhvani T. Patel, Development and validation of the UV-spectrophotometric method for determination of terbinafine hydrochloride in bulk and in formulation, Pharm Methods. 2(3): 2011, p. 198–202.
7. Piyush Gupta, Tara Chand and Manoj Khardiya, Analytical Method Development and its Validation for Estimation of Amisulpride by Reversed Phase High Performance Liquid Chromatography (RP-HPLC), International Journal of Research in Pharmaceutical and Biomedical Sciences, Vol. 4 (2), 2013 p. 542-549.

8. Kamal Sweidan, Mohammad Elayan, Dima Sabbah, Gada Idrees and Tawfiq Arafat, Study of Forced Degradation Behavior of Amisulpride by LC-MS and NMR and Development of a Stability-Indicating Method, Bentham science, Volume 14, Issue 2, 2018 p. 157-165.
9. Anna Maślanka, Paweł Żmudzki, Marek Szłósarczyk, Przemysław Talik, Urszula Hubicka, Photodegradation assessment of amisulpride, doxepin, haloperidol, risperidone, venlafaxine, and zopiclone in bulk drug and in the presence of excipients, Monatshefte für Chemie – 151, 2020, p. 483–493.
10. Budavari S. The Merck Index. 12th ed. New Jersey, USA: Merck and Co., Inc; 1996. p. 1564.
11. Martindale. The Complete Drug Reference. 32nd ed. Great Britain: Council of Royal Pharmaceutical Society of Great Britain; 1999. pp. 367–87.
12. Delgado JN, Remers WA. Text book of Organic Medicinal and Pharmaceutical Chemistry. 9th ed. Philadelphia: J. B. Liipincott Company; 1991. Wilson and Gisvold's; pp. 145–53.
13. Goncealves-codoso S, Schapoval EE. High performance chromatographic assay of terbinafine hydrochloride in tablets and creams. J Pharm Biomed Anal. 1999;19:809–12. doi: 10.1016/s0731-7085(98)00119-8.
14. Ji XF, Yu KY, Zhang W. Determination of terbinafine hydrochloride, chlorohexidine and triameinolone acetate in compound ointment by reversed phase HPLC. Chin J Pharm Anal. 1997;17:363–5.
15. Yagnesh MH, Melachlan AJ. Determination of terbinafine in tissues. Biomed Chromatogr. 2000;14:261–8.
16. Zehender H, Denouel J, Roy M, Le-Saux L, Schaub P. Simultaneous determination of terbinafine and five metabolites in human plasma and urine by high performance liquid chromatography using online solid phase extraction. J Chromatogr B. 1995;664:347–55.
17. Denouel J, Keller HP, Schaub P, Delborde C, Humbert H. Determination of terbinafine and its desmethyl metabolites in human plasma by high performance liquid chromatography. J Chromatogr B. 1995;663:353–9.
18. f.Schatz F, Haberl H. Analytical methods for the determination of terbinafine and its metabolites in human plasma, milk and urine. Arzneim-Forsch. 1989;39:527–32.
19. Brigol N, Bakhtiyar R, Dou L, Majumdar T, Tse FL. Quantitative analysis of terbinafine in human and minipig plasma by liquid chromatography tandem mass spectrometry. Rapid Commun Mass-Spectrom. 2000;14:141–9.
20. Cardoso SG, Schapoval EE. UV spectrophotometry and non aqueous determination of terbinafine hydrochloride in dosage forms. J AOAC Int. 1999;82:380–3.
21. Arranz A, Fernandez S, Moreda JM, Cid A, Arranz JF. Voltametric behavior of the antimycotic terbinafine at the hanging mercury drop electrode. Anal Chim Acta. 1997;351:97–103.
22. Arun Prasad K, Narayanan N, Rajalakshami G. Preparation and evaluation of solid dispersion of terbinafine hydrochloride. Int J Pharm Sci Rev Res. 2010;3:130–4.
23. ICH-Guidelines Q2 (R1), Validation of Analytical Procedures: Text and Methodology. 2005