

Preparation of quercetin loaded porous microsphere-composed gel for the treatment of atopic dermatitis in BALB/c mice

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Optimization of gel

Tab. S1 Effect of different concentration of Carbomer 934 on gels

Concentration of carbomer 934 (mg/mL)	Gelatability	Appearance
1	No gel	Transparent and delicate
5	No gel	Transparent and delicate
10	Gel	Transparent and delicate
15	Gel	Transparent and delicate
20	Gel	Transparent and delicate
25	Gel	Translucent and hard
30	Gel	Translucent and hard

Tab. S2 Effect of different concentration of glycerol on gels

Concentration of glycerol (mg/mL)	Gelatability	Appearance
25	Gel	No oily
50	Gel	No oily
75	Gel	Moderate lubrication
100	Gel	Moderate lubrication
125	Gel	Moderate lubrication
150	Gel	Over oiling

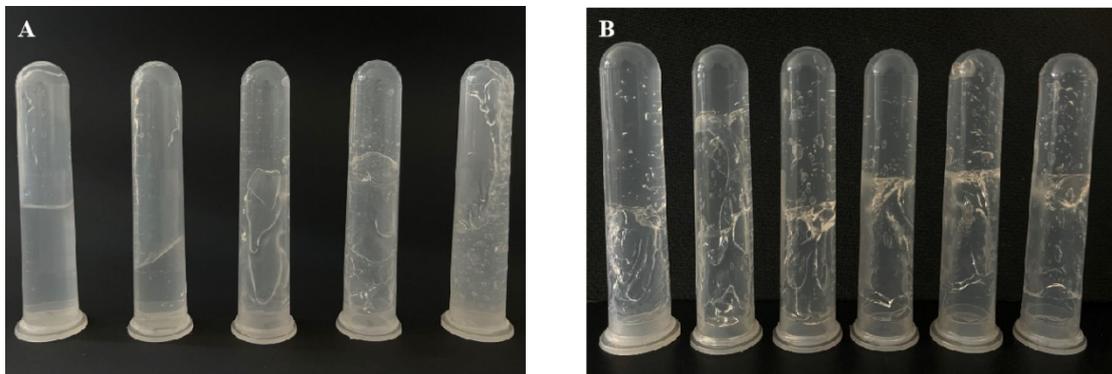


Fig. S1 (A) Effect of different concentration of Carbomer 934 on gels. (B) Effect of different concentration of glycerol on gels.

Carbomer concentration significantly affects gel spreadability and dosing accuracy. Results indicate that gels prepared with Carbomer 934 at concentrations between 10–20 mg/mL exhibit excellent properties, with a fine texture and pleasant skin feel. The optimal carbomer concentration was further determined through orthogonal experimental design. Glycerin concentration had minimal impact on gel formation but significantly influenced skin feel during application. Gels prepared within the 75–125 mg/mL glycerin range exhibited superior skin feel.

Tab. S3 Orthogonal test optimization design and results

No.	Factors			Cumulative release (%)
	A: Carbomer 934 (mg/mL)	B: Glycerin (mg/mL)	C: Quercetin (mg/mL)	
1	10	75	0.5	47.42
2	10	100	1.0	54.86

3	10	125	1.5	40.96
4	15	75	1.0	52.62
5	15	100	1.5	48.42
6	15	125	0.5	63.93
7	20	75	1.5	39.08
8	20	100	0.5	60.71
9	20	125	1.0	52.67
K ₁	47.75	46.37	57.35	
K ₂	54.99	54.66	53.38	
K ₃	50.82	52.52	42.82	
R	7.24	8.29	14.53	
order			C>B>A	
Optimal combination			A2B2C1	

Analysis of the orthogonal test data revealed that the R-value determined the order of importance for the three factors as $C > B > A$. Thus, the order of influence for the four factors was quercetin addition amount, glycerol dosage, and carbomer 934 concentration. Based on the K-value, the optimal selections for quercetin addition amount, glycerol dosage, and carbomer 934 concentration were A2, B2, and C1, respectively. The optimal combination of the three factors is A2B2C1, corresponding to a carbomer 934 concentration of 15 mg/mL, a glycerol dosage of 100 mg/mL, and a quercetin addition of 0.5 mg/mL.