STABILITY INDICATING RP-HPLC METHOD FOR SIMULTANEOUS ESTIMATION OF SIMETHICONE, DOMPERIDONE, MAGALDRATE AND SODIUM ALGINATE: APPLICATION TO SYRUP FORMULATION

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ABSTRACT

A rapid and validated stability indicating RP-HPLC method using isocratic elution and coupled with photodiode array detection was developed for quantifying the content of simethicone, domperidone, magaldrate and sodium alginate in bulk and syrup formulation. The best mobile phase used in this study consisted of 0.1 % orthophosphoric acid/acetonitrile (50/50, V/V) with a flow rate of 0.7 mL min^{-1}. Under optimized conditions used in this study, selected drugs were eluted at 3.301 min (simethicone), 4.293 min (domperidone), 5.220 min (magaldrate) and 6.149 min (sodium alginate) within 12 min run time without any interfering excipients. Peak areas and selected drug content demonstrated excellent linearity (simethicone – 5 to 30 µg mL^{-1}; domiperidone – 2.5 to 15 µg mL^{-1}; magaldrate – 120 to 720 µg mL^{-1}; sodium alginate – 25 to 150 µg mL^{-1}). Percent recovery, which represents accuracy, was 99.12–100.18 % for simethicone, 99.59-100.52 % for domperidone, 99.23-100.25 % for magaldrate and 99.57-100.02 % for sodium alginate. Percent relative standard deviation, which represents precision, was observed in the range of 0.078-0.983 % (simethicone), 0.528-0.861 % (domperidone), 0.278-1.069 % (magaldrate), 0.316-0.572 % (sodium alginate). The developed method displayed favourable accuracy and recovery and was suitable for determining the content of simethicone, domperidone, magaldrate and sodium alginate combination in syrup formulations.

Keywords: Simethicone, domperidone, magaldrate, sodium alginate, syrup formulations, analysis

INTRODUCTION

Domperidone is a specific dopamine receptor blocker. It acts as antiemetic, increases peristalsis in the gastrointestine and causes the release of prolactin[1]. Domperidone has very good affinity for the dopamine receptors D2 and D3. These receptors are seen in chemoreceptor trigger zone, which is present outside the brain blood that controls vomiting and nausea[2,3]. Domperidone is prescribed in gastric motility disorders like duodenogastric, dyspeptic and reflux oesophagitis symptoms[4,5]. Chemically, domperidone is called as 5-chloro-1-(1-[3-(2-oxo-2,3-dihydro-1*H*-benzo[*d*]imidazol-1-yl)propyl]piperidin-4-yl)-1*H*-benzo[*d*]imidazol-2(3*H*)-one.

Magaldrate, chemically known as magnesium aluminate monohydrate, is an antacid available in tablet and suspension dosage form[6,7]. Gastric acid converts rapidly magaldrate to aluminum hydroxide and magnesium hydroxide. These two compounds are poorly absorbed and hence show a continued antacid effect. Because of antacid activity, magaldrate neutralizes and decreases stomach acid and relieves indigestion and heartburn. Magaldrate is used in management of stomach upset, ulcers and other digestive chaos[8].

Simethicone, chemically known as poly (dimethylsiloxane) silicon dioxide, is an antifoaming agent belonging to the antiflatulent drug class[9,10]. Simethicone treats gas symptoms that include painful pressure, bloating and fullness. Simethicone changes gas bubbles surface tension in intestine and stomach, which makes the gas bubbles to form bigger bubbles. The larger bubbles are passed easily[11].

Sodium alginate is extracted from the brown algae cell walls[12]. Chemically it is a sodium salt of D-galacturonic acid. Sodium alginate is used as an ingredient in different preparations of pharmaceutical compounds where it merges with bicarbonate to hold back reflux. Sodium alginate is prescribed in heart burn and gastroesophageal reflux disease[13,14].

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Table I: System suitability test values

Suitability Parameter	Mean* value ± RSD				Acceptance limit
	SIM	DOM	MAG	SOD	
Retention time	3.301± 0.122	4.293± 0.031	5.215± 0.143	6.142± 0.205	RSD ≤2
Peak area	153135± 0.611	109621 ± 0.905	5235961± 0.434	2070575 ± 0.441	RSD ≤2
Plate count	5609± 1.932	6564± 0.452	10103± 1.439	10538± 1.292	> 2000
Resolution	-	5.083± 1.481	4.300± 1.471	4.017± 1.016	> 1.5
Peak tailing	1.133± 1.328	1.047± 0.780	1.143± 0.452	1.130± 0.560	≤2

**Mean of 6 values; SIM – simethicone; DOM – domperidone; MAG – magaldrate; SOD - sodium alginate; RSD – relative standard deviation*

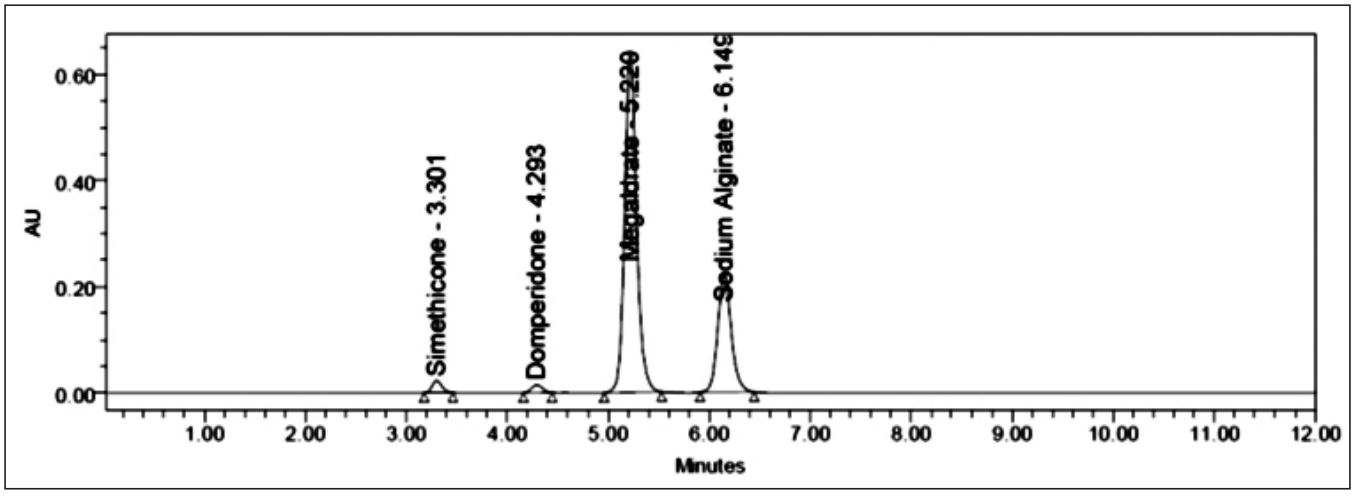

Fig. 1: Chromatogram of simethicone, domperidone, magaldrate and sodium alginate with conditions optimized

The combined dosage form of the above said four compounds is available as syrup dosage form. The brand name is Perigel-D syrup (Bio Care Remedies, Haryana, India). Perigel-D has labeled quantities of 20 mg of simethicone, 10 mg of domperidone, 480 mg of magaldrate, and 100 mg of sodium alginate[15]. Perigel-D syrup is used in the management and treatment of all the above described conditions. Combination of four described drugs is not listed in any pharmacopeia. Yet, no analytical method has been reported for the quantification of simethicone, domperidone, magaldrate, and sodium alginate simultaneously in their syrup formulation. In this investigation, a novel, rapid precise and accurate stability indicating RP-HPLC method was developed for the quantification of simethicone, domperidone, magaldrate, and sodium alginate simultaneously, and the developed method was validated using guidelines of International Conference on Harmonization.

MATERIALS AND METHODS

Instrumentation

Waters Alliance 2695 HPLC system was employed for method development and validation, set with pump, auto sampler and discovery symmetry C18 (250 mm × 4.6 mm) 5 µm particle size column, and the detector consisted of photodiode array operated at 230 nm. Empower software (version 2) was used for evaluation and processing of chromatographic data.

Chemicals and solvents

Acetonitrile (HPLC grade) was obtained from Merck India Ltd (Mumbai, India). Reagent grade orthophosphoric acid, hydrochloric acid, hydrogen peroxide and sodium hydroxide were obtained from Avantor Performance Materials India Limited (Gurgaon, India). Water utilized was acquired from Milli-Q system (Millipore, USA).

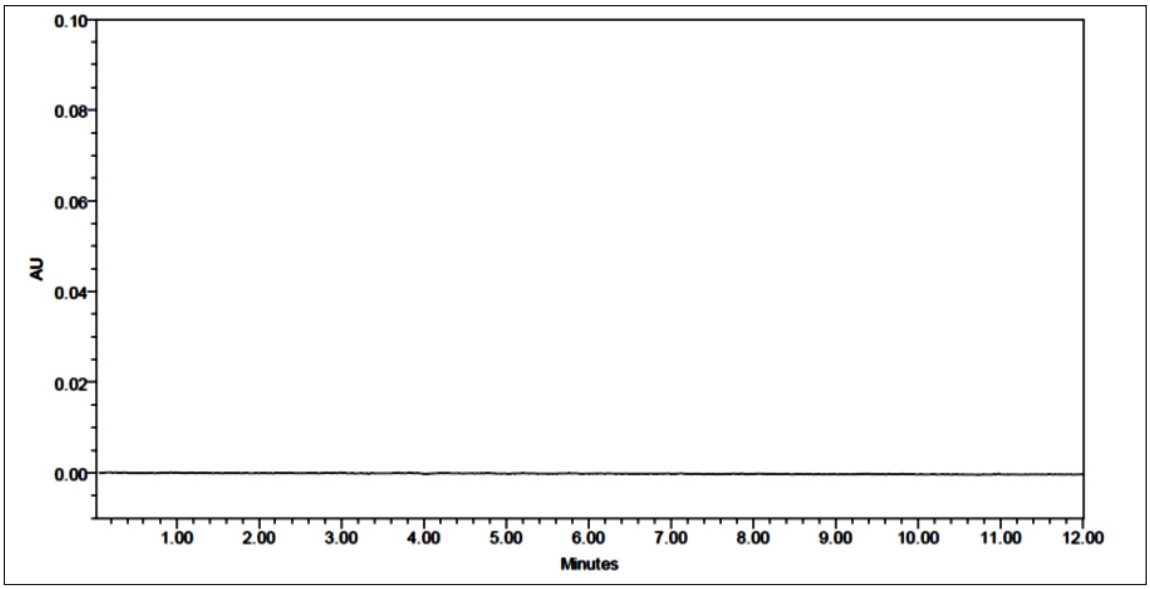

Fig. 2a: Chromatogram of mobile phase without drug

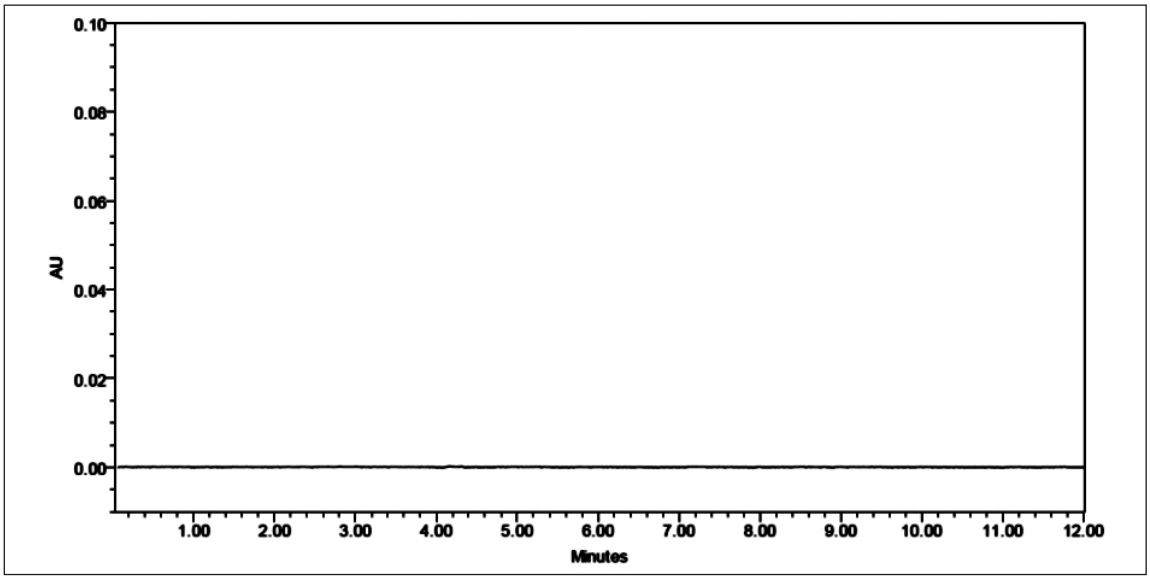

Fig. 2b: Chromatogram of placebo solution

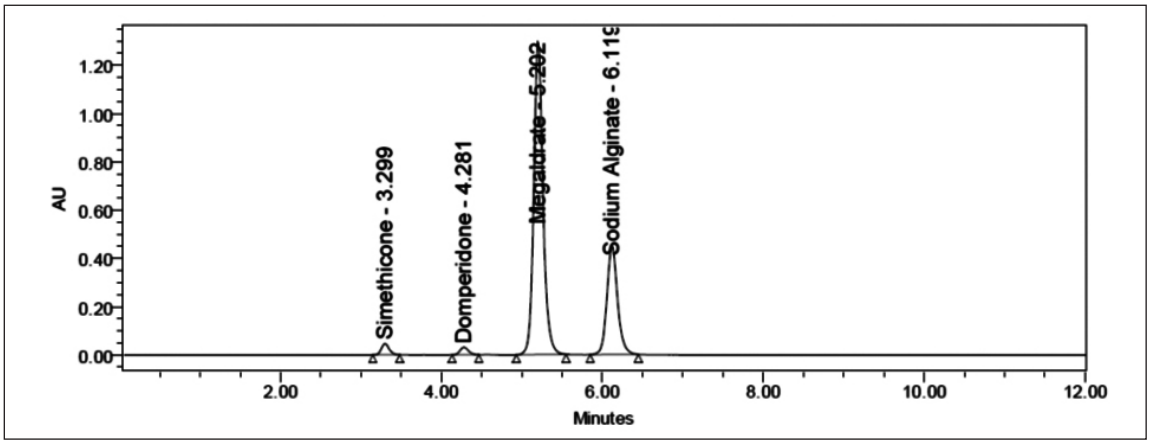

Fig. 2c: Chromatogram of working solution

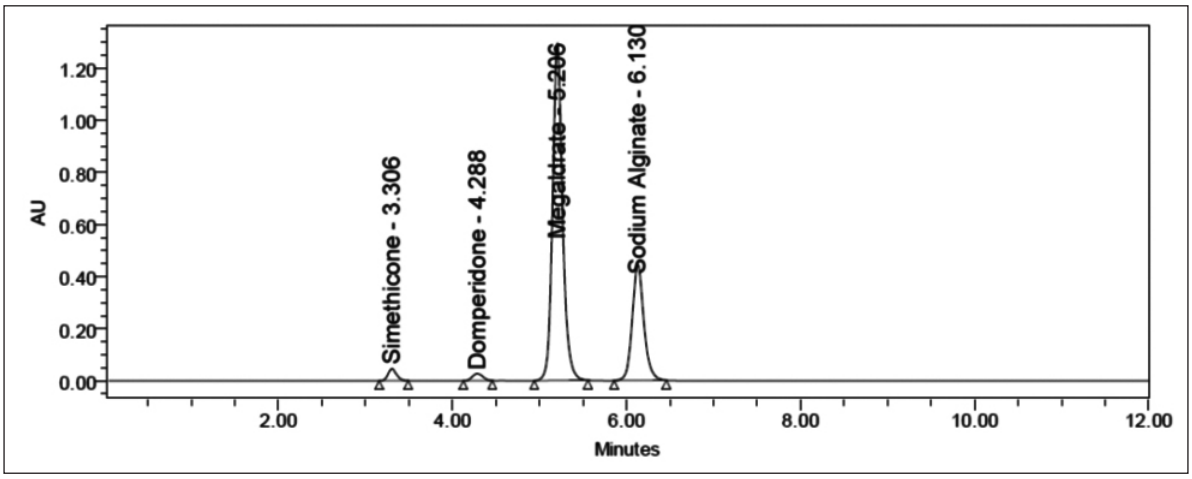

Fig. 2d: Chromatogram of syrup sample solution

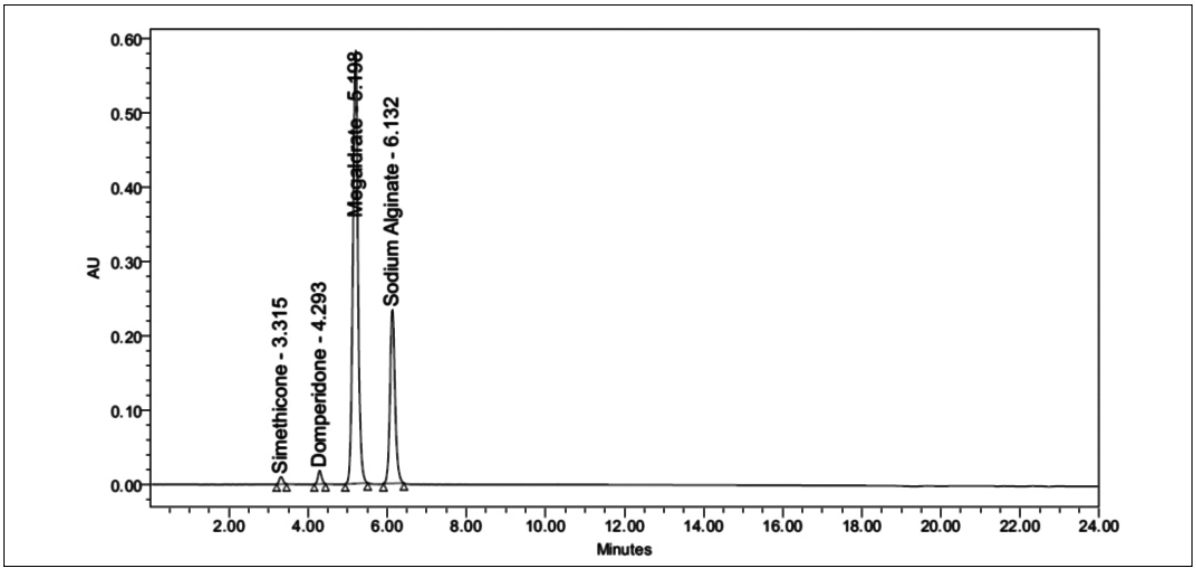

Fig. 3a: Chromatogram of acid degraded syrup sample

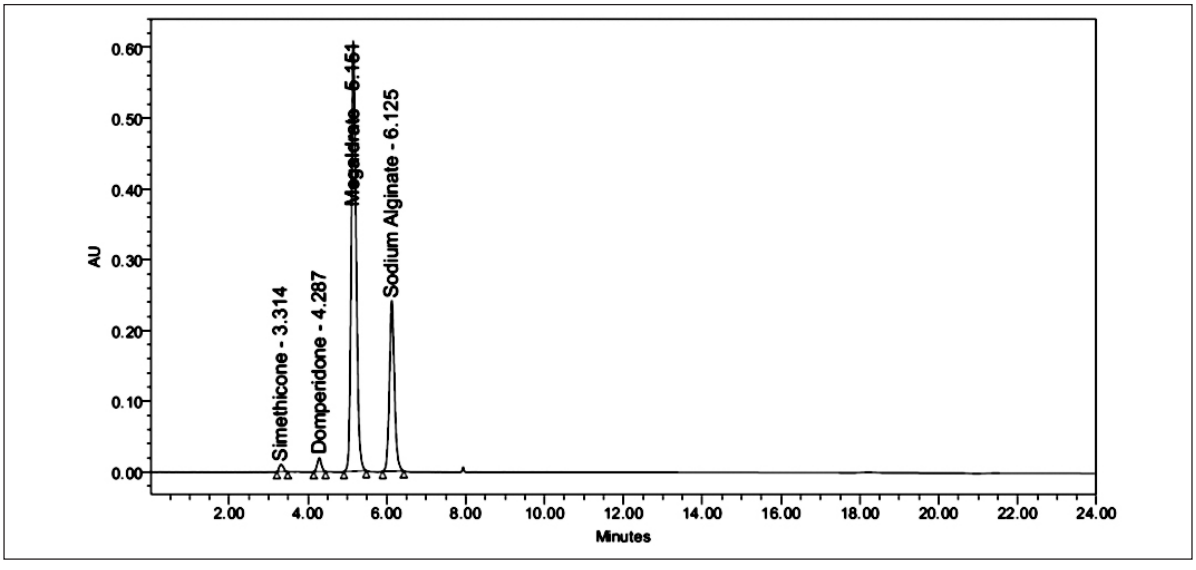

Fig. 3b: Chromatogram of base degraded syrup sample

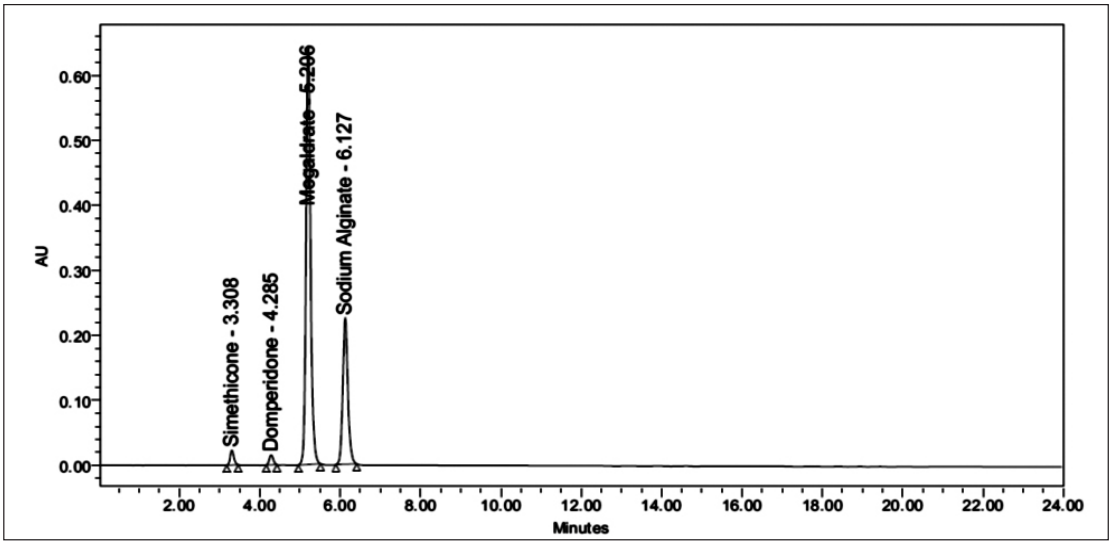

Fig. 3c: Chromatogram of water degraded syrup sample

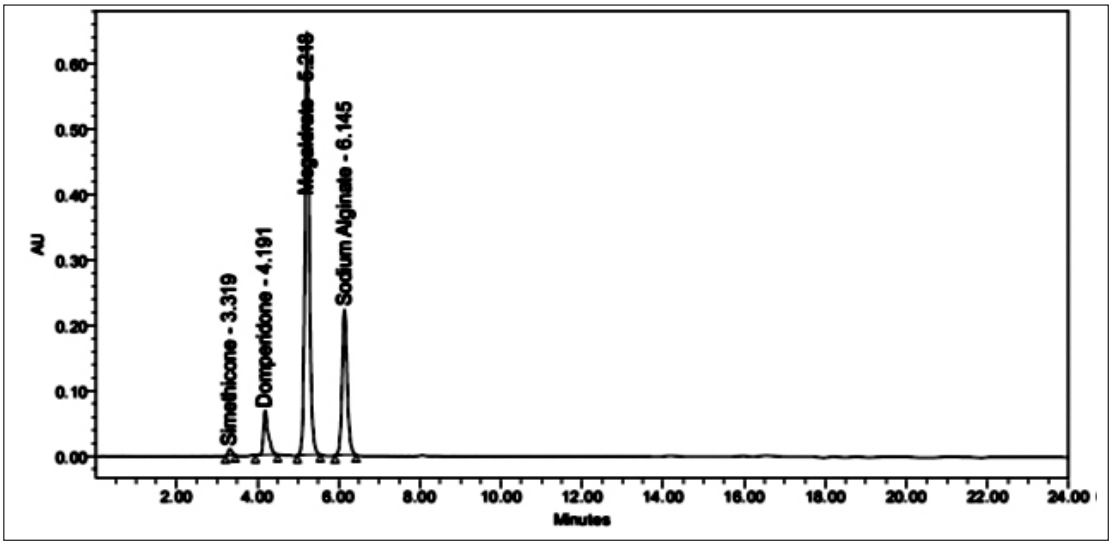

Fig. 3d: Chromatogram of oxidatively degraded syrup sample

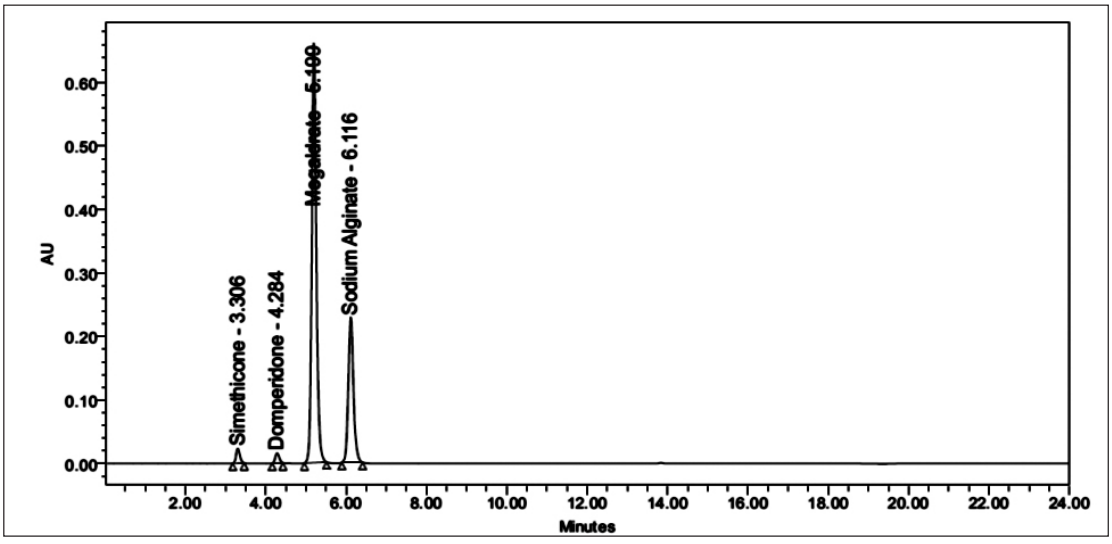

Fig. 3e: Chromatogram of thermally degraded syrup sample

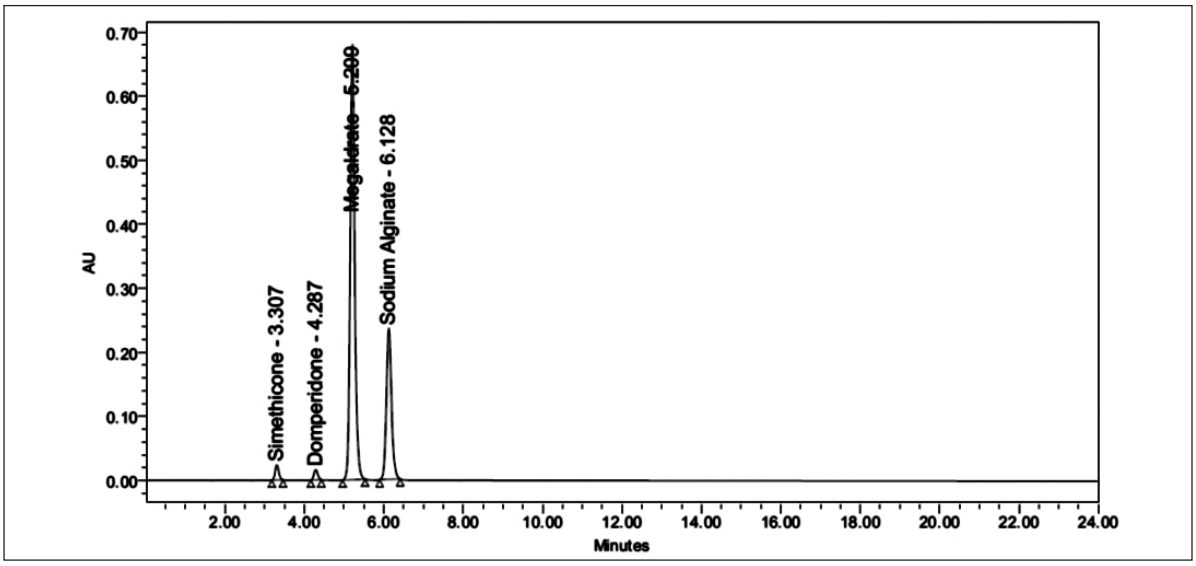

Fig. 3f: Chromatogram of photolytically degraded syrup sample

Table II: Linearity and sensitivity values of simethicone, domperidone, magaldrate and sodium alginate

Drug	Linearity (µg mL^{-1})	Regression equation*	Regression coefficient (R^2)	LOD (µg mL^{-1})	LOQ (µg mL^{-1})
SIM	5.0 - 30.0	y = 7454 C + 453.8	0.9990	0.268	0.813
DOM	2.5 - 15.0	y = 11007 C + 199.8	0.9998	0.064	0.193
MAG	120 - 720	y = 10870 C + 63981	0.9994	1.618	4.905
SOD	25.0 - 150.0	y = 20695 C + 30828	0.9995	0.592	1.795

**y=mC + I, y is peak area, m is slope, C is concentration of drug, I is intercept on y-axis; SIM – simethicone; DOM – domperidone; MAG – magaldrate; SOD - sodium alginate*

Chromatographic conditions

Mobile phase employed was a mixture of 0.1 % of orthophosphoric acid/acetonitrile (50/50, V/V) (pH 3.5). Through 0.45 µm membrane filter, the mobile phase was filtered and degassed before use. Isocratic elution mode with flow rate of 0.7 mL min^{-1} was set. 27 ^{0}C of column temperature and 10 µL of sample volume, 230 nm of detection wavelength were employed in the present chromatographic method.

Standard solutions

Standard reference simethicone, domperidone, magaldrate, and sodium alginate were provided by BMR Chemicals and Enterprises (Hyderabad, India). Stock solutions of simethicone (200 µg mL^{-1}), domperidone (100 µg mL^{-1}), magaldrate (4800 µg mL^{-1}) and sodium alginate (1000 µg mL^{-1}) were prepared in diluent (water and acetonitrile in equal proportions). Working standard solutions with following concentrations were made by correct dilution of stock solution with diluent:

- Simethicone - 5.0, 10.0, 15.0, 20.0, 25.0 and 30.0 µg mL^{-1}
- Domperidone - 2.5, 5.0, 7.5, 10.0, 12.5 and 15.0 µg mL^{-1}
- Magaldrate - 120, 240, 360, 480, 600 and 720 µg mL^{-1}
- Sodium alginate - 25.0, 50.0, 75.0, 100.0, 125.0 and 150.0 µg mL^{-1}

Sample solution

Perigel-D syrup with labeled quantities of 20 mg of simethicone, 10 mg of domperidone, 480 mg of magaldrate, and 100 mg of sodium alginate was employed. An accurately measured volume of syrup corresponding to 20 mg simethicone, 10 mg domperidone, 480 mg magaldrate, and 100 mg sodium alginate was transferred to 100 mL beaker and stirred for 40 min using magnetic stirrer with 30 mL of diluent. The solution was centrifuged for 20 min. The collected supernatant was filtered via 0.45 µm membrane filter and diluted to 100 mL in 100 mL

volumetric flask with diluent. Suitable dilution (simethicone - 20 µg mL^{-1}; domperidone - 10 µg mL^{-1}; magaldrate - 480 µg mL^{-1}; sodium alginate - 100 µg mL^{-1}) was made for the assay using the diluent.

Calibration curve construction

For constructing calibration curve, 6 standard concentrations of simethicone, domperidone, magaldrate and sodium alginate in the range of 5.0 - 30.0 µg mL^{-1}, 2.5 - 15.0 µg mL^{-1}, 120 - 720 µg mL^{-1} and 25.0 - 150.0 µg mL^{-1}, respectively, were prepared from stock standard solution and diluent. 10 µL of each concentration solution was injected into the HPLC system. The chromatogram and peak areas of simethicone, domperidone, magaldrate, and sodium alginate at each concentration level were determined using the described chromatographic conditions. The linearity was determined by linear regression.

Analysis of simethicone, domperidone, magaldrate and sodium alginate in syrup

The sample syrup solution with concentration, simethicone - 20 µg mL^{-1}; domperidone - 10 µg mL^{-1}; magaldrate - 480 µg mL^{-1}; sodium alginate - 100 µg mL^{-1}, was prepared in diluent. The conditions described under "chromatographic conditions" were applied. The nominal content of simethicone, domperidone, magaldrate and sodium alginate in syrup formulation was calculated either employing corresponding calibration curve or regression equation.

Stability studies of simethicone, domperidone, magaldrate and sodium alginate

The stability of simethicone, domperidone, magaldrate and sodium alginate in syrup formulation was determined under hydrolytic (acid/base/water), photolytic, thermolytic, and oxidative conditions of stress[16,17]. Acid, base and water hydrolytic stress beside oxidative stress was achieved by mixing 1 mL of stock syrup sample solution (simethicone - 200 µg mL^{-1}; domperidone - 100 µg mL^{-1}; magaldrate - 4800 µg mL^{-1}; sodium alginate - 1000 µg mL^{-1}) with 1 mL aqueous solutions of 2 N HCl, 2 N NaOH, water and 10 % H_2O_2, respectively. The solutions were place in 10 mL volumetric flask and refluxed at 60 ^{0}C for 30 min (6 h for neutral degradation with water). Stock syrup sample solution as above was exposed to UV (in UV chamber for 7 days) and 105 ^{0}C (in hot air oven for 6 h) for photo and thermal degradation studies, respectively. Samples were withdrawn after specified period of degradation and diluted appropriately with diluent to obtain a concentration of simethicone - 20 µg mL^{-1}; domperidone - 10 µg mL^{-1}; magaldrate - 480 µg mL^{-1}; sodium alginate - 100 µg mL^{-1} previous to analysis by the proposed method. The peak areas of degraded samples were compared with the undegraded samples to access the percent degradation of simethicone, domperidone, magaldrate and sodium alginate in each stress condition applied.

RESULTS AND DISCUSSION

Method development

Buffer pH, organic phase percentage, mobile phase composition, flow rate and column temperature were optimized to get good chromatographic separation followed by quantification of simethicone, domperidone, magaldrate and sodium alginate simultaneously. With Discovery Symmetry C18 (250 mm × 4.6 mm, particle size 5 µm) column better peak separation with good resolution between simethicone, domperidone, magaldrate and sodium alginate was obtained. After checking several combinations of organic solvents and buffer, mobile phase composition having a mixture of 0.1 % orthophosphoric acid and acetonitrile (50:50, V/V) having pH of 3.5 with a flow rate of 0.7 mL min^{-1} was optimized. The column temperature was chosen at 30 ^{0}C to get the required peak shape and resolution. Subsequent to a 10 µL injection, simethicone, domperidone, magaldrate and sodium alginate peaks were eluted at 3.301 min, 4.293 min, 5.220 min and 6.149 min, respectively (Fig. 1) and detected via photodiode array detector at 230 nm.

Method validation

Validation of RP-HPLC method for system suitability, linearity, sensitivity (limit of detection (LOD) and limit of quantitation (LOQ)), precision, accuracy, selectivity, specificity, and robustness was done as indicated in ICH guidelines[18]. A working solution of simethicone (20 µg mL^{-1}), domperidone (10 µg mL^{-1}), magaldrate (480 µg mL^{-1}) and sodium alginate (100 µg mL^{-1}) was prepared from stock solution with diluent to test all the validation parameters, except for linearity. For linearity, 6 standard solution with concentration of simethicone, domperidone, magaldrate and sodium alginate in the range of 5.0 - 30.0 µg mL^{-1}, 2.5 - 15.0 µg mL^{-1}, 120 - 720 µg mL^{-1} and 25.0 - 150.0 µg mL^{-1}, respectively was prepared from stock solution using diluent.

System suitability

To check system suitability, 10 µL of working solution of simethicone, domperidone, magaldrate and sodium alginate was injected in six replicates into the HPLC system. Plate count, peak asymmetry, resolution and relative standard deviation of retention time and peak

areas of simethicone, domperidone, magaldrate and sodium alginate were determined. Relative standard deviation was not greater than 2.0 %, peak asymmetry was less than 2, plate count was more than 2000 and resolution was not less than 1.5, as shown in Table I. All the determined values are within the acceptance criterion, therefore the system is appropriate for the analysis of simethicone, domperidone, magaldrate and sodium alginate simultaneously.

Linearity

Standard calibration curves of simethicone, domperidone, magaldrate and sodium alginate exhibited linearity in the range of 5.0 - 30.0 µg mL^{-1}, 2.5 - 15.0 µg mL^{-1}, 120 - 720 µg mL^{-1} and 25.0 - 150.0 µg mL^{-1}, respectively. The regression linear equation for simethicone, domperidone, magaldrate and sodium alginate are shown in Table II. The values indicated the good relationship between the drug concentrations and their respective peak areas.

Sensitivity

The proposed method's sensitivity was established by determining LOQ and LOD by serially injecting lower concentrations of simethicone, domperidone, magaldrate and sodium alginate solutions, showing a peak by a signal to noise ratio of 10:1 and 3:1, respectively. LOQ and LOD are the least quantity of drug which is quantified and detection precisely, respectively. The values, as presented in Table I, proved the adequate sensitivity of the method developed.

Selectivity

Working standard, syrup sample, mobile phase without drug and placebo solutions were employed to test the selectivity of method. For selectivity testing, the solutions described were injected into the HPLC system and chromatograms were compared to assess if any interfering peaks are co eluted near or at the peaks of simethicone, domperidone, magaldrate and sodium alginate. Chromatograms shown in Fig. 2a – 2d indicated no peak at or near simethicone, domperidone, magaldrate and sodium alginate peak retention times. The retention times of simethicone, domperidone, magaldrate and sodium alginate were nearly same in working standard and syrup sample solution chromatograms. This confirmed about the proposed method's ability to produce true and good results free from interference by components of mobile phase and excipients of syrup.

Precision

The intra-day precision and inter-day precision for the proposed method was determined by six analyse of working solution. Intra-day precision was assessed by measuring relative standard deviation for peak areas of simethicone, domperidone, magaldrate and sodium alginate six times on the same day. Inter-day precision was assessed by measuring relative standard deviation for peak areas of simethicone, domperidone, magaldrate and sodium alginate on two different days. The results of intra- and inter-day precision showed (Table III) that the method is precise inside the satisfactory limits.

Table III: Precision results for simethicone, domperidone, magaldrate and sodium alginate

Drug	Intra-day precision		Inter-day precision	
	Peak area* (mAU)	RSD (%)	Peak area* (mAU)	RSD (%)
SIM	153474	0.630	150124	0.444
DOM	109475	0.716	106425	1.001
MAG	5249058	0.549	5193454	0.834
SOD	2067946	0.198	2053871	0.699

**Mean of 6 values; SIM – simethicone; DOM – domperidone; MAG – magaldrate; SOD - sodium alginate; RSD – relative standard deviation*

Accuracy

Recovery study, to test accuracy of the developed method, was performed for 3 different levels at 50 %, 100 %, and 150 % of labeled claim concentration employing standard spiking technique. The preanalyzed syrup sample solution was spiked with standard simethicone, domperidone, magaldrate and sodium alginate. The prepared solutions were assayed three times using the developed method. The amount of simethicone, domperidone, magaldrate and sodium alginate in the three samples was determined using the calibration curve or regression equation. Results of accuracy illustrated percentage recovery at studied 3 levels in the range of 99.12–100.18 % (simethicone), 99.59-100.52 % (domperidone), 99.23-100.25 % (magaldrate), 99.57-100.02 % (sodium alginate) and percent relative standard deviation values were in the range of 0.078-0.983 % (simethicone), 0.528-0.861 % (domperidone), 0.278-1.069 % (magaldrate) and 0.316-0.572 % (sodium alginate), as revealed in Table IV. The results indicate the accuracy and applicability of the developed method for routine analysis

Table IV: Recovery results of simethicone, domperidone, magaldrate and sodium alginate from syrup formulation

Spiked percentage (%)	Labeled claim (mg)	Spiked quantity (mg)	Total mean recovered* (mg)	Percentage recovered (%)	RSD (%)
Simethicone					
50	20	10	29.95	99.82	0.427
100	20	20	40.07	100.18	0.983
150	20	30	49.56	99.12	0.078
Domperidone					
50	10	5	14.94	99.59	0.861
100	10	10	20.07	100.37	0.650
150	10	15	25.13	100.52	0.528
Magaldrate					
50	480	240	721.80	100.25	0.278
100	480	480	955.08	99.49	0.319
150	480	720	1190.77	99.23	1.069
Sodium alginate					
50	100	50	150.03	100.02	0.316
100	100	100	199.13	99.57	0.572
150	100	150	249.60	99.84	0.497

** Average of three values determined; RSD – relative standard deviation*

Table V: Robustness results of simethicone, domperidone, magaldrate and sodium alginate

Parameter	Value tested	PLC	PET	RES	PLC	PET	RES
		Simethicone			**Domperidone**		
Mobile phase*	45:55	5653	1.16	-	8810	1.11	5.9
	55:45	5072	1.15	-	6987	1.04	4.5
Flow rate (mL min^{-1})	0.6	6068	1.13	-	8104	1.05	5.4
	0.8	5168	1.17	-	7139	1.06	4.9
Temperature (^{0}C)	28	5810	1.14	-	7554	1.04	4.9
	32	5957	1.11	-	8175	1.08	5.6
-	**-**	**Magaldrate**			**Sodium alginate**		
Mobile phase*	45:55	10755	1.17	4.3	11118	1.16	3.7
	55:45	10186	1.16	4.9	10616	1.13	4.6
Flow rate (mL min^{-1})	0.6	10095	1.15	4.5	10470	1.14	4.1
	0.8	10012	1.16	4.2	10353	1.14	3.9
Temperature (^{0}C)	28	10531	1.17	4.7	10926	1.14	4.3
	32	10799	1.16	4.3	11192	1.15	3.9

PLC – Plate count; PET – Peak tailing; RES – Resolution

Table VI: Percent degradation of simethicone, domperidone, magaldrate and sodium alginate

Condition applied	Peak area		Degraded (%)	Peak area		Degraded (%)
	US	DS		US	DS	
	Simethicone			Domperidone		
Acid	153135	142520	7.21	109621	101844	7.28
Alkali	153135	143093	6.84	109621	102677	6.52
Oxidation	153135	144504	5.92	109621	103443	5.82
Dry heat	153135	147799	3.77	109621	104937	4.46
UV light	153135	151373	1.45	109621	106837	2.73
Neutral	153135	152826	0.50	109621	108761	0.98
	Magaldrate			Sodium alginate		
Acid	5235961	5071116	3.25	2070575	1869096	9.82
Alkali	5235961	5093894	2.81	2070575	1890070	8.81
Oxidation	5235961	5107434	2.55	2070575	1933234	6.73
Dry heat	5235961	5153735	1.67	2070575	1997582	3.62
UV light	5235961	5159547	1.56	2070575	2050031	1.09
Neutral	5235961	5218953	0.42	2070575	2063600	0.44

US – undegraded sample; DS – degraded sample

Table VII: Peak purity values of simethicone, domperidone, magaldrate and sodium alginate in degraded samples

Condition applied	PPA	PTV	PPA	PTV
	Simethicone		Domperidone	
Acid	0.132	0.468	0.135	0.568
Alkali	0.326	0.560	0.443	0.585
Oxidation	0.159	0.437	0.117	0.463
Dry heat	0.142	0.323	0.401	0.635
UV light	0.142	0.313	0.374	0.604
Neutral	0.150	0.325	0.420	0.630
	Magaldrate		Sodium alginate	
Acid	0.192	0.453	0.180	0.290
Alkali	0.460	0.580	0.183	0.291
Oxidation	0.168	0.587	0.187	0.290
Dry heat	0.167	0.623	0.184	0.290
UV light	0.176	0.691	0.182	0.288
Neutral	0.163	0.584	0.178	0.290

PPA – peak purity angle; PTV – peak threshold value

of simethicone, domperidone, magaldrate and sodium alginate simultaneously in syrup formulation.

ROBUSTNESS

Robustness was tested by varying the mobile phase ratio by ±5 %, column temperature by ±2 ^{0}C and flow rate by ±0.1 mL min^{-1}. Changes were made to assess evaluate their effect on system suitability parameters of the method. The robustness results showed that in applied small changes in method conditions, system suitability values (plate count, tailing factor and resolution) of simethicone, domperidone, magaldrate and sodium alginate were within the limits of acceptance criteria (Table V).

Stability studies

The chief aim of stability studies was to assess the stability of selected drug combination, specificity and stability indicating nature of developed procedure. Stability of simethicone, domperidone, magaldrate and sodium alginate in syrup formulation was studied under thermolytic, photolytic, hydrolytic (acid/base/water) and oxidation stress conditions. The peak area values of selected drug in undegraded sample, degraded sample and percent degradation of drugs in applied conditions of degradation are summarized in Table VI. The

chromatograms of degraded syrup sample are shown in Fig. 3a-3f. Simethicone, domperidone, magaldrate and sodium alginate demonstrated good stability in neutral hydrolysis condition and was less stable in the acid condition applied. The purity of simethicone, domperidone, magaldrate and sodium alginate peaks was checked by photo diode array detector. Peak purity was estimated by testing from 200 nm to 400 nm. The less peak purity angle than peak threshold value in all degradation conditions applied proved the purity of peak (Table VII). This makes sure the absence of any degradant peaks within the peaks of simethicone, domperidone, magaldrate and sodium alginate.

CONCLUSION

We have developed a simple, rapid, reliable and accurate stability indicating RP-HPLC method for simultaneous analysis of simethicone, domperidone, magaldrate and sodium alginate. This method has been validated following International Conference on Harmonization for analysis of simethicone, domperidone, magaldrate and sodium alginate in syrup and bulk samples. C18 column set at 30 ^{0}C and an isocratic mobile phase having 0.1 % orthophosphoric acid and acetonitrile (50:50 V/V) with a flow rate of 0.7 mL min^{-1} were used. The method displayed good linearity over the assayed concentration range, good intra- and inter-day precision. The method is accurate, selective, and robust for simethicone, domperidone, magaldrate and sodium alginate analysis with adequate detection and quantification limits and is appropriate for its planned use. This stability indicating method can be adapted to analyze easily simethicone, domperidone, magaldrate and sodium alginate combination in syrup formulation and for regular analysis in quality control laboratories.

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