ASEC 2024 Conference

The 5th International Electronic Conference on Applied Sciences

04–06 December 2024 | Online

MDPI

Paving The Road from Small- to Large-scale Production of Green Nano Pharmaceuticals

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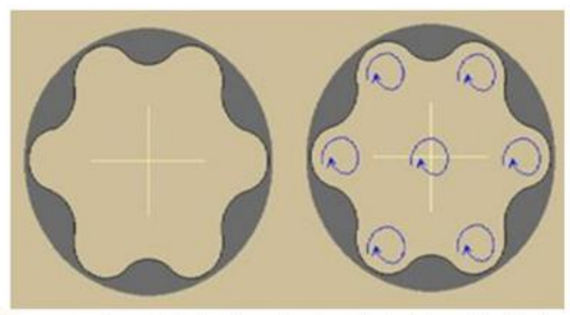
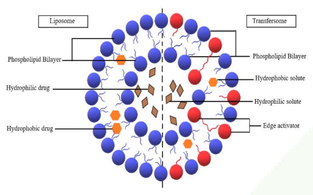
01 Synthesis of homemade vessel of capacity 50 ml



A cross-section of the beaker, showing the baffles of the beaker and multiple turbulences created by magnetic stirring during the formulation of nanoparticles as introduced by Mozafari.



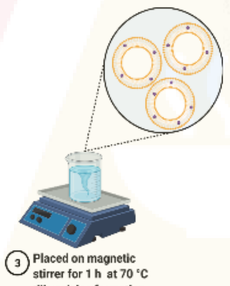
02
- Formulation Development

Via a modified heating method in homemade vessel simulating Mozafari's one

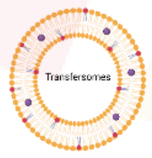
- Characterization & optimization

1 Hydartion of Lecithin and sodium deoxycholate in phosphate buffer for 1 h

2 Lecithin and SDC are added after heating glycerol with HK for 30 min

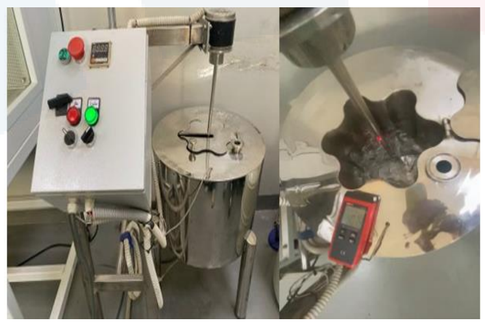


3 Placed on magnetic stirrer for 1 h at 70 °C till vesicles formation



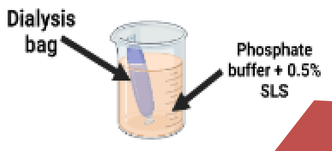
4 Transfersomes formation

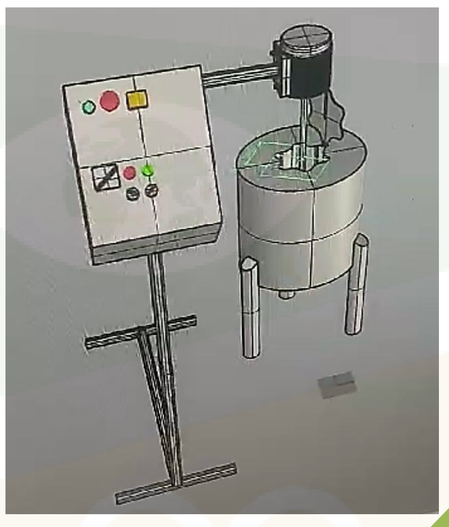
03 Scaling up of Mozafari's vessel to fabricate a prototype pilot scale beaker of capacity 10 Liters



04 Preparation of the optimized formula on both scales the small and pilot scale then characterization of both formulae

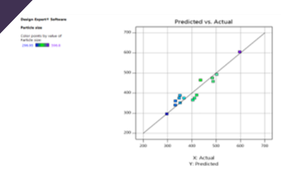
05 In vitro drug release of both formulations using Dialysis bag in the shaking water bath

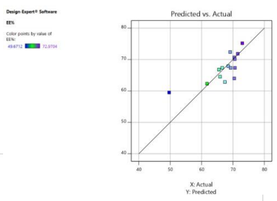


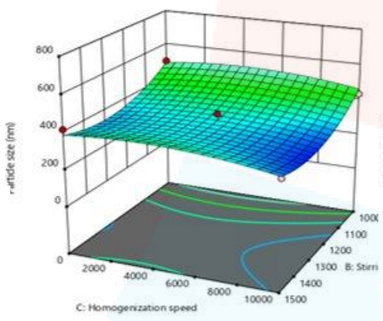


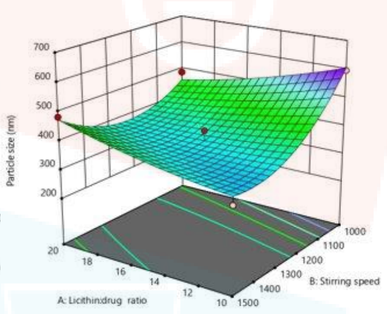
Methods

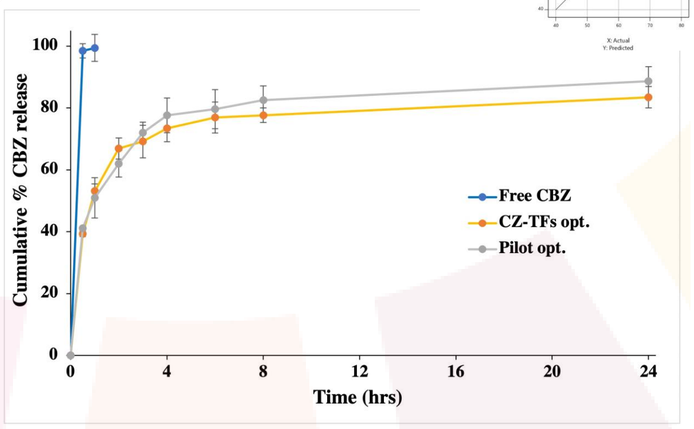
Results

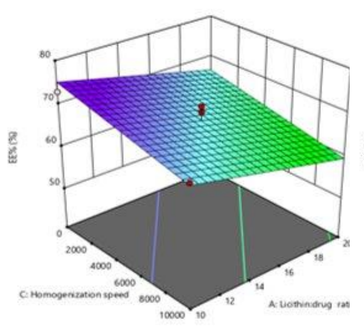


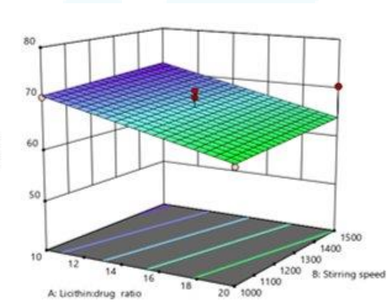












Response	PS (nm)	EE (%)
Expected	312.133	75.774
Observed (Lab -scale)	323.12	76.28
Observed (Pilot-scale)	341.5±1.4	75.01±0.5

Overview

Aim of this study

To investigate novel, easily scalable, environmentally friendly methods to prepare drug-loaded nanoparticles on a pilot-scale without using toxic organic solvents.

Additionally, to locally design, develop, and optimize prototype pilot scale equipment for nanoparticle synthesis as a means of creating a bridge between lab and industrial scales.

Conclusion

CZTs optimized formulation was successfully fabricated on both small- and pilot-scale using a simple, scalable, green, modified heating method. Box–Behnken surface analysis proved to be an efficient tool to optimize the CZTs formulations. CZTs fabricated on the two scales possessed comparable results showing uniform nanosize, high EE%, and provided sustained release.