Preface & thesis architecture

Biopolymers have diverse biomedical applications. Recently, drug loaded biopolymeric scaffolds have emerged as a solution for various biomedical challenges including slow wound healing problem. A suitable biomemmic scaffold can be utilized to design an effective wound dressing for accelerated wound healing. The presented work is targeted to achieve this goal.

After brief introduction and literature review (in Chapter 1 & 2), the whole experimental work has been presented into three sections.

Section I:

Chapter 3

This chapter compiles the starting experimental work of this study. The work was started with two polymers *viz.* Silk Fibroin (SF) and Gellan Gum (GG) and ciprofloxacin hydrochloride (*cpr*) antibiotic drug. The polymers and drug were chosen on the basis of literature review. This chapter includes the details of scaffold fabrication, characterized and evaluated of different properties.

In through investigation the fabricated scaffolds of SF and GG, showed some undesirable results. To overcome the found drawbacks, it was decided to further modify the scaffolds by changing one polymer (replacing gellan gum with chitosan) and by incorporating silver nanoparticles (AgNPs) along with drug *cpr* into the scaffold. For economic feasibility and eco-friendly approach it was also decided to synthesize the AgNPs through green rout using herbal extracts of different plants.

Section II:

This section is dedicated to the work related with the biosynthesis of AgNPs through green rout using herbal extracts of different plants. Herbal extracts of more than 20 plants were screened for their potency to synthesize AgNPs but the activity was reported in herbal extracts of only two plants *viz*. *Salvinia molesta* and *Tamarindus indica.* The complete synthesis and characterization studies were

carried out with both the plants separately and the work has been compiled here in the two chapters i.e. *Chapter 4* and *Chapter 5.*

Chapter 4

This chapter describes about the studies on AgNPs synthesis using aqueous extract of leaves of *Salvinia molesta* (AES), an aquatic fern. Green route of herbal synthesis was then optimized through one factor at a time approach. Synthesized AgNPs were purified and characterized through SEM, TEM, FTIR, XRD, EDX and AFM techniques. Antimicrobial potential of synthesized AgNPs was estimated using disc diffusion assay and cell viability studies.

Chapter 5

This chapter has written on the studies on AgNPs synthesis using aqueous AgNPs using aqueous extract *Tamarindus indica* (AET) leaves. All the similar studies were conducted as in chapter 4 with AES.

In the end of complete studies of AgNPs synthesis with AES and AET the results of both the studies were compared and the better AgNPs were chosen for the incorporation in to the scaffolds on the basis of results and their antimicrobial potential.

Section III:

This section of the thesis is based on the studies on modification and improvement in the fabricated scaffolds of SF and to develop a wound dressing through improved scaffold. Finally the developed dressing was evaluated in an *in-vivo* system. This study of section III has been presented here as in a single chapter as *Chapter 6*

Chapter 6

This chapter is mainly focused on the improvement of previously designed scaffolds. For improvising the porosity and better biomimmicing the GG was replaced with chitosan (CS). For prolonged antibacterial effect the AgNPs were also

incorporated in to scaffolds along with *cpr.* The modified scaffolds were prepared by using SF-CS blend and fabricated scaffolds were again characterized in detail and suitable results were achieved. These modified scaffolds were then utilized to design an adhesive wound dressing. The designed wound dressing was then evaluated for its healing potential through *invivo* studies. The *invivo* studies were carried out on rat as model animal and wound healing was monitored through morphological and histological methods.

Conclusion (*Chapter 7*)

After detailed presentation of experiments and findings the whole work has concluded in this part of the thesis.