

FORMULATION OF CURCUMIN NANOEMULSION GEL FOR SQUAMOUS CELL CARCINOMA

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INTRODUCTION

- Squamous cell carcinoma (SCC), the second most common non-melanoma skin cancer globally, is attributed to ultraviolet radiation exposure.
- Current therapeutic approaches including surgery, radiotherapy, and chemotherapy present limitations in patient compliance and systemic toxicity.
- Curcumin, a natural bioactive compound with anticancer properties, faces challenges in topical delivery due to poor aqueous solubility and limited bioavailability.
- This study aimed to develop a curcumin-loaded nanoemulsion gel for SCC treatment.

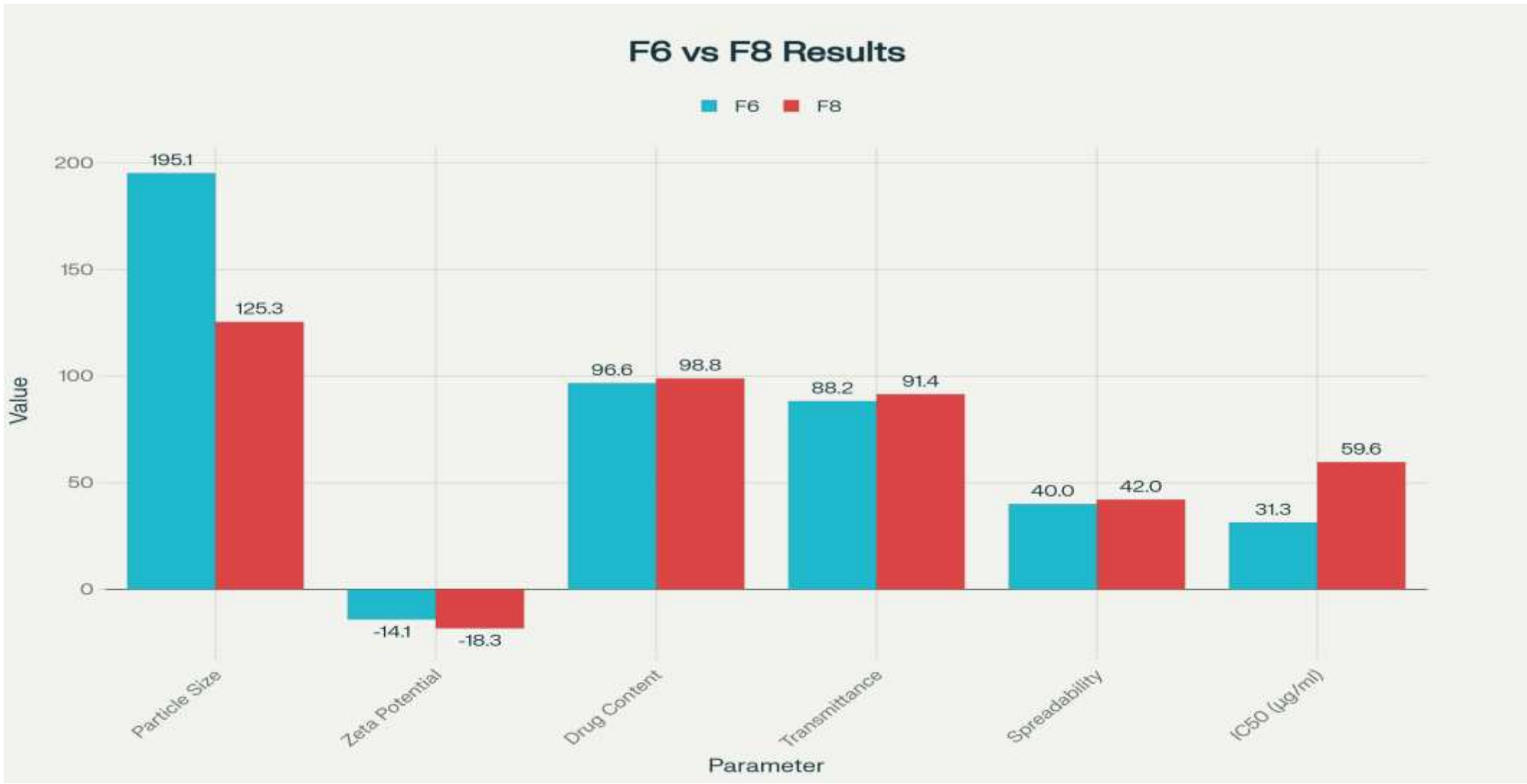
AIM

- Formulate and characterize a nanoemulsion gel containing curcumin for topical delivery and assessment of anticancer activity against squamous cell carcinoma.

METHOD

S.NO	METHOD	PARAMETERS
1.	Calibration & Oil Screening	UV-Vis 421 nm Standards 4-14 µg/mL R <sup>2</sup> ≥ 0.99
2.	Nanoemulsion Formulation	Spontaneous emulsification Oil: Smix (1:1-1:9) 27 formulations
3.	Thermodynamic Stability Heat-Cool (6 cycles)	Heat-Cool (6 cycles) Centrifugation (3500 rpm) Freeze-Thaw (3 cycles)
4.	Characterization Zetasizer ZS	Zetasizer ZS 90, Particle size nm Zeta potential, % Transmittance FTIR
5.	Gel Formation	Carbopol 1% + Nanoemulsion + TEA, pH 5.5-6.0, Viscosity: 50,000-200,000 cP
6	In Vitro Release Franz Diffusion Cell	Franz Diffusion Cell, Phosphate Buffer pH 5.5, 24h 8 Time points, Flux calculation
7.	Cell Line Study MTT Assay	MTT Assay, SCC cells Concentrations: 1-50 µM IC <sub>50</sub> determination, ANOVA

RESULTS & DISCUSSION



- The optimized formulation (F8) showed the smallest particle size (125.3 nm), strongest zeta potential (-18.3 mV), and highest drug content (98.8%), making it the most stable and effective.
- The gel was skin-friendly (pH 5.7), spread well, and remained physically stable.
- F8 provided slow, sustained curcumin release over 24 hours (59.41%) and demonstrated strong anticancer activity (IC<sub>50</sub>: 59.63 µg/ml), supporting its potential as a patient-friendly, efficient treatment for skin cancer.

CONCLUSION

- Formulation F8 is an optimized nanoemulsion gel offering safe, patient-friendly topical curcumin delivery for squamous cell carcinoma.
- It provides a small particle size, strong stability, and high drug content. The gel achieves sustained release and significant anticancer activity.
- F8 effectively overcomes curcumin's solubility and permeability limitations, making it a promising non-invasive therapy for skin cancer.

FUTURE WORK

- Conduct in vivo studies and extended skin permeation tests.
- Evaluate long-term safety, stability, and patient compliance.
- Scale-up formulation for clinical trials in SCC therapy.

REFERENCES

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