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# Various Analytical Methods for the Determination of Terazosin in Different Matrices

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**Abstract** Terazosin is used in men for symptom relief in the case of benign prostatic hyperplasia. This is categorized under the group of alpha one adrenoreceptor blockers. Terazosin is also used in high blood pressure by relaxing blood vessels so that blood can easily pass through. In this systematic review different analytical methods for the determination of terazosin in different matrices are discussed. Overall thirty six different analytical methods for the determination of terazosin were found in literature survey, 12 spectrophotometry, 2 TLC, 2 HPTLC, 16 HPLC and 4 electroanalytical methods were found. Advantages and disadvantages of available methods are also discussed. This review also adds knowledge about the place of terazosin therapy in hypertension or enlarged prostate. This review is useful for the researchers involved in the development of new analytical method or formulation.

***Keywords:*** *Terazosin, spectrophotometry, chromatography, HPLC, HPTLC, method validation*

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## 1. Introduction

Lower urinary tract symptoms (LUTS) in elderly men were traditionally attributed to the enlarging prostate. The mechanisms invoked were one or all of the following: histologic benign prostatic hyperplasia (BPH), benign prostatic enlargement (BPE), or benign prostatic obstruction (BPO). [1] These symptoms associated with BPH are known as lower urinary tract symptoms (LUTS). Symptoms of BPH affect 50% of men older than 60 years and almost 90% of men older than 90 years [2].

Benign prostate hyperplasia (BPH) is a urological disorder caused by the noncancerous enlargement of the prostate as men age. As the prostate enlarges, it can constrict the urethra, inducing various symptoms including a weak urinary stream, incomplete bladder emptying, nocturia, dysuria and bladder outlet obstruction. [3] In benign prostatic hyperplasia (BPH) there will be a sudden impact on overall quality of life of patient. [4] BPH is rarely life threatening, but it can lead to acute urological problems, for example acute urinary retention (AUR) [5].

In humans, the prostate lies immediately below the base of the bladder surrounding the proximal portion of the urethra and consists of canals and follicles lined with columnar epithelial cells and surrounded by a fibromuscular stroma consisting of connective tissue and smooth muscles. In the large scale Multinational Survey of the Aging Male, 34% of men in the USA and 29% of European men aged 50–80 years reported moderate to severe LUTS. LUTS and sexual dysfunction are common and important health concerns of men aged ≥ 50 years [6].

$\alpha_1$-Adrenergic receptors (AR) mediate many of the physiological functions of the endogenous catecholamine's noradrenaline and adrenaline such as smooth muscle contraction or cellular hypertrophy. Moreover, they are the molecular target for clinically used drugs for the treatment of e.g. arterial hypertension or BPH [7].

α-Adrenoreceptor antagonists are frequently used to treat patients with LUTS and benign prostatic enlargement because of their significant effect on storage and voiding symptoms, QOL, flow rate, and post void residual urine volume. [8] The $\alpha_1$-blockers reduce smooth muscle tone in the prostate and result in rapid improvements in urinary symptoms and flow [9].

The greatest safety concern associated with the use of these agents is the occurrence of vasodilatory symptoms such as dizziness and orthostatic hypotension resulting from inhibition of $\alpha_1$-ARs in the systemic vasculature. [10] However Rossitto et al [11] recommended in their publication to use alpha one blocker therapy in a patient having both hypertension and BPH.

Terazosin hydrochloride dehydrate [12] RS-1-(4-amino-6, 7-dimethoxy-2-quinazolinyl)-4-[(tetra-hydro-2-furanyl) carbonyl]- piperazine monohydrochloride [Figure 1] is a α1-adrenoceptor blocker with a long lasting action. [13] This is official in European Pharmacopoeia [12], USP [13], BP [14] and indicated in mild to moderate hypertension and benign prostatic hyperplasia [15]. It is used in the management of hypertension and in benign prostate hyperplasia to relieve symptoms of urinary obstruction.[16] Terazosin is rapidly and almost completely absorbed from the gastrointestinal tract after oral administration and is extensively metabolized in the liver to yield piprazine and three other inactive

metabolites. Absorption is not affected by the presence of food. The major route of elimination is via the biliary tract and the drug is excreted in faeces (60%) and urine (40%). Around 10% is excreted as the parent drug and the remainder as its metabolites. Renal impairment shows no significant effect on pharmacokinetics. [17] Terazosin also shown more effective relief and fewer adverse events than those treated with placebo in the patients with female lower urinary tract symptoms (LUTS) [18].

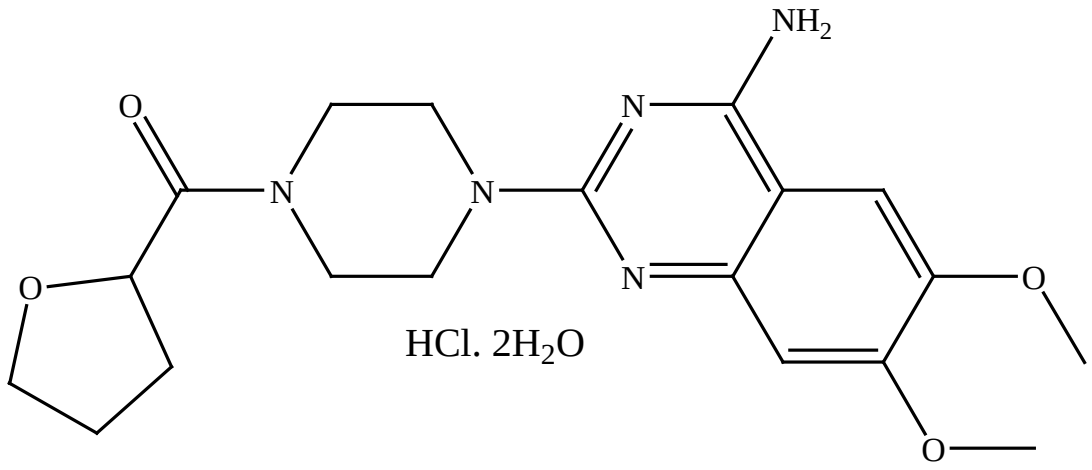


**Figure 1.** Chemical structure of terazosin hydrochloride dehydrate

Thus this is clearly evident that Terazosin is one of the important alpha one adrenoreceptor blocker for BPH. This forms the basis of our study. In this systematic review different analytical methods available in the current literature for the determination of Terazosin in different matrices are reported. The presented review will be useful for the researchers involved in development of analytical methods of terazosin or formulations.

In this literature survey twelve different spectrophotometric, twenty chromatographic and four electroanalytical methods for terazosin determination in various different matrices were found. Overall aim of the presented review is to benefit scientific community with the knowledge of analytical methods of terazosin determinations.

## 2. Results [Analytical Methods]

Analytical methods for the determination of terazosin were searched for in various reputated database like Sciencedirect, Pubmed, Medknow, NCBI, Taylor and Francis and Google scholar were explored by using keywords "Analytical methods for terazosin", "Determination of terazosin", "Spectrophotometric method for terazosin determination, "Chromatographic method for terazosin determination", "Electroanalytical methods for determination of terazosin".

### 2.1. Spectrophotometric Methods

Spectrophotometry is essentially a trace- analysis technique and is one of the most powerful tools in chemical analysis.[19] Spectrophotometric techniques remain a frequent choice for routine analyses as they provide simple, accurate and inexpensive solutions when compared to other methods.[20] Spectrophotometric tools, and consequently the methods for interpretation of spectrophotometric data, are of increasing importance for analytical laboratories, as well as for environmental, biomedical and industrial monitoring [21].

Spectrophotometric methods are among the oldest methods of analytical chemistry. The absorption of visible light by certain chemical substances has long been used for visual determination of their substances. The term "colorimetry" was used for those analytical methods, in which chemical elements were determined by comparing the color of unknown samples with appropriate standards, either in graduated cylinders or in visual comparators.[22] Application of derivative technique of spectrophotometry offers a powerful tool for quantitative analysis of multi-component mixtures. Derivative spectroscopy (DS) has been directly used for the simultaneous determination of organic and inorganic compounds [23].

Summary of different spectrophotometric methods for the determination of terazosin is provided under Table 1.

Other than methods presented in the Table 1, negative results of simultaneous determination of TRZ with other alpha one adrenoreceptor blockers[31] is also available. Another method proposed is based on the conversion of the analyte (terazosin) in the form of an ion associated complex formed with zinc thiocyanate by a filter and a detectable species by x-ray spectrometry.[32] The linear dynamic range and detection limit reported was $0.732\times10^{-3}$ to 1000 mg/ml and 0.732 µg/ml respectively.

#### 2.1.1. Comparison

Specrofluorimetry as an analytical tool provides a well defined identity of the compounds present in the sample on the basis of their unique fluorescent nature. The compounds can be analysed upto the levels of nanograms. [33] Spectrofl uorimetry is considered a sensitive and simple technique. [34] The acid-dye method can provide a more sensitive technique for certain amines and quaternary ammonium compounds that absorb weakly in the ultraviolet region. [35] In the case of Terazosin spectrofluorimetry method proves to be more advantageous in case of sensitivity. Acid-dye or methods based on ion pair complex are less sensitive and requires extraction from respective solvents after reaction.

**Table 1. Summary of spectrophotometry methods**

| Principle | Wavelength | Linear range | LOD | LOQ | Application | Ref |
|---|---|---|---|---|---|---|
| Diazotization with 1 % sodium nitrite and HCl followed by coupling with ß-naphthol in 4% NaOH. | 560 nm | 1-10 µg/ml | - | 1 µg/ml | Tablets | [24] |
| Fluorimetry: Dilution in methanolic 0.1 N $H_2SO_4$ | $\lambda_{ex}$ 246 nm and $\lambda_{em}$ 382 nm | 25-150 ng/ml | - | 25 ng/ml | Tablets | [25] |
| Fluorimetry: based on the application of hydrophobic 1-Hexylpyridinium hexafluorophosphate [Hpy][$PF_6$] ionic liquid (IL) as a microextraction solvent was proposed to preconcentrate terazosin. | $\lambda_{em}$ 376 nm & $\lambda_{ex}$ 330 nm. | 0.1 to 115 µg $L^{-1}$ | 0.027 µg/ml | - | Urine and plasma | [26] |
| Spectrofluorimetry | $\lambda_{ex/em}$ = 280/413 nm | 0–9 × $10^{-6}$ mol $l^{-1}$ | 0.21 mg $l^{-1}$ | - | Interactions between terazosin and bovine serum albumin (BSA) | [27] |
| Spectrofluorimetry. Acetic acid 1 mol $L^{-1}$ in ethanol was used as diluting agent [Slit width 1.5 nm both Ex and Em] | $\lambda_{ex}$ 332 nm and $\lambda_{em}$ 382 nm. | 1×$10^{-5}$ to 7.0 µgm$L^{-1}$ | 3.04×$10^{-4}$ µg/ml | 1.0×$10^{-3}$ µg/ml | Tablets | [28] |
| Spectrofluorimetry. Acetic acid 1 mol $L^{-1}$ in ethanol was used as diluting agent [Slit width 5 nm both Ex and Em] | $\lambda_{ex}$ 332 nm and $\lambda_{em}$ 382 nm | | 1.11×10−5 µg/ml | 3.7×$10^{-5}$ µg/ml | Tablets and urine samples | |
| Direct measurements of the first and second derivative spectra of samples | $D_1$ = 340, $D_2$ = 345 nm | 4-18 µgm$L^{-1}$ | - | - | Determination in the presence of degradation product | [29] |
| The reaction of with chloranil (CH) in aqueous solution of pH 9 to give an intense yellow color | 340 nm | 24-45 µgm$L^{-1}$ | - | - | | |
| The reaction of the drug with mercurochrome (MER) in aqueous alkaline medium to give an intense red color | 543 nm | 4-12 µgm$L^{-1}$ | - | - | | |
| Ion-pair salt between the drug and bromocresol purple (BCP) | 412 nm | 4-20 µgm$L^{-1}$ | - | - | | |
| Fluorimetry | $\lambda_{ex}$ 390 nm and $\lambda_{em}$ 382 nm. | 0.025-0.1 µgm$L^{-1}$ | - | - | | |
| Ion pair complex with dyes bromocresol green, bromothymol blue, methyl orange and alizarine red in acidic buffer pH 3.0-5.0. | 419, 415, 425 and 428 nm resp. | 2.0-14 1.0-12 1.0-10 5.0-130 µgm$L^{-1}$ resp | 0.186, 0.106, 0.286, 1.286 µg $ml^{-1}$ resp. | 0.619, 0.353, 0.954, 4.286 µg $ml^{-1}$ resp. | Pure and tablets | [30] |

## 2.2. Chromatography

Chromatography presents one of the greatest methodological phenomenon of the twentieth century with an extremely fruitful output for the future. Chromatography was realized for the first time as an analytical “technological” process over a hundred years ago, but only in the more recent decades, investors have noticed that many natural processes are in fact chromatographic [36]. Chromatography is a proven method for separating complex samples into their constituent parts, and is undoubtedly the most important procedure for isolating and purifying chemicals. [37] Chromatographic methods are commonly used for the quantitative and qualitative analysis of raw materials, drug substances, drug products and compounds in biological fluids [38].

High-performance liquid chromatography (HPLC) was introduced to pharmaceutical analysis not long after its discovery in the late 1960s. By now it has developed into a generally applicable analytical method providing rapid and versatile separation possibilities that meet the increasing requirements for purity testing of bulk pharmaceuticals and pharmaceutical products [39].

HPTLC is a sophisticated instrumental technique based on full capabilities of TLC. The advantages of automation scanning, full optimization, selective detection principle, minimum sample preparation, hyphenation etc., enable it to be powerful analytical tool for chromatographic information of complex mixtures of organic, inorganic and biomolecules. [40] HPTLC is a valuable tool for reliable identification because it can provide chromatographic fingerprints that can be visualized and stored as electronic images [41].

Summary of chromatographic methods and summary of methods for determination of terazosin in different combinations are presented under Table 2 and Table 3 respectively.

### 2.2.1. Comparison of Chromatographic Methods

Different chromatographic methods including 2 TLC[42], 2 HPTLC[43,44], 4 HPLC-F[45,46,47,48] and 11 HPLC-UV[12,13,44,49,50,51,52,53,54,55,56] methods for the determination of Terazosin in different matrices is available in current literature.

Fluorescence has allowed liquid chromatography (LC) to expand into a high-performance technique. High-performance liquid chromatography (HPLC) procedures with fluorescence detection are used in routine analysis for assays in the low nanogram per milliliter range and concentrations as low as picogram per milliliter often can be measured.[57] Fluorescence-based HPLC has been used as a sensitive and less costly alternative approach to LC-MS.[58] This may be the reason that no direct LC-MS method is available. Here in the case of comparison of chromatographic methods of Terazosin, HPLC-F methods [45,46,47,48] seem to be quite sensitive methods as compared to other chromatographic methods.

**Table 2. Summary of chromatographic methods of Terazosin in different matrices**

| Method | Chromatographic condition | Linear range | LOD | LOQ | Applicaation | Ref |
|---|---|---|---|---|---|---|
| TLC | Silica Gel 60 $F_{254}$ Mobile phase: Chloroform:Toluene:MeOH (9:1:6). Spot visualize by UV and starch potassium iodide spray | NM | NM | NM | To separate 2-Piperazinyl-6,7-dimethoxy-4-aminoquinazoline, 2-chloro-4-amino-6,7-dimethoxyquinazoline and 2-Tetrahydrofuroyl piperazine | [42] |
| | Silica Gel 60 $F_{254}$ Mobile Phase: Methylene chloride: Ethyl acetate:acetic acid (19:1:0.2). Spots visualize by Ceric sulfate ammonium molybdate spray | NM | NM | NM | Degradation product tetrahydro-2-furoic acid | |
| Stablity indicating HPTLC | Silica gel precoated aluminum plate $60_{F-254}$ plates, [20cm × 10cm with 250µm thickness and wavelength selected was 254nm. Mobile phase Chloroform:Toluene:MeOH (9:1:6). | 50-2500 µg/ml | 18.06 µg/ml | 54.72µg/ml. | Tablets | [43] |
| HPTLC | Silica gel precoated aluminum plate $60_{F-254}$ plates, [20cm × 10cm with 250µm thickness and wavelength selected was 254nm. Chloroform and methanol in the ratio 9.5:0.5. | 0.8-1.2 mg/ml | 0.013 mg/ml | 0.041 mg/ml | Simultaneous determination with Prazosin, Alfuzosin and Doxazosin | [44] |
| HPLC with fluorescence | 40 mm ammonium perchlorate in methanol:deionised water (9+1) adjusted to pH 6.8 with 1% (v/v) methanolic perchloric acid). and injected on a 125×4 mm $C_{18}$ column. Detection was performed fluorimetrically $\lambda_{ex}$ = 250 nm, $\lambda_{em}$ = 325 nm. | - | - | - | Plasma determination | [45] |
| HPLC with Fluoresence | Column packed with spherical silica gel particles chemically bonded with octadecyl groups (5 mm, 150×4 mm I.D). 0.01 M disodium hydrogen phosphate-acetonitrile–tetrahydrofuran (76:22:2, v/v) adjusted to pH 6.5 using 85% w/w phosphoric acid solution Flow-rate 1 ml /min. Fluoresence detection $\lambda_{ex}$ = 250 nm and $\lambda_{em}$ 370 nm | 0.25 to 100 ng/ml | NM | 0.25 ng/ ml | Pharmacokinetic studies | [46] |
| HPLC with Fluoresence | Chiral stationary phase used was Chiralpak AD 100 mm×2.1 mm I.D. (10 mm particle size). Hexane–2-propanol–diethylamine mixture. The pump was operated in isocratic mode pump A, hexane and 2-propanol with 0.05% (v/v)0.9% diethylamine [65:35] B, flow rate 0.15 ml/min. Fluoresence detection $\lambda_{ex}$ = 238 nm and $\lambda_{em}$ 370 nm | 0.0625 to 64 ng/ml | NM | 62.5 pg/ml | Enantioselective determination | [47] |
| HPLC with Fluoresence | Shimpack column VP-ODS (Japan) 150mm×4.0mm(5.0 µmparticle size). Mobile phase, an isocratic solvent system of 0.01mol $L^{-1}$ disodium hydrogen phosphate–acetonitrile–tetrahydrofuran (76:22:2, v/v) adjusted to pH 6.5 using 85% (w/w) phosphoric acid solution; flow rate, 1.0 $mLmin^{-1}$; temperature, 30 °C. $\lambda_{ex}$ = 250 nm and $\lambda_{em}$ 370 nm. | 20.0, 180.0 and 320.0 $ngmL^{-1}$ | 0.1308 ng/ml | NM | Tablets | [48] |
| HPLC-UV | 5-µm Zorbax Rx $C_8$ columns measuring 15 cm x 4.6 mm I.D. Additional columns included µ-Bondapak $C_{18}$ (10 µm) 30 cm x 3.9 mm I.D. Nucleosil $C_{18}$ (5 µm) 15 cm x 4.6 mm I.D. Bakerbond C, wide-pore (5 µm) 25 cm x 4.6 mm I.D. J.T., Versapak C,, (5 µm) measuring 30 cm x 4.0 mm I.D. and a Serva Techsphere $C_8$ (5 µm) measuring 25 cm x 4.6 mm. Mobile phase: 175 ml of acetonitrile, 50 ml of isopropyl alcohol and 1775 ml of 0.05 M citrate buffer. Flowrate, 2.0 ml/min. λ = 254 nm | 0.5 µg/ml | - | - | Minor impurities | [49] |
| HPLC-UV | RP $C_{18}$ column using water/acetonitrile/methanol/glacial acetic acid/diethylamine (25:35:40:1:0.017). Wavelength 254 nm | 50–500 $µgml^{-1}$ | NM | NM | Stability indicating HPLC method under ICH recommended condition | [50] |
| | 5 µm Waters Spherisorb ODS2 column (250 mm ×4.6 mm i.d.). Mobile phase: acetonitrile:water: acetic acid: diethyl amine (65:35:1:0.2) in an isocratic mode. λ = 254 nm | - | - | - | Comparison of degradation behavior of Terazosin, Prazosin and Doxazosin | [51] |
| HPLC-UV | Reversed-phase ($C_{18}$) HPLC column. The mobile phase, 10 mM $Na_2HPO_4$: acetonitrile: THF (76:22:2; v/v/v) adjusted to pH 6.5 using 85% phosphoric acid, was run at a flow rate of 1.3ml $min^{-1}$, and the column effluent was monitored using a fluorescence detector $\lambda_{ex}$ = 250 nm and $\lambda_{ex}$ 370 nm at 50 °C | - | 5 ng/ml | - | Plasma and Urine determinations | [52] |
| on-line SPE–HPLC | Shim-pack VP-ODS column (Shimadzu, 150×4.6 mm id, 5 µm). Gradient elution: Solution A (25 mM $NaH_2PO_4$ buffer at pH 2.7 and methanol, 65:35 v/v), and Solution B (25 mM $NaH_2PO_4$ buffer at pH 2.7 and methanol, 20:80 v/v). The gradient elution procedure was from 0% B | 0.005–5 µg/mL | 0.5 ng/mL. | - | Clinical plasma samples | [53] |

| | | | | | | |
|---|---|---|---|---|---|---|
| | to 100% B within 20 min. The flow rate was 1.0 mL/min, and wavelength was 254 nm. | | | | | |
| HPLC-UV | RP $C_{18}$ column (250 mm × 4.6 mm, 5 µm) employing UV detection at 254 nm. The mobile phase consisted of ACN– THF - 0.01 mol/l potassium dihydrogenphosphate solution (15:5:80, v/v) at a flow rate of 1.0 ml/min. | 10 – 400 ng/ml | - | 10 ng/ml. | pharmacokinetic studies of terazosin. | [54] |
| HPLC-UV | Column: size: l = 0.25 m, Ø = 4.0 mm; stationary phase: octadecylsilyl silica gel for chromatography R (5 µm); temperature: 25 °C. Mob ile phase Dissolve 2.80 g of sodium laurilsulfate R in 1000.0 mL of water R and add 11.0 mL of a solution containing 202.4 g/L of triethylamine and 230.0 g/L of phosphoric acid; adjust to pH 2.5 with phosphoric acid; mix 600 volumes of this solution with 400 volumes of acetonitrile. Flow rate 1.0 mL/min. λ = 210 nm. | - | - | - | Impurities | [12] |
| HPLC-UV | Column: size: l = 0.25 m, Ø = 4.6 mm; stationary phase: octylsilyl silica gel for chromatography R (5 µm); temperature: 30 °C. Mobile phase Mix 2 volumes of triethylamine, 350 volumes of acetonitrile, and 1650 volumes of a solution containing 6 g/L of sodium citrate and 14.25 g/L of anhydrous citric acid. Flow rate 1.0 mL/min. λ = 245 nm. | - | - | - | Related substances | [12] |
| HPLC-UV | Mobile phase: Prepare a filtered and degassed mixture of pH 3.2 Citrate buffer and acetonitrile (1685:315). pH 3.2 Citrate buffer— Dissolve 12.0 g of sodium citrate dihydrate and 28.5 g of anhydrous citric acid in 1.95 L of water. Adjust with anhydrous citric acid or sodium citrate to a pH of 3.2 ± 0.1. Dilute with water to 2.0 L, and mix. 254-nm detector and a 4.6-mm × 25-cm column that contains packing L7. The column temperature is maintained at about 30°C. The flow rate is about 1.0 mL per minute. | - | - | - | Assay | [13] |

**Table 3. Summary of chromatographic methods of Terazosin in combination with other drugs**

| Drugs | Method | Chromatographic condition | Linear range | LOD | LOQ | Application | Ref |
|---|---|---|---|---|---|---|---|
| TRZ+ Prazosin+ Doxazosin | HPLC-UV | Kromacil $C_{18}$ column. Mobile phase consisting of A: ACN–diethylamine (0.05 ml), B: methanol, and C: 10 mM Ammonium acetate, The gradient condition (A:B:C) was: 60:40:0:0 for 8 min, 60:20:20:0 for 1 min, 60:0:40:0 for 5 min, and a further 60:40:0:0 gradient for 1 min for system equilibration. λ=254 nm. | 2–500 µg/ml | 0.065, µg/ml | 0.197, µg/ml | Formulations | [55] |
| TRZ+ Alfuzosin, Prazosin, Doxazosin, Tamsulosin | HPLC-UV | $C_{18}$ column, a UV detector at 230 nm and a elution was performed under a gradient mobile phase composed of (A) ACN- diethylamine (0.05 mL), (B) methanol, (C) 10 mM ammonium acetate and (D) Water | 4-16 µg/ml | 0.08 µg/ml | 0.264 µg/ml | Formulations | [44] |
| TRZ+ Prazosin | HPLC-UV | Kromacil $C_{18}$ column. Methanol mobile phase. Flow rate 1.1 ml/min | 10-60 µg/ml | 0.514 µg/ml | 1.557 µg/ml | Formulations | [56] |

## 3. Electroanalytical Methods

Modern electrochemical methods are now sensitive, selective, rapid, and easy techniques applicable to analysis in the pharmaceutical fields, and indeed in most areas of analytical chemistry. They are probably the most versatile of all trace pharmaceutically active compound analysis. [59] Electrochemistry has always provided analytical techniques characterized by instrumental simplicity, moderate cost and portability. [60] Electroanalytical techniques can easily be adopted to solve many problems of pharmaceutical interest with a high degree of accuracy, precision, sensitivity and selectivity, often in a spectacularly reproducible way by employing this approach [60,61].

Four electoanalytical methods [14,62,63,64] were found during literature survey.

## 4. Conclusion

Different analytical methods (n=36) for determination of terazosin were discussed in this presented review. 12 spectrophotometry, 2 TLC, 2 HPTLC, 16 HPLC and 4 electroanalytical methods were found in literature survey. Advantages and disadvantages of different methods e.g. spectrophotometery, chromatography [HPLC and HPTLC] and electroanalytical methods were also discussed. Details of spectrophotometry and electroanalytical methods are provided in Table 1 and Table 4 respectively. Table 2 and Table 3 represents different chromatographic methods of terazosin in different matrices. This article is useful for the scientists involved in the research related to terazosin particularly in the areas of method development or development of new formulations. This review also provides a brief knowledge of place of terazosin in

hypertension and benign prostatic hyperplasia which can be compared to other drugs available in same indication.

**Table 4. Summary of electroanalytical methods**

| Method | Principle | Linear range | LOD | LOQ | Application | Ref |
|---|---|---|---|---|---|---|
| Potentiometric methods | TRZ reacts with tetraphenyl borate or ammonium reineckate to form ion association complex. Form 1:2 ion association complex. | $10^{-5}$-$10^{-2}$ M for both methods | $5.6 \times 10^{-6}$ M for both methods | - | Tablets | [62] |
| Potentiometric sensor | Ion-pair complex of terazosin-tetraphenylborate was prepared by mixing 20 mL of 0.01 mol L-1 solution with 20 mL of tetraphenyl borate solution (0.01 mol L-1) under stirring, precipitate was filtered off, washed with water and dried in room temperature | $10^{-5}$-$10^{-2}$ mol $L^{-1}$ | $7.9 \times 10^{-6}$ mol $L^{-1}$ | - | pure and pharmaceutical formulation. | [63] |
| Voltametry | Two surfactants were used, an anionic type, sodium dodecyl sulfate (SDS) and a cationic type, cetyl trimethyl ammonium bromide (CTAB). Addition of SDS to the terazosin-containing electrolyte was found to enhance the oxidation current signal while CTAB showed an opposite effect. | - | $6.00 \times 10^{-7}$ mol $L^{-1}$ | - | urine samples and tablet formulations | [64] |

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