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A review on chromatographic method for estimation of valsartan

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Abstract
Valsartan is an angiotensin II receptor antagonist (ARB), which is selective for the type I (AT1) angiotensin receptors. It act by blocking the action of angiotensin II which reduce blood pressure by constricting blood vessels and activating aldosterone. Different Chromatographic methods are available for single and combination with other drugs. Most of Methods were of RP-HPLC, LC and HPTLC because these methods provided with best available reliability, repeatability, analysis time and sensitivity.

Keywords: valsartan, HPLC (high performance liquid chromatography), HPTLC (high performance thin layer chromatography), LC (liquid chromatography)

Introduction
Valsartan is an antihypertensive agent known as angiotensin II receptor antagonist (ARB), which is selective for the type I (AT1) angiotensin receptors. Valsartan is used for the treatment of high blood pressure and congestive heart failure by blocking the blood pressure, increasing effects of AT2 via the RAAS. Valsartan specifically and competitively blocks the binding of AT2 to the AT1 subtype receptor in vascular smooth muscle and the adrenal gland, preventing AT II-mediated vasoconstriction, aldosterone synthesis & secretion, renal reabsorption of sodium, resulting in vasodilation, increased excretion of sodium & water, a reduction in plasma volume, and a reduction in blood pressure.

Reported methods are categorized depending on the following considerations:

1. Single component analyzed by chromatographic method.
2. Analysis of Valsartan with other drugs by chromatographic method.

Table 1: Reported Analytical Method of Valsartan: [2-16]

Sr. No.	Drug	Method	Description
1.	Valsartan in bulk and tablet dosage forms	**RP-HPLC**	**Detection wavelength:** 248 nm **Mobile phase:** Water: acetonitrile: glacial acetic acid (550:450:1 v/v/v) **Linearity range:** 2-14 µg/ml **Retention time:** 2.350 min **Flow rate:** 2.0ml/min **Limit of detection:** 0.1078 ng/ml **Limit of Quantitation:** 0.3298 ng/ml
2.	Valsartan in pharmaceutical dosage form	**RP-HPLC**	**Detection Wavelength:** 210 nm **Mobile phase:** methanol: Phosphate buffer pH-3.0 (65:35 v/v) **Stationary phase:** phenomenox C18, 5 µm , 25 cm× 4.6 mm i.d. column **Retention time:** 6.22 min **Flow rate:** 1 ml/min **Limit of detection:** 0.02 µg/ml **Limit of Quantitation:** 0.06 µg/ml
3.	Valsartan in pure and tablet dosage form	**RP-HPLC**	**Detection Wavelength:** 233nm **Mobile phase:** acetonitrile: phosphate buffer (55:45 v/v) **Stationary phase:** Kromasil C18 column (250 × 4.5 I.D., 5µm) **Retention time:** 3.943 min **Limit of detection:** 0.034 µg/ml **Limit of Quantitation:** 0.104 µg/ml
4.	Valsartan and its degradation products	**ISOCRATIC HPLC**	**Detection Wavelength:** 250 nm **Mobile phase:** Methanol: water (70/30 v/v) **Retention time:** 0.40 min, 0.27 min **Flow rate:** 1.2 ml/min
5.	Valsartan in solid oral dosage form	**RP-HPLC**	**Detection wavelength:** 248 nm **Mobile phase:** acetate buffer: acetonitrile: methanol (38/24/38 v/v/v/) **Stationary phase:** ODS C18 (250 mm× 4.6 mm, 5 µm) **Retention time:** 4.6 ± 0.06 min **Flow rate:** 1.2 ml/min **Limit of detection:** 0.17 µg/ml **Limit of Quantitation:** 0.56 µg/ml

6.	Valsartan in tablet dosage form	**RP-HPLC**	**Detection Wavelength:** 265 nm **Stationary column:** C18 (250× 4.6 mm) **Mobile phase:** ammonium dihydrogen phosphate buffer: methanol (33.5: 66.5 v/v) **Flow rate:** 1.0 ml/min **Retention time:** 11.6 min **Limit of detection:** 6 ng/ml **Limit of quantitation:** 18 ng/ml
7.	Valsartan and Hydrochlorothiazide in Tablets	**RP-HPLC**	**Detection wavelength:** 270 nm. **Stationary phase:** C18 column **Mobile phase:** Methanol: Acetonitrile: Water: Isopropyl alcohol (v/v) **Flow rate:** 1ml/min **Linearity range:** VAL: 5-150 µg/ml HCT: 78-234 µg/ml
8.	Valsartan potassium (VP) and Amlodipine besylate (AB) in tablet dosage form	**RP-HPLC**	**Stationary phase:** C18 column **Mobile phase:** Methanol: Water (62:38 v/v) **Flow rate:** 1.4 ml/min **Detection wavelength:** 230 nm **Linearity range:** VP: 112- 208 µg/mL AB: 07-13 µg/mL
9.	Propranolol and Valsartan in Bulk drug and Gel Formulation	**RP-HPLC**	**Stationary phase:** C18 column **Mobile phase:** acetonitrile: methanol: 0.01 M disodium hydrogen phosphate (50:35:15 v/v/v) **Flow rate:** 1 ml/min **Linearity range:** PROP:5-50 µg/mL VAL: 4-32 µg/ml **Limit of detection:** PROP: 0.25 µg/mL VAL: 0.45 µg/mL **Limit of Quantitation:** PROP: 0.85 µg/mL VAL: 1.39 µg/mL
10.	Amlodipine, Valsartan and Hydrochlorothiazide in dosage forms and spiked human plasma	**RP-HPLC**	**Detection Wavelength:** 227 nm **Stationary phase:** RP-C18 chromatographic column **Mobile phase:** Acetonitrile: phosphate buffer pH-2.8 :(40/60 v/v) **Flow rate:** 0.8 ml/min **Retention time:** hydrochlorothiazide: 2.26 min Amlodipine: 3.16 min Valsartan: 11.19 min **Limit of detection:** Hydrochlorothiazide: 1.42 µg/ml Amlodipine: 1.04 µg/ml Valsartan: 0.39 µg/ml **Limit of Quantitation:** Hydrochlorothiazide:0.81 µg/ml Amlodipine: 3.16 µg/ml Valsartan: 4.31 µg/ml
11.	Sacubitril and Valsartan in bulk and pharmaceutical dosage form	**RP-HPLC**	**Detection Wavelength:** 241 nm **Linearity range:** Sacubitril: 58.8-137.2 µg/ml Valsartan: 61.2-142 µg/ml **Flow rate:** 1 ml/min **Retention time:** Valsartan : 4.003 min Sacubitril: 2.927 min **Injection volume :** 20 µl **Limit of detection:** Valsartan: 1.52 µg/ml Sacubitril: 0.72 µg/ml **Limit of Quantitation:** Valsartan: 4.74 µg/ml Sacubitril: 2.20 µg/ml
12.	Amlodipine and Valsartan in combined dosage form	**RP-HPLC**	**Detection Wavelength:** 240 nm **Mobile phase:** phosphate buffer: acetonitrile: methanol (46:44:10 v/v/v) **Injection volume:** 20 µl **Flow rate:** 1 ml/min **Retention time:** Amlodipine 7.1 min Valsartan: 3.4 min
13.	Valsartan and Hydrochlorothiazide in tablet dosage form	**HPTLC**	**Detection Wavelength:** 260 nm **Stationary phase:** silica gel 60F(254) **Mobile phase:** chloroform: methanol: toluene: glacial acetic acid (6:2:1:0.1 v/v/v/v) **Limit of detection:** VAL: 100 ng/spot HCT: 300 ng/spot **Limit of Quantitation:** VAL: 30 ng/spot HCT: 100 ng/spot
14.	Nebivolol Hydrochloride and Valsartan	**HPTLC**	**Detection Wavelength:** 280 nm and 240 nm **Stationary phase:** silica gel 60 F_{254} **Mobile phase:** Ethyl Acetate: Methanol: Acetic acid **Limit of detection:** Nebivolol Hydrochloride: 89.58 ng/band Valsartan: 35.07 ng/band **Limit of Quantitation:** Nebivolol Hydrochloride: 271.46 ng/band Valsartan: 106.28 ng/ml
15.	Amlodipine and Valsartan in Human Plasma	**LCMS**	**Stationary phase:** Luna C18 (2)100A (150 × 4.6 mm, 5 µm) column **Mobile phase: acetonitrile:** 5 mM ammonium formate solution (80:20, v/v)

Conclusion

This review portray the reported Chromatographic methods developed and validated for estimation of Valsartan. According to this review it was concluded that for Valsartan different Chromatographic methods are available for single and combination. The mobile phase containing Phosphate buffer, Methanol and Acetonitrile were common for most of the chromatographic method to provide more resolution. For chromatographic method flow rate is observed in the range 0.6 - 2 ml/min to get good resolution time. For most of the chromatographic methods common solvent is Phosphate buffer and Methanol. Hence this all methods found to be simple, accurate, economic, precise and reproducible in nature. Most of Methods were of RP-HPLC, LC and HPTLC because these methods provided with best available reliability, repeatability, analysis time and sensitivity.

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