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Research Article

# A VALIDATED RP-HPLC METHOD FOR THE DETERMINATION OF MELATONIN AND ZOLPIDEM TARTARATE IN BULK AND PHARMACEUTICAL DOSAGE FORMS

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**ABSTRACT**

A new method was established for simultaneous estimation of Melatonin and Zolpidem Tartarate and by RP-HPLC method. The chromatographic conditions were successfully developed for the separation of Melatonin and Zolpidem Tartarate by using Hypersil BDS C18 column (250×4.6mm) 5.0µm, flow rate was 1.0ml/min, mobile phase ratio was (50:50 v/v) Potassium dihydrogen o-phosphate Buffer: Acetonitrite pH 4.3 (pH was adjusted with Ortho-phosphoric acid), detection wavelength was 235nm. The instrument used was WATERS HPLC Auto Sampler, Separation module 2690, photo diode array detector 996, Empower-software version-2. The retention times of Melatonin 2.60 mins and Zolpidem were found to be 3.31 mins. The % purity of Melatonin and Zolpidem Tartarate and was found to be 99.66% and 99.94% respectively. The system suitability parameters for Melatonin and Zolpidem Tartarate such as theoretical plates and tailing factor were found to be 3817 and 1.3, 4492, 1.1 and the resolution was found to be 6.0. The analytical method was validated according to ICH guidelines (ICH, Q2 (R1)). The linearity study Melatonin and Zolpidem Tartarate was found in concentration range of 12µg-72µg and 20µg-120µg and correlation coefficient ($r^2$) was found to be 0.999 and 0.999, % recovery was found to be 95.0% and 105.0%, %RSD for repeatability was 0.095 and 0.087, % RSD for intermediate precision was 0.095 and 0.087 respectively. The precision study was precise, robust, and repeatable. LOD value was 0.7729 and 1.947 , and LOQ value was 2.3422 and 5.9026 respectively. Hence the suggested RP-HPLC.

**KEYWORDS:** Hypersil BDS C18 column, Melatonin ,Zolpidem Tartarate, RP-HPLC

## INTRODUCTION

Melatonin is N-[2-(5-methoxy-1H-indol-3-yl) Ethyl] ethanamide, Antioxidant, Insominia treatment, mild diuretic and soluble in water and ethanoland Melting point 117 ° C. Melatonin[1,2] is a derivative of tryptophan. It binds to melatonin receptor type IA, which then acts on adenylate cylcase and the inhibition of a cAMP signal transduction pathway. Melatonin not only inhibits adenylate cyclase, but it also activates phospholipase C. This potentiates the release of arachidonate. By binding to melatonin receptors 1 and 2, the downstream signaling cascades have various effects in the body. The melatonin receptors[3] are G protein-coupled receptors and are expressed in various tissues of the body.

ZolpidemTartarateN,N,6-Trimethyl-2-(4-methylphenyl)-imidazo[1,2-a]pyridine-3-acetamide tartarate and is used GABA Agonists**,** Hypnotics and Sedatives and very slightly soluble in water, soluble in methanol, acetone and sparingly soluble in ethanol 95%.Zolpidem[4] binds with high affinity and acts as a full agonist at the $\alpha_1$containing $GABA_A$ receptors, about 10-fold lower affinity for those containing the $\alpha_2$ - and $\alpha_3$ - $GABA_A$ receptor subunits, and with no appreciable affinity for $\alpha_5$ subunit containing receptors. $\omega_1$ type $GABA_A$ receptors are the $\alpha_1$ containing $GABA_A$ receptors and $\omega_2$ $GABA_A$ receptors are the $\alpha_2$, $\alpha_3$, $\alpha_4$, $\alpha_5$ and $\alpha_6$ containing $GABA_A$ receptors. $\omega_1$ $GABA_A$ receptors[5] are primarily found in the brain whereas $\omega_2$receptors[6] are primarily found in the spine.

## MATERIALS AND METHODS

### Instruments used

WATERS HPLC Auto Sampler, Separation module 2690, photodiode array detector 996, Empower-software version-2, pump (LC-10AT) and (LC-10ATVP),EV-100 UV-Visible spectrophotometer. Electronic balance and Ultrasonicator, Hypersil pack BDS c18 RP column, 250mm*5mm. PH analyzer (ELICO). HPLC injecting syringe ( 25ug) HAMILTON.

### Chemicals and reagents

Melatonin and Zolpidem Tartrate were supplied from Mylan Laboratories, Hyderabad and Potassium dihydrogen o-phosphate and Acetonitrile(MOLY CHEM, HPLC GRADE), Double distilled water and o-phosphoric acid(MERCK) were employed in the present work.

## SELECTION OF WAVELENGTH

UV scan of the Melatonin and Zolpidem tartrate was done individually and both Were overlayed upon each other to get the required wavelength. The wavelength of 235nm was found to be effective in determination of both the drugs at a time.

## OPTIMIZED METHOD

Buffer preparation: weigh accurately 1.36g of potassium dihydrogen O-phosphate and dissolve it in 1000ml of Milli-Q

water. Adjust the pH to 4.3 with orthophosphoric acid, filter through 0.45µm nylon membrane filter and degas.
Mobile phase: Buffer and Acetonitrile were mixed in the ratio of 50:50 and sonicated to degas.

**Chromatographic conditions**
Flow rate: 1.0 ml/min
Column: Hypersil BDS C-18, 250 x 4.6 mm,5µ
Detector wave length: 235nm
Column temperature: Ambient
Injection volume: 10µl
Run time: 7 mins
Diluent: Buffer: Acetonitrile (50:50)

**Isocratic programme**

| Name of the peak | Retention time(min) |
|---|---|
| Melatonin | 2.60 |
| Zolpidem Tartrate | 3.31 |

**Standard stock Preparation**

Weigh and transfer accurately about 15.0 mg of Melatonin and 25mg of Zolpidem tartarate Working Standard into a 25 ml clean dry volumetric flask, add about 15 ml of the mobile phase, sonicate for 5 minutes, and dilute to volume with mobile phase.

**Diluted Standard**

Pipette out 1ml from the standard stock solution, into a 25 ml clean dry volumetric flask, and dilute to the mark with 25 ml of diluent.

**Sample preparation**

Weigh and powder about ten tablets in a neat clean and dry motor and pestle .weigh and transfer accurately about 0.9211gm of the tablet powder into the 25ml clean dry volumetric flask, add about 15ml of the mobile phase, sonicate for 5 minutes, and dilute to volume with mobile phase. Filter the solution through the what Mann filter paper, from the filtrate pipette out 1ml of the sample solution into a 25ml volumetric flask, make up the volume of diluent (mobile phase).

## RESULTS AND DISCUSSION

### SYSTEM SUITABILITY

A Standard solution was prepared by using melatonin and zolpidem tartarate working standards as per test method and was injected five times into the HPLC system. The system suitability parameters were evaluated from standard chromatograms by calculating the % RSD from five replicate injections for melatonin and zolpidem tartarate retention times and peak areas. The % RSD for the retention times of principal peak from 5 replicate injections of each Standard solution should be not more than 2.0 % The number of theoretical plates (N) for the Melatonin and Zolpidem tartarate peaks is NLT 2000. The Tailing factor (T) for the Melatonin and Zolpidem tartarate peaks is NMT 1.5.

### PRECISION

Method precision: prepare five replicate injection of the standard solution of the same concentration and inject five times one after the other.

### ACCURACY (RECOVERY)

A study of accuracy was conducted by preparing three different concentrations of the working standards of melatonin and zolpidem tartarate i.e. 80%, 100% and 120%.inject them into the HPLC and the obtained parameters are considered to be standard. Later inject each concentration three times and compare the parameters with that of the standard. The average % recovery of melatonin and zolpidem tartarate was calculated. The mean % recovery of the melatonin and Zolpidem tartarate at each level should be not less than 95.0% and not more than 105.0%.

### LINEARITY OF TEST METHOD

Preparation of linearity stock solution: Transfer an accurately weighed quantity of about 15mg of melatonin and 25mg of zolpidem tartarate into a 25ml volumetric flask. Add about 15ml of the diluent and sonicate to dissolve. Make the volume up to the mark with the diluent. From the stock serial dilutions were made by taking 0.2, 0.4, 0.6, 0.8, 1.0ml and 1.2ml into the 10ml volumetric flask and diluted with the diluent up to the mark. Inject these solutions into the HPLC system and record the area of analyte peaks. Plot a graph of concentration (in x-axis) vs. analyte peak area (in y-axis).evaluate the correlation coefficient between concentration and peak area on y-intercept of the correlation plot. Correlation Coefficient should be not less than 0.9990.
% of y-Intercept should be ±2.0. % of RSD for level 1 and Level 6 should be not more than 2.0%.

### RUGGEDNESS OF TEST METHOD

Analyst to Analyst variable:
System to system /Analyst to Analyst/column to Column variability study was conducted on different HPLC systems, different columns and different analysts under similar conditions at different times. Six samples were prepared and each was analysed as per test method. The relative standard deviation for Melatonin and Zolpidem tartarate were found to be below 2 % on the columns, systems and Analysts. Comparison of both the results obtained on two different HPLC systems, different column and different analysts shows that the assay test method is rugged for System to system /Analyst to Analyst/column to Column variability.

### ROBUSTNESS

**1. Effect of variation of flow rate**

A study was conducted to determine the effect of variation in flow rate. Standard solution prepared as per the test method was injected into the HPLC system using flow rates, 0.9ml/min and 1.1ml/min. The system suitability parameters were evaluated and found to be with in the limits for 0.9ml/min and 1.1ml/min flow.

Melatonin and Zolpidem tartarate were resolved from all other peaks the retention times were comparable with those obtained for mobile phase having flow rates 1.0ml/min.

From the above study it was established that the allowable variation in flow rates is 0.9ml/min and 1.1ml/min.

**2. Effect of variation of wavelength**

A study was conducted to determine the effect of variation in wavelength. Standard and sample solutions were prepared as per the test method and injected into the HPLC system using wavelength 232nm and 237nm. The system suitability parameters were evaluated and found to be with in the limits for wavelength 232nm and 237nm.

Melatonin and Zolpidem tartarate were resolved from all other peaks and the retention times were comparable with those obtained for mobile phase having wavelength. From the above study it was established that the allowable variation in wavelength 232nm and 237nm**.**

**LIMIT OF DETECTION (LOD) AND LIMIT OF QUANTIFICATION (LOQ)**

From the linearity data. Calculate the limit of detection and quantification, using the following formula
LOD =3.3σ/S
Melatonin =3.3*7.5162/32.09 = 0.7729342 µg/mL
Zolpidem tartarate = 3.3*26.52995/44.946 = 1.9478671µg/mL
Where,
σ = standard deviation of the response.
S = slope of the calibration curve of the analyte.
LOQ = 10 σ/S
Melatonin =10*7.5162/32.09 = 2.3422249 µg/mL
Zolpidem tartarate =10*26.52995/44.946 = 5.90262759µg/mL

**ASSAY OF TABLET DOSAGE FORM**

Applicability of the proposed method of the simultaneous estimation of Melatonin and Zolpidem tartarate was studied by assay of commercial tablets Zolsoma label to contain Melatonin 3 mg and Zolpidem tartarate 5 mg. The results indicate that the amount of each drug in the tablets is within the requirements of 98-102%of the label claim

**SPECIFICITY**

**INTERFERENCE FROM DEGRADATION PRODUCTS**

A study was conducted to demonstrate the effective separation of degradants from Melatonin and Zolpidem tartarate .Separate portions of Drug product exposed to following stress conditions to induce degradation.

- Acid degradation
- Base degradation
- Peroxide degradation
- Thermal degradation

Stressed samples were injected into the HPLC system with photo UV- detector by following test method conditions. All degradant peaks were resolved from Melatonin and Zolpidem tartarate peaks in the chromatograms of all samples and did not shown any considerable peaks under the above conditions. The chromatograms of stressed samples were evaluated for peak purity of Melatonin and Zolpidem tartarate using Spinchrom software. For all forced degradation samples the degradants should not interference in quantitating the Melatonin and Zolpidem tartarate.

**TABLE 1 SYSTEM SUITABILITY FOR MELATONIN**

| Injection | Retention time | Peak Area | USP Plate count | USP Tailing |
|---|---|---|---|---|
| 1 | 2.607 | 2053.695 | 3764 | 1.3 |
| 2 | 2.607 | 2032.791 | 4028 | 1.3 |
| 3 | 2.603 | 2041.007 | 3755 | 1.4 |
| 4 | 2.607 | 2043.002 | 3764 | 1.3 |
| 5 | 2.610 | 2044.85 | 3774 | 1.3 |
| **Mean** | 2.6068 | 2043.069 | 3817 | 1.32 |
| **SD** | 0.00249 | 7.516278 | 118.1439 | --- |
| **%RSD** | 0.095519 | 0.367892 | --- | --- |

**TABLE 2 SYSTEM SUITABILITY FOR ZOLPIDEM TARTARATE**

| Injection | Retention time | Peak Area | USP Plate count | USP Tailing |
|---|---|---|---|---|
| 1 | 3.303 | 4792.44 | 4441 | 1.3 |
| 2 | 3.303 | 4721.838 | 4441 | 1.2 |
| 3 | 3.3 | 4745.158 | 4697 | 1.3 |
| 4 | 3.3 | 4770.05 | 4432 | 1.3 |
| 5 | 3.307 | 4761.404 | 4450 | 1.3 |
| **Mean** | 3.3026 | 4758.178 | 4492.2 | 1.28 |
| **SD** | 0.002881 | 26.52995 | 114.6634 | --- |
| **% RSD** | 0.087233 | 0.557565 | --- | - -- |

**TABLE 3 PRECISION DATA FOR MELATONIN**

| | Injection | Retention time | Peak Areas |
|---|---|---|---|
| **Concentratin 100%** | 1 | 2.607 | 2056.182 |
| | 2 | 2.607 | 2047.687 |
| | 3 | 2.603 | 2046.484 |
| | 4 | 2.607 | 2043.00 |
| | 5 | 2.610 | 2044.85 |
| **Statistical Analysis** | **Mean** | 2.6068 | 2043.069 |
| | **SD** | 0.00249 | 7.516278 |
| | **% RSD** | 0.095519 | 0.367892 |

**TABLE 4: PRECISION DATA FOR ZOLPIDEM TARTARATE**

| | Injection | Retention time | Peak Areas |
|---|---|---|---|
| **Concentration 100%** | 1 | 3.303 | 4784.662 |
| | 2 | 3.303 | 4776.91 |
| | 3 | 3.300 | 4777.279 |
| | 4 | 3.300 | 4773.459 |
| | 5 | 3.307 | 4775.943 |
| **Statistical Analysis** | **Mean** | 3.3026 | 4777.651 |
| | **SD** | 0.002881 | 4.1932 |
| | **% RSD** | 0.087233 | 0.087767 |

**TABLE 5 ACCURACY (RECOVERY) DATA FOR MELATONIN**

| Concentration of Melatonin | Peak Area | Amount found | %recovery | | |
|---|---|---|---|---|---|
| **standard 60mcg** | 2143.997 | | | | |
| 54mcg injection 1 | 1890.612 | 52.9092 | 97.9801 | | |
| 54mcg injection 2 | 1898.698 | 53.2354 | 98.3988 | **SD** | 4.2697 |
| 54mcg injection 3 | 1892.277 | 52.9545 | 98.0663 | **%RSD** | 0.23 |
| **Average** | 1927.196 | 53.0330 | **99.87554** | | |
| 66mcg injection 1 | 2348.157 | 65.7132 | 99.5652 | | |
| 66mcg injection 2 | 2341.570 | 65.5297 | 99.2864 | **SD** | 9.1723 |
| 66mcg injection 3 | 2330.036 | 65.2062 | 98.7970 | **%RSD** | 0.39 |
| Average | 2356.588 | 65.94937 | **99.2160** | | |
| 78mcg injection 1 | 2773.142 | 77.6064 | 99.4951 | | |
| 78mcg injection 2 | 2749.729 | 76.9512 | 98.6556 | **SD** | 12.510 |
| 78mcg injection 3 | 2769.076 | 77.4930 | 99.3501 | **%RSD** | 0.45 |
| Average | 2763.982 | 77.27573 | **99.07145** | | |

**TABLE 6: ACCURACY (RECOVERY) DATA FOR ZOLPIDEM TARTARATE**

| Concentration of Zolpidem tartarate | Peak area | Amount found | %recovery | | |
|---|---|---|---|---|---|
| **standard 100mcg** | 5067.553 | | | | |
| 90mcg injection 1 | 4526.282 | 89.3190 | 99.243 | | |
| 90mcg injection2 | 4561.378 | 90.0112 | 100.012 | **SD** | 34.599 |
| 90mcg injection 3 | 4492.181 | 88.6464 | 98.496 | **%RSD** | 0.76 |
| Average | 4526.614 | 89.32543 | **99.25048** | | |
| 110mcg injection 1 | 5528.526 | 109.0978 | 99.179 | **MEAN** | |
| 110mcg injection 2 | 5552.49 | 109.5692 | 99.608 | **SD** | 30.5906 |
| 110mcg injection 3 | 5491.757 | 108.3710 | 98.519 | **%RSD** | 0.55 |
| Average | 5524.258 | 109.0123 | **99.10212** | | |
| 130mcg injection 1 | 6528.526 | 132.777 | 102.136 | | |
| 130mcg injection 2 | 6652.49 | 131.276 | 100.982 | **SD** | 85.1991 |
| 130mcg injection 3 | 6691.757 | 131.051 | 100.808 | **%RSD** | 1.29 |
| Average | 6624.257 | 132.034 | **101.565** | | |

**TABLE 7: LINERITY DATA FOR MELATONIN**

| Concentration Of Melatonin | Average area | Statistical Analysis | |
|---|---|---|---|
| 12 | 517.00 | Slope | 32.09 |
| 24 | 829.106 | y-Intercept | 107.93 |
| 36 | 1271.69 | Limit of detection | 2.3968396 |
| 48 | 1685.658 | Limit of quantification | 7.2631503 |
| 60 | 2008.96 | r2 (coefficient of determination) | 0.9981 |
| 72 | 2421.872 | | |
| | | Correlation coefficient (r) | 0.9994 |

**TABLE 8: LINERITY DATA FOR ZOLPIDEM TARTARATE**

| Concentration Of Zolpidem | Average area | Statistical Analysis | |
|---|---|---|---|
| 20 | 1012.992 | Slope | 44.946 |
| 40 | 1881.68 | y-Intercept | 128.99 |
| 60 | 2816.713 | Limit of detection | 1.75143 |
| 80 | 3836.228 | Limit of quantification | 5.30736 |
| 100 | 4682.996 | r2 coefficient of determination | 0.998 |
| 120 | 5420.79 | | |
| | | Correlation coefficient r | 0.99919 |

**TABLE 9: RUGGEDNESS DATA FOR MELATONIN AND ZOLPIDEM TARTARATE**

| S.No | | Area of Melatonin | Area of Zolpidem tartarate |
|---|---|---|---|
| 1 | Analyst 1 | 2145.100 | 5068.467 |
| 2 | Analyst 2 | 2138.949 | 5069.079 |
| % RSD | | 0.203051 | 0.0193666 |

**TABLE 10: ROBUSTNESS DATA FOR MELATONIN AND ZOLPIDEM TARTARATE**

| System suitability parameters | Flow rate ml/min | | | Acceptance criteria |
|---|---|---|---|---|
| | 0.9 | 1.0 | 1.1 | |
| Tailing factor of Melatonin peak | 1.2 | 1.3 | 1.3 | NMT1.5 |
| Tailing factor of Zolpidem tartarate peak | 1.2 | 1.2 | 1.1 | NMT1.5 |

**TABLE 11 ASSAY DATA FOR MELATONIN AND ZOLPIDEM TARTARATE**

| Drug | Amount | | % label claim |
|---|---|---|---|
| | Labeled | Measured | |
| Melatonin | 3 mg | 2.98mg | 99.66 |
| Zolpidem tartarate | 5 mg | 4.99mg | 99.94 |

**TABLE 12: STABILITY INDICATING DATA**

| Degradation mechanism / condition | Observation |
|---|---|
| Protected sample | No interference at Retention time of analyte peak |
| Acid degradation<br>0.1 N HCl Reflux – 30.0 min | No interference at Retention time of analyte peak |
| Base degradation<br>0.01 N NaOH Reflux 30.0min | No interference at Retention time of analyte peak |
| Peroxide degradation<br>3.0% $H_2O_2$ Reflux – 30.0min | No interference at Retention time of analyte peak |
| Thermal degradationAt 105°C - 48 Hrs | No interference at Retention time of analyte peak |

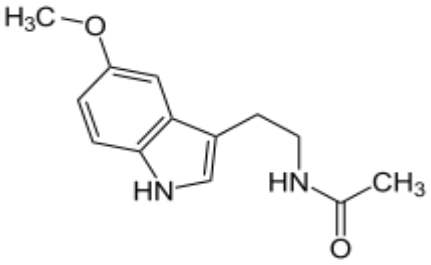


**FIGURE 1: MELATONIN**

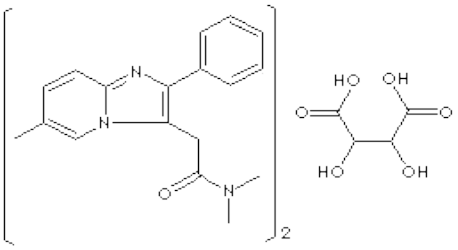


**FIGURE 2: ZOLPIDEM TARTARATE**

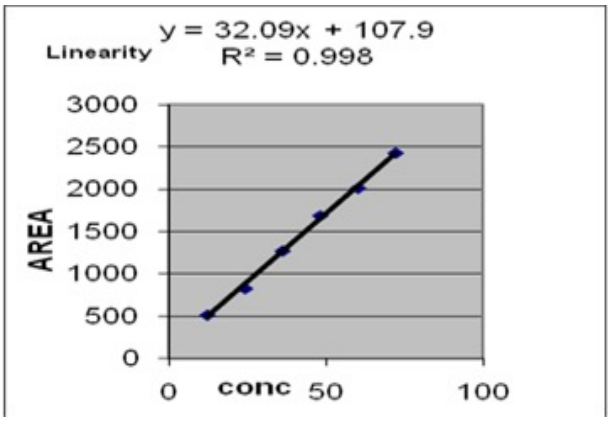


**FIGURE 3 LINERITY FOR MELATONIN**

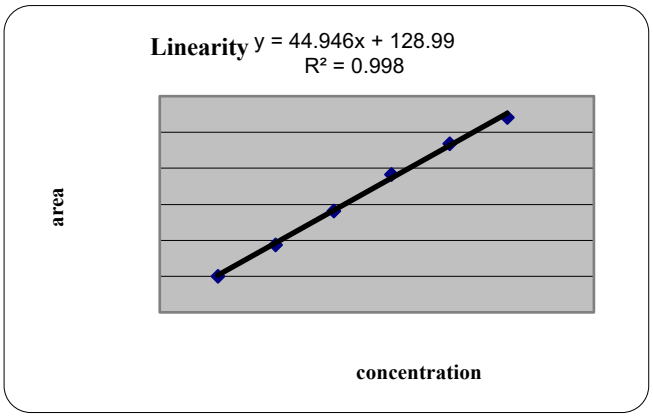


**FIGURE 4 LINERITY FOR ZOLPIDEM TARTARATE**

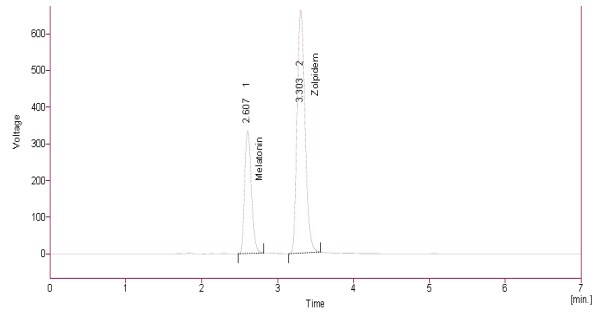


**FIGURE 5 CHROMATOGRAM OF SYSTEM SUITABILITY**

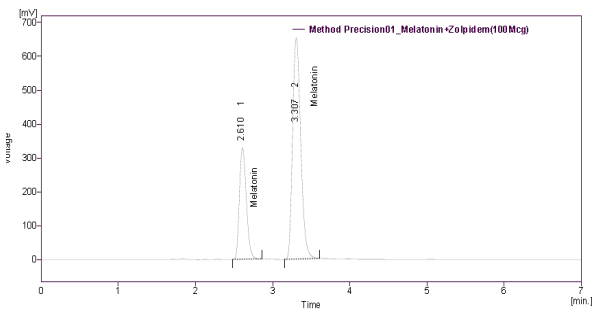


**FIGURE 6 CHROMATOGRAM OF PRECISION**

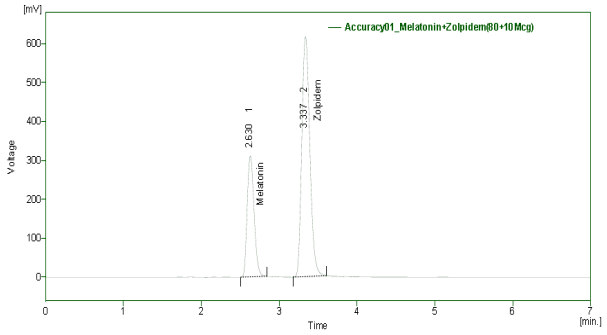


**FIGURE 7 CHROMATOGRAM OF ACCURACY**

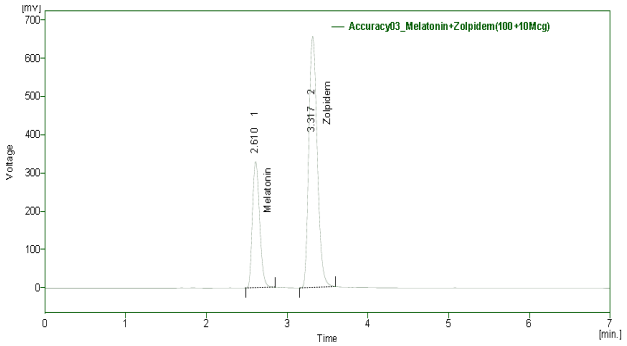


**FIGURE 8 CHROMATOGRAM OF ACCURACY**

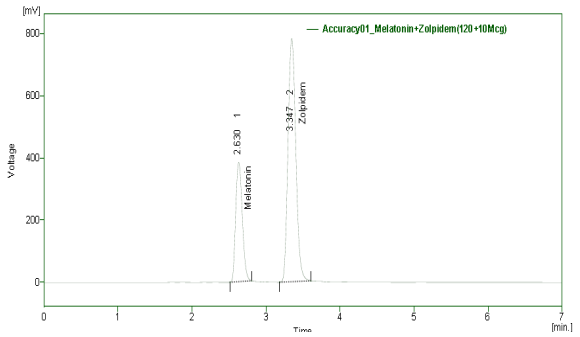


**FIGURE 9 CHROMATOGRAM OF ACCURACY**

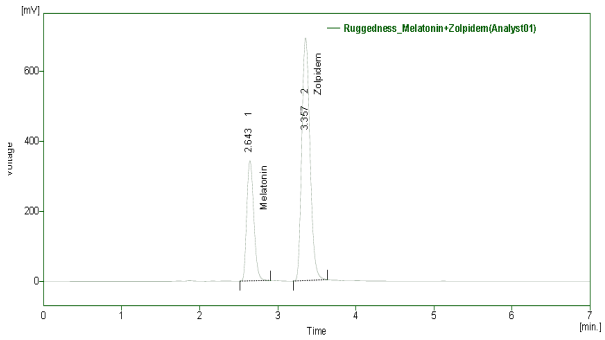


**FIGURE 10 CHROMATOGRAM OF RUGGEDNESS**

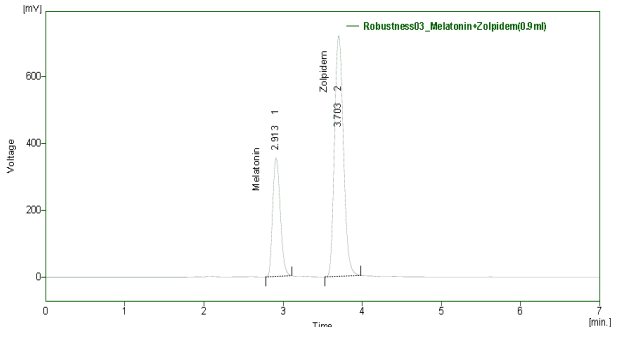


**FIGURE 11 CHROMATOGRAM OF ROBUSTNESS**

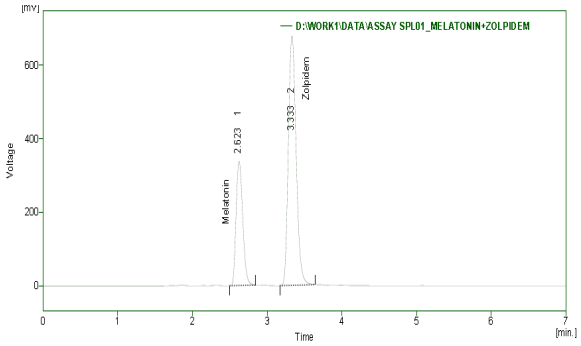


**FIGURE 12 CHROMATOGRAM OF ASSAY**

## SUMMARY AND CONCLUSION

Development of new analytical methods for the determination of drugs in pharmaceutical dosage forms is more important in pharmacokinetic, toxicological and biological studies. Today pharmaceutical analysis entails much more than the analysis of active pharmaceutical ingredients or the formulated product. Analytical testing is one of the more interesting ways for scientists to take part in quality process by providing actual data on the identity, content and purity of the drug products.. As a result, new products can be assured to have comparable quality and can be brought to international markets faster.

A simple reverse phase HPLC method was developed for the simultaneous determination of Melatonin and Zolpidem tartarate in pharmaceutical dosage form. A Hypersil BDS RP-c18 (250 × 4.6 mm), 5µ column from Thermo in isocratic mode, with mobile phases pH 4.3 phosphate buffer and acetonitrile was used. The

flow rate was 1.0-ml/ min and effluent was monitored at 235 nm. The retention times were 2.60 and 3.31 min for Melatonin and Zolpidem tartarate respectively. As per ICH guide lines the method was validated over the range of 10–1000 µg/mL for the three analytes and precise. The method was completely validated showing satisfactory data for all the method validation parameters tested. Hence this method can be introduced into routine use for determination of Melotonin and Zolpidem Tartarate.

**REFERENCES**


1. Madhur gupta, K. Kohli, Dinesh kumar and K. Gupta, A reverse phase high performance liquid chromatography Method for simultaneous estimation of melatonin,Carbamazepine epoxide and carbamazepine Simultaneously in serum, Indian Journal of physiology and pharmacology 2006; 50 (4) : 427–430
2. M.Isabelrodriguez-naranjo, Angelgil-izquierdo, Anam.troncoso, Emma cantos, M.Carmengarcia-parrilla, melatonin: A new bioactive compound in wine. Journal of food composition and analysis 2009 Volume 22 (3),177-183
3. José .p. munoz, Rosa m. Ceinos, José.Soengas, Jesús m.Míguez A simple and sensitive method for determination of melatonin in plasma, Bile and intestinal tissues by high performance liquid chromatography with Fluorescence detection., Journal of chromatography, 877 (2009) 2173–2177.
4. El.zeany, A.moustafa, N.farid, Determination of zolpidem hemitartrate by quantitative HPTLC and LC, Journal of pharmaceutical and biomedical analysis 33 (2003) 393-401
5. Paula r. Ring, james m. Bostick Validation of a method for the determination of zolpidem In human plasma using LC with fluorescence detection, Journal of pharmaceutical and biomedical analysis 22 (2000) 495–504
6. Thomas keller, andrea schneider, edith tutsch-bauer ,Gc/Ms determination of zolpidem in postmortem Specimens in a voluntary intoxication Forensic science international 106 (1999) 103–108


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