

**FORMULASI DAN KARAKTERISASI NANOEMULSI
ISOLAT KURKUMIN MENGGUNAKAN *SIMPLEX LATTICE*
*DESIGN***

SKRIPSI

**ARYANI NURJANAH
A242032**



**SEKOLAH TINGGI FARMASI INDONESIA
YAYASAN HAZANAH
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Sebagai salah satu syarat untuk memperoleh gelar Sarjana Farmasi

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A242032**



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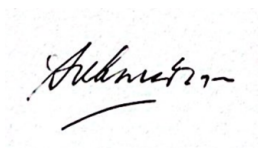
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September 2025

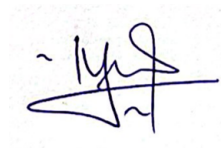
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Kutipan atau saduran ini sebagian atau apapun seluruh naskah, harus menyebut nama pengarang dan sumber aslinya, yaitu Sekolah Tinggi Farmasi Indonesia.

Skripsi ini dipersembahkan untuk kedua orang
tuaku “Ya allah berikan kesehatan selalu
untuk kedua orang tuaku” Terimakasih
kepadamu ya allah dan untuk diriku sendiri
yang telah berjuang hingga berada dititik ini.

ABSTRAK

Penuaan kulit merupakan proses multifaktorial ditandai dengan kerutan, elastisitas kulit yang berkurang, hiperpigmentasi, dan tekstur kulit yang kasar. Kurkumin berpotensi untuk mengurangi penuaan kulit, namun memiliki penetrasi yang rendah ke dalam kulit, sehingga dibutuhkan sistem penghantaran nanoemulsi. Penelitian ini bertujuan mengembangkan formula nanoemulsi mengandung isolat kurkumin yang optimal menggunakan *simplex lattice design* dengan tiga faktor, yaitu minyak cengkeh (5–10%), PEG-40 HCO (10–20%) dan propilen glikol (10–15%) dengan respon persen transmitan. Berdasarkan hasil analisis *simplex lattice design* didapatkan formula optimum yaitu minyak cengkeh 5%, PEG-40 HCO 17,531% dan propilen glikol 12,469% dengan nilai *desirability* sebesar 1,000. Nanoemulsi yang dihasilkan memiliki pH $5,29 \pm 0,009$, viskositas $24,67 \pm 0,471$ cP, hasil sentrifugasi dengan tidak terjadi *creaming* dan pemisahan fase namun terdapat sedikit pengendapan, persen transmitan $99,535 \pm 0,260\%$, ukuran doplet $17,8 \pm 0,7$ nm, PDI $0,133 \pm 0,021$, dan zeta potensial $-31,6$ mV. Uji penetrasi kulit secara *in vitro* menunjukkan nanoemulsi kurkumin memiliki kemampuan penetrasi yang lebih baik dibandingkan emulsi kurkumin dengan persentase difusi sebesar 87,795% selama 240 menit. Hasil penelitian ini didapatkan formula optimum nanoemulsi isolat kurkumin dengan karakteristik fisik yang baik.

Kata kunci: Nanoemulsi, Kurkumin, *Simplex lattice design*, *Antiaging*, Penetrasi kulit

ABSTRACT

Skin aging is a multifactorial process characterized by wrinkles, reduced elasticity, hyperpigmentation, and rough skin texture. Curcumin has the potential to reduce skin aging; however, it has poor skin penetration, thus a nanoemulsion delivery system is required. This study aimed to develop an optimal nanoemulsion formulation containing curcumin isolate using a simplex lattice design with three factors, namely clove oil (5–10%), PEG-40 HCO (10–20%), and propylene glycol (10–15%), with percent transmittance as the response. Based on simplex lattice design analysis, the optimum formula consisted of 5% clove oil, 17,531% PEG-40 HCO, and 12,469% propylene glycol with a desirability value of 1,000. The resulting nanoemulsion had a pH of $5,29 \pm 0,009$, viscosity of $24,67 \pm 0,471$ cP, centrifugation results with no creaming or phase separation but slight precipitation, percent transmittance of $99,535 \pm 0,260\%$, droplet size of $17,8 \pm 0,7$ nm, PDI of $0,133 \pm 0,021$, and zeta potential of $-31,6$ mV. In vitro skin penetration testing showed that the curcumin nanoemulsion exhibited better penetration ability than the curcumin emulsion, with a diffusion percentage of 87,795% within 240 minutes. The results indicated that the optimum curcumin isolate nanoemulsion formula possessed good physical characteristics.

Keywords: *Nanoemulsion, Curcumin, Simplex lattice design, Antiaging, Skin penetration*

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DAFTAR ISI

LEMBAR PENGESAHAN	i
KUTIPAN	ii
PERSEMBAHAN	iii
ABSTRAK	iv
<i>ABSTRACT</i>	v
KATA PENGANTAR	vi
DAFTAR ISI	vii
DAFTAR TABEL	ix
DAFTAR GAMBAR	x
DAFTAR LAMPIRAN	xi
BAB I PENDAHULUAN	1
1.1 Latar Belakang	1
1.2 Identifikasi Masalah	2
1.3 Tujuan Penelitian	2
1.4 Kegunaan Penelitian	3
1.5 Waktu dan Tempat Penelitian	3
BAB II TINJAUAN PUSTAKA	4
2.1 Kulit	4
2.1.1 Struktur Kulit	4
2.1.2 Fungsi Kulit	6
2.1.3 Sistem Penghantaran Obat Melalui Kulit	7
2.2 Penuaan Kulit	8
2.2.1 Faktor Penuaan Intrinsik	9
2.2.2 Faktor Penuaan Ekstrinsik	9
2.3 <i>Antiaging</i>	10
2.4 Kunyit (<i>Curcuma longa</i> L.)	10
2.3.1 Morfologi	11
2.3.2 Kandungan Senyawa Kunyit	11
2.3.3 Khasiat dan Manfaat Kunyit	12
2.5 Kurkumin	12
2.6 Nanoemulsi	12
2.6.1 Definisi	12
2.6.2 Komponen Nanoemulsi	13
2.6.3 Metode Pembuatan Nanoemulsi	14
2.6.4 Kelebihan Nanoemulsi	15
2.6.5 Mekanisme Nanoemulsi dalam Meningkatkan Penetrasi	15
2.7 Eksipien	18
2.7.1 Minyak Cengkeh	18
2.7.2 Polietilen Glikol 40 <i>Hydrogenated Castor Oil</i>	18

2.7.3	Propilen Glikol	18
2.8	<i>Design Expert</i>	19
BAB III	TATA KERJA	20
3.1	Alat	20
3.2	Bahan	20
3.3	Metodologi Penelitian.....	20
3.3.1	Optimasi Formula Nanoemulsi Kurkumin	20
3.3.2	Formulasi Nanoemulsi Kurkumin	21
3.3.3	Karakterisasi Nanoemulsi Kurkumin	22
BAB IV	HASIL & PEMBAHASAN.....	25
4.1	Optimasi Formula Nanoemulsi Kurkumin	25
4.2	Formula Optimum Nanoemulsi Kurkumin.....	28
4.3	Karakterisasi Nanoemulsi.....	31
4.3.1	Uji Organoleptik.....	31
4.3.2	Uji Viskositas	32
4.3.3	Penetapan pH.....	32
4.3.4	Uji Sentrifugasi.....	33
4.3.5	Uji Ukuran Droplet dan <i>Polydispersity Index</i> (PDI)	33
4.3.7	Zeta Potensial	35
4.3.8	Uji Penetrasi Kulit	36
BAB V	SIMPULAN & ALUR PENELITIAN SELANJUTNYA	40
5.1	Simpulan.....	40
5.2	Alur Penelitian Selanjutnya.....	40
DAFTAR PUSTAKA		41
LAMPIRAN		50

DAFTAR TABEL

Tabel		Halaman
3.1	Faktor dan Respon SLD.....	20
3.2	Optimasi Formula Nanoemulsi Kurkumin SLD.....	21
4.1	Hasil Respon Persentase Transmittan.....	26
4.2	Analisis Model Eksperimen.....	27
4.3	Uji ANOVA terhadap Respon.....	27
4.4	Hasil Analisis Regresi terhadap Respon.....	27
4.5	Formula Optimum Nanoemulsi Kurkumin.....	29
4.6	Hasil Validasi Formula Optimum terhadap Respon	29
4.7	Hasil Karakterisasi Nanoemulsi Kurkumin.....	31

DAFTAR GAMBAR

Tabel	Halaman
2.1 Struktur Lapisan Kulit.....	4
2.2 Lapisan Epidermis.....	4
2.3 Rute Penghantaran Obat Melalui Kulit.....	8
2.4 Kunyit.....	11
2.5 Struktur Kurkumin.....	12
2.6 (A) Nanoemulsi Minyak dalam Air m/a (B) Nanoemulsi Air dalam Minyak a/m.....	13
2.7 Mekanisme Nanoemulsi dalam Meningkatkan penetrasi.....	15
2.8 Struktur Polietilen Glikol 40 <i>Hydrogenated Castor Oil</i>	18
2.9 Struktur Propilen Glikol.....	18
4.1 Organoleptik 11 Run.....	26
4.2 Plot kontur (a) plot permukaan model 3D (b)	28
4.3 Plot kontur <i>desirability</i> dan prediksi respon formula optimum	29
4.4 Organoleptik Nanoemulsi Kurkumin.....	31
4.5 Grafik Pengujian Ukuran Droplet (a) Replikasi 1, (b) replikasi 2, (c) replikasi 3.....	34
4.6 Grafik Pengujian Zeta Potensial.....	35
4.7 Panjang Gelombang Maksimum Kurkumin.....	36
4.8 Grafik Kurva baku.....	36
4.9 Grafik Uji Penetrasi Nanoemulsi Kurkumin.....	37
4.10 Grafik Fluks Nanoemulsi Kurkumin.....	38

DAFTAR LAMPIRAN

Tabel	Halaman
1. Hasil Optimasi <i>Simplex Lattice Design</i>	48
2. Hasil Karakterisasi Nanoemulsi.....	50
3. Hasil Uji Penetrasi.....	52
4. Hasil Pengujian Ukuran Droplet dan PDI.....	55
5. Hasil Pengujian Zeta Potensial.....	62
6. Prosedur Kerja.....	63
7. <i>Certificate of Analysis</i> Isolat Kurkumin.....	65
8. <i>Certificate of Analysis</i> Minyak Cengkeh.....	66
9. <i>Certificate of Analysis</i> PEG-40 HCO.....	67
10. <i>Certificate of Analysis</i> Propilen Glikol.....	69
11. <i>Certificate of Analysis</i> Aquadest.....	70
12. <i>Certificate of Analysis</i> Kalium Dihidrogen Fosfat Pro Analisis.....	71
13. <i>Certificate of Analysis</i> Metanol Pro Analisis.....	72

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