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Development of *Mimosa pudica* incorporated silk-PCL nanofibrous mat for wound healing application

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In this study, ethanol extracted *Mimosa pudica* was incorporated into the silk-PCL (Polycaprolactone) nanofibrous mat was prepared through electrospinning method. Silk-PCL polymer ratio was optimized and it was found that silk-PCL (70:30) concentration forms nanofiber. To improve antibacterial activity against infected wound, 2.5% of the *Mimosa pudica* herbal extract was added to silk-PCL solution and electrospun into nanofibrous. These developed nanofibers were analyzed through SEM, TGA. Further, the nanofibrous mat was evaluated for antimicrobial activity and concluded that the leaf extract of *Mimosa pudica* have strong antimicrobial activity against *E. coli* than *S. aureus*. Drug release study of electrospun mat shows the sustained drug release of *Mimosa pudica* due to the presence PCL polymer on the nanofiber mat. Thus, this study confirmed that the *Mimosa pudica* incorporated silk-PCL electrospun mat can hold great promises to be used in wound healing applications.

Keywords: *Mimosa pudica,* silk, polycaprolactone, electrospinning, wound healing.

Introduction

Skin is a largest outer covering organ of the body. Wound is created on skin by burn, accidental trauma or chronic wound[1]. Wound healing is a complex process and it comprising four phases namely hemostasis, inflammation, proliferation and remodeling. Wound healing process requiring various cells such as keratinocytes, fibroblasts and endothelial cells responsible for collagen formation[2]. Many people concentrating on antimicrobial wound dresses for wound healing application. The herbal drug incorporated nanofibrous mat used as a antimicrobial agents to kill microbes. *Mimosa pudica* (touch me not plant) a natural plant is proven pharmacological activities such as to have antimicrobial, antidiabetic, antitoxin, antihepatotoxin, antioxidant and wound healing activities[3]. Ethanol is used as a solvent to extract secondary metabolities like alkaloid, glycoside, flavonoid and tannis[4,5]. Silk fibroin is a natural protein is used to promote granulation tissue proliferation and re-epithelialization[6]. Hence, the attempts were made to produce the *Mimosa pudica* incorporated silk-PCL nanofibrous mat by electrospun mat was useful in wound healing application.

Preparation of nanofibrous mat and characterizations:

The 70:30 of concentration of silk-PCL was taken and add 2.5% (w/v) of *Mumosa pudica* extract of and stirred for 1 h. The spinning was carried out 20 KV and 20 cm distance. The flow rate was controlled at 1 ml/h. Surface morphologies of fibers were assessed using SEM. TGA used to analysis the thermal stability of nano fibrous mats. Hemolysis which is the test made for analyzing the blood compatibility of the sample. The disc diffusion method is used to evaluate antibacterial activity of the nanofibrous mat. Drug loaded electrospun mat conducted against *E. coli* and *S. aureus* by disc diffusion method and incubated at 37°C for 24 h and zone was measured. The drug delivery study, 2×2 cm^2 samples were incubated into 25 ml of PBS (pH 7.4) at 100 rpm and investigated by UV spectrophotometer.

Results and discussion

Mimosa pudica incorporated silk-PCL were prepared and SEM image of Fig. 1 shows that all fibers were smooth and uniform, without any appearing beads on fiber surface and the fibers range 450 nm to 900 nm. Thermal degradation of

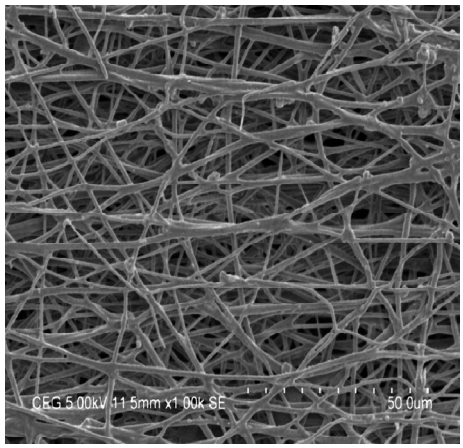

Fig. 1. SEM image of MP-silk-PCL nanofibers.

silk and *Mimosa pudica* incorporated silk-PCL nanofibrous scaffolds gives an enhanced thermal stability when compare to pure silk shown in Fig. 2. The hemolysis percentages for all the mats were observed to be less than 5% (1.2%, 1.3%,

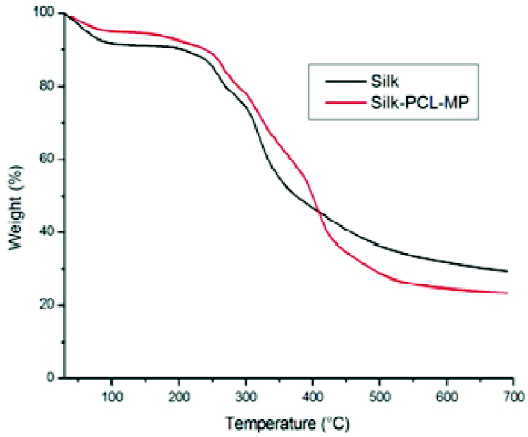

Fig. 2. TGA of silk and MP-silk-PCL nano mat.

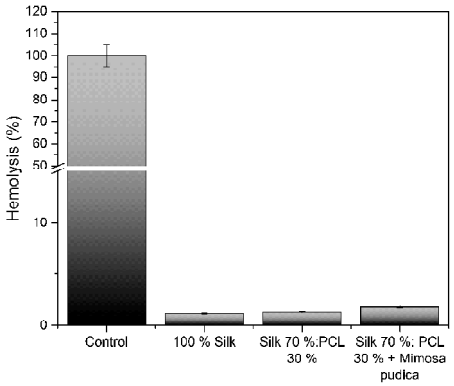

Fig. 3. Blood compatibility of mat.

1.8% for silk, silk-PCL, silk-PCL-*Mimosa pudica*). From Fig. 3 suggest that the all electrospun mats were blood compatible. *Mimosa pudica* extract incorporated electrospinning mat have a strong zone of inhibition on *E. coli* was observed when compared to *S. aureus* was shown in Fig. 4. The Fig. 5 shows sustained drug release obtained within 4 h due to the presence PCL.

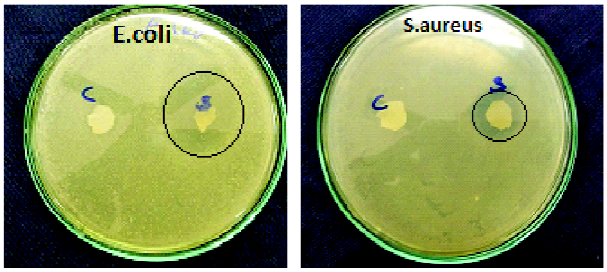

Fig. 4. Antimicrobial activity of MP-silk-PCL against *E.coli* and *S.auerus.*

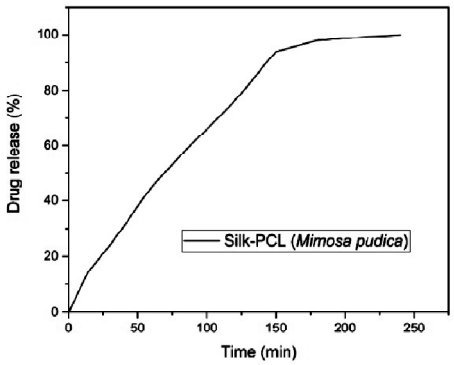

Fig. 5. Drug release profile.

Conclusion

In this study, *Mimosa pudica* incorporated silk-PCL nanofiborus mat was successfully prepared by electrospinning method. Electrospun mat shows good biocompatibility, antimicrobial activity and controlled rate of drug release. *Mimosa pudica* incorporated silk-PCL electrospun mat can be used as a wound dressing material for infected wound.

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