Research Article **ISSN: 2349 – 7106**

Asian Journal of Research in Chemistry and Pharmaceutical Sciences

Journal home page: www.ajrcps.com

https://doi.org/10.36673/AJRCPS.2020.v08.i01.A13

UV SPECTROPHOTOMETRIC METHOD FOR ESTIMATION OF PALIPERIDONE IN BULK AND THEIR SOLID DOSAGE FORM

Minal P. Khanapure*[1], Deepak S. Bhosale[1], Naziya Kalyani[1], Komal Hotkar[1]

[1*]Department of Pharmaceutics, D.S.T.S. Mandal's College of Pharmacy, Solapur - 413004, Maharashtra, India.

ABSTRACT

Objective: The simple, rapid, reproducible, sensitive and economical method of UV Spectrophotometry for the estimation of Paliperidone (PPD) in bulk and its formulation was developed and validated. **Methods:** The UV spectrum of Paliperidone in Dimethylformamide (DMF) showed λ max at 280nm. The linearity was established in the concentration range of 10-60µg/ml for Paliperidone. This method was validated for different analytical parameters such as linearity, accuracy, precision, ruggedness and robustness. **Results:** The method shows approximate linearity over the concentration range of 10-60µg/ml with the regression equation y = 0.0187x - 0.1258 and regression correlation coefficient r^2= 0.999 at 280nm. However, the method was found to be highly precise with LOD (1.82) and LOQ (6.07). **Conclusion:** Considering above results the developed method can be successfully applied for the determination of Paliperidone in different pharmaceutical dosage forms.

KEYWORDS

Paliperidone, Spectrophometry, Dimethylformamide (DMF), Method development and Validation.

Author for Correspondence:

Minal P. Khanapure,

Department of Pharmaceutics,

D. S. T. S. Mandal's College of Pharmacy,

Solapur - 413004, Maharashtra, India.

Email: khanapure.minal9@gmail.com

INTRODUCTON

The active metabolite of risperidone is paliperidone which is used in treatment of the schizophrenia. The disease called schizophrenia is a serious mental disorder in which people interpret reality abnormally. The problem associated with it shows hallucinations, delusions, and disordered thinking. To treat this type of disease an anti-psychotic drug are given, whereas the drug called paliperidone itself act as an psychotropic agent which belongs to the chemical class of benzisoxazole derivatives[1]. The chemical name of Paliperidone is (RS) -3- [2-[4-(6-fluoro-1, 2-benzoxazol-3-yl) piperidin-1-yl]ethyl]-9-hydroxy-2-methyl-6, 7, 8, 9-

tetrahydropyrido[1, 2-a] pyrimidin-4-one.The molecular formula of Paliperidone is $C_{23}H_{27}FN_4O_3$ and molecular mass is 426.484 g/mol. The paliperidone has antagonistic effect on α1 and α2 adrenergic receptors and also on H1receptors[2-3]. Additionally, it blocks serotonin and dopamine receptors but it has no any effect on muscarinic acetylcholine receptors. Some of UV spectrophotometric methods of PPD were developed by using different solvents. This present study shows rapid, accurate, precise, simple and economic method development of PPD by UV spectrophotometric method in bulk and pharmaceutical dosage form[4-5].

MATERIAL AND METHODS

Instrumentation

A UV visible double beam spectrophotometer [Systronics 2201] with 1 cm quartz cuvettes was used for all absorbance measurement.

All weights were taken on analytical balance (Shimadzu AY220). Sonicator (Oscar Ultrasonic Cleaner- Microclean -103) was used for dissolving Paliperidone in Dimethylformamide (DMF).

Chemicals and Reagents

Drug sample of Paliperidone was taken as a gift sample by Nova Chem Drugs Pvt. Ltd, Pune (India). Tablets of paliperidone (paliris) were purchased from local market.

Solvents Used- DMF is used as diluent.

Experimental

Preparation of Standard Stock Solution

The standard solution of Paliperidone was prepared by dissolving 10mg of accurately weighed Paliperidone with DMF in a 10ml of volumetric flask and sonicated for 20mins and vortex for 5 mins. This stock solution was further diluted with DMF as per the requirement.

Procedure for plotting calibration curve

The calibration curve performed by taking fresh aliquots of standard solution (1000µg/ml), ranging from 0.1 to 0.6ml were transferred into a series of 10ml volumetric flasks and volumes were adjusted by using DMF upto the mark. The final concentrations were made as 10-60µg/ml. By using DMF as a blank, the absorbance's were recorded at 280nm. The calibration curve was constructed by plotting absorbance versus concentration of drug.

Procedure for assay of paliperidone

Weigh accurately 20 tablets containing Paliperidone. An accurately weighed portion was powdered containing equivalent weight of 10mg of Paliperidone and was transferred into 100ml of volumetric flask. The contents were dissolved in DMF and kept for sonication for 30mins. Then by using 0.45 micron whatmann filter paper the solution was filtered and final volume was made with DMF to get the solution 1000µg/ml. Then this solution was further diluted as per requirement with DMF. A series of different solutions were made by using above sample solution. The concentration considered for calculation of assay of paliperidone is 25µg/ml and absorbance's were recorded at 280nm.

RESULTS AND DISCUSSION[6-8]

The absorption spectral analysis shows the λ max of Paliperidone at 280nm.

The developed method was validated by International conference on Harmonization (ICH) guidelines.

Linearity

The linearity was confirmed by taking aliquots of concentration of 10-60µg/ml and absorbance was measured. It was performed in single day only. The obtained absorbance shows good regression coefficient at wavelength 280nm. The slope and intercept values were recorded. The linearity was plotted against absorbance of Paliperidone vs concentration of Paliperidone.

The regression coefficient was found to be 0.999. The absorbance was found in limit i.e. 0-2. Hence the analyzed parameter was found to be validated.

Assay

The absorbance of two dilutions of 25µg/ml of Paliris Tablet was determined and % purity was calculated. The results are given in the Table No.2.

Accuracy

The accuracy is the analytical parameter, recovery studies were carried out by adding different amounts of bulk samples of Paliperidone were taken which is within the linearity range and added to the

pre-analyzed formulation. From this the percentage recovery values were calculated.

Range

The range is the analytical parameter of interval between lower and upper concentration limit of an analyte i.e. 10-60µg/ml.

Precision

Precision is a measure of how to close the data value to each other for a number of measurements under same analytical condition. Precision may be considered the levels according to ICH such as repeatability, intermediate precision and reproducibility. The precision is performed as inter-day and intra-day. Intra-day precision was performed in one day and inter-day precision was performed in three days. Paliperidone was evaluated at concentration 30µg/ml.

The percentage RSD for intra-day precision was found to be 0.3136% and inter-day precision was found to be 0.3655%. The percentage RSD of intra-day and inter-day precision was found within limit i.e. NMT 2%. Hence the parameter was found to be validated.

Limit of Detection (LOD)

The Limit of Detection (LOD) of an analytical method is the lowest amount of analyte in a sample that can be detected, but not necessarily quantitated, under the stated experimental condition. It is calculated by formula,

LOD = 3 Sa / b

The limit of detection was found to be 1.82µg/ml.

Limit of Quantitation (LOQ)

The parameter limit of quantitation is the lowest amount of drug in a solution which can be estimated with an acceptable accuracy and precision under the experimental conditions.

LOQ =10 Sa /b

The limit of detection was found to be 6.07µg/ml.

Ruggedness

The reproducibility of the result when the method is performed under actual use conditions. The ruggedness includes various analysts, laboratories, columns, instruments, sources of reagents, chemicals, solvents etc. The ruggedness of the method was determined by carrying out the different analyst. The results were analysed.

The change in analyst at concentration i.e.15µg/ml showed that the obtained result not affected by it.

Robustness

Robustness is the small, but deliberate variation in method parameter which was determined by making slight changes in the experimental conditions such as temperature and stability of analytical solution. Robustness is used to verify the method performance that is not affected by changes in normal experiments. The change in concentration i.e. 15µg/ml and change in wavelength i.e. 280nm and 286nm. The obtained results shown that there is negligible effect on results. The percentage RSD of robustness was found within limits i.e. NMT 2%. Hence, the performed parameter was found to be validated.

Table No.1: Results for linearity

S.No	Concentration (µg/ml)	Absorbance
1	10	0.045
2	20	0.256
3	30	0.446
4	40	0.622
5	50	0.81
6	60	0.983

Table No.2: Assay of Paliperidone

S.No	Formulation	Labeled Amount	Amount Obtained	% purity
1	Paliris Tablet	3 mg	2.98 mg	99.3%

Table No.3: Regression analysis of the calibration curve for proposed method

S.No	Parameters	Method values
1	λ max	280nm
2	Beer's law	10-60µg/ml
3	Correlation coefficient (r)	0.999
4	Regression equation (Y = mx +c)	0.0187x-0.1258
5	Slope (m)	0.0187
6	Intercept (c)	0.1258

Table No.4: Results of LOD and LOQ

LOD(µg/ml)	1.82
LOQ(µg/ml)	6.07

Table No.5: Result for precision (Intra-day)

S.No	Concentration (µg/ml)	Absorbance 1	Absorbance 2	Absorbance 3	% RSD
1	30	0.446	0.447	0.445	
2	30	0.445	0.446	0.442	
3	30	0.447	0.445	0.443	
4	30	0.446	0.447	0.446	
5	30	0.444	0.445	0.445	
6	30	0.443	0.448	0.445	
SD		0.001472	0.001211	0.001506	
% RSD		0.330654%	0.271335%	0.338832%	**0.3136%**

Table No.6: Result for precision (Inter day)

S.No	Concentration (µg/ml)	Day 1	Day 2	Day 3	%RSD
1	30	0.446	0.445	0.447	
2	30	0.445	0.442	0.445	
3	30	0.448	0.446	0446	
4	30	0.446	0.448	0.445	
5	30	0.447	0.445	0.448	
6	30	0.445	0.446	0.443	
SD		0.001169	0.001966	0.001751	
% RSD		0.26202	0.441553	0.392937	**0.3655%**

Table No.7: Result for Robustness

S.No	Wavelength	280nm	286nm
1	Concentration	15µg/ml	15µg/ml
2	Absorbance	0.145	0.154
3	---	0.146	0.154
4	---	0.147	0.155
5	---	0.144	0.156
6	---	0.146	0.150
7	---	0.145	0.155
8	Average	0.1455	0.154
9	SD	0.001049	0.002098

Table No.8: Result of Ruggedness

S.No	Concentration	Absorbance (Analyst 1)	Analyst 2
1	15µg/ml	0.145	0.145
2	---	0.146	0.143
3	---	0.147	0.145
4	---	0.146	0.147
5	---	0.144	0.145
6	---	0.146	0.149
7	Average	0.145667	0.145667
8	SD	0.001033	0.002066

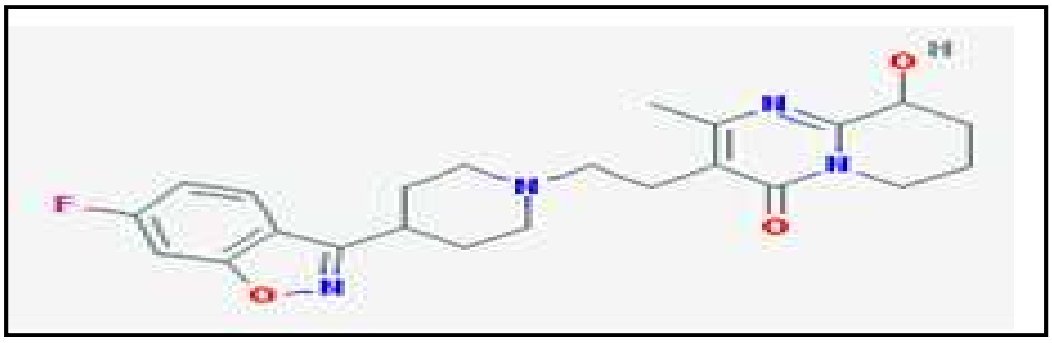

Figure No.1: Structure of Paliperidone

UV SPECTRA OF PALIPERIDONE

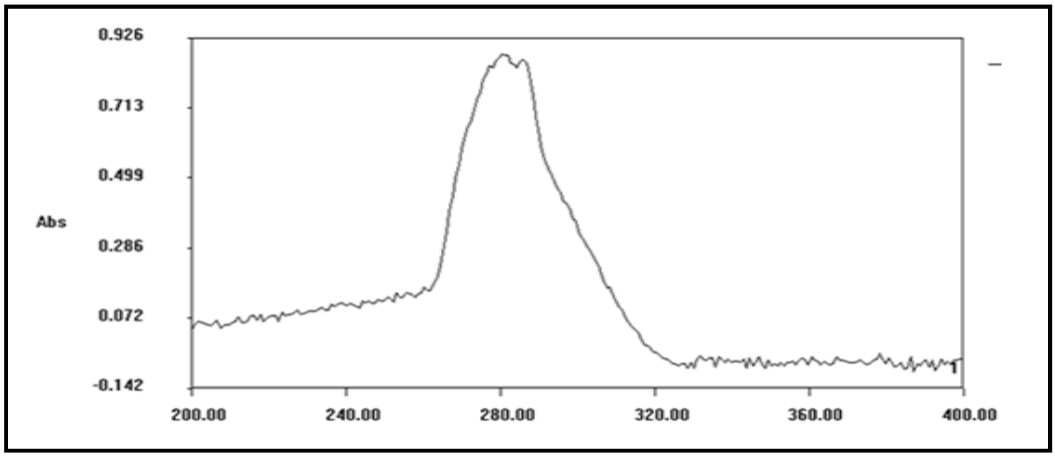

Figure No.2: UV Spectrum of Paliperidone

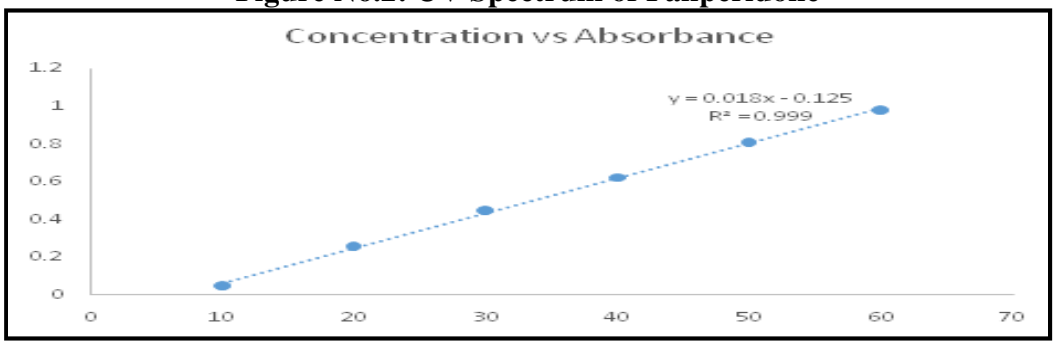

Figure No.3: Calibration curve of Paliperidone

CONCLUSION

The UV Spectrophotometric method was developed and validated thoroughly for quantitative estimation of Paliperidone in pure and its solid dosage form. The results of analysis of formulation by the proposed method were found to be accurate, precise, economic and less time consuming with sensitivity. This method can be easily applied for the analysis of Paliperidone in dosage forms.

ACKNOWLEDGEMENT

Authors would like to thanks Principal, College of Pharmacy, Solapur for providing necessary facilities and support to carry out this work.

CONFLICT OF INTEREST

We declare that we have no conflict of interest.

BIBLIOGRAPHY

1. Injavarapu C D, Uttam P P. New method development and validation of UV-Spectrophotometer for the estimation of paliperidone in bulk and pharmaceutical dosage form, *Int. J of Pharmaceutical research and bio-science,* 3(2), 2014, 106-125.
2. Farzana I G, Jignesh S S and Maheswari D M. Development and validation of spectrophotometric method for simultaneous estimation of paliperidone and olanzapine in synthetic mixture, *International journal of recent scientific research,* 8(4), 2017, 16559-16562.
3. Rakshit K T, Ravikumar M J, Mukesh C P, Dipika R T, Hitesh A J. A Validated Spectrophotometric Method for Determination of Paliperidone Palmitate in Bulk Drug and its Pharmaceutical Dosage Form, *Research and Reviews: J of pharm. and Pharmaceutical Sci.,* 2(3), 2013, 37-41.
4. Bhushan M F, Harsha P B, Rahul S T, Dipak A K. Four UV Spectrophotometric methods for estimation of Paliperidone in bulk and their pharmaceutical dosage form, *Analytical chem. an Indian J*, 16(7), 2016, 277-287.
5. Snehal B G, Rajendra B P, Rushiraj M G. Stability Indicating analytical method development and Validation for estimation of paliperidone and its pharmaceutical dosage form, *World J of pharm. and pharmaceutical Sci*, 6(1), 2017, 1382-1394.
6. ICH, Q2 (R1) Validation of analytical procedures: text and methodology, *International Conference on harmonization,* 1996.
7. Rele V R. UV spectrophotometric estimation of paliparidone by derivative method in pharmaceutical dosage form, *Research J pharm and Tech,* 10(2), 2017, 396-400.
8. Umamaheswar K V, Ravindrababu N M and Rambabu C S. Spectrophotometric methods for the quantitative estimation of paliperidone in formulations, *Elixir Pharmacy*, 60, 2013, 16435-16437.

Please cite this article in press as: Minal P Khanapure *et al.* UV spectrophotometric method for estimation of paliperidone in bulk and their solid dosage form, *Asian Journal of Research in Chemistry and Pharmaceutical Sciences,* 8(1), 2020, 78-83.