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Clotrimazole Loaded Topical Gels: Formulation, Development and *In-vitro* Evaluation

Balakrishnan M[*1], Perumallu Sudarsanam[2], Neelima T[3], Lavanya E[3], Vidya S[3], Ajith Kumar K[3], Akash N[3], Gayathri Y[3]

[1]Department of Pharmacognosy, Seshachala College of Pharmacy, Nagari road, Puttur-517 583, Chittoor (Dist), Andhra Pradesh, India
[2]Department of Pharmaceutics, Seshachala College of Pharmacy, Nagari road, Puttur-517 583, Chittoor (Dist), Andhra Pradesh, India
[3]Seshachala College of Pharmacy, Nagari road, Puttur-517 583, Chittoor (Dist), Andhra Pradesh, India

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ABSTRACT

The present study aimed to formulate and evaluate clotrimazole topical gel. Clotrimazole topical gel was prepared by dispersion method by utilizing various gelling agents like Carbopol 934p, HPMC K100, and Sodium alginate in three different ratios to achieve desired drug release. Prepared six gel formulations of clotrimazole were evaluated for pH, Viscosity, Drug content, Drug diffusion studies, and Drug release kinetic studies. The Drug-polymer compatibility reports have been done by FTIR absences of extraneous interactions among excipients. CTZGF4 releases 99.53% of the drug at the end of 8 hours and was considered as the best formulation. Therefore, formulations containing Carbopol produced better results than other formulations.

*Corresponding Author

Name: Balakrishnan M
Phone: 9490846668
Email: mbalakrishnan66@yahoo.com

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INTRODUCTION

Clotrimazole is a lipid-soluble imidazole derivative. It is widespread antimycotic agent [1]. It commonly prescribed shows poor bioavailability, referable low misty solubility as well as slow dissolution prospering water [2]. Gels are semisolid systems in which a liquid phase is constrained within a three-dimensional polymeric matrix in which a high degree of physical cross-linking [3].

MATERIALS & METHODS

Clotrimazole (Pearl pharma, Islamabad), HPMC, Carbopol 934, sodium alginate, triethanolamine (Sigma Aldrich, Germany), PEG 400, propylene alcohol, Ethanol, DMSO (Merck, Germany) other chemicals of analytical reagent grade were procured from S.D Fine Chemicals Ltd, Mumbai.

Methodology

FT-IR Studies

The clotrimazole topical gel and other excipients are smooth pellet method with a KBr smart up [4].

Formulation

The polymers such as HPMC K100, Sodium alginate, Carbopol 934 were molten in a renowned measure of pure water. After complete dispersion the polymer way out celebrated a side for 24 hours for the reason that to complete the swelling. An appropriately weighed amount of clotrimazole was dissolved in a such that measure of DMSO, Polyethylene Glycol was liquefied in detail with high speed magnetic stitter (500rpm) attractive precautions [5]. Lastly

ethanol and propylene glycol used to be also seek a homogenous dispersal of gel [Table 1].

Evaluation of Topical Gel

Clarity

The varied formulation depends on inspection beneath black and white background [6] as well as it was graded hence; turbid +, clear ++, very clear (glassy) +++.

pH

It revolves around with a digital pH meter. The pH each formulation was worn out triplicate and ordinary values has been calculated [7].

Spreadability

The 1gm containing gel enclosed by two glass plates subsequent to 1 min the mass of the upper plate put on the top of two slides for 5min to expel air and to provide an identical film of gel enclosed by the slides [8].

Viscosity

The viscosity of the prepared gels was plumbed employing a brook field viscometer. The viscosity of the gel was noted [9].

Drug Content

The 1 gm in reference to gel melted in 6.8 pH Phosphate buffer subsequent to suitable preparation absorbance used to be recorded employing a UV visible spectrometer at 240 nm [10].

In vitro diffusion study

The Planned out gel transmit in a Franz diffusion cell. The phosphate buffer give up in a receptor compartment, after that 1 gm gel was spread uniformly on the membrane [11]. The donor compartment was approach with a receptor compartment and the room temperature was serviced at 37±0.5°C.

Kinetic Treatment

The data acquired from the *in vitro* diffusion tests obtain the kinetic track record analysis.

Zero-order kinetics: $Q_t = Q_o + K_o t$

First-order kinetics: $Q_t = log\ Q_o + K_1 t/2.303$

Higuchi model: $Q_t = K_H \cdot t^{1/2}$

Korsmeyer-Peppas release model: $Mt / M_\infty = K \cdot t^n$

RESULTS & DISCUSSION

Compatibility studies

There has been no interaction within the functional groups as the principal peaks the drug-polymer mixture [Table 2] & [Figures 1 and 2].

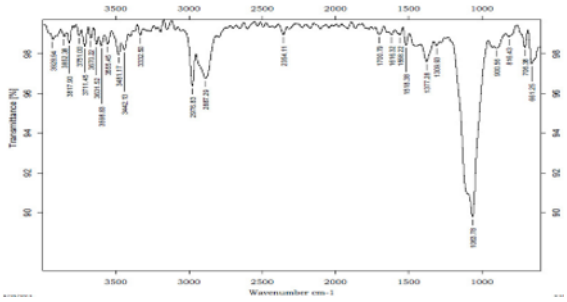

Figure 1: IR Spectra of Clotrimazole

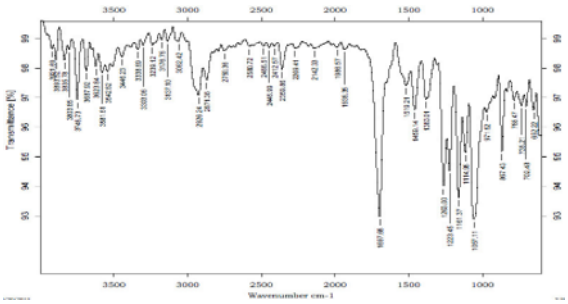

Figure 2: IR Spectra of Mixture

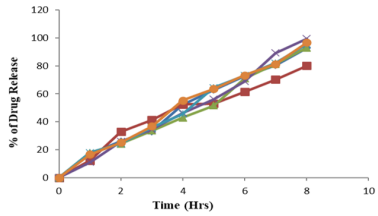

Figure 3: *In-vitro* drug release Profiles of Formulations CTZGF1-CTZGF6

Evaluation of Clotrimazole Topical Gels

Clarity

All gels have been strain ubiquity of particles & translucent and white viscous [Table 3].

pH

The CTZGF1-CTZGF6 cooperate the variability of 6.2 to 6.9 [Table 3].

Homogeneity

The CTZGF1-CTZGF6 exhibited to good homogeneity using the omission of lumps [Table 3].

Spreadability

The spreadability of gels follows the ranges 19.51 g.cm/sec - 33.91 g.cm/sec [Table 3].

Viscosity

The various formulated gels repose a variety of 86.28 centipoises to 96.22 centipoises [Table 3].

Drug Content

The prepared gel formulations encounter impending within the range of 78.53 % to 98.56 % [Table 3].

Table 1: Formulation Data of Clotrimazole Topical Gels

Formulation code	Drug (mg)	HPMC K4 (mg)	Carbopol 934 (mg)	Sodium Alginate (mg)	Permeation enhancer (Ethanol: PG)	PEG
CTZGF1	200	70	-	-	10%	5%
CTZGF2	200	100	-	-	10%	5%
CTZGF3	200	-	70	-	10%	5%
CTZGF4	200	-	100	-	10%	5%
CTZGF5	200	-	-	70	10%	5%
CTZGF6	200	-	-	100	10%	5%

Table 2: Interpretation Data of IR Spectra of Mixture

FTIR Spectrum	IR absorption bands (cm-1)		Bond	Functional group
	Observed peak	Characteristic peak		
Clotrimazole	3711.45	3700-3500	O-H (stretch)	Alkenes, Aromatic ring
	1700.79	1810-1775	C=O stretch	Alkynes
	1196.52	1300-1100	C-C stretch	Aldehyde, Ketones
Mixture	1700.79	1810-1775	C=O stretch	Alkynes
	3687.92	3700-3500	O-H (stretch, free)	Alkenes, Aromatic ring
	1697.68	1640-1610	C=C stretch (conjugated)	Alkenes, aromatic ring
	1223.45	~1250	C-O-C stretch	Aldehyde, Ketones

Table 3: Evaluation Parameters of Developed Gel

Formulation Code	Clarity	pH	Homogeneity	Spread Ability (g.cm/sec)	Viscosity (cps)	Drug Content (%)
CTZGF1	++	6.1	Good	32.32	9376	88.92
CTZGF2	++	6.3	Good	22.54	9545	78.53
CTZGF3	+++	6.4	Good	33.65	9376	94.30
CTZGF4	+++	6.5	Good	36.24	9442	98.56
CTZGF5	+++	6.2	Good	32.32	8375	91.82
CTZGF6	++	6.1	Good	23.43	9267	92.02

Turbid: +, Clear: ++, Very clear (glassy): +++

Table 4: *In-vitro* drug release of Formulated gels

Time (Hrs)	% Drug Release					
	CTZGF1	CTZGF2	CTZGF3	CTZGF4	CTZGF5	CTZGF6
1	16.86	12.28	17.89	11.06	17.98	16.64
2	25.98	32.98	24.25	25.76	24.23	25.23
3	33.16	41.36	33.67	34.56	35.90	36.76
4	52.18	52.46	42.86	46.24	45.60	55.34
5	62.86	52.93	51.66	56.22	64.38	63.55
6	72.56	61.50	70.88	68.90	73.14	73.23
7	80.46	70.34	81.45	89.34	81.98	81.34
8	92.86	80.14	93.06	99.53	95.60	96.65

Table 5: Correlation coefficient data and diffusion exponent data of CTZGF1-CTZGF6 formulations

Formulation code	Correlation Coefficient Values (r^2)				Diffusion Exponent Value (n)
	Zero-order	First order	Higuchi	Korsmeyer-Peppas	
CTZGF1	0.9708	0.9240	0.9747	0.9781	0.5902
CTZGF2	0.9700	0.9135	0.9781	0.9881	0.6021
CTZGF3	0.9795	0.9076	0.9805	0.9910	0.6439
CTZGF4	0.9883	0.9422	0.9858	0.9968	0.7380
CTZGF5	0.9689	0.9326	0.9802	0.9763	0.5911
CTZGF6	0.9711	0.9154	0.9833	0.9885	0.6052

In vitro drug diffusion studies

These release studies unconcealed so the order of waiver as proven in Table 4 and Figure 3. The Correlation coefficient data and diffusion exponent data of formulation [Table 5].

CONCLUSION

It can be concluded from the present investigation that proper selection of polymers and drugs is a prerequisite for designing and developing a topical gel. The varying concentrations of the three polymers were found to influence drug release, Spreadability, and viscosity. Topical Gel formulations prepared with Carbopol 934p, HPMC K 100, and Sodium alginate have shown good homogeneity and stability. However the Carbopol 934p (CTZGF4) based gel well tried impending flair of choice since it showed the top percent of drug release and good rheological properties. *In vitro* release study has shown that increased concentration of polymers has improved drug release.

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Conflict of Interest

The authors attest that they have no conflict of interest in this study.

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