# Fabrication and characterization of eugenol-loaded eudragit (RS100) nanofibrous mats

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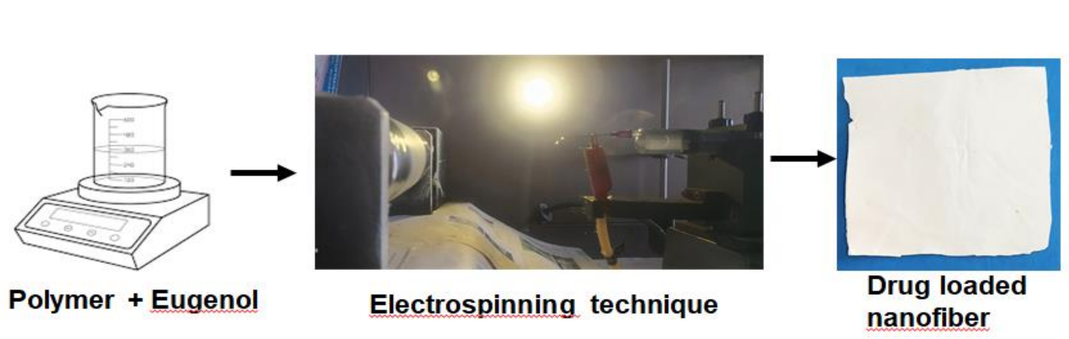
## Abstract

This study aims at fabricating eugenol loaded eudragit (RS 100) nanofibers by electrospinning technique. The effect of eugenol loading on morphology, hydrophobicity and mechanical properties of polymer nanofiber was analysed by various tools. The results revealed significant enlargement of fibers from 261 nm to 412 nm upon increasing the eugenol concentration from 0% to 3%. The secondary interaction between the drug and the polymer were analysed by FTIR spectroscopy with the shift of the absorption band to lower wavenumbers. Furthermore, the enhanced swelling capacity of the membranes (359%) was found favourable for the increased cell attachment of nanofibrous scaffolds, cell proliferation and tissue recovery. The good compatibility between the drug and the matrix was established by increased modulus and tensile strength values. Taking together all these characteristics, the fabricated nanofibrous membrane found as an efficient system for various biomedical and environmental applications.

## Introduction

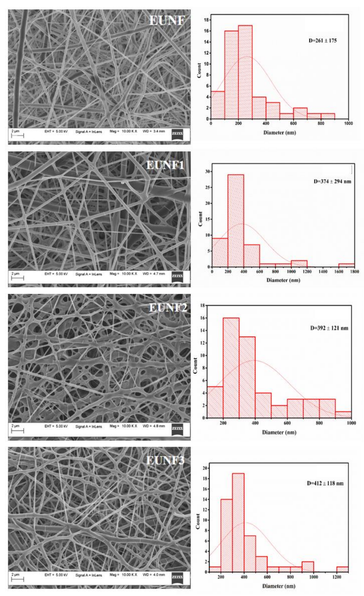
- Polymer-based electrospun nanofibers are an intriguing new class of materials that find applications in several disciplines such as biomedical, filtration, cosmetics, sensors, protective clothing and many more
- They shows high drug loading, enhanced therapeutic index, localized delivery, high surface area to volume ratio, superior mechanical performance, and flexibility in surface functionality[1]
- Eudragit (RS100) is a cationic copolymer of poly(ethyl acrylate, methyl–methacrylate and chlorotrimethyl–ammonioethyl methacrylate[2]
- Eugenol (4-allyl-2-methoxyphenol) is a well-known natural antimicrobial derived from Syzygium aromaticum which is mainly used in traditional medicines for eliminating tooth pain[3]

## Set up

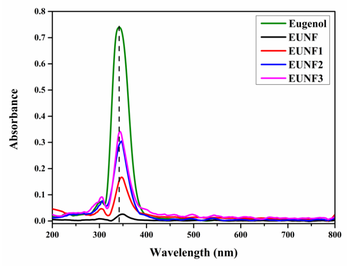



## Results

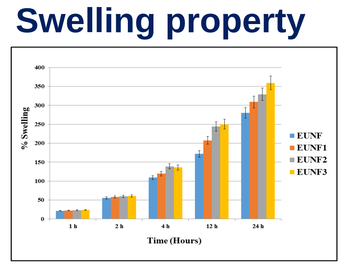
### FE-SEM



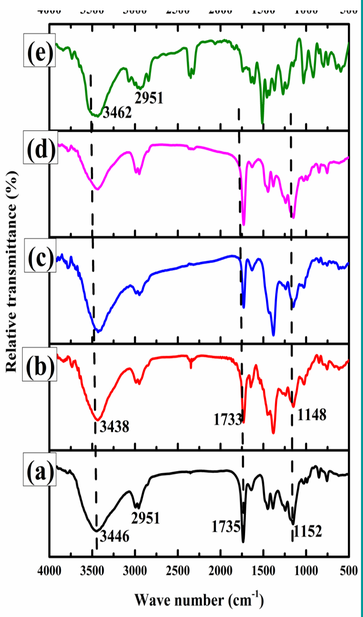

### UV-Vis spectroscopy




### Swelling property




### FT-IR




**Mechanical properties of fabricated nanofibers**

| Samples | Load(Force) N | Tensile modulus (MPa) | Tensile strength (MPa) | Elongation@ Break % | Stress @ Break (MPa) |
|---|---|---|---|---|---|
| EUNF | 0.86 | 13.21 ± 2.12 | 0.238 ± 0.02 | 1.41 ± 0.03 | 0.23 |
| EUNF1 | 1.28 | 24.15 ± 1.61 | 0.4809 ± 0.09 | 1.35 ± 0.08 | 0.47 |
| EUNF2 | 2.87 | 30.73 ± 0.67 | 0.745 ± 0.04 | 1.23 ± 0.02 | 0.71 |
| EUNF3 | 3.14 | 36.80 ± 1.15 | 0.92 ± 0.01 | 1.08± 0.01 | 0.97 |

## Design/Other information

- Electrospinning parameters
  - 0.4 mL/h
  - 13 cm distance
  - 16 kV voltage
- Characterization techniques
  - FE-SEM
  - FT-IR
  - UV-Vis spectroscopy
  - Swelling property
  - Mechanical property

**Combination of electrospun membranes**

| Membrane | Eudragit (RS 100) (%W/V) | Eugenol (% W/V) |
|---|---|---|
| EUNF | 25 | - |
| EUNF1 | 25 | 1 |
| EUNF2 | 25 | 2 |
| EUNF3 | 25 | 3 |

## Conclusions

- The present effort is concentrated on fabrication of eugenol loaded eudragit nanofiber.
- The developed nanofiber composite mats of EUNF/eugenol were bead-free and randomly organized. The average fiber diameter increased upon increasing the drug concentration.
- The FTIR spectral studies revealed possible hydrogen bonding to stabilize the drug/matrix composite via hydrogen bond formation. These findings were also supported by UV-Vis spectra where composite fiber mats showed bathochromic shifts in the composite mat.
- The thermal and mechanical studies indicated an increase in the flexibility of nanofiber mats.
- Thus the current work evidenced the use of electrospun fibers as an effective material in various biomedical and environmental applications

## References

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