A REVIEW ON ANALYTICAL METHOD FOR DETERMINATION OF ANGIOTENSIN II-RECEPTOR ANTAGONISTS IN DIFFERENT DOSAGE FORMS

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ABSTRACT

Angiotensin II-Receptor Antagonist effective approach towards hypertension and Conjunctive Heart Failure. Angiotensin II acts on two G-Proteine-Coupled receptor, of which the Angiotensin ‘AT1’ subtypes account for all the classic action of Angiotensin. As well as Vasoconstriction include stimulation of aldosterone production by adrenal cortex. The Antihypertensive effects on ACE inhibition and ARBs results primarily from vasodilatation with little change in cardiac output or rate, renal blood flow may increases. AT-II Antagonists includes drug like Azilsartan, Candesartan, Eprosartan, Irbesartan, Losartan, Olmesartan, Telmisartan, Valsartan and many other drugs. This Review enlists different method developed for determination of AT II-Receptor Antagonist like UV. Spectrophotometric, HPLC, RP-HPLC, HPTLC, LC-UV, UPLC, LC-MS/MS, and Q-Absorbance Method.

Keywords: Hypertension, AT II-Receptor Antagonist, ARBs, ACE, Spectrophotometric

INTRODUCTION[1-5]:

Hypertension is High Blood Pressure [1]. Blood Pressure is the force of blood pushing against the walls of arteries as it flow through them, arteries are Blood Vessels that carry Oxygenated Blood from heart to the body tissues [1]. It is serious because people with this condition have a higher risk for heart diseases and other medicinal problem than people with normal BP, serious complication can be avoided by getting regular BP checks and treating Hypertension as soon as it is diagnosed [1]. If it is left untreated, Hypertension can lead to medical condition like Heart Attack, Arteriosclerosis, Enlarged Heart or Kidney Damage [1]. BP measurements are classified in Stages, according to severity [1].

A. Normal blood pressure: less than less than 120/80 mm Hg
B. Pre-hypertension: 120-129/80-89 mm Hg
C. Stage 1 hypertension: 140-159/90-99 mm Hg
D. Stage 2 hypertension: at or greater than 160-179/100-109 mm Hg

A typical Physical Examination to evaluate Hypertension includes: Medical and Family History, Chest X-Ray, Electrocardiogram (ECG), Blood and Urine Tests, Ophthalmoscopy: Examination of Blood Vessels in Eye [1]. Antihypertensive classes of drugs are as follows [1]

1. Diuretics and Beta-blockers
2. Calcium channel blockers
3. Angiotensin converting enzyme inhibitor (ACE inhibitors)
4. Alpha-blockers
5. Alpha-beta blockers and Vasodilators
6. Peripheral acting adrenergic antagonists
7. Centrally acting agonists

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Angiotensin converting enzyme inhibitors (ACE inhibitors):[2-5]

Angiotensin II Receptor Antagonists Blockade of the Renin-Angiotensin system is now recognized as an effective approach to the treatment of Hypertension and Congestive Heart Failure.[2]. Blocking the Renin- Angiotensin System (RAS) led to the discovery of Angiotensin-Converting-Enzyme (ACE) Inhibitors, developed as agents that would more completely block the RAS and thus decrease the adverse effects seen with ACE Inhibitors.[3]. AT II Antagonists includes drug like Azilsartan, Candesartan, Eprosartan, Irbesartan, Losartan, Olmesartan, Telmisartan, and Valsartan. According to Clinical Trial. AT-II-Receptor Antagonists are as effective as Calcium-Channel Blockers, β-Blockers, and ACE Inhibitors in the treatment of Hypertension and induce fewer Adverse Effects.[3]. Adverse Effects like dizziness, headache, upper-respiratory-tract infection, cough, and gastrointestinal disturbances occur at about the same rate as with placebo.[3]. Renin is an Enzyme produce by Kidney in response to a number of factors, but principally Adrenergic (β1 Receptor) activity and Sodium Depletion. Renin converts a circulating Glycoprotein (Angiotensinogen) into biologically inert ACE or Kinase II into the highly potent Vasoconstrictor Angiotensin II.[4]. ACE located on luminal surface of capillary endothelial cells, particularly in lungs, and there are also Renin-Angiotensin Systems in many organs, e.g. Heart, Brain, the relevance of which is uncertain[4]. Angiotensin II acts on two G-Protein-Coupled Receptor, of which the Angiotensin ‘AT1’ subtypes account for all the classic action of Angiotensin. As well as Vasoconstriction include stimulation of aldosterone production by adrenal cortex[4]. Angiotensin II have an important effect on blood pressure[4]. Bradykinin (endogenous vasodilator found in blood vessel walls) is also a substrate for ACE. Potentiation of Bradykinin contributing to the lowering of BP of ACE inhibitor in patient with Low-Renin causes of Hypertension[4].

USES [4]:
- The Anti hypertensive effects on ACE Inhibition and ARBs results primarily from Vasodilatation with little change in Cardiac output or rate, Renal Blood Flow may increases.
- ACE Inhibitors and ARBs are most useful in Hypertension when the raised BP results from excess Renin production.

ARBs are remarkably free of side effects because they do not increase Kinin level; the ACE inhibitor related cough is not encountered. Angiordema, urticaria and taste disturbance are also rare[5]. Though effects of ACE Inhibitor and ARBs are not identical, latter it have all metabolic and prognostic advantage of ACE Inhibitor[5].

Table 1: Analysis of Component of drug by different Spectrophotometric Method[6-47]

<table>
<thead>
<tr>
<th>S.no</th>
<th>Drug</th>
<th>Method</th>
<th>Description</th>
<th>Ref</th>
</tr>
</thead>
</table>
| 1    | Azilsartan Medoxomil in Bulk and Pharmaceutical dosage forms | New Simple UV Spectrophotometric Method | Wavelength: 249 nm  
Solvent: Acetonitrile  
Linearity Range: 1-20 μg/ml  
Correlation Coefficient (R²): 0.999  
LOD: 0.40 μg/ml  
LOQ: 1.31 μg/ml | 6 |
| 2    | Candesartan Cilexetil in Marketed tablet | UV Spectrophotometric | Wavelength: 253 nm  
Solvent: Methanol  
Linearity Range: 2-25 μg/ml  
Correlation Coefficient (R²): 0.9993  
LOD: 18.1 μg/ml  
LOQ: 54.90 μg/ml | 7 |
| 3    | Eprosartan Mesylate | UV Spectrophotometer | Wavelength: 233nm  
Solvent: 0.1N Methanol  
Linearity Range: 2-30 μg/ml  
Correlation Coefficient (R²): 0.9998  
LOD: 0.3623 μg/ml  
LOQ: 1.098 μg/ml | 8 |
| 4    | Irbesartan in Bulk and Dosage Forms | New Simple UV Spectrophotometry | Wavelength: 246.4 nm  
Solvent: 1 M sodium bicarbonate and 2 M urea (50:50% v/v)  
Linearity Range: 10-35 μg/ml | 9 |
<table>
<thead>
<tr>
<th>No.</th>
<th>Compound/Drug Name</th>
<th>Method</th>
<th>Wavelength</th>
<th>Solvent</th>
<th>Linearity Range</th>
<th>LOD (µg/ml)</th>
<th>LOQ (µg/ml)</th>
<th>R²</th>
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</thead>
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<td>Losartan Potassium in Pharmaceutical dosage forms</td>
<td>UV Spectrophotometry</td>
<td>234nm</td>
<td>Methanol</td>
<td>8-22 µg/ml</td>
<td>1.23</td>
<td>3.72</td>
<td>0.9998</td>
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<td>6</td>
<td>Olmesartan Medoxomil in Pharmaceutical Formulation</td>
<td>Validated Spectrophotometric Method</td>
<td>256nm</td>
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<td>4-14 µg/ml</td>
<td>0.105</td>
<td>0.3045</td>
<td>0.9993</td>
</tr>
<tr>
<td>7</td>
<td>Telmisartan</td>
<td>Visible Spectrophotometry</td>
<td>427nm</td>
<td>Methanol</td>
<td>10-60 µg/ml</td>
<td>8.362</td>
<td>9.21</td>
<td>10.9991</td>
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<td>Valsartan in Pure and it’s Formulations</td>
<td>U.V Spectrophotometric Assay Method</td>
<td>250.80 nm</td>
<td>Methanol and Water</td>
<td>5-30 µg/ml</td>
<td>1.79</td>
<td>5.97</td>
<td>0.996</td>
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<td>9</td>
<td>Azilsartan Medoxomil in bulk and its dosage forms</td>
<td>RP-HPLC Method</td>
<td>248 nm</td>
<td>0.05M Potassium Hydrogen Phosphate : Acetonitrile (60:40)</td>
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<tr>
<td>10</td>
<td>Azilsartan Medoxomil Potassium in Human Plasma</td>
<td>RP-HPLC Method</td>
<td>254 nm</td>
<td>25 mM Ammonium Acetate buffer (pH 5.5) : Acetonitrile 55:45/v/v</td>
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<td>11</td>
<td>Candesartan Cilexetil in Solid Dosage Forms</td>
<td>RP-HPLC Method</td>
<td>254 nm</td>
<td>0.02M Mono Basic Potassium Phosphate Buffer: Acetonitrile: Triethyl Amine (40:60:0.2) and adjust pH to 6.0 with Ortho Phosphoric Acid.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Drug/Preparation</td>
<td>Method Type</td>
<td>Detection Wavelength</td>
<td>Mobile Phase</td>
<td>Stationary Phase</td>
<td>Retention Time</td>
<td>Flow Rate</td>
<td></td>
</tr>
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<td>12</td>
<td>Trityl Candesartan in Bulk Drug</td>
<td>RP-HPLC Method</td>
<td>255nm</td>
<td>Buffer 0.1% Tri Fluoro Acetic acid in Water, and Acetonitrile</td>
<td>Analytical column C-18 1.7μm, (2.1 X 100) mm</td>
<td>2.3 min</td>
<td>0.45 mL/min</td>
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<td>13</td>
<td>Eprosartan Mesylate</td>
<td>HPLC Method</td>
<td>233nm</td>
<td>Acetonitrile : Methanol (35:9:6 v/v/v)</td>
<td>Reverse Phase C18 (150x4.6mm, 5μm.)</td>
<td>6.02 min</td>
<td>1.0 mL/min</td>
<td></td>
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<tr>
<td>14</td>
<td>Irbesartan in pharmaceutical dosage forms</td>
<td>HPLC Method</td>
<td>260nm</td>
<td>Methanol : Acetonitrile : 2% OPA (40:40:20,v/v/v)</td>
<td>Inertsil ODS C-18, 5μm column having 250 x 4.6mm</td>
<td>4.5 min</td>
<td>1.5 mL/min</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Losartan Potassium in Pharmaceutical FORMULATIONS</td>
<td>Isocratic HPLC Assay(UV Method)</td>
<td>225nm</td>
<td>Triethylamine solution(0.5%) pH 2.4 : Acetonitrile (60:40 v/v)</td>
<td>CLC-C8 column 150*4.6 mm, 5μm</td>
<td>4.5 min</td>
<td>1.0 mL/min</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Losartan Potassium in bulk and Formulations</td>
<td>Rapid ultra-performance liquid chromatography Method</td>
<td>245nm</td>
<td>Phosphate buffer (pH 3.2) : Acetonitrile (50:50 v/v)</td>
<td>Waters Acquity BEH C18 (100 mm× 2.1 mm), 1.7-μm column</td>
<td>5.0 min</td>
<td>0.2 mL/min</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Olmesartan Medoxomil tablets</td>
<td>RP-HPLC Method</td>
<td>255nm</td>
<td>Acetonitrile: 5 mM Ammonium Acetate (adjusted to pH 4.5 using Ortho Phosphoric Acid) (60:40 v/v)</td>
<td>C18 (250 mm x 4.6 mm i.d., 5 μ)</td>
<td>4.9 min</td>
<td>1.0 mL/min</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Olmesartan Medoxomil from tablet dosage form</td>
<td>HPTLC Method</td>
<td>301nm</td>
<td>Chloroform: Acetonitrile: Toluene: Glacial Acetic Acid (1:8:1:0.1 v/v)</td>
<td>Silica gel60 F254 TLC plates 10x10cm with layer thickness 0.2cm</td>
<td>50-500 ng/spot</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
- Detection Wavelength: The wavelength at which the detection occurs.
- Mobile Phase: The components of the mobile phase used in the chromatography.
- Stationary Phase: The type of column used for the stationary phase.
- Retention Time: The time it takes for the compound to elute from the column.
- Flow Rate: The rate at which the mobile phase flows through the column.
<table>
<thead>
<tr>
<th>Method</th>
<th>Correlation Coefficient ($R^2$):</th>
<th>LOD:</th>
<th>LOQ:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telmisartan in serum samples, RP-HPLC Method</td>
<td>0.999</td>
<td>4.79 ng/spot</td>
<td>15.97 ng/spot</td>
</tr>
<tr>
<td>Valsartan in Pharmaceutical Dosage Forms, RP-HPLC Method</td>
<td>Detection Wavelength: 269 nm</td>
<td>Mobile Phase: Methanol : Water : THF 60:35:05 (v/v/v)</td>
<td>Stationary Phase: C_{18} Column</td>
</tr>
<tr>
<td></td>
<td>LOD: 4.79 ng/spot</td>
<td>Linearity Range: 10-35 ppm</td>
<td>Retention Time: 4.6 min</td>
</tr>
<tr>
<td>Hydrochlorothiazide and Candesartan Cilexetil in pharmaceutical formulations, LC-UV Method</td>
<td>Detection Wavelength: 271 nm</td>
<td>Mobile Phase: 0.02 M Potassium Dihydrogen Phosphate : Methanol : Triethyl-Amine (25:75:0.2)</td>
<td>Stationary Phase: Phenyl-2 column</td>
</tr>
<tr>
<td></td>
<td>LOD: 5-45 μg/ml</td>
<td>Linearity Range: Hydrochlorothiazide: 5-45 μg/ml</td>
<td>Candesartan Cilexetil: 12-56 μg/ml</td>
</tr>
<tr>
<td></td>
<td>retention: hydrochlorothiazide: 2.8 min</td>
<td>Correlation Coefficient ($R^2$): 0.999</td>
<td>Candesartan Cilexetil: 4.9 min</td>
</tr>
<tr>
<td>Eprosartan, Hydrochlorothiazide in pharmaceutical dosage forms, UPLC Method</td>
<td>Detection Wavelength: 274 nm</td>
<td>Mobile Phase: Acetonitrile : Disodium Hydrogen Phosphate Buffer (0.01 M; pH 5.5 adjusted with Phosphoric Acid)</td>
<td>Stationary Phase: Acquity® HSS C18 column (1.7 μm, 2.1 mm × 150 mm)</td>
</tr>
<tr>
<td></td>
<td>LOD: 0.017-3.79 μg/mL</td>
<td>Linearity Range: 0.017-3.79 μg/mL</td>
<td>Flow Rate: 0.3 mL/min</td>
</tr>
<tr>
<td>Olmesartan Medoxomil and Amlodipine Besylate in tablet Dosage Form, UV Spectrophotometry</td>
<td>Wavelength: Olmesartan Medoxomil: 265 nm</td>
<td>Amlodipine Besylate: 360 nm</td>
<td>Solvent: ACN: Water</td>
</tr>
<tr>
<td></td>
<td>LOD: 2-32 μg/mL</td>
<td>Linearity Range: Olmesartan Medoxomil: 2-32 μg/mL</td>
<td>Amlodipine Besylate: 2-20 μg/mL</td>
</tr>
<tr>
<td></td>
<td>Correlation Coefficient ($R^2$): 0.999</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Losartan and Irbesartan in Pure and Pharmaceutical Preparation, Spectrophotometric Method</td>
<td>Wavelength: Losartan: 485 nm</td>
<td>Irbesartan: 481 nm</td>
<td>Solvent: Distilled Water</td>
</tr>
<tr>
<td></td>
<td>LOD: 25-150 μg/mL</td>
<td>Linearity Range: Losartan: 25-150 μg/mL</td>
<td>Irbesartan: 20-100 μg/mL</td>
</tr>
<tr>
<td>25</td>
<td>Rosuvastatin calcium and Telmisartan in bulk and combined dosage form</td>
<td>UV Spectrophotometric Method</td>
<td>Correlation Coefficient ($R^2$): Losartan: 0.9934 Irbesartan: 0.9994</td>
</tr>
<tr>
<td>26</td>
<td>Valsartan and Cilnidipine in Synthetic Mixture</td>
<td>Spectrophotometric Method</td>
<td>Second Order Derivative Detection Wavelength: Valsartan: 227 nm Cilnidipine: 219 nm Solvent: Methanol Linearity Range: Valsartan: 5-25 μg/ml Cilnidipine: 2-10 μg/ml Correlation Coefficient ($R^2$): Valsartan: 0.9980 Cilnidipine: 0.9994</td>
</tr>
<tr>
<td>27</td>
<td>Eprosartan and Hydrochlorthiazide in Tablets</td>
<td>HPLC Method</td>
<td>Detection Wavelength: 272nm Mobile Phase: 0.5% Formic Acid-Methanol-Acetonitrile ([80 : 25 : 20 v/v/v]) Stationary Phase: Phenomenex C18 column (250 x 4.6 mm i.d., 5 μm) Linearity Range: 2.5-25 μg/ml Correlation Coefficient ($R^2$): 0.999 Retention Time: Eprosartan: 7.69 ± 0.10min Hydrochlorthiazide: 4.24 ± 0.09 min Flow Rate: 1.0 mL/min</td>
</tr>
<tr>
<td>28</td>
<td>Azilsartan and Chlorthalidone in pharmaceutical Dosage forms</td>
<td>RP-HPLC Method</td>
<td>Detection Wavelength: 230nm Mobile Phase: 0.1% Ortho Phosphoric Acid buffer : Acetonitrile (30:70) Stationary Phase: ODS (250mm: 4.6mm, 5μ) Linearity Range: Azilsartan: 100ppm-600ppm Chlorthalidone: 31.25-187.5μg/ml Correlation Coefficient ($R^2$): 0.999 Flow Rate: 1.0 mL/min</td>
</tr>
<tr>
<td>29</td>
<td>Candesartan and Amlodipine in bulk and pharmaceutical dosage forms</td>
<td>RP-HPLC Method</td>
<td>Detection Wavelength: 238nm Mobile Phase: Potassium Hydroxide : Acetonitrile (35:65 V/V) Stationary Phase: C18 analytical column (150 mm x 4.6 mm I.D., 5 μm) Linearity Range: Candesartan: 4-24 μg/mL Amlodipine: 2.5-15 μg/mL Correlation Coefficient ($R^2$): Candesartan: 0.999 Amlodipine: 1</td>
</tr>
</tbody>
</table>
|   | 30 | Simultaneous Equation Method and Q-Absorbance Method | Retention Time: 3.610 min  
Flow Rate: 1.0 mL/min |
|---|---|---|---|
|   | Irbesartan and Hydrochlorthiazide in Tablets | Simultaneous Equation Method  
Detection Wavelength:  
Irbesartan: 250nm  
Hydrochlorthiazide: 270.6  
Mobile Phase: Methanol  
Linearity Range:  
Irbesartan: 2-36 μg/mL  
Hydrochlorthiazide: 1-18 μg/mL  
Correlation Coefficient ($R^2$): 0.999  
Q-Absorbance Method  
Linearity Range: 1-24 μg/mL | 35 |
|   | 31 | RP-HPLC Method | Detection Wavelength: 210nm  
Mobile Phase: Methanol and phosphate buffer (pH 6.8) in the ratio of 85:15  
Stationary Phase: LUNA C18 column at 210 nm by isocratic elution  
Linearity Range:  
Perindopril: 200-500 μg/mL  
Losartan: 30-80 μg/mL  
Correlation Coefficient ($R^2$): 0.999  
Retention Time:  
Perindopril: 4.62 min  
Losartan: 4.09 min  
Flow Rate: 0.8 mL/min | 36 |
|   | 32 | RP-HPLC Method | Detection Wavelength: 237nm  
Mobile Phase:  
Mobile Phase-A: 70% v/v of Buffer pH-3.7 and 30%v/v of Acetonitrile  
Mobile Phase-B: 70% v/v Acetonitrile: 30% v/v Buffer pH-3.7.  
Stationary Phase: Inertsil ODS 3V C18 (150 X 4.6 mm, 5μm)  
Linearity Range:  
Amlodipine: 1.25-7.5 μg/mL  
Losartan: 12.5-75 μg/mL  
Correlation Coefficient ($R^2$): 0.999  
Retention Time:  
Amlodipine: 5.13 min  
Losartan: 11.11 min  
Flow Rate: 1.0 mL/min | 37 |
|   | 33 | UV Spectrophotometric Method by Q-Analysis | Detection Wavelength:  
Atenolol: 275nm  
Losartan Potassium: 282nm  
Linearity Range: 5-30  
Correlation Coefficient ($R^2$): 0.999 | 38 |
|   | 34 | HPTLC Method | Detection Wavelength: 254nm  
Stationary Phase: Aluminum plates coated with Silica gel 60 F254 adsorbent  
Linearity Range: | 39 |
<table>
<thead>
<tr>
<th>Sequence</th>
<th>Compound(s) and Formulation</th>
<th>Method</th>
<th>Mobile Phase</th>
<th>Detection wavelength</th>
<th>Correlation Coefficient ($R^2$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>Olmesartan Medoxomil and Hydrochlorothiazide</td>
<td>UV, HPLC Method</td>
<td>Acetonitrile : Methanol (1:1) Mobile phase B 15 mM Phosphate Buffer (pH adjusted to 3.0 with Ortho Phosphoric Acid) (50:50) Phenomenex Luna HPLC analytical column (250 x 4.6 mm, 5 μm)</td>
<td>225nm</td>
<td>0.99930 μg/mL Olmesartan: 0.99930 μg/mL Indapamide: 0.99660</td>
</tr>
<tr>
<td>36</td>
<td>Telmisartan and Amlodipine in Human Plasma</td>
<td>LC–MS/MS Method</td>
<td>Acetonitrile: 5 mm Ammonium acetate buffer (50:50, v/v) Phenomenex Luna HPLC analytical column (50x4.6mm, 5μm in particle size)</td>
<td>41</td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>Telmisartan and Chlorthalidone in Bulk and Pharmaceutical Dosage Form</td>
<td>HPTLC Method</td>
<td>Acetonitrile : Toluene : Glacial Acetic Acid (7.5: 2.5: 0.05 v/v/v) Precoated silica gel 60F254 plates</td>
<td>242nm</td>
<td>Telmisartan: 0.26 ± 0.02 Hydrochlorothiazide: 0.67 ± 0.02</td>
</tr>
<tr>
<td>38</td>
<td>Telmisartan and Indapamide in Pure Marketed Formulation</td>
<td>RP-HPLC Method</td>
<td>Buffer: Acetonitrile : Methanol (40:25:30) Amazone C18, 5 Microm, 150 x 4.6 mm</td>
<td>285nm</td>
<td>Telmisartan:6-22.5microg/ml Indapamide:11.2-42microg/ml Flow rate: 1.0 ml/min</td>
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<tr>
<td>39</td>
<td>Valsartan and Ramipril in Combine Dosage Forms</td>
<td>RP-HPLC Method</td>
<td>Phosphate Buffer (1%): Acetonitrile</td>
<td>225nm</td>
<td>Telmisartan:6-22.5microg/ml Indapamide:11.2-42microg/ml Flow rate: 1.0 ml/min</td>
</tr>
</tbody>
</table>
| 40 | Valsartan and Ezetimide in Pharmaceuticals | Stability-Indicating HPLC Method | Detection Wavelength: 230 nm  
Mobile Phase: Phosphate Buffer and Acetonitrile  
(58:42v/v, pH 3.15)  
Stationary Phase: C18 Column  
Linearity Range: 1-200 μg/ml  
Flow Rate: 0.8 mL/min  
Correlation Coefficient (R²): 0.999 |
|---|---|---|---|
| 41 | Olmesartan Medoxomil, Amlodipine Besylate and Hydrochlorothiazide in Pharmaceutical Dosage Forms | Simultaneous Equation Method and Absorption Correction Method | Method A  
Detection Wavelength:  
Olmesartan Medoxomil: 266.2nm  
Amlodipine Besylate: 238.5nm  
Hydrochlorothiazide: 271.2nm  
Linearity Range: 4-24 μg/ml  
Correlation Coefficient (R²): 0.999  
Method B  
Detection Wavelength:  
Olmesartan Medoxomil: 266.2 nm  
Amlodipine Besylate: 359nm  
Hydrochlorothiazide: 316.4nm |
| 42 | Valsartan, Amlodipine and Hydrochlorothiazide in Dosage Form and Spiked Human Plasma | HPLC Method | Detection Wavelength: 227 nm  
Mobile Phase: Acetonitrile-Phosphate Buffer (0.05 M) with pH 2.8 (40/60, v/v)  
Stationary Phase: RP-C18 chromatographic column, Phenomenex Kinetex (150 mm × 4.6 mm i.d)  
Linearity Range:  
Valsartan: 5 - 40 μg/ml  
Amlodipine: 4-28 μg /m  
Hydrochlorothiazide: 1 - 12 μg/ml  
Retention Time:  
Valsartan: 11.19 min  
Amlodipine: 3.16 min  
Hydrochlorothiazide: 2.26 min  
Flow Rate: 0.8 mL/min |

**CONCLUSION:**
This Review represents the Reported Spectrophotometric and Chromatographic Methods Developed and Validated for determination of Angiotensin II-Receptor Antagonist in different Dosage Forms. Here ARBs shows the simple, accurate, precise method development of the different drug formulations. The Method Development take place for determination of AT II-Receptor Antagonist like UV Spectrophotometric, HPLC, RP-HPLC, HPTLC, LC-UV, UPLC, LC-MS/MS, and Q-Absorbance.
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**REFERENCES:**


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