ejpmr, 2021,8(12), 230-241

SJIF Impact Factor 6.222

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Research Article

ISSN 2394-3211

EJPMR

CHEMICAL FORCE DEGRADATION ASSAY METHOD EVALUATION FOR SIMULTANEOUS ESTIMATION OF ALBENDAZOLE AND IVERMECTIN IN BULK VETERINARY DOSAGE FORM

Dr. Osman Ahmed*[1], Ashraf Unnisa[1], Meher Afrin[1], Mohammed Akthar Sulthana[1] and Dr. Anas Rasheed[2]

[1]Department of Pharmaceutical Analysis, Deccan School of Pharmacy, Hyderabad.
[2]CSO, Gaelib Medications Private Limited, Hyderabad.

***Corresponding Author: Dr. Osman Ahmed**

Department of Pharmaceutical Analysis, Deccan School of Pharmacy, Hyderabad.

Article Received on 23/09/2021 **Article Revised on 13/10/2021** **Article Accepted on 03/11/2021**

ABSTRACT

In order to achieve the separation under the optimized conditions after experimental trials that can be summarized. Stationary phase like Hypersil BDS C18 (100 mm x 2.1 mm, 1.7 µm) column was most suitable one, since it produced symmetrical peaks with high resolution and a very good sensitivity and with good resolution. The flow rate was maintained 1.2 mL min-1 shows good resolution. The PDA detector response of Albendazole and Ivermectin, veterinary dosage form was studied and the best wavelength was found to be 215 nm showing highest sensitivity.

KEYWORDS: veterinary dosage form, Albendazole and Ivermectin.

INTRODUCTION

Veterinary Pharmaceutical

Veterinary pharmaceutical could be a field of pharmaceutical that's concerned with the avoidance, control, conclusion, and treatment of sickness, clutter, and harm in animals. It is additionally known as veterinary therapeutic hone. This can be in expansion to creature raising, cultivation, breeding, sustenance investigate, and item improvement being secured by the association. A wide assortment of creature species, both tamed and wild, are secured by the field of veterinary medication, which too incorporates a different range of illnesses that will influence different species.

Albendazole

Albendazole, commonly known as albendazolum could be a pharmaceutical that's utilized to treat a number of parasitic worm diseases, counting roundworms. It may be utilized to treat a assortment of sicknesses, counting giardiasis, trichuriasis, filariasis, neurocysticercosis, hydatid malady, pinworm infection, and ascariasis, among others. It is managed orally Nausea, stomach torments, and cerebral pains are all common antagonistic impacts of this medication.

One of the possibly serious antagonistic impacts is bone marrow concealment, which regularly recuperates when the medicate is ceased for a whereas. It has been watched that the liver is kindled, and people who have had past liver issues are at higher risk. It is classified as pregnancy category C within the Joined together States and category D in Australia, showing that it may be hurtful to a pregnant lady in the event that devoured. Albendazole may be a benzimidazole antihelminthic sedate with a wide run of action against an assortment of helminths.

Chemical Structure

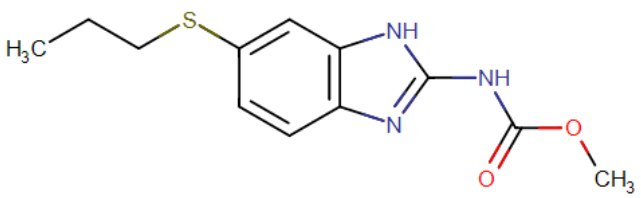


Fig. 1 Chemical Structure of Albendazole.

Ivermectin

Ivermectin is an anti-parasite medicate with a wide extend of movement. It was at first promoted beneath the brand title Stromectol® and was aiming for utilize against worms (with the special case of tapeworms). Be that as it may, in 2012, it was endorsed for the topical treatment of head lice invasions in patients 6 months of age and more seasoned, and was in this way showcased beneath the brand title SkliceTM. Ivermectin could be a medicate that's mostly utilized in people to treat onchocerciasis, in spite of the fact that it is additionally successful against other sorts of worm invasions (such as strongyloidiasis, ascariasis, trichuriasis and enterobiasis).

Chemical Structure

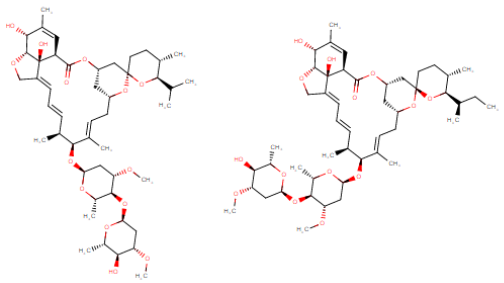


Fig. 2 Chemical Structure of Ivermectin.

Validation of Analytical Methods (USP/ICH)

Method validation, according to the United States Pharmacopeia (USP), is performed to ensure that an analytical methodology is accurate, specific, reproducible, and rugged over the specified range that an analyte will be analyzed. Regulated laboratories must perform method validation in order to be in compliance with FDA regulations. In a 1987 guideline (Guideline for Submitting Samples and Analytical Data for Methods Validation), the FDA designated the specifications in the current edition of the USP as those legally recognized when determining compliance with the Federal Food, Drug and Cosmetic Act can be referred to as the "eight steps of method validation"

EXPERIMENTAL METHODOLOGY

Method Validation

The analytical procedure refers to the way of performing the analysis. It should describe in detail the steps necessary to perform each analytical test. This may include but is not limited to: the sample, the reference standard and the reagents preparations, use of the apparatus, generation of the calibration curve, use of the formulae for the calculation, etc. The described method extensively validated in terms of specificity, system suitability, linearity, accuracy, precision, limit of detection, limit of quantification and robustness.

- **Forced degradation studies of our selected pharmaceutical drugs**

In order to establish the analytical method for a stability indicating method, the drugs are subjected to various stress conditions to conduct forced degradation studies. Stress studies were carried out under the conditions of acid/base hydrolysis, oxidation, reduction, in accordance with ICH Q1A (R2). Several trials with different severity of each stressed condition are to be conducted, so that upto 10-30% degradation is to be achieved.

RESULTS

Preparation of Standard Stock Solution

Preparation of Diluent

In order to achieve the separation under the optimized conditions after experimental trials that can be summarized. Stationary phase like Hypersil BDS C18 (100 mm x 2.1 mm, 1.7 µm) column was most suitable one, since it produced symmetrical peaks with high resolution and a very good sensitivity and with good resolution. The flow rate was maintained 1.2 mL min-1 shows good resolution. The PDA detector response of ALBENDAZOLE and IVERMECTIN was studied and the best wavelength was found to be 215 nm showing highest sensitivity.

The mixture of two solutions Alcohol and acetonitrile in the ratio of 60:40%v/v". Finally, the pH was adjusted to 7.65 by sodium hydroxide with gradient programming was used as mobile phase at 1.2mL/min was found to be an appropriate mobile phase for separation of ALBENDAZOLE and IVERMECTIN. The column was maintained at ambient temperature.

Preparation of internal standard solution

Weighed accurately about 10 mg of ALBENDAZOLE and IVERMECTIN working standard and transfer to 100 ml volumetric flask, add 50 ml of mobile phase and sonicate to dissolve it completely and then volume was made up to the mark with mobile phase to get 100 µg/ml of standard stock solution of working standard. Then it

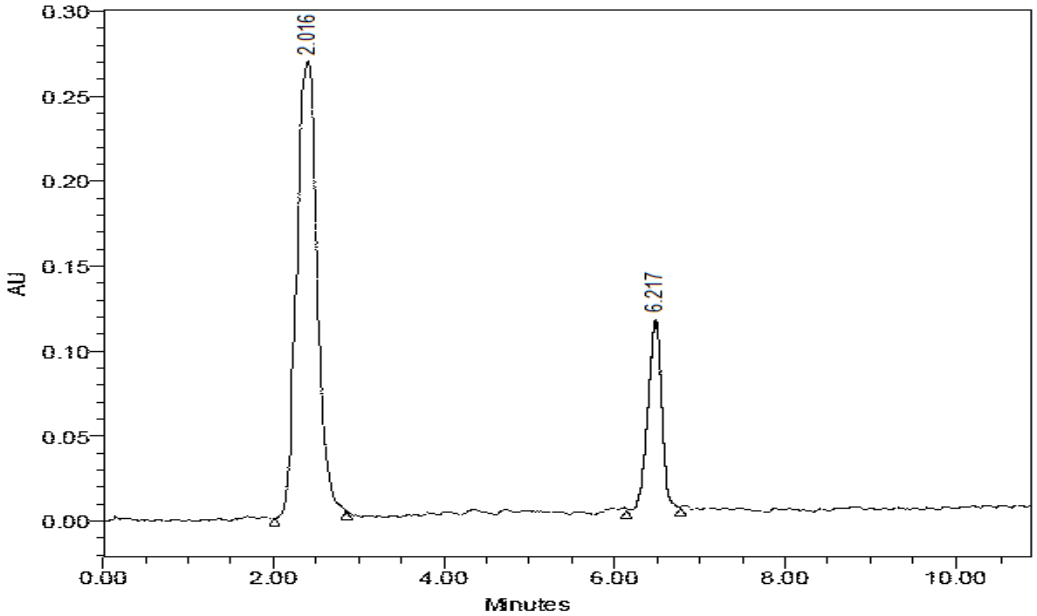
was ultrasonicated for 10 minutes and filtered through 0.20 µ membrane filter.

Preparation of ALBENDAZOLE and IVERMECTIN standard solution

Weighed accurately about 10 mg of ALBENDAZOLE and IVERMECTIN and transfer to 100 ml volumetric flask, add 50 ml of mobile phase and sonicate to dissolve it completely and then volume was made up to the mark with mobile phase to get 100 µg/ml of standard stock solution of working standard. Then it was ultrasonicated for 10 minutes and filtered through 0.20 µ membrane filter.

ALBENDAZOLE and IVERMECTIN	
System	UPLC
Stationary Phase	C18 column
"Mobile Phase"	"Alcohol and acetonitrile in the ratio of 60:40%v/v"
Diluents	Methanol
Injection volume	20µl
Temperature	Ambient
Flow rate	1.2 ml/min
UV detection	215nm
Retention Time	ALBENDAZOLE – 2.016mins; IVERMECTIN – 6.217 mins
Inference	"High column pressure were observed"

ALBENDAZOLE and IVERMECTIN in UPLC System



Chromatogram of standard preparation of ALBENDAZOLE and IVERMECTIN ("Alcohol and acetonitrile in the ratio of 60:40%v/v")

VALIDATION

ACCURACY

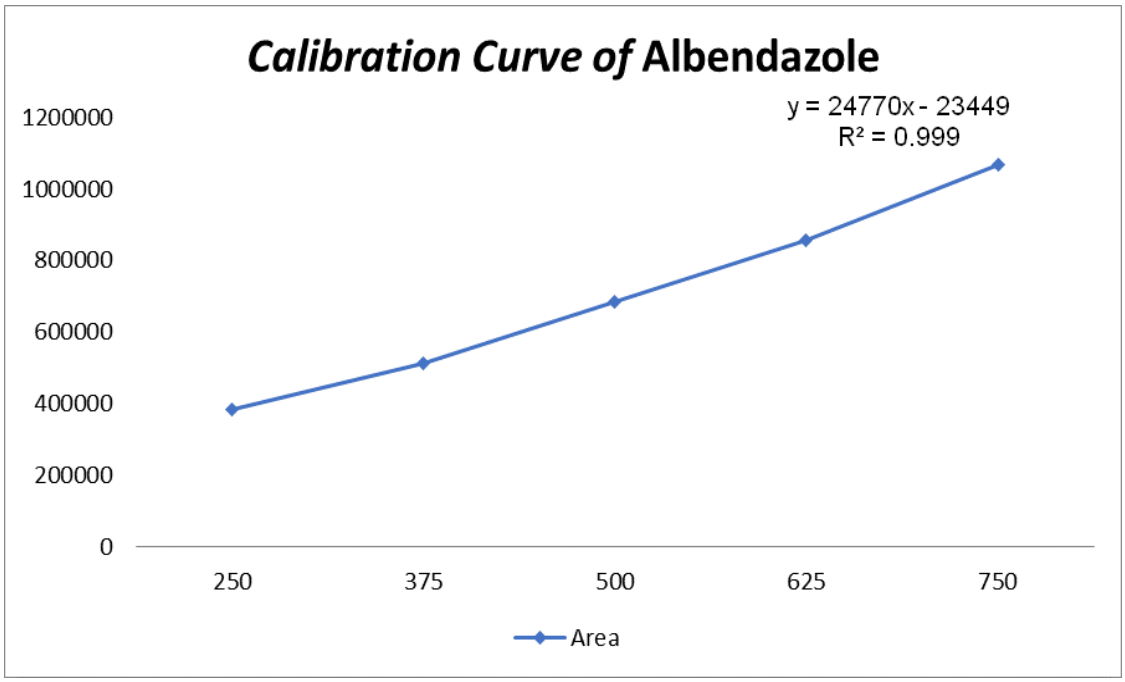
Results of accuracy study

Drug	**Level %**	**Amount added (µg/ml)**	**Amount found (µg/ml)**	**% Recovery**	**Mean recovery (%)**	**Std. Dev**	**% RSD**
Albendazole	50	5.64	5.55	98.40	98.97%	0.306	0.78%
	100	11.88	11.72	98.65			
	150	16.43	16.41	99.87			
Ivermectin	50	1.25	1.24	99.20	98.98%	0.194	0.20%
	100	2.5	2.47	98.82			
	150	3.78	3.74	98.94			

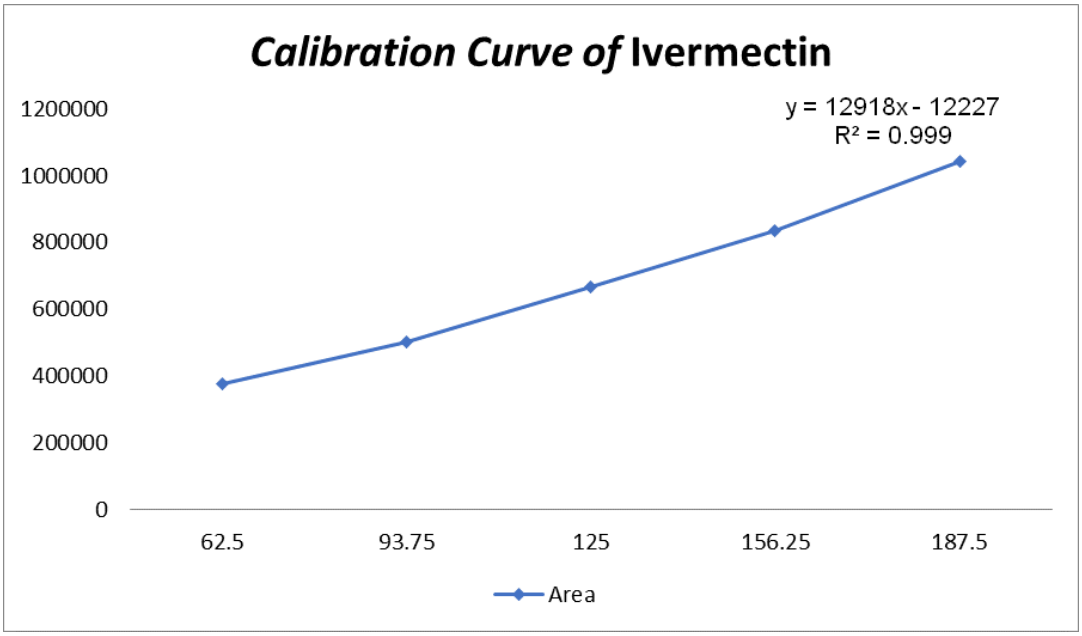
PRECISION STUDY
METHOD PRECISION
Table No: 12. METHOD PRECISION.

Replicate	***ALBENDAZOLE***		**IVERMECTIN**
S.No.	**Injection volume (µl)**	**Area**	**Area**
1	10 ul	684559	667881
2		684672	667754
3		684601	667969
4		684521	667894
5		684519	667909
6		684607	667856
Average	684579.83		667877.16
Std.Dev	58.782		71.22
% RSD	0.01%		0.02%
Standard potency	99.98%		99.98%

LINEARITY



Calibration Curve of Albendazole



Calibration Curve of Ivermectin

Linearity level	*ALBENDAZOLE*		*IVERMECTIN*	
Level	**Concentration (µg/ml)**	**Area**	**Concentration (µg/ml)**	**Area**
1	250	385064	62.5	375690
2	375	513419	93.75	500920
3	500	684559	125	667894
4	625	855698	156.25	834867
5	750	1069622	187.5	1043583
Correlation co-efficient	0.9992		0.9994	
Slope	247703		129188	
Intercept	234494		122276	

ROBUSTNESS

Parameter	*ALBENDAZOLE*		*IVERMECTIN*	
	Peak Area	**% RSD**	**Peak Area**	**%RSD**
Low	684654	0.03%	667849	0.04%
	684662		667793	
	684717		667786	
Actual	684756	0.02%	667741	0.02%
	684649		667851	
	684687		667845	
High	684758	0.02%	667734	0.03%
	684690		667814	
	684699		667703	

Robustness

RUGGEDNESS

Sr. No.	*ALBENDAZOLE*	*IVERMECTIN*
1	684756	667703
2	684852	667775
3	684762	667867
Mean	684790	667781
Std. Dev.	53.77	82.20
%RSD	0.02%	0.04%

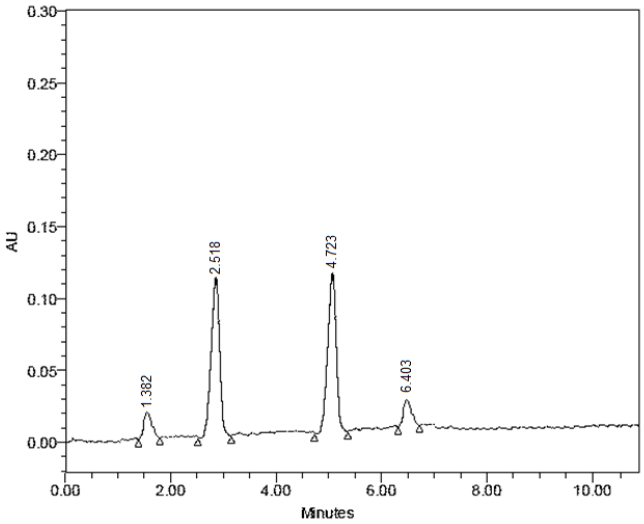
Ruggedness

ANALYSIS OF FORMULATION

Assay studies for the analysis of formulation of Albendazole and Ivermectin. Fixed chromatographic conditions were made use for the analysis of formulation.

Acidic Degradation

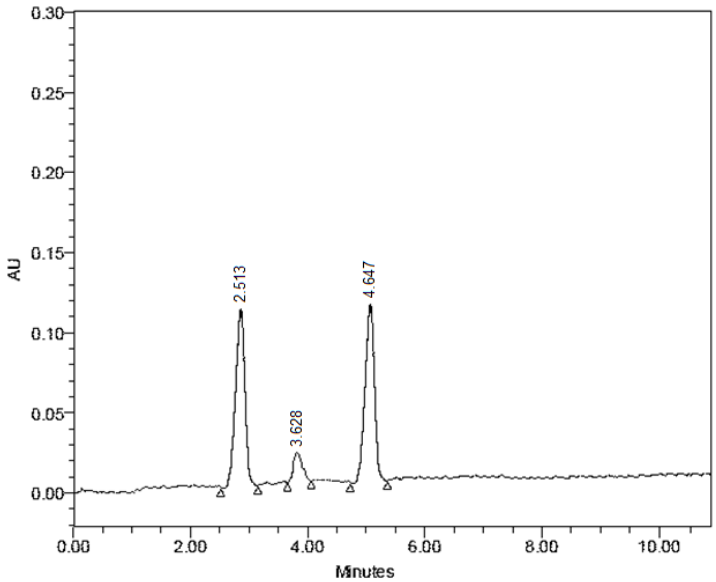
An accurate 10 ml of pure drug sample solution was transferred to a clean and dry round bottom flask (RBF). 30 ml of 0.1 N HCl was added to it. It was refluxed in a water bath at 60°C for 6 hours. Drug became soluble after reflux which was insoluble initially. Allowed to cool at room temperature. The sample was then neutralized using 2N NaOH solution and final volume of the sample was made up to 100ml with water to prepare 100ppm solution. It was injected into the UPLC system against a blank of mobile phase after optimizing the mobile phase composition, chromatogram was recorded."



Acidic Degradation

Basic Degradation

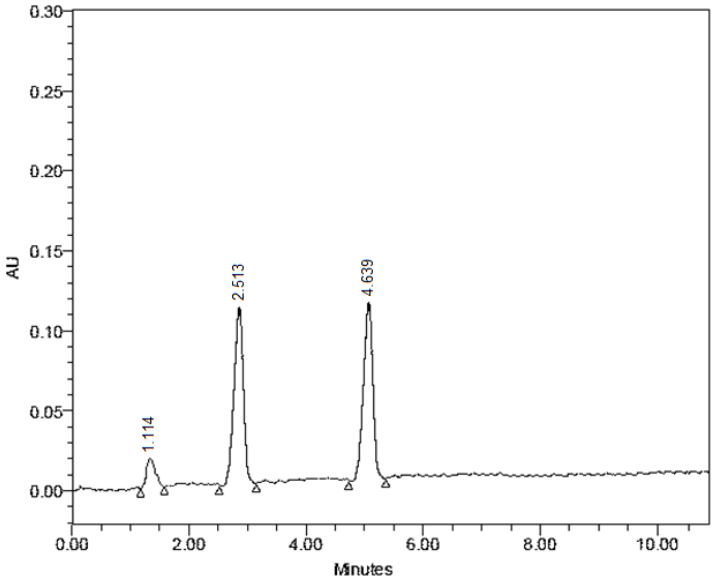
"An accurate 10 ml of pure drug sample solution was transferred to a clean and dry RBF. 30 ml of 0.1N NaOH was added to it. It was refluxed in a water bath at 60°C for 6 hours. Drug became soluble after reflux which was insoluble initially. It was allowed to cool at room temperature. The sample was then neutralized using 2N HCl solution and final volume of the sample was made up to 100ml with water to prepare 100ppm solution. It was injected into the UPLC system against a blank of mobile phase after optimizing the mobile phase composition, chromatogram was recorded."



Basic Degradation

Oxidative

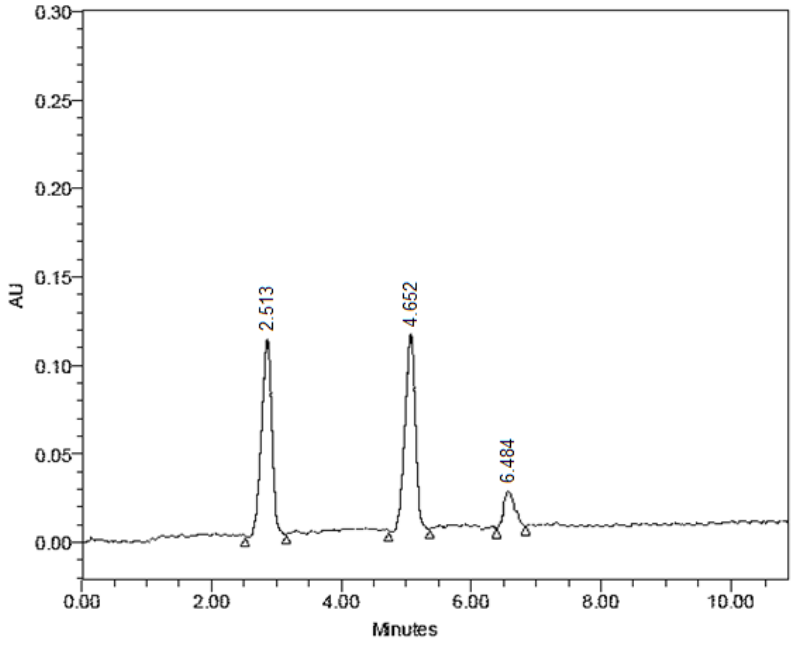
Approximately 10 ml of pure drug sample was transferred in a clean and dry 100 ml volumetric flask. 30 ml of 3% H2O2 and a little methanol was added to it to make it soluble and then kept as such in dark for 6 hours. Final volume was made up to 100 ml using water to prepare 100 ppm solution. The above sample was injected into the UPLC system. The chromatogram was recorded.



Oxidative Degradation

Wet Heat Degradation

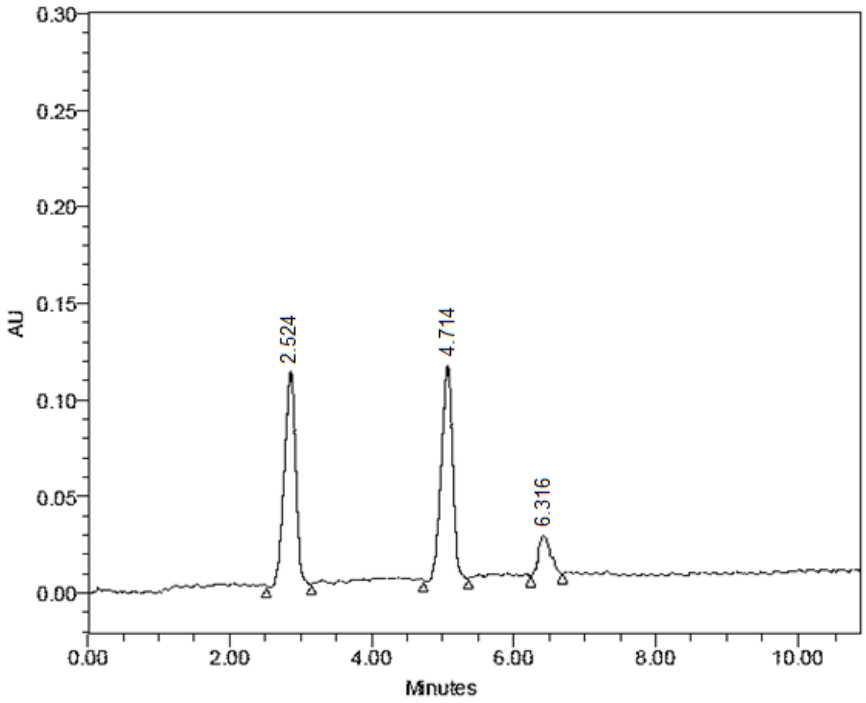
"Accurate 10 ml of pure drug sample was transferred to a clean and dry RBF. 30ml of HPLC grade water was added to it. Then, it was refluxed in a water bath at 60°C for 6 hours uninterruptedly. After the completion of reflux, the drug became soluble and the mixture of drug and water was allowed to cool at room temperature. Final volume was made up to 100 ml with HPLC grade water to prepare 100 ppm solution. It was injected into the UPLC system against a blank of mobile phase after optimizing the mobile phase composition, chromatogram was recorded."



Wet Heat Degradation

Photolytic

The photochemical stability of the drug was also studied by exposing the drug solution (4ml) to sunlight for 6 h. Twenty microlitres of the resultant solutions were injected onto column and the chromatograms were run as described.



Photolytic Degradation

Nature of Stress	Degradation condition	Time(h)	Number of degradation products
Acidic	60°C	6	2
Basic	60°C	6	1
Oxidative	RT	6	1
Wet Heat	105°C	6	1
Photolytic	AT	6	1

Forced degradation Study

Acidic Degradation

$$\% \ Assay = \frac{357338}{365461} \times \frac{04.05}{100} \times \frac{1}{25} \times \frac{100}{04.06} \times \frac{25}{1} \times \textbf{Error!} \times 98.60 = 96.26\%$$

Basic Degradation

$$\% \ Assay = \frac{362849}{365461} \times \frac{04.05}{100} \times \frac{1}{25} \times \frac{100}{04.06} \times \frac{25}{1} \times \textbf{Error!} \times 98.60 = 97.75\%$$

Oxidative Degradation

$$\% \ Assay = \frac{359276}{365461} \times \frac{04.05}{100} \times \frac{1}{25} \times \frac{100}{04.06} \times \frac{25}{1} \times \textbf{Error!} \times 98.60 = 96.78\%$$

Wet Heat

$$\% \ Assay = \frac{362765}{365461} \times \frac{04.05}{100} \times \frac{1}{25} \times \frac{100}{04.06} \times \frac{25}{1} \times \textbf{Error!} \times 98.60 = 97.72\%$$

Photolytic Control

$$\% \ Assay = \frac{363393}{365461} \times \frac{04.05}{100} \times \frac{1}{25} \times \frac{100}{04.06} \times \frac{25}{1} \times \textbf{Error!} \times 98.60 = 97.89\%$$

CONCLUSION

The RPUPLC techniques that were used in this study met all of the requirements. The approaches that have been proposed have the potential to generate more interest in the assessment of inadequate medical items and the scheduling of employment in the future. It was observed on all instances that unexpected recoveries had occurred, and it was revealed at the Convention that strategies may be employed for exams utilising the veterinarian dosage procedures.

REFERENCES

1. Y. C. Mayur*, Osman Ahmad, V. V.S. Rajendra Prasad, M. N. Purohit, N. Srinivasulu, S. M. Shanta Kumar, "Synthesis of 2-Methyl N^{10}-Substituted Acridones as Selective Inhibitors of Multidrug

Resistance (MDR) Associated Protein in Cancer Cells". Medicinal Chemistry, Bentham Science Publishers, 2008; 4(5): 457-465(9).
2. Osman Ahmed*, Pankaj Sharma, Jaya Sharma, "Synthesis and Pharmacological Study of Azetidinone Derivatives" International Journal of Pharmaceutical Science & Education, 2013; 11-18.
3. Osman Ahmed*, Pankaj Sharma, Jaya Sharma, Dr. Indrajeet Singhvi, "Synthesis and Anticonvulsant Activity of Some Substituted Azetidinone Derivatives" Asian Journal of Pharmaceutical Research and Development, 2013; 5.
4. Osman Ahmed*, Dr. Md Salahuddin, Vinutha. K, Pankaj Sharma. "Design, Synthesis and Biological Evaluation of Some Novel Substituted Thiazolidinone Derivatives as Potent Antihyperglycemic Agents". International Journal of Pharmaceutical Research Scholars, 2013; 2: 3.
5. Osman Ahmed*, Md Salahuddin, Pankaj Sharma, Indrajeet Singhvi "Synthesis and biological investigations of some new thiazolidinone derivatives as anti-tubercular agents", American Journal of Pharmtech Research, 2013; 3: 193-201.
6. Osman Ahmed*, Md. Salahuddin, Iffath Rizwana, M.A.Aleem, Pankaj Sharma, "Synthesis, Characterization and Biological Evaluation of Novel thiazolidinone derivatives as Anti-inflammatory Agents", Indo American Journal of Pharmaceutical Research, 2013; 3(10): 8121-8126.
7. Osman Ahmed*, Pankaj Sharma, Indrajeet Singhvi. "Synthesis and Anti-Hyperglycemic activity of Some Novel Thiazolidinone Derivatives". Indo American Journal of Pharmaceutical Research, 2014; 4(02): 1008-1014.
8. Osman Ahmed*, Pankaj Sharma, Indrajeet Singhvi. "Anticonvulsant Activity of Some Novel Substituted Thiazolidinone Derivatives against Maximal Electro Shock Induced Seizure". International Journal of Pharmaceutical Research Scholars, 2014; 3(1): 289-294.
9. Osman Ahmed*, Mohd Haseeb Ur Rahman, Abdul Najeeb, Sk. Md. Noorullah, S.A.Azeez Basha, Design, "Synthesis and Anti- inflammatory activity of certain fused Novel Thienopyrimidines Derivatives", International Journal of Pharmaceutical Research Scholars, 2013; 2(4): 82-87.
10. Syed Aamer Ali, SK Danda, Syed Abdul Azeez Basha, Rasheed Ahmed, Osman Ahmed, Mohd Muqtader Ahmed. "Comparision of uroprotective activity of reduced glutathione with Mesna in Ifosfamide induced hemorrhagic cystitis in rats". Indian Journal of Pharmacology, 2014; 46: 105-108.
11. Osman Ahmed*, Syed Azeemuddin Razvi, T K Md Rayees, M A Nafay Shoeb, Md Salahuddin. "Synthesis Characterization and Anti-inflammatory activity of some substituted pyrimidine derivatives". Indo American Journal of Pharmaceutical Research, 2014; 4(05): 2301-2306. DOI: 10.1044/1980-iajpr.14369.
12. Osman Ahmed*, Farhana Begum, Nishat Fatima, Md. Salahuddin. "Synthesis and Biological Activity of Some Novel Pyrimidine Derivatives". International Journal of Pharmaceutical Research Scholars, 2014; 3(4): 103-108.
13. Ms. Farhana Begum, Osman Ahmed, Md. Salahuddin, Nishat Fatima. "Synthesis, Characterization and Anti-Hyperglycemic Activity of Novel Pyrimidine Derivatives". Indo American Journal of Pharm Research, 2014; 4(11): 5501-5506. DOI: 10.1044/19 80-iajpr.141042
14. Osman Ahmed*, Mehruq Fatima, Juveriya Parveen, Asma Farheen, Ayesha Binth Saleh, Dr. Syed Mahmood Ahmed. Changes in Pulmonary Function Test (PFT) Before and After Adding Tiotropium Bromide to the Ongoing Therapy of Severe Persistant Asthamatics. Indo American Journal of Pharm Research, 2015: 5(01). DOI: 10.1044/1980-iajpr.141266.
15. Mohd Khader, Mohd Mahboob Shareef, Syeda Huda Noorain, Osman Ahmed. Synthesis, Characterization and Biological Activity of Some Novel Pyrimidine Derivatives. Indo American Journal of Pharm Research, 2015: 5(03).
16. Fayeza Batool, Osman Ahmed, Anas Rasheed. An Assay Method for the Simultaneous Estimation of Acetaminophen and Tramadol using RP-HPLC Technology. Indo American Journal of Pharmaceutical Research, 5(7): 2605-2610.
17. Fayeza Batool, Osman Ahmed, Anas Rasheed. A Stability Indicating Method for the Simultaneous Estimation of Acetaminophen and Tramadol in Pharmaceutical Dosage Form. American Journal of PharmTech Research, 2015; 5(04): 674-683.
18. Humeera Rafeeq, Talath Fatima, Afiya Ansari, Osman Ahmed. Personalized Medicine - A Boon For Treating Rheumatoid Arthritis. Indo American Journal of Pharmaceutical Research, 5(8).
19. Humeera Rafeeq, Osman Ahmed, M.A Khaleq, Samee A, Amer M. Progress In The Treatment of Neuroblastoma. Indo American Journal of Pharmaceutical Research, 5(8).
20. Talath Fatima, Osman Ahmed, Amer Mahboob, Afiya Ansari, Amatullah Fathimah. Personalized Medicine - A Review – Progress In The Treatment of Non Small Cell Lung Cancer (NSCLC) In A New Era of Personalised Medicine. Indo American Journal of Pharmaceutical Research, 5(8).
21. Talath Fatima*, Osman Ahmed, Afiya Ansari, Amatullah Fathimah, Amer Mahboob. Novel Therapeutic Approaches to a Chronic Inflammatory Disorder – Asthma. International Journal of Pharmaceutical Research Scholars, 2015; 4(3): 112-117.
22. Humeera Rafeeq*, Osman Ahmed, Sohail Ali, Mohd Younus, Mohd Bilal. A Review on Mowat-Wilson Disorder, International Journal of Pharmaceutical Research Scholars, 2015; 4(3): 176-181.

23. Humeera Rafeeq*, Osman Ahmed, Fayeeza Ameen, Amreen Sultana, Maryam Fatima. A Review on Harlequin Ichthyosis. International Journal of Pharmaceutical Research Scholars, 2015; 4(3): 189-193.
24. Anees Begum*, Osman Ahmed. An Assay Method for the Simultaneous Estimation of Albuterol and Ipratropium Bromide using RP- HPLC Technology. International Journal of Pharmaceutical Research Scholars, 2016; 5(4): 33-37.
25. Anas Rasheed*, Osman Ahmed. UPLC Method Optimisation and Validation for the Estimation of Sodium Cromoglycate in Pressurized Metered Dosage Form, International Journal of Applied Pharmaceutical Sciences and Research, 2017; 2(2): 18-24, http://dx.doi.org/10.21477/ijapsr.v2i2.7774
26. Anas Rasheed*, Osman Ahmed. UPLC Method Development and Validation for the Determination of Chlophedianol Hydrochloride in Syrup Dosage Form. International Journal of Applied Pharmaceutical Sciences and Research, 2017; 2(2): 25-31. http://dx.doi.org/10.21477/ijapsr.v2i2.7775
27. Anas Rasheed*, Osman Ahmed. Validation of a Forced Degradation UPLC Method for Estimation of Beclomethasone Dipropionate in Respules Dosage Form. Indo American Journal of Pharmaceutical Research, 2017: 7(05).
28. Anas Rasheed*, Osman Ahmed. Validation of a UPLC method with diode array detection for the determination of Noscapine in syrup dosage form, European Journal of Pharmaceutical and Medical Research, 2017; 4(6): 510-514.
29. Anas Rasheed*, Osman Ahmed. Stability indicating UPLC method optimisation and validation of Triamcinolone in syrup dosage form. World Journal of Pharmaceutical and Life Sciences, 2017; 3(4): 200-205.
30. Anas Rasheed*, Osman Ahmed. Stability indicating UPLC method optimisation and validation of Pholcodine in bulk dosage form. European Journal of Biomedical and Pharmaceutical Sciences, 2017; 4(6): 572-579.
31. Anas Rasheed*, Osman Ahmed. Analytical method development and validation for the determination of Codeine in syrup dosage form using UPLC technology. World Journal of Pharmaceutical and Life Sciences, 2017; 3(5): 141-145.
32. Anas Rasheed*, Osman Ahmed. Analytical stability indicating UPLC assay and validation of Fluticasone propionate in nasal spray inhaler dosage form. World Journal of Pharmaceutical and Life Sciences, 2017; 3(5): 168-172.
33. Anas Rasheed*, Osman Ahmed. Stability indicating UPLC method optimisation and validation of Acetylcysteine in syrup dosage form. European Journal of Pharmaceutical and Medical Research, 2017; 4(7): 485-491.
34. Anas Rasheed*, Osman Ahmed. Analytical stability indicating UPLC assay and validation of Ciclesonide in dry powder inhaler dosage form. European Journal of Pharmaceutical and Medical Research, 2017; 4(7): 523-529.
35. Anas Rasheed*, Osman Ahmed. Analytical stability indicating UPLC assay and validation of Dextromethorphan in syrup dosage form. European Journal of Pharmaceutical and Medical Research, 2017; 4(7): 548-554.
36. Anas Rasheed*, Osman Ahmed. Analytical Development and Validation of a Stability-Indicating Method for the Estimation of Impurities in Budesonide Respules Formulation, International Journal of Applied Pharmaceutical Sciences and Research, 2017; 2(3): 46-54. http://dx.doi.org/10.21477/ijapsr.v2i3.8100
37. Anas Rasheed*, Osman Ahmed, Analytical Separation and Characterisation of Degradation Products and the Development and Validation of a Stability-Indicating Method for the Estimation of Impurities in Ipratropium Bromide Respules Formulation, International Journal of Applied Pharmaceutical Sciences and Research, 2017; 2(3): 55-63, http://dx.doi.org/10.21477/ijapsr.v2i3.8101
38. Neha Naaz*, Khaja Uzair ul Hasan, Aaminah Najmus Sahar, Prof. Dr. Osman Ahmed. Plights and Predicaments in the Pharmacy Industry. Indo American Journal of Pharmaceutical Research, 2017: 7(11).
39. Syed Vakeeluddin*, Osman Ahmed, Kauser Fathima, Analytical Method Development and Validation for the Simultaneous Estimation of Budesonide and Formoterol in Bulk and Dosage Form Using RP-HPLC Method, Indo Am. J. P. Sci, 2017; 4(07).
40. Dr. Osman Ahmed*, Syed Vakeeluddin, Kauser Fathima. A Stability Indicating Method for the Simultaneous Estimation of Budesonide and Formoterol in Bulk and Dosage Form. Indo American Journal of Pharmaceutical Research.
41. Kauser Fathima*, Dr. Osman Ahmed, Syed Vakeeluddin, Analytical Method Development and Validation for the Simultaneous Estimation of Ofloxacin and Metronidazole in Bulk and Dosage Form Using RP-HPLC, Indo Am. J. P. Sci, 2017; 4(07).
42. Dr. Osman Ahmed*, Kauser Fathima, Syed Vakeeluddin. A Stability Indicating Method for the Simultaneous Estimation of Ofloxacin and Metronidazole in Bulk and Dosage Form. Indo American Journal of Pharmaceutical Research, 2018: 8(01).
43. Mohd Shafi, Osman Ahmed, Anas Rasheed, Validation Of A UPLC Method With Diode Array Detection Using C18 Column For The Determination Of Fluorometholone In Parenteral Dosage Form, Indo Am. J. P. Sci, 2018; 05(07).
44. Validation Of A Forced Degradation Uplc Method For Estimation Of Glibenclamide In Oral Dosage Form, Dr. Osman Ahmed, Mohd Kareem Ahmed and Dr. Anas Rasheed. World Journal of Pharm. and Life Sci., 2019; 5(10): 74-82.

45. Evaluation And Validation Of A UPLC Method For Simultaneous Estimation Of Glimepiride, Metformin And Voglibose In Oral Dosage Form, Mohd Kareem Ahmed, Dr. Osman Ahmed and Dr. Anas Rasheed. European Journal Of Biomedical and Pharmaceutical Sciences, 2019; 6(13): 329-337.
46. Stability Indicating Method Evaluation And Validation For Simultaneous Estimation Of Glimepiride, Metformin And Voglibose In Oral Dosage Form Using LCMS, Mohd. Kareem Ahmed, Dr. Osman Ahmed and Dr. Anas Rasheed European Journal Of Biomedical and Pharmaceutical Sciences, 2019; 6(13): 338-349.
47. Stability Indicating Method Evaluation And Validation For Simultaneous Estimation Of Metformin And Sitagliptin In Oral Dosage Form Dr. Osman Ahmed, Mohd Kareem Ahmed and Dr. Anas Rasheed, European Journal Of Pharmaceutical And Medical Research, 2019; 6(12): 494-502.
48. Evaluation And Validation Of A UPLC Method For Simultaneous Estimation Of Metformin And Sitagliptin In Oral Dosage Form Dear Dr. Osman Ahmed, Mohd Kareem Ahmed and Dr. Anas Rasheed European Journal Of Pharmaceutical And Medical Research, 2019; 6(12): 494-502.
49. Evaluation And Validation Of A UPLC Method For Estimation Of Amoxyclav In Oral Dosage Form. Dr. Osman Ahmed*, Sumaiya Fatima and Dr. Anas Rasheed, World Journal of Pharm. and Life Sci., 2020; 6(9): 107-113.
50. RESPULES *Sumaiya Fatima, Dr. Osman Ahmed and Dr. Anas Rasheed, World Journal of Pharm. and Life Sci., 2020; 6(9): 68-77.
51. POLYMORPHISM Sumaiya Fatima*, Dr. Osman Ahmed and Dr. Anas Rasheed World Journal of Pharm. and Life Sci., 2020; 6(9): 78-93.
52. Chemical force degradation assay method evaluation for simultaneous estimation of amoxicillin and potassium clavulanate in oral dosage form Sumaiya Fatima*, Dr. Osman Ahmed and Dr. Anas Rasheed, European Journal Of Pharmaceutical And Medical Research, 2020; 7(9): 320-325.
53. Characterization of force degradation assay method evaluation for simultaneous estimation of amoxicillin and potassium clavulanate in oral dosage form using UPLC-MS/MSN Sumaiya Fatima*, Dr. Osman Ahmed and Dr. Anas Rasheed ejbps, 2020; 7(9): 285-294.
54. Evaluation and validation of a uplc method for simultaneous estimation of amoxicillin and potassium clavulanate in oral dosage form. Sumaiya Fatima*, Dr. Osman Ahmed and Dr. Anas Rasheed. European Journal Of Pharmaceutical And Medical Research, 2020; 7(9): 326-335.
55. Spiked force degradation assay method evaluation for estimation of amoxyclav in oral dosage form. Dr. Osman Ahmed*, Sumaiya Fatima and Dr. Anas Rasheed. World Journal of Pharm. and Life Sci., 2020; 6(9): 185-191.
56. Anas Rasheed Et.Al; Validation Of A Uplc Method With Diode Array Detection Using C18 Column For The Determination Of Fluorometholone In Parenteral Dosage Form, Indo American Journal Of Pharmaceutical Sciences, Iajps, 5(7): 6209-6215.
57. Anas Rasheed Et.Al; Analytical Method Development And Validation For The Determination Of Fluorometholone Using C8 Column In Parenteral Dosage Form By Uplc Technology, World Journal Of Pharmaceutical And Life Sciences, Wjpls, 2018; 4(8): 106-109.
58. Anas Rasheed Et.Al; Analytical Stability Indicating Uplc Assay And Validation Using C18 Column For Fluorometholone In Parenteral Dosage Form, World Journal Of Pharmaceutical And Life Sciences, Wjpls, 2018; 4(8): 110-114.
59. Anas Rasheed Et.Al; Validation Of A Forced Degradation Uplc Method Using C8 Column For Fluorometholone In Parenteral Dosage Form, European Journal Of Pharmaceutical And Medical Research, Ejpmr, 2018; 5(8): 311-318.
60. Anas Rasheed Et.Al; Analytical Separation And Characterisation Of Degradation Products Method For The Estimation Of Impurities In Fluorometholone In Parenteral Dosage Form, European Journal Of Pharmaceutical And Medical Research, Ejpmr, 2018; 5(8): 319-324.
61. Anas Rasheed Et.Al; Validation Of A Forced Degradation Uplc Method For Estimation Of Glibenclamide In Oral Dosage Form, World Journal Of Pharmaceutical And Life Sciences, Wjpls, 2019; 5(10): 74-82.
62. Anas Rasheed Et.Al; Evaluation And Validation Of A Uplc Method For Simultaneous Estimation Of Glimepiride, Metformin And Voglibose In Oral Dosage Form, European Journal Of Biomedical And Pharmaceutical Sciences, Ejbps, 2019; (6): 13: 329-337.
63. Anas Rasheed Et.Al; Stability Indicating Method Evaluation And Validation For Simultaneous Estimation Of Glimepiride, Metformin And Voglibose In Oral Dosage Form Using Lcms, European Journal Of Biomedical And Pharmaceutical Sciences, Ejbps, 2019; 6(13): 338-349.
64. Anas Rasheed Et.Al; Evaluation And Validation Of A Uplc Method For Simultaneous Estimation Of Metformin And Sitagliptin In Oral Dosage Form, European Journal Of Pharmaceutical And Medical Research, Ejpmr, 2019; 6(12): 365-371.
65. Anas Rasheed Et.Al; Stability Indicating Method Evaluation And Validation For Simultaneous Estimation Of Metformin And Sitagliptin In Oral Dosage Form, European Journal Of Pharmaceutical And Medical Research, Ejpmr, 2019; 6(12): 494-502.
66. Anas Rasheed Et.Al; Uplc Method Optimisation And Validation For The Estimation Of Sodium Cromoglycate In Pressurized Metered Dosage Form,

International Journal Of Applied Pharmaceutical Sciences And Research, 2017; 2(2): 18-24.
67. Anas Rasheed Et.Al; Uplc Method Development And Validation For The Determination Of Chlophedianol Hydrochloride In Syrup Dosage Form International Journal Of Applied Pharmaceutical Sciences And Research, 2017; 2(2): 25-31.
68. Anas Rasheed Et.Al; Analytical Method Development And Validation For The Determination Of Codeine In Syrup Dosage Form Using Uplc Technology, World Journal Of Pharmaceutical And Life Sciences, Wjpls, 2017; 3(5): 141-145.
69. Anas Rasheed Et.Al; Validation Of A Uplc Method With Diode Array Detection For The Determination Of Noscapine In Syrup Dosage Form European Journal Of Pharmaceutical And Medical Research, Ejpmr, 2017; 4(6): 510-514.
70. Anas Rasheed Et.Al; Validation Of A Forced Degradation Uplc Method For Estimation Of Beclomethasone Dipropionate In Respules Dosage Form Indoamerican Journal Of Pharmaceutical Research, 2017; 7(05): 8608-8616.
71. Anas Rasheed Et.Al; Analytical Stability Indicating Uplc Assay And Validation Of Ciclesonide In Dry Powder Inhaler Dosage Form European Journal Of Pharmaceutical And Medical Research, Ejpmr, 2017; 4(7): 523-529.
72. Anas Rasheed Et.Al; Analytical Stability Indicating Uplc Assay And Validation Of Fluticasone Propionate In Nasal Spray Inhaler Dosage Form World Journal Of Pharmaceutical And Life Sciences, Wjpls, 2017; 3(5): 168-172.
73. Anas Rasheed Et.Al; Stability Indicating Uplc Method Optimisation And Validation Of Triamcinolone In Syrup Dosage Form World Journal Of Pharmaceutical And Life Sciences, Wjpls, 2017; 3(4): 200-205.
74. Anas Rasheed Et.Al; Stability Indicating Uplc Method Optimisation And Validation Of Pholcodine In Bulk Dosage Form European Journal Of Biomedical And Pharmaceutical Sciences, Ejbps, 2017; 4(6): 572-579.
75. Anas Rasheed Et.Al; Analytical Stability Indicating Uplc Assay And Validation Of Dextromethorphan In Syrup Dosage Form European Journal Of Pharmaceutical And Medical Research, Ejpmr, 2017; 4(6): 548-554.
76. Anas Rasheed Et.Al; Stability Indicating Uplc Method Optimisation And Validation Of Acetylcysteine In Syrup Dosage Form European Journal Of Pharmaceutical And Medical Research, Ejpmr, 2017; 4(7): 485-491.
77. Anas Rasheed Et.Al; Analytical Development And Validation Of A Stability-Indicating Method For The Estimation Of Impurities In Budesonide Respules Formulation International Journal Of Applied Pharmaceutical Sciences And Research, 2017; 2(3): 46-54.
78. Anas Rasheed Et.Al; Analytical Separation And Characterisation Of Degradation Products And The Development And Validation Of A Stability-Indicating Method For The Estimation Of Impurities In Ipratropium Bromide Respules Formulation International Journal Of Applied Pharmaceutical Sciences And Research, 2017; 2(3): 55-63.
79. Anas Rasheed Et.Al; Analytical Separation And Characterisation Of Degradation Products And The Development And Validation Of A Stability-Indicating Method For The Estimation Of Impurities In Levosalbutamol Respules Formulation International Journal Of Applied Pharmaceutical Sciences And Research, 2017; 2(3): 83-92.
80. Anas Rasheed Et.Al; Analytical Separation And Characterisation Of Degradation Products And The Development And Validation Of A Stability-Indicating Method For The Estimation Of Impurities In Montelukast Oral Dosage Formulation. International Journal Of Applied Pharmaceutical Sciences And Research, 2017; 2(3): 69-77.
81. Anas Rasheed Et.Al; An Assay Method For The Simultaneous Estimation Of Acetaminophen And Tramadol Using Rp-Hplc Technology Indo American Journal Of Pharmaceutical Research, 2015; 5(07).
82. Anas Rasheed Et.Al; A Stability Indicating Method For The Simultaneous Estimation Of Acetaminophen And Tramadol In Pharmaceutical Dosage Formamerican Journal Of Pharma Tech Research, 5(04): 673-683.
83. Anas Rasheed Et.Al; Analytical Method Development And Validation For The Simultaneous Estimation Of Aspirin, Clopidogrel Bisulphate And Atorvastatin Calcium In Tablet Dosage Form, American Journal Of Pharma Tech Research, 4(04): 534-541.