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DEVELOPMENT AND EVALUATION OF ALOE VERA-BASED MUCOADHESIVE BUCCAL FILMS OF TRIAMCINOLONE ACETONIDE FOR LOCALIZED MANAGEMENT OF RECURRENT APHTHOUS STOMATITIS

Mukesh M.[1]*, D. Sudhan[2]

[1,2]Department of Pharmaceutics, Adhiparasakthi College of Pharmacy, Melmaruvathur – 603 319, Tamil Nadu, India (Affiliated to The Tamil Nadu Dr. M.G.R. Medical University, Chennai).

***Corresponding Author: Mukesh M.**

Department of Pharmaceutics, Adhiparasakthi College of Pharmacy, Melmaruvathur - 603 319, Tamil Nadu, India (Affiliated to The Tamil Nadu Dr. M.G.R. Medical University, Chennai).

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ABSTRACT

Recurrent aphthous stomatitis (RAS) is a common oral mucosal disorder marked by recurrent, painful ulcers. Triamcinolone acetonide (TA) is a topical corticosteroid used for RAS, but conventional topical preparations are quickly cleared from the oral cavity by saliva and mechanical movement. This study aimed to develop and evaluate Aloe vera-based mucoadhesive buccal films of TA for localized delivery. Six formulations (F1–F6) were prepared by solvent casting using HPMC E15 and sodium carboxymethyl cellulose (Na CMC) as film-forming polymers and glycerin as plasticizer, with Aloe vera content increased from 0 mg (F1) to 1.0 mg (F6). Preformulation studies included organoleptic evaluation, melting point, solubility, λmax determination, calibration curve and FTIR compatibility studies. The films were evaluated for appearance, thickness, folding endurance, surface pH, weight uniformity, dispersion and disintegration time, drug content and in-vitro dissolution in phosphate buffer pH 6.8. TA showed λmax at 242 nm, a melting point of 293 °C and a linear calibration curve (R^2 = 0.9986; 2–10 µg/mL). FTIR showed no evidence of major drug–polymer interaction. All films were smooth and flexible. Thickness was 0.480 ± 0.000 to 0.563 ± 0.012 mm, folding endurance 187.00 ± 5.00 to 222.67 ± 7.77, surface pH 6.52 to 7.28, and weight 48.20 ± 0.84 to 50.00 ± 0.71 mg. Dispersion and disintegration times were 22–30 s, and drug content was 93.33–98.83%. Cumulative drug release at 30 min decreased with increasing Aloe vera content, from 99.2% (F1) to 86.7% (F6). F4 (0.6 mg Aloe vera) gave the best overall balance of clarity, flexibility, near-neutral surface pH (6.98), drug content (97.37%) and drug release (92.6% at 30 min), and was selected as the optimized formulation. Mucoadhesion, permeation and stability studies are still needed to confirm its suitability for RAS.

KEYWORDS: Aloe vera, Mucoadhesive buccal film, Triamcinolone acetonide, Recurrent aphthous stomatitis, HPMC E15, Sodium CMC, Solvent casting, Localized drug delivery.

1. INTRODUCTION

The oral cavity is an accessible site for drug administration, and the buccal mucosa can be used for both local and systemic delivery.[1,2] Dosage forms that adhere to the buccal mucosa can stay at the site of application for longer, which is useful for treating lesions of the oral cavity.[1,2]

Recurrent aphthous stomatitis (RAS) is one of the most common conditions of the oral mucosa. It causes recurrent, painful ulcers that can interfere with eating, drinking and speaking. Its exact cause is not fully established, and management aims to relieve pain, promote healing and reduce the severity or frequency of recurrence.[3,4] Topical therapy is generally preferred for localized lesions, and topical corticosteroids such as triamcinolone acetonide (TA) are among the commonly used first-line options.[3,5] However, continuous salivary flow, swallowing and movements of the tongue and cheeks shorten the contact time of conventional topical preparations with the lesion.[1,2]

Mucoadhesive buccal films are thin, flexible dosage forms that can be applied directly to the mucosa and made with a range of film-forming polymers.[6,7] Hydrophilic polymers such as hydroxypropyl methylcellulose (HPMC) are widely used for this purpose, and their type and concentration influence film properties and drug release.[2,6] Natural materials are also of interest. Aloe vera has been studied for oral mucosal conditions including oral ulcers, and systematic reviews report potential benefits for healing, although the strength of the evidence varies with the preparation and condition studied.[8,9]

Combining Aloe vera with a polymeric film system may offer a convenient way to deliver TA to aphthous lesions. This study therefore developed six TA buccal films (F1–F6) using HPMC E15 and Na CMC with increasing amounts of Aloe vera, and evaluated their physical, mechanical and drug-release characteristics to identify a suitable formulation.

2. MATERIALS AND METHODS

2.1 Materials

Triamcinolone acetonide was obtained from Mahima Life Science Pvt. Ltd., Aloe vera (mucilage/powder) from Formulators Inc., HPMC E15 from Exeltis Pharma, sodium carboxymethyl cellulose from Ingredion Pharma Solutions, glycerin from Orchid Pharma, and ethanol and distilled water from Loba Chemicals.

2.2 Instruments

An electronic balance (Wensar), FTIR spectrophotometer (Bruker), UV-visible spectrophotometer (Lab India UV-300), sonicator (Sonica), melting point apparatus (Octovision), magnetic stirrer (REMI), pH meter (Infra DG), vernier caliper (Mitutoyo), dissolution apparatus (Veego) and hot air oven (LabTech Instruments) were used.

2.3 Preformulation studies

Organoleptic properties. TA was examined visually for colour, appearance, odour and taste.

Melting point. The melting point was determined by the capillary method using a melting point apparatus. Three readings were taken and the mean was calculated.

Solubility. Qualitative solubility was assessed in distilled water, ethanol, phosphate buffer pH 6.8, methanol, chloroform and isopropyl alcohol by adding a small quantity of drug to each solvent and shaking thoroughly.

Determination of λmax and calibration curve. A TA solution in phosphate buffer pH 6.8 and ethanol was scanned between 200 and 400 nm to determine λmax. A calibration curve was then prepared from a stock solution of TA in ethanol, diluted with phosphate buffer pH 6.8 to give 2, 4, 6, 8 and 10 µg/mL. Absorbance was read at λmax, and concentration was plotted against absorbance.

FTIR compatibility study. FTIR spectra (4000–400 cm^{-1}) were recorded for pure TA and for physical mixtures of TA with HPMC E15 + Na CMC, TA with Na CMC, and TA with HPMC E15. The characteristic peaks of the drug were compared with those in the mixtures for any shift, disappearance or new peak.

2.4 Formulation of buccal films

Films were prepared by solvent casting. Six formulations (F1–F6) were made in which only the Aloe vera content was varied (Table 1).

Table 1: Composition of the buccal films (F1–F6).

Ingredient	F1	F2	F3	F4	F5	F6
Triamcinolone acetonide (mg)	10	10	10	10	10	10
HPMC E15 (mg)	150	150	150	150	150	150
Aloe vera (mg)	0	0.2	0.4	0.6	0.8	1.0
Sodium CMC (mg)	25	25	25	25	25	25
Glycerin (mL)	0.20	0.20	0.20	0.20	0.20	0.20
Ethanol (mL)	1.0	1.0	1.0	1.0	1.0	1.0
Distilled water	q.s.	q.s.	q.s.	q.s.	q.s.	q.s.

HPMC E15 was dissolved in distilled water with continuous stirring, followed by Na CMC and the specified quantity of Aloe vera. TA was separately dissolved in ethanol, and this solution and the glycerin were added with stirring to obtain a homogeneous casting solution. The solution was sonicated to remove entrapped air and the volume was made up to 15 mL with distilled water. It was then poured into a flat-bottomed glass dish, spread evenly, dried, and the dried film was peeled off and cut into 2 × 2 cm^2 units.

2.5 Evaluation of the films

Physical appearance. Colour, smoothness, flexibility and clarity were assessed visually.

Thickness. Thickness of three films per formulation was measured with a vernier caliper and expressed as mean ± SD.

Folding endurance. Three 2 × 2 cm^2 films per formulation were folded repeatedly at the same place until they broke. The number of folds was recorded and the mean ± SD calculated.

Surface pH. Each film was allowed to hydrate in a small quantity of distilled water and the surface pH was measured with a pH meter.

Uniformity of weight. Five 2 × 2 cm² films per formulation were weighed individually and the mean ± SD calculated.

Dispersion and in-vitro disintegration time. A film was placed in phosphate buffer pH 6.8 (dispersion test) and the time for complete dispersion and disintegration was recorded, together with any visible residue.

Drug content. A film was extracted into the solvent, suitably diluted, and the absorbance was read at 242 nm. Drug content (%) was calculated from the calibration curve equation

In-vitro dissolution. A film was placed in 900 mL of phosphate buffer pH 6.8 in the dissolution apparatus. Samples were withdrawn at 0, 2, 4, 6, 8, 10, 15 and 30 min, replaced with fresh medium, diluted when required and analyzed at 242 nm. Cumulative percentage drug release was calculated using the calibration curve, with correction for sample withdrawal.

2.6 Data presentation

Replicate measurements are expressed as mean ± standard deviation. Formulations were compared on their physical characteristics, pharmaceutical properties and drug release.

3. RESULTS AND DISCUSSION

3.1 Preformulation studies

Organoleptic properties, melting point and solubility. TA was a white, odorless, crystalline powder with a slightly bitter taste. Its melting point was 293 °C (readings 293, 294 and 293 °C). TA was practically insoluble in distilled water, slightly soluble in phosphate buffer pH 6.8, soluble in methanol, chloroform and isopropyl alcohol, and freely soluble in ethanol (Table 2). Because TA is poorly soluble in aqueous media, ethanol was used to dissolve the drug during film preparation and in the UV analysis.

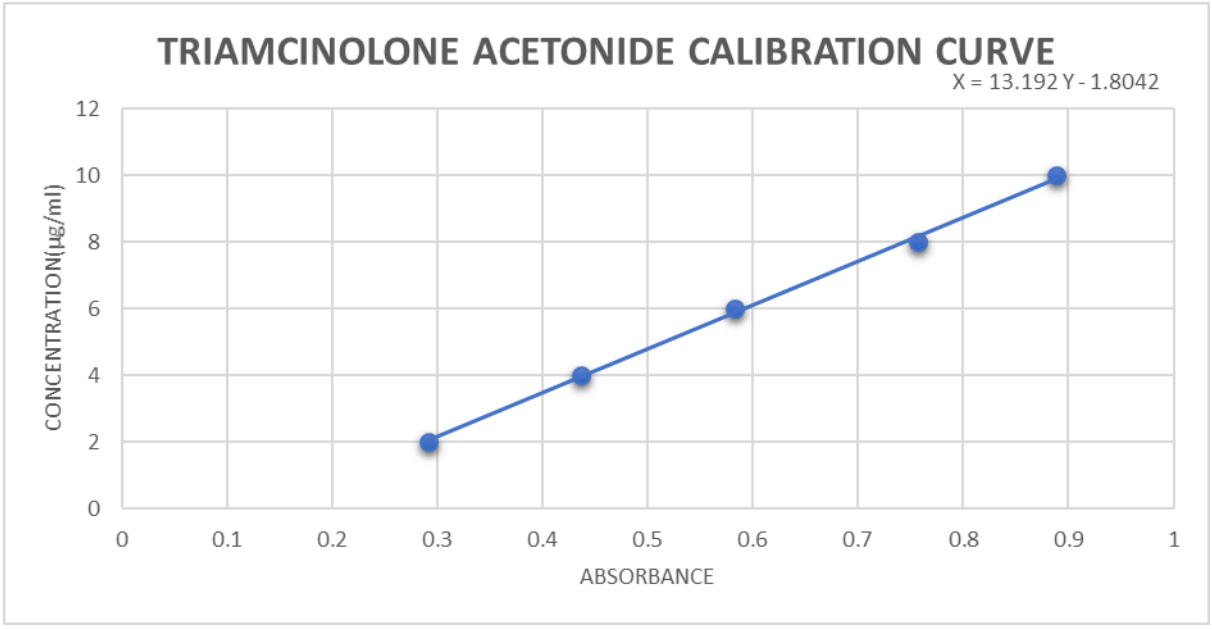
Table 2: Solubility of triamcinolone acetonide.

Solvent	Solubility
Distilled water	Practically insoluble
Phosphate buffer pH 6.8	Slightly soluble
Ethanol	Freely soluble
Methanol	Soluble
Chloroform	Soluble
Isopropyl alcohol	Soluble

λmax and calibration curve. TA showed maximum absorbance at 242 nm. The calibration curve was linear over 2–10 µg/mL (Table 3), with the regression equation y = 0.0757x + 0.1374 and R^2 = 0.9986, where y is absorbance and x is concentration in µg/mL.

Table 3: Calibration data for TA at 242 nm.

Concentration (µg/mL)	Absorbance
2	0.292
4	0.437
6	0.583
8	0.757
10	0.889



X AXIS – Concentration (mg/ml)
Y AXIS - Absorbance

Fig. 1: Calibration curve chart of Triamcinolone acetonide.

FTIR compatibility

The spectrum of pure TA showed bands for O–H stretching (3690.24 and 3525.21 cm^{-1}), =C–H stretching (3030.92 cm^{-1}), aliphatic C–H stretching (2964.40 and 2924.58 cm^{-1}), C=O stretching (1707.00 and 1688.04 cm^{-1}), C=C stretching (1661.44 cm^{-1}) and C–F stretching (1055.95 cm^{-1}), confirming the identity of the drug. In the TA + HPMC E15 + Na CMC mixture, the ester carbonyl band appeared at 1745.52 cm^{-1} and C–F bands at 1235.32 and 1186.57 cm^{-1}, with the ether band of the polymers at 1055.80 cm^{-1}. In the TA + Na CMC mixture, the carbonyl band was retained at 1706.37 cm^{-1} and the carboxylate bands of Na CMC appeared at 1575.52 and 1419.72 cm^{-1}. In the TA + HPMC E15 mixture, the carbonyl band appeared at 1706.83 cm^{-1} and the ether bands of HPMC at 1235–1059 cm^{-1}. In all mixtures the characteristic drug bands were retained without disappearance of major peaks or appearance of prominent new bands, suggesting no major chemical interaction between TA and the polymers.[10,11]

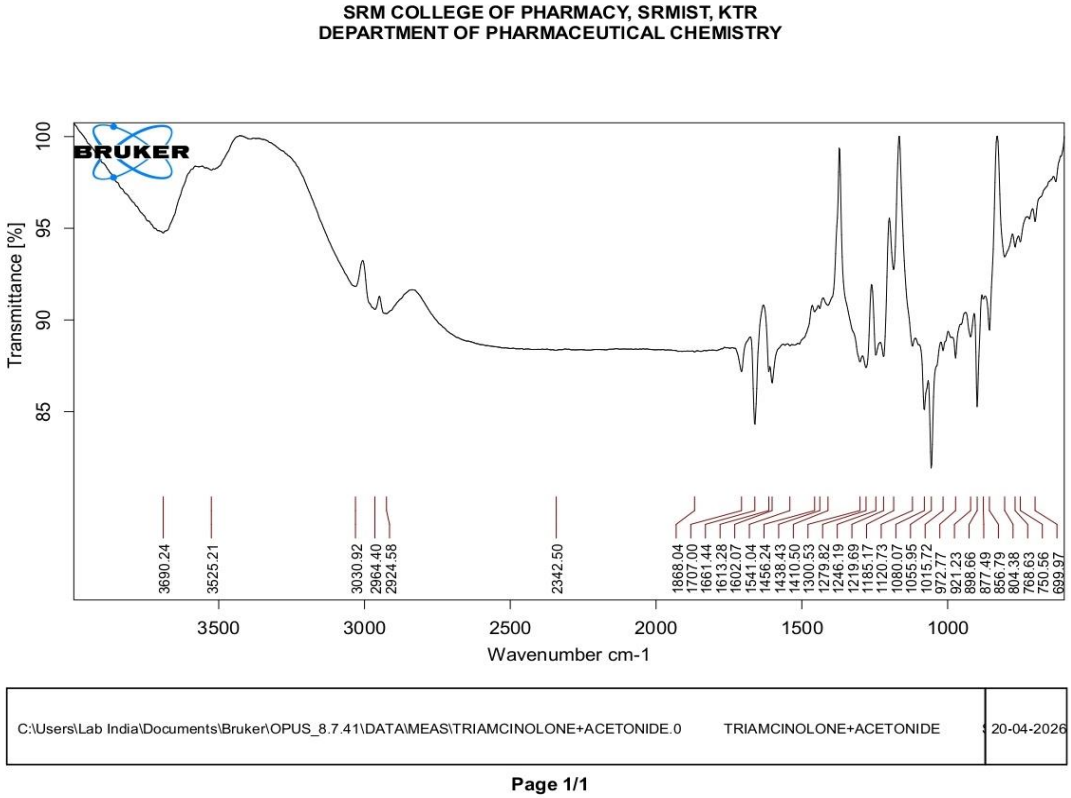


Fig. 2: FTIR spectrum of Triamcinolone acetonide.

Table 4: FTIR spectral interpretation of Triamcinolone acetonide.

S. NO.	OBSERVED PEAK (CM^{-1})	FUNCTIONAL GROUP	INTERPRETATION
1	3690.24	O–H stretching	Hydroxyl group
2	3525.21	O–H stretching	Secondary alcohol
3	3030.92	=C–H stretching	Olefinic group
4	2964.40	C–H stretching	Aliphatic group
5	2924.58	C–H stretching	Alkane
6	1688.04	C=O stretching	Ketone carbonyl
7	1707.00	C=O stretching	Conjugated ketone
8	1661.44	C=C stretching	Unsaturated steroid nucleus
9	1055.95	C–F stretching	Fluoro substituent

Inference

The FTIR spectrum showed all characteristic peaks corresponding to Triamcinolone Acetonide, confirming its identity and structural integrity. No abnormal peaks were observed.

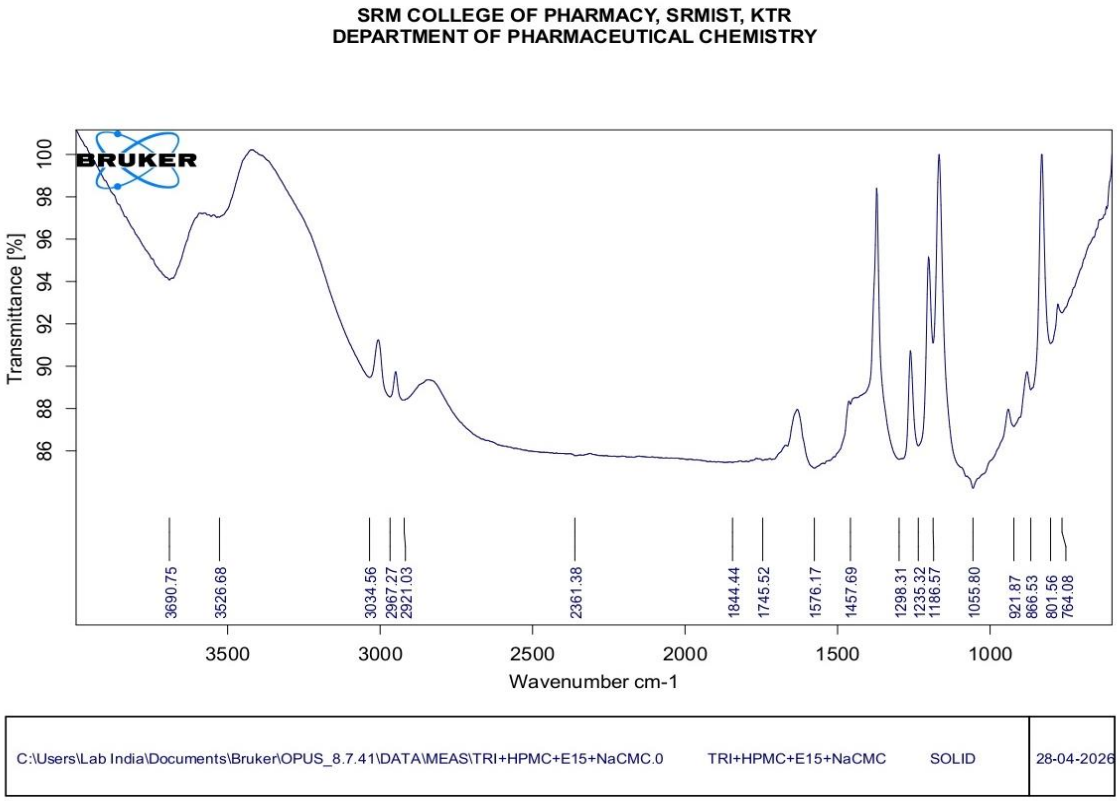


Fig. 3: FTIR spectrum of Triamcinolone acetonide + HPMC E15 + Sodium CMC.

Table 5: FTIR spectral interpretation of Triamcinolone acetonide + HPMC E15 + sodium CMC.

S. No.	Observed Peak (cm^{-1})	Functional Group	Interpretation
1	3690.75, 3526.68	O–H stretching	Hydroxyl groups of drug and polymers
2	3034.56	=C–H stretching	Unsaturated steroid nucleus
3	2962.27, 2921.03	C–H stretching	Aliphatic hydrocarbon vibrations
4	1745.52	C=O stretching	Ester carbonyl group of Triamcinolone Acetonide
5	1576.17	C=C stretching	Steroidal ring vibrations
6	1457.69	CH_2 bending	Aliphatic deformation
7	1298.31	C–O stretching	Ester linkage
8	1235.32, 1186.57	C–F stretching	Characteristic fluorinated corticosteroid peaks
9	1055.80	C–O–C stretching	Ether linkage of HPMC and Sodium CMC
10	921.87, 866.53	Ring vibrations	Steroidal skeletal vibrations
11	801.56, 764.08	C–H bending	Out-of-plane bending vibrations

Inference

The spectrum of the physical mixture was recorded in the range of 4000–400 cm^{-1} to identify any possible drug–excipient interactions. The characteristic peaks of Triamcinolone Acetonide were retained in the physical mixture without significant shifting or disappearance. The ester carbonyl peak was observed at 1745.52 cm^{-1}, while the characteristic C–F stretching vibrations appeared at 1235.32 cm^{-1} and 1186.57 cm^{-1}. The broad absorption band observed between 3690.75 and 3526.68 cm^{-1} corresponded to hydroxyl group stretching contributed by both the drug and hydrophilic polymers. The ether linkage of the polymers was evident at 1055.80 cm^{-1}.The ether linkage of the polymers was evident at 1055.80 cm^{-1}.The absence of any additional peaks or major changes in the characteristic absorption bands indicates that no chemical interaction occurred between the drug and the selected polymers. Therefore, HPMC E15 and Sodium CMC were found to be compatible with Triamcinolone Acetonide and suitable for the development of mucoadhesive buccal films.

The retention of characteristic peaks of Triamcinolone Acetonide in the physical mixture without the formation of new peaks confirms the compatibility of the drug with HPMC E15 and Sodium CMC.

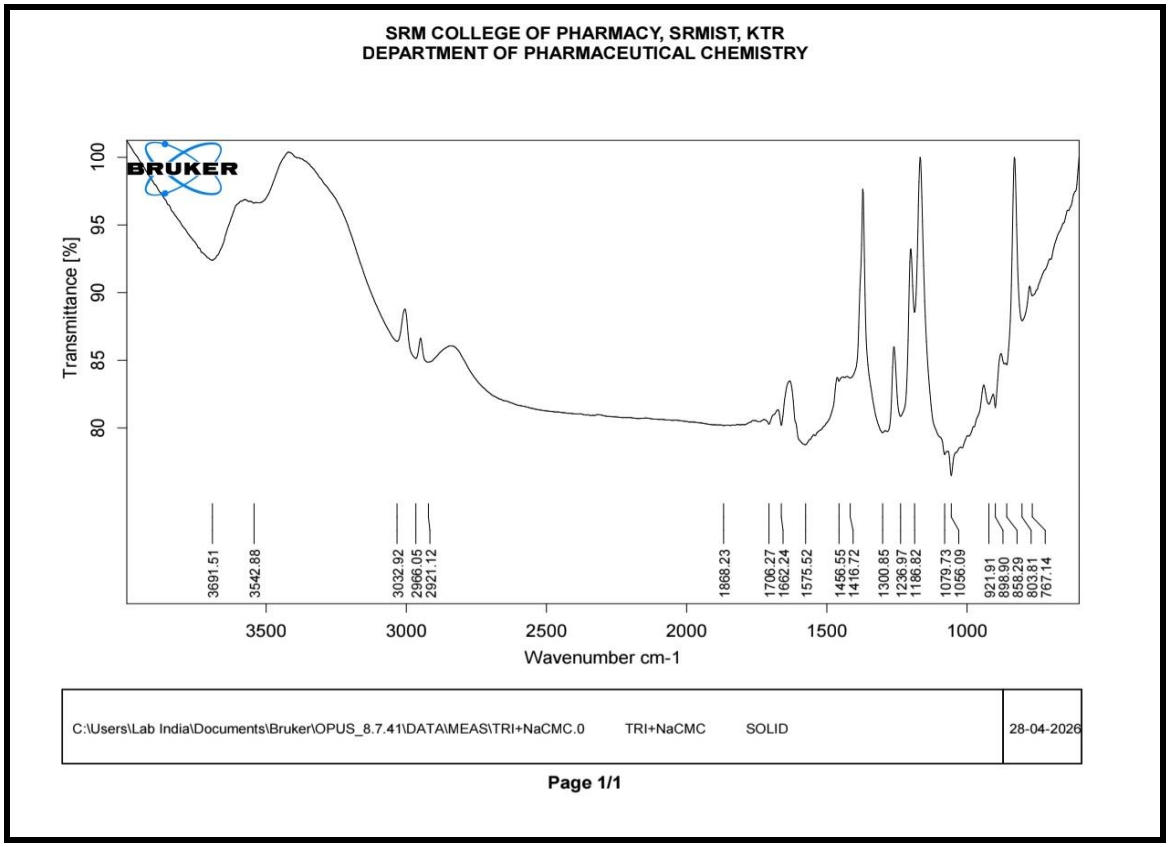


Fig. 4: FTIR spectrum of Triamcinolone acetonide + Sodium CMC.

Table 6: FTIR spectral interpretation of Triamcinolone acetonide + sodium CMC.

S.no	Observed Peak (cm^{-1})	Functional Group	Interpretation
1	3691.51	O–H stretching	Indicates hydroxyl groups present in the drug and polymer, including possible moisture-associated absorption.
2	3542.88	O–H stretching	Broad hydroxyl stretching characteristic of the hydrophilic polymer structure.
3	3032.92	=C–H stretching	Corresponds to C–H stretching associated with unsaturated groups.
4	2963.06	Aliphatic C–H stretching	Represents asymmetric stretching of CH_3 and CH_2 groups.
5	2921.12	Aliphatic C–H stretching	Indicates methylene and methyl group vibrations.
6	1706.37	C=O stretching	Characteristic carbonyl absorption corresponding to ester/ketone groups of triamcinolone acetonide.
7	1662.24	C=C/C=O stretching	Associated with unsaturation and conjugated carbonyl vibrations of the drug.
8	1575.52	COO^- asymmetric stretching	Characteristic asymmetric stretching of the carboxylate group present in Sodium CMC.
9	1456.55	CH_2 bending	Corresponds to deformation vibrations of methylene groups.
10	1419.72	COO^- symmetric stretching	Characteristic symmetric stretching vibration of the carboxylate group in Sodium CMC.
11	1301.32	C–O stretching	Represents C–O vibrations associated with the polymer and drug structure.
12	1236.97	C–O stretching	Associated with ether and alcohol functional groups.
13	1180.82	C–O–C stretching	Indicates glycosidic/ether linkage vibrations in Sodium CMC.
14	1070.79	C–O stretching	Characteristic of polysaccharide backbone vibrations.
15	1056.09	C–O–C stretching	Associated with ether linkages in Sodium CMC.
16	921.91–806.14	Fingerprint region vibrations	Represents skeletal and C–H deformation vibrations of the drug-polymer mixture.

Inference

The FTIR spectrum of the physical mixture of Triamcinolone Acetonide and Sodium CMC showed characteristic absorption bands corresponding to O–H, C–H, C=O, carboxylate (COO^-), and C–O functional groups. The characteristic carbonyl peak of Triamcinolone Acetonide was retained at approximately 1706.37 cm^{-1}. The characteristic carboxylate absorption bands of Sodium CMC were observed at approximately 1575.52 cm^{-1} and 1419.72 cm^{-1}, corresponding to asymmetric and symmetric stretching vibrations of the COO^- group, respectively.The retention of the characteristic peaks of both Triamcinolone Acetonide and Sodium CMC without significant peak disappearance or substantial shifts suggests the absence of any major chemical interaction between the drug and polymer. Hence, the FTIR study confirms that Triamcinolone Acetonide is compatible with Sodium CMC and the polymer can be considered suitable for formulation development.

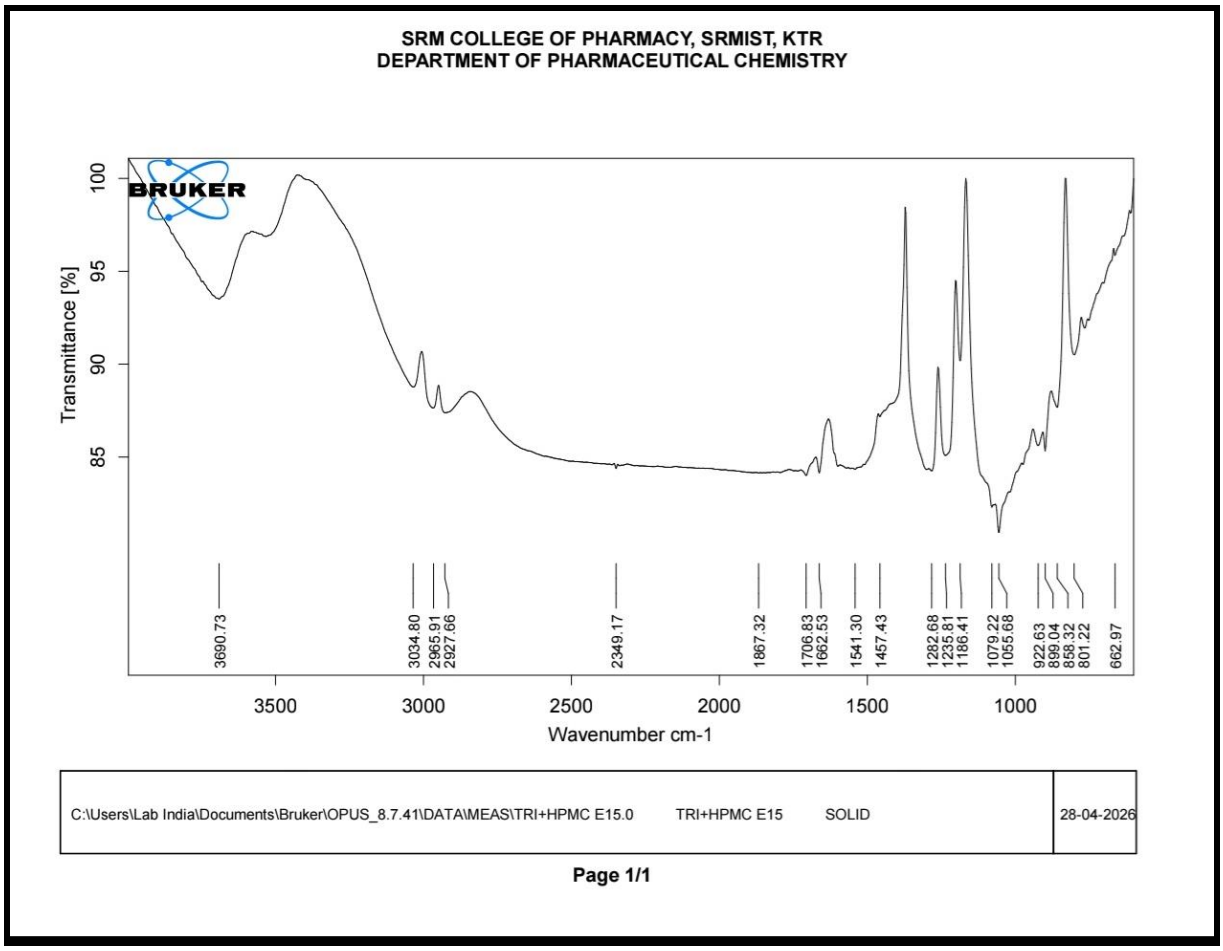


Fig. 5: FTIR spectrum of Triamcinolone acetonide + HPMC E15.

Table 7: FTIR spectral interpretation of Triamcinolone acetonide + HPMC E15.

S.no	Observed Peak (cm^{-1})	Functional Group	Interpretation
1	3690.73	O–H stretching	Indicates the presence of hydroxyl groups associated with triamcinolone acetonide and/or absorbed moisture.
2	3034.80	=C–H stretching	Represents C–H stretching associated with unsaturated groups.
3	2966.11	Aliphatic C–H stretching	asymmetric stretching of CH_3/CH_2 groups.
4	2927.66	Aliphatic C–H stretching	Indicates the presence of methylene and methyl groups in the drug and polymer structure.
5	1706.83	C=O stretching	Characteristic carbonyl stretching corresponding to ester/ketone functional groups of triamcinolone acetonide.
6	1662.65	C=C/C=O stretching	Associated with unsaturation and conjugated carbonyl groups present in triamcinolone

			acetonide.
7	1541.30	C=C skeletal vibration	Represents skeletal vibrations within the molecular structure.
8	1457.43	CH_2 bending	Corresponds to deformation vibrations of aliphatic CH_2 groups.
9	1282.68	C–O stretching	Indicates C–O vibrations associated with ester and alcohol functionalities.
10	1235.16	C–O–C stretching	Characteristic ether linkage vibration, mainly associated with HPMC.
11	1186.41	C–O stretching	Corresponds to ether and alcohol functional groups.
12	1079.22	C–O–C stretching	Characteristic of ether linkages present in HPMC E15.
13	1059.86	C–O stretching	Indicates alcohol and ether functional groups.
14	922.63	C–H bending	Represents out-of-plane bending vibrations.
15	899.04	Fingerprint region vibrations	Corresponds to skeletal and C–H deformation vibrations of the drug-polymer mixture.

Inference

The FTIR spectrum of the physical mixture of Triamcinolone Acetonide and HPMC E15 exhibited characteristic absorption peaks corresponding to hydroxyl (O–H), aliphatic C–H, carbonyl (C=O), C–O, and C–O–C functional groups. The characteristic carbonyl peak of triamcinolone acetonide was observed at approximately 1706.83 cm^{-1}, while the ether-related peaks characteristic of HPMC E15 were observed in the region of 1235–1059 cm^{-1}.

The characteristic functional groups of both the drug and polymer were retained in the spectrum without significant disappearance or major shifting of peaks. Therefore, the FTIR results indicate that Triamcinolone Acetonide is compatible with HPMC E15, and no significant chemical interaction was observed between the drug and polymer.

3.2 Evaluation of the films

Physical appearance. All films were smooth and flexible. F1–F4 were white, clear and transparent, while F5 and F6 were milky white and translucent. The loss of clarity at the two highest Aloe vera levels suggests that the film matrix became less transparent as Aloe vera content increased.

Thickness and weight. Mean thickness ranged from 0.480 ± 0.000 mm (F2) to 0.563 ± 0.012 mm (F5) (Table 4). Thickness and mean weight (48.20 ± 0.84 to 50.00 ± 0.71 mg) both rose gradually from F1 to F6, with low variation between individual films, indicating reasonably uniform film formation and consistent film units.[12,13]

Folding endurance. Folding endurance ranged from 187.00 ± 5.00 (F6) to 222.67 ± 7.77 (F2) and decreased with increasing Aloe vera content, but all films withstood well over 150 folds, showing adequate flexibility.

Surface pH. Surface pH rose steadily from 6.52 (F1) to 7.28 (F6). All values lie close to the neutral range of the oral cavity, so the films are unlikely to irritate the mucosa.[12,14]

Table 8: Physical characteristics of the films (mean ± SD).

Formulation	Thickness (mm, n = 3)	Folding endurance (n = 3)	Surface pH	Weight (mg, n = 5)
F1	0.483 ± 0.006	220.33 ± 15.73	6.52	48.20 ± 0.84
F2	0.480 ± 0.000	222.67 ± 7.77	6.55	48.60 ± 0.55
F3	0.500 ± 0.010	218.33 ± 6.03	6.79	49.00 ± 0.71
F4	0.500 ± 0.000	196.00 ± 4.36	6.98	49.00 ± 0.71
F5	0.563 ± 0.012	191.00 ± 3.61	7.19	49.80 ± 0.84
F6	0.563 ± 0.006	187.00 ± 5.00	7.28	50.00 ± 0.71

Disintegration time. All films disintegrated completely in phosphate buffer pH 6.8 without visible residue. For each formulation, the disintegration times were rising from 22 min (F1) to 30 min (F6) (table 9). The slight increase with Aloe vera content is consistent with the thicker, more polymer-rich films, and all films would dissolve rapidly once hydrated.[14,15]

Drug content. Drug content ranged from 93.33% (F1) to 98.83% (F6) (Table 9), showing satisfactory and consistent incorporation of TA into the film matrix.[12,13,16] F4 contained 97.37% of the labelled drug.

Table 9: Disintegration time and drug content.

Formulation	Disintegration Time (min)	Drug content (%)
F1	22	93.33
F2	23	94.40
F3	25	96.10
F4	27	97.37
F5	28	98.27
F6	30	98.83

In-vitro dissolution. All formulations showed a progressive rise in cumulative drug release over 30 min (Table 6). Release became slower as Aloe vera content increased: F1 was fastest and F6 slowest, with 99.2%, 97.5%, 95.1%, 92.6%, 89.8% and 86.7% released at 30 min for F1–F6 respectively. F4 released 51.0% at 6 min, 74.5% at 10 min and 92.6% at 30 min. The slower release at higher Aloe vera levels may reflect greater hydration and viscosity of the swollen polymer matrix, which would slow the diffusion of TA, although this was not tested directly in this study.[17,18]

Table 10: In-vitro cumulative drug release (%) in phosphate buffer pH 6.8.

Time (min)	F1	F2	F3	F4	F5	F6
0	0.0	0.0	0.0	0.0	0.0	0.0
2	28.4	25.7	23.1	20.8	18.5	16.9
4	46.8	43.2	39.7	36.1	32.8	29.6
6	62.7	59.1	55.0	51.0	47.2	43.5
8	75.8	72.3	68.4	64.5	60.6	56.8
10	84.6	81.7	78.0	74.5	70.8	67.1
15	93.1	90.7	87.6	84.3	80.9	77.4
30	99.2	97.5	95.1	92.6	89.8	86.7

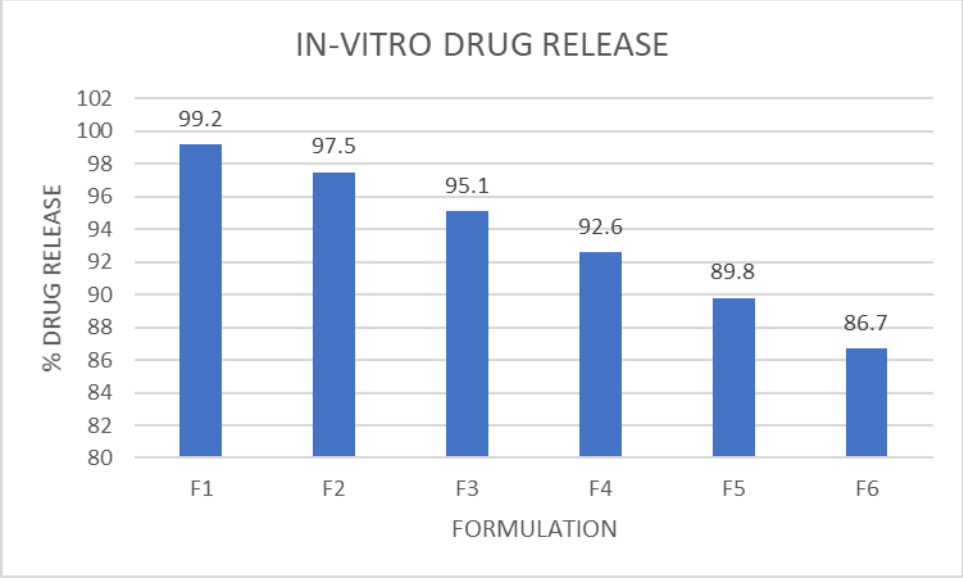


Fig. 6: In vitro drug release chart.

3.3 Selection of the optimized formulation

The formulations were compared on appearance, thickness, folding endurance, surface pH, weight uniformity, dispersion/disintegration, drug content and dissolution. F5 and F6 were thicker, less flexible and translucent, and released the drug most slowly (89.8% and 86.7% at 30 min). F1–F3 released faster, but F1 contained no Aloe vera, and F2 and F3 had lower drug content (94.40% and 96.10%) than F4. F4 produced a clear, flexible film (about 0.50 mm thick; 196 folds) with a near-neutral surface pH of 6.98, a drug content of 97.37%, rapid disintegration (27 s) and 92.6% drug release at 30 min while still containing Aloe vera. Therefore **F4** is selected as the optimized formulation.

3.4 Limitations

This is a formulation and in-vitro characterization study. Mucoadhesive strength, residence time, swelling behavior, ex-vivo permeation, long-term stability and in-vivo or clinical performance were not evaluated, and FTIR compatibility was assessed for TA with the polymers but not with Aloe vera. These studies are needed before the films can be considered ready for use in RAS.[19]

4. CONCLUSION

Aloe vera-based buccal films of triamcinolone acetonide were successfully prepared by solvent casting using HPMC E15 and Na CMC. FTIR studies indicated no major interaction between TA and the polymers. All six formulations were smooth and flexible, with a near-neutral surface pH, uniform weight, rapid disintegration (22–30 s) and satisfactory drug content (93.33–98.83%). Increasing the Aloe vera content slowed drug release, from 99.2% (F1) to 86.7% (F6) at 30 min. F4 gave the best balance of physical, mechanical and drug-release properties and is a promising candidate for localized delivery of TA in recurrent aphthous stomatitis. Mucoadhesion, ex-vivo permeation and stability studies are planned.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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