

## CHAPTER-2

### LITERATURE SURVEY

#### Literature Survey

##### 2.1 Literature review on Sofosbuvir and Daclatasvir

Literature survey reveals that there are few reported HPLC [25-27] and UV/ HPLC [28], UHPLC [30], UPLC-MS/MS [31-33], and LC-MS/MS [34] for sofosbuvir and HPLC methods [35-39] and one HPLC-DAD method [40] for daclatasvir individually and simultaneous estimation with different drugs like ledipasvir [41-44], velpatasvir [45,46] and simeprevir [47] etc. Similarly only one UV method has been reported for sofosbuvir in combination with daclatasvir [48]. These methods were discussed in table 2.1, 2.2 and 2.3 respectively.

**Table 2.1: Previous HPLC and UPLC-MS methods reported for the determination of Sofosbuvir**

S.No.	Author/ Reference	Column used	Mobile phase (% v/v)	$\lambda_{\max}$ (nm)	RT (min)	Linearity ( $\mu\text{g/mL}$ )	Recovery (%)	$r^2$
1	Shaadmin N Shaik 25	Greece C-18 (250mm*4.6mm, 5 $\mu\text{m}$ )	Methanol: phosphate buffer (45:55)	261	-	25-125	99.9	0.9993
2	Nemade R.M 26	RP C-18	Methanol: Water (70:30)	261	4.819	20-100	99.8	0.9999
3	Ravi kumar. V 27	Phenomenex prodigy ODS-3V	Methanol: TFA (30:70)	260	2.990	100-600	99.35	0.996
4	Swathi.P 28	Hypersil C-18	Methanol (100)	265	3.515 $\pm$ 0.02	20-100	99.33 $\pm$ 0.42	0.9997
5	Sherif Abdel 29	Hypersil ODS	Methanol: ACN (90:10)	260	1.99 $\pm$ 0.05	2-60	-	0.9996
6	John Saida 30	Waters BEH C-18	ACN: water (30:70)		2.307	10-120 ppm	99.65	0.999
7	Mr. Rezk 31	BEH C-18	Formic acid: ACN	-	-	0.25- 3500ng/ml	-	-
8	B.M. Gandhi 32	Gemini C-18	Formic acid: methanol (30:70)	-	-	4.063- 8000.01		>0.9956
9	Mohan Vikas 33	Hisil C-18	Phosphate buffer: methanol (50:50)	263	1.01	5-30	-	1.000
10	Nebsen 34	Intersil ODS	Methanol: water (70:30)	254	4.5	5-150	100.14 $\pm$ 0.84	0.9999

<b>Previous HPLC methods reported for the determination of Daclatasvir</b>								
<b>11</b>	<b>Sumathi.K 35</b>	Intersil ODS	ACN: methanol (70:30)	230	2.658	20-80	98.0-102.0	0.999
<b>12</b>	<b>Hanna Saleh 36</b>	Hypersil BDS	Potassium dihydrogen phosphate: ACN (50:50)	320	2.33	0.5-100	99.71-100.86	>0.999
<b>13</b>	<b>Sonia. T Hasab 37</b>	Hypersil C-18	Phosphate buffer: ACN (60:40)	312	-	0.75-120	-	0.9999
<b>14</b>	<b>G. Srinivasulu 38</b>	Chiral PAK ID-3 (Binary mobile phase)	ACN: diethyl amine & Methanol: diethyl amine	315	-	-	90.0-112.0	>0.999
<b>15</b>	<b>G.Nannetti 39</b>	X-Terra RP-18	Ammonium acetate buffer: ACN (56:44)	318	-	-	-	>0.999
<b>16</b>	<b>V. Ashok Chakravarthy 40</b>	Zorbax eclipse plus	Water: methanol (20:80)	315	-	10-150	98.6-99.8	0.9999
<b>17</b>	<b>M.M. Baker 41</b>	C-18	Phosphate buffer: ACN (75:25)	306	5.4	0.6-60	-	>0.999

**Table 2.2: Previous HPLC methods reported for the simultaneous estimation of sofosbuvir and daclatasvir with other drugs**

<b>1</b>	<b>Mohd. El. Kaseem (SFB/ LDP) 42</b>	Eclipse XDB C-18	Potassium dihydrogen phosphate & Hexane sulfonate: ACN (50:50)	254	2.429 (S) 4.529 (L)	40-500 30-300	99.51± 0.38 (S,L)	0.9999 (S,L)
<b>2</b>	<b>Bakht Zaman (SFB/ LDP) 43</b>	Luna analytical column	Ammonium acetate buffer: ACN (35:65)	245	4.468± 0.013 (S) 8.242± 0.012 (L)	-	100± 1 (S, L)	>0.999 (S, L)
<b>3</b>	<b>Nagaraju 44</b>	Intersil ODS	TFA buffer: ACN: Methanol (30:50:20)	-	3.205 (S) 3.774 (L)	40-120	99.2-100.9 98.40-100.09	0.999
<b>4</b>	<b>U. Jyothi 45</b>	X-Terra C-18	TFA: Methanol	269	3.442 (S) 4.68 (V)	80-240 20-60	97-103	0.9997
<b>5</b>	<b>Sarath N 46</b>	Discovery C-18	Orthophosphoric acid: ACN	240	2.24 (V) 3.26 (S)	25-253 100-1003	99.58 100.38	0.9999
<b>6</b>	<b>Surya Prakash Rai 47</b>	Hypersil C-18	ACN: TFA	245	2.37(S) 5.49(L)	100-600(S) 22.5-135(L)	100.45 100.10	1.0000 For both drugs
<b>7</b>	<b>Raj kumar. B (SFB/ SIM) 48</b>	X- terra C-18	ACN: Water (75:25)	253	2.090 (S) 5.289 (SIM)	7-35 (S) 18.2-91 (SIM)	98.0-100.2 (S, SIM)	0.9999

S: Sofosbuvir, L: Ledipasvir, V: Velpatasvir, SIM: Simeprevir

**Table 2.3: Previous UV method reported for the simultaneous determination of sofosbuvir and daclatasvir**

S.No.	Author/ Reference	Solvent	$\lambda_{\max}$ (nm)	Linearity	Recovery (%)	R <sup>2</sup>
1	Ashok Chakravarthy 49	Methanol	261 (D) 317 (S)	50-150 (D) 43-143 (S)	99.4- 100.6 (D) 99.7- 110.6 (S)	< 0.99 (D) 0.99 (S)

## 2.2 Literature review on Lamivudine and Dolutegravir

Literature survey reveals that HPLC [50-71], HPTLC [73,74] and UV-spectrophotometric methods [75,76] were reported for the estimation of lamivudine in combination with dolutegravir and also with other drugs. The methods were discussed in table 2.4 and 2.5 respectively.

**Table 2.4: Previous HPLC methods for the simultaneous estimation of lamivudine with dolutegravir and other drugs**

S.No.	Author/ Reference	Column used	Mobile phase (% v/v)	$\lambda_{\max}$ (nm)	RT (min)	Linearity ( $\mu\text{g/mL}$ )	Recovery (%)	r <sup>2</sup>
1	B.V. Purnima (LAM/ABC/DTG) 50	Intersil ODS	Phosphate buffer: ACN:Water	245	1.692 2.210 4.155	15-90 (L) 30-180 (A) 2.5-15 (D)	100.18-101.08(L) 99.21-100.38(A) 99.02-100.43(D)	-
2	Sindhu priya. D (ABC/ DTG/LAM) 51	Kinetex 5 $\mu$	ACN: Water	258	5.2 8.4 3.1	20-100 (A) 2-16 (D) 10-80 (L)	99.86-100.0(A) 99.64-101.04(D) 99.94- 101.24(L)	0.999 for all drugs
3	Monica. M(ABC/ LAM/ DTG) 52	Agilent C- 18	Ammonium Formate: methanol (40:60)	262	1.73 1.30 4.32	5-50 for all drugs	99.33-99.82(A) 99.07-99.55(L) 98.59-99.52(D)	0.999 (A,L) 0.998

4	<b>Bin Fan</b> (ZID/ LAM/ NEV) 53	Octyl silane	Sodium phosphate buffer: ACN (86:14)	265	-	57.6-2880 ng/ml (Z) 59.0-17650 ng/mL (L) 53.2-13300 ng/mL (N)	>92 for all drugs	-
5	<b>Savaser. A</b> (ABC/LAM/ ZID) 54	Zorbax	Methanol: Water: Phosphate buffer (80:10:10)	275	-	500-3000 ng/mL (A) 500-5000 ng/mL (L,Z)	99.45 (A) 99.34 (L) 100.17 (Z)	0.999 (A,L) 0.997
6	<b>Narottam. P</b> (LAM/ABC/ DTG) 55	Kromasil	Buffer: ACN (65:35)	257	2.250 2.734 9.633	15-90ppm(L) 30-180ppm (A) 2.5-15ppm (D)	99.612-101.01(L) 100.18-100.50(A) 99.97-101.15(D)	0.999 for all drugs
7	<b>Hari Prasad. P</b> (LAM/STV) 56	Grace smart RP C-18	Methanol, ACN: Phosphate buffer (60:20:20)	254	2.50 4.25	10-602 (L) 10-60 (S)	99.37-100.57 (L) 99.54-100.35(S)	0.9992 (L) 0.9999 (S)
8	<b>Mohideen. S</b> (ABC/LAM) 57	Intersil ODS	Phosphate: ACN (70:30)	254	2.620 4.307	20-120(A) 10-60 (L)	99.0-99.2 for both drugs	-
9	<b>Veena. D.S</b> (LAM/RLG) 58	Phenomenex C-18	Methanol: ACN: Phosphate buffer (75:15:10)	254	3.13±0.017 7.27±0.01	10-100(L) 5-30 (R)	96.5-102.5 For both drugs	0.8306 (A) 0.8423 (R)
10	<b>Saidulu</b> 59	Luna phenyl hexyl C-18	ACN: Ortho phosphoric acid buffer	258	3.3 (L) 4.5 (A) 6.3 (D)	3-45 6-90 0.5-75	100.58 100.27 100.11	0.999 for all drugs
11	<b>Srivani</b> 60	BDS hypersil C- 18	Disodium hydrogen phosphate buffer: methanol (50:50)	238	4.8 (L) 5.7 (ST)	15-90 3-18	98-102	>0.9988 >0.9979

<b>12</b>	<b>P. Kumar 61</b>	Phenomenex lunaC-18	Buffer: ACN (85:15)	280	9.341	20-600	99.468-101.110	0.9992
<b>13</b>	<b>Ravi sankar.P 62</b>	Welchrom RP-C18	Phosphate buffer: ACN (50:50)	241	2.393(L) 2.7 (Z)	2-10 4-20	98.88 99.70	0.9995 0.9991
<b>12</b>	<b>Umesh.M. Patel 63</b>	Kromasil C- 18	ACN: ammonium acetate	265	13.66(L) 16.51 (ST)	2.5-50 0.5-10	100.71±0.80 99.91±0.64	>0.9999
<b>13</b>	<b>Chandra Sekar reddy. K (DTG&amp; it's enantiomer) 64</b>	Lux cellulose-4	ACN: Water: Ortho phosphoric acid	258	0.75 1.33	0.167- 2.276 (E) 1.195-2.180 (D)	102.8-103.2 (E) 97.5-96.2 (D)	0.9997 (E) 0.9993 (D)
<b>14</b>	<b>Anjaneyulu 65</b>	Enable C-18	Methanol: Water (70:30)	260	3.04 (L) 5.35 (T)	10-50 10-50	100.46-100.66 for both drugs	-
<b>15</b>	<b>N.M. Rao 66</b>	Rp C-18	Phosphate buffer with KOH: ACN	260	2.8 (L) 5.2 (T) 11.5(D)	27-162 27-162 4.5-28	99.08-100 98.97-99.78 98.83-99.86	1.0010 0.9998 0.9995
<b>16</b>	<b>Bhavsar 67</b>	Kromasil C- 18	Methanol: phosphate buffer (70:30)	254	2.76 (T) 3.96 (L) 10.5 (E)	1-6 1-6 2-12	99.57-101.42 99.46-101.36 99.96-100.87	0.9991 0.9992 0.9995
<b>17</b>	<b>Jayaraman Anbu 68</b>	Hypersil ODS	Ammonium acetate: acetic acid	250	3.275 (L) 4.475 (ST)	37.5-225 10-60	100.1 for both drugs	0.9999
<b>18</b>	<b>Khaleel 69</b>	Intersil ODS	Phosphate buffer: ACN: methanol	257	2.169(A) 2.676(L) 6.367(D)	15-90 30-180 2.5-15	98.01-101.5 9.20-101.67 98.35-102.14	-

<b>19</b>	<b>D.A. Kumar 70</b>	Hi Q-sil C-18	Potassium dihydrogen orthophosphate: methanol (55:45)	272	3.8 (L) 6.3 (Z) 8.1 (A)	5-250 5-250 5-140	99.4-100.4	>0.998
<b>20</b>	<b>M. Padmaja 71</b>	Intersil ODS C-18 column	Methanol: water (35:65)	256	2.157(EFV) 3.456(L) 6.502(Z)	5-150 1-120 5-150	98-102	0.9929 0.99631.0
<b>21</b>	<b>T. Kalpana 72</b>	Symmetry C-18	Sodium dihydrogen phosphate: ACN: Methanol	260	5.2 (L) 11.0 (D) 13.0 (T)	0.5-7.5	96.27 92.12 94.07	>0.95
<b>22</b>	<b>Socka lingam. A (STV/ LAM/ NEV) 73</b>	Hypersil ODS	Sodium phosphate buffer: ACN (4:1)	266 271 315	2.85 4.33 8.39	-	99.16-101.89 for all drugs	0.9843- 0.9999 for all drugs
<b>23</b>	<b>Kapoor 74</b>	RP-18	Acetic acid: methanol (80:20)	270	5.9 (L) 8.8 (ST) 14.2 (N)	-	99.7-100.4 99.3-100.6 98.3-100.3	>0.9999

L: Lamivudine, N: Nevirapine, Z: Zidovudine, ST: Stavudine, A: Abacavir, R: Raltegravir, T: Tenofovir, D: Dolutegravir, EFV: Efavirenz



**Table 2.5: Previous UV methods reported for the simultaneous determination of Lamivudine with other drugs**

S. No.	Author/ Reference	Solvent	$\lambda_{\max}$ (nm)	Linearity ( $\mu\text{g/mL}$ )	Recovery (%)	$R^2$
1	Vaishali 75	HCl	280.2 (L) 312 (N) 266.8 (Z)	5-25 5-50 5-40	99.18 99.90 100.16	0.9995 0.9992 0.9995
2	Devyani 76	Methanol	270.9 (L) 326.4 (SL)	-	99.07-103 99.0-102.0	0.9992 0.9998

L: Lamivudine, N: Nevirapine, Z: Zidovudine, SL: Silymarin

### 2.3 Literature review on Emtricitabine and Tenofovir Alafenamide

A thorough literature survey has been done and found many methods reported for the analysis of emtricitabine and tenofovir alafenamide individually. Drosto et al., developed a method of HPLC with fluorescence [77], P. Kumar et al., developed a RP-HPLC method [78], Ganesh Kumar et al., developed colorimetry [79] for the estimation of emtricitabine. Mulubwa et al., developed a HPLC-MS method [80], and Khedkar developed a UV-spectrophotometric method for the estimation of tenofovir alafenamide [81].

N.A. Gomes et al., developed a LC-MS/MS method [82] and M.R. Rezk et al., developed a HPLC method for the simultaneous estimation of emtricitabine and tenofovir alafenamide in human serum [83].

After a thorough literature survey, one UV-spectrophotometric method reported for the simultaneous estimation of emtricitabine [84,85] and a few RP-HPLC methods have been reported for the estimation of emtricitabine in combination with other drugs like tenofovir alafenamide, efavirenz, cobicistat, lamivudine and rilpivirine, discussed in table 2.6 [86-108].

**Table 2.6: Previous HPLC methods for the simultaneous estimation of emtricitabine and tenofovir alafenamide**

S. No	Author/ Reference	Column used	Mobile phase (% v/v)	$\lambda_{\text{max}}$ (nm)	RT (min)	Linearity ( $\mu\text{g/mL}$ )	Recovery (%)	$r^2$
1	<b>Bhushan. P.B (EMT/ TNF) 86</b>	RP C-18	Methanol: water (60:40)	260	3.10 7.38	5-30 (E) 40-240 (T)	99.43-101.02(E) 100.25-101.58(T)	0.999 For both drugs
2	<b>Prasanth. S.D (TNF/ EMT/ EFV) 87</b>	Intersil ODS	Phosphate buffer: ACN	256	5.0 2.0 7.7	20-300(T) 24.5-367.5(E) 60-900 (EFV)	99-101 For all drugs	0.9997 (T) 0.9996 (E) 0.9992 (EFV)
3	<b>Balarami reddy. Y (EMT/ TNF) 88</b>	Phenomenex luna	Phosphate buffer: ACN (60:40)	260	2.81 7.42	40-240 (E) 60-360(T)	100.21 (E) 98.97 (T)	0.9993 0.9999
4	<b>Arun Ramaswamy (EMT/ TNF/ EFV) 89</b>	Zorbax SBCN	Methanol: buffer	260	-	40-120(E) 80-160(T) 200-280(EFV)	100.09 (E) 99.88 (T) 100.04 (EFV)	>0.999 for all drugs
5	<b>Gummaluri. R.K (EMT/ TNF/ EVG/ CBST) 90</b>	Atlantis C-18	TFA: ACN	240	2.06 4.86 5.87 5.36	12.5-125 For all drugs	99.72 (E) 99.72(T) 99.86 (EVG) 100.19 (C)	0.9999 0.9996 0.9990 0.9999
6	<b>Magesh (EMT/ TNF) 91</b>	Intersil ODS	Methanol: water (80:20)	260	2.88 3.932	20-100(E) 30-150(T)	98.0 (E) 102.0 (T)	0.999 For both drugs
7	<b>Srividya. D (TNF/ EFV) 92</b>	Agilent zorbax eclipse XDB	ACN: Phosphate buffer (70:30)	255	2.44 5.52	3-18(T) 6-36(EFV)	98.92-101.70 (T) 98.22-101.75 (EFV)	0.9987 0.9982
8	<b>Dhara.S.B (TNF/ LAM/ EFV) 93</b>	Kromasil C-18	Methanol: Phosphate buffer (70:30)	254	-	1-6 (T, L) 2-12(EFV)	9.46-101.36(T) 99.57-101.42(L) 99.96-100.87 (EFV)	0.9991 (T) 0.9992 (L) 0.9995 (EFV)

9	Uttam Prasad 94	Intersil ODS 3V	Potassium dihydrogen phosphate: ACN (30:70)	265	1.976(E) 2.661(T) 4.316(R)	50-300 75-450 6.25-37.5	99.71- 99.96 99.68- 100.05 99.82- 100.08	0.999
10	Sharma 95	Luna C-18	ACN: Potassium dihydrogen phosphate: TEA (70:30:0.5)	260	1.78(E) 2.27(T)	5-50	100.09- 100.11  100.02- 100.08	0.9995  0.9986
11	Appala Raju 96	Hypersil BDS C-18	ACN:: potassium dihydrogen phosphate (60:40)	260	3.865 (T) 3.107(E) 11.85 (EFV)	6-72 4-48 12-144	98.78 98.57 98.28	1.0 0.999 1.0
12	Deepti.K 97	Phenomenex luna C-18	Methanol: phosphate buffer (70:30)	258	2.605 (E) 3.781 (T)	45-105 30-70	100.5 101.2	0.999
13	Ajay 98	ACE C-18	Potassium dihydrogen phosphate: methanol	270	-	0.7mg/ml (E) 1.06mg/ml (T)	100.1 100.9	0.9998 0.9995
14	Seshachalam 99	ODS 3V	Sodium phosphate buffer: methanol (85:15)	280				
15	S.S. Chittlange 100	Silica gel 60 <sub>254</sub>	Methanol: toluene: ethyl acetate: ammonia	272	-	10-140 320-1120 480-1680	99.10±0.50 99.16±0.40 99.71±0.20	0.998 0.998 0.999
16	Dr. Srinivasa Rao 101	Thermosil C-18	Methanol: triethyl amine (70:30)	260	3.706 (T) 4.632 (E) 8.121 (EFV)	15-75 10-50 10-50	99-101	0.9999
17	Srinath. A 102	Hypersil ODS	Methanol: TEA (68:32)	260	1.801 (L) 2.506 (T) 6.549 (EFV)	10-50 (L,T) 20-100 (EFV)	99.9-101.7 99.7-100.6 99.2-99.7	0.999
18	Sudha t 103	Phenomenex Gemini C-18	MeCN: phosphate buffer	-	-	10-50 4-12	99.25- 99.84	0.9998 0.9995 0.9996
19	S. Venkatesan 104	Phenomenex Gemini C-18	meCN: potassium dihydrogen phosphate: TEA	270	-	28-84 (E) 42-126(T) 3.5-10.5 (R)	100±2	>0.999

20	<b>Neha Jaiswal 105</b>	Younglin SK C-18	Methanol: water (80:20)	265	3.4667 (T) 5.1833 (L)	10-50 for both drugs	98-102	-
21	<b>Maithilee Joshi (EMT/ TNF) 106</b>	Precoated silica gel 60 F <sub>254</sub>	Chloform: methanol (9:1)	265	-	20-1000 ng/mL for all drugs	99.54 (E) 99.69 (T)	0.9995 0.9996
22	<b>Mallikarjuna Rao 107</b>	RP C-18	Phosphate buffer: ACN (95:5)	240	1.5 (E) 5.4 (EFV) 6.6 (C) 7.5 (T)	10-60 7.5-45 7.5-45 15-90	98.88 98.83 100.38 99.77	0.9992 0.9999 0.9999 0.9998
23	<b>Prabhakar Reddy 108</b>	Phenomenex C-18	Ammonium acetate : ACN	265	4.0 (E) 10.1 (T) 11.8 (R)	20-100 30-150 2.5-12.5	98.-102	0.997- 0.999

#### 2.4 Literature review on Sacubitril and Valsartan

Literature survey has been done and found many methods reported for the analysis of valsartan in pharmaceutical dosage forms by UV and HPLC methods [109-112]. Various authors have been reported the estimation of valsartan in combination with other drugs like hydrochloro thiazide, nebivolol, ezetimibe in tablet dosage forms [113-116]. Samya et al., developed a HPLC method for the simultaneous estimation of valsartan with amlodipine and hydrochloro thiazide in human plasma [117] and Raja Haranath Babu and co-workers developed a LC-MS/MS method for the simultaneous estimation of valsartan in combination with sacubitril in rat plasma [118].

A few RP-HPLC methods have been reported for the simultaneous estimation of sacubitril and valsartan and also in combination with other drugs like hydrochloro thiazide, ramipril etc, were discussed in table 2.6 [119-131].

**Table 2.7: Previous HPLC methods for the simultaneous estimation of Sacubitril and Valsartan**

S.No.	Author	Column used	Mobile phase (% v/v)	$\lambda_{\max}$ (nm)	RT (min)	Linearity ( $\mu\text{g/mL}$ )	Recovery (%)	$r^2$
1	Ahmed.M (SAC/ VAL) 119	Enable C-18	ACN: Citrate buffer (60:40)	267	4.907 (S) 5.565 (V)	30-320 for both drugs	99.98 $\pm$ 0.4726 (S) 99.99 $\pm$ 0.1305 (V)	0.9999 For both drugs
2	C.J.Patel (SAC/ VAL) 120	LC-20 AT C-18	Potassium phosphate buffer: Buffer (50:50)	224	4.170 (S) 6.530 (V)	12.25-36.75(S) 12.75-38.25(V)	99.72-100.02(S) 99.87-100.17(V)	0.999 For both drugs
3	Naazneen.S (SAC/ VAL) 121	X-Terra C-18	ACN: Methanol: potassium dihydrogen phosphate (30:50:20)	263	3.01 (S) 4.22 (V)	20-160 For both drugs	99.20-99.50(S) 99.8.5-100.90(V)	0.999 0.998
4	Swathi.V (SAC/ VAL) 122	C-18	Methanol: water (80:20)	241	3.420 (S) 4.567 (V)	60-140 (S) 61-155 (V)	100.17-100.55 For both drugs	0.997 For both drugs
5	Kena.H. Patel (SAC/ VAL) 123	C-18	ACN: Methanol: Water (30:50:20)	267	2.464 (S) 3.264 (V)	50-250 For both drugs	99.25-100.90 (S) 99.59-101.05(V)	0.9982 0.9972
6	Hari Bhaskar.V (SAC/ VAL) 124	Terrosil C-18	Phosphate buffer: ACN (25:75)	254	2.589 (S) 3.71 (V)	0.2-0.6(S) 0.1-0.3(V)	99.77-100.12 For both drugs	0.999 For both drugs
7	Shalini.P (Alisken, Ramipril, VAL/ HCZ) 125	Purosphere star RP 18e	TEA buffer: ACN	215	-	20-120 For all drugs	-	0.9993 0.9927 0.9997 0.9997
8	Madana Gopal.N (VAL/ SAC) 126	Intersil ODS	Phosphate buffer: ACN (50:50)	271	-	12-60 (V) 65-73(S)	98.0-103.0 For both drugs	0.999 For both drugs

<b>9</b>	<b>Ferheen Begum 127</b>	Intersil ODS	Phosphate buffer: methanol: ACN (30:50:20)	241	2.927(S) 4.003(V)	58.8-137.2 61.2-142	99.60 98.08	0.997
<b>10</b>	<b>Mustafa 128</b>	C-18	Phosphate buffer: methanol: ACN (46:10:44)	240	7.1 (AM) 3.4 (V)	0.1-50 0.05-50	98.5 $\pm$ 0.8 99.6 $\pm$ 0.6	0.9992 0.9991
<b>11</b>	<b>Rahul R Nahire 129</b>	Waters symmetry C-18	Methanol: potassium dihydrogen phosphate (60:40)	238	4.6 (AM) 7.5 (V)	0.5-100	99.98 100.12	0.997
<b>12</b>	<b>Hani.M Hafez 130</b>	Spherical monomeric C-18	Ammonium acetate buffer: ACN	240	-	2-12 (AM) 10-60 (L) 16-96 (V) 4-24 (AT)	100.18 100.79 100.45 100.8	0.9998 0.9997 0.9998 0.9998
<b>13</b>	<b>K. Reddy 131</b>	C-18	Potassium dihydrogen phosphate: ACN	237	4.5(H) 6.0(AM) 10.6(V)	5-75	98-102	0.9999 0.9999 0.9998

From the extensive literature survey, the much works have not been carried out for the above drugs for validation. Hence, the authors are interested to carry out the development and validation of new drugs with all parameters.