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Title: Preparation, Characterization and Antimicrobial Studies of Drug Loaded Polymer Blend Films

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Abstract: Necessary information about wounds, their healing stages and their concerned issues, hydrogel wound dressing and their cross linking systems which affect the wound healing are discussed in first chapter. In second and third chapter development of chitosan and poly (vinyl alcohol) based hydrogel films discussed. Fourth and fifth chapter discussed the biological properties of hydrogel films loaded with plant extract and market available drugs.

Findings: Chitosan based optimized hydrogel film on swelling analysis does not lose its shape and was not dissolved in to the different buffer solution except pH 4.4 at different temperatures. On increasing the concentration of PNIPAm from 2% to 4%: T_g, T_m and weight loss temperature decreased. FESEM images clearly showed the cross linking network on to the hydrogel film surface. In the development of poly (vinyl alcohol) (PVA) based chitosan (CS) hydrogel films with Citric acid (CA) as a cross linker it was found that by increasing the content of PVA swelling % increased. Carboxyl (COOH) groups of CA and hydroxyl (OH) groups of PVA and CS have ester linkage which was confirmed by both FTIR and DSC. FTIR and DSC confirmed the GS absorption from the buffer solution in to chitosan based hydrogel film. On increasing the temperature and change in pH of the buffer solution, GS absorption increased which was confirmed by zone of inhibition against *E. coli*. Re-generation of saccharide peak in *S. alba* extract loaded hydrogel film at 1047 cm^{-1} and increased in height of other peaks confirmed the interaction of *S. alba* leaves extract compounds to the hydrogel film. Exothermic decomposition peaks at 112°C, 175°C and 251°C, reveals the effect of extract on hydrogel films. FESEM images easily show the presence of GS and *S. alba* extract in to the hydrogel film. *E. faecium, C. glabrata, and C. tropicalisis* were the most resistant strains while *S. typhi* and *C. guilliermondii* were the most susceptible strains to *S. alba* extract. In PVA based hydrogel films the in vitro release profiles of TCL (at high temperature, at low pH, at low CS content) follow the first order Fickian diffusion kinetics. *P. aeruginosa and C. albicans* were the most susceptible strains while *E. coli* and *C. tropicalisis* were the most resistant strains to *J. regia* leaves extract.

Recommendation: Skin is an important natural barrier for protecting internal dermis from the external environment and it loses its protected mechanism upon damage. The treatment of injury or disease by plant materials either in the crude or processed state is known as traditional herbal treatment. High toxicity and multidrug resistance associated with various standard antimicrobial drugs have necessitated search for safer alternatives in plant derived materials. Among them, *J. regia* and *S. alba* are two potent antimicrobial plants. Plant extract loaded CP1A and CPW hydrogel films created a viable option to treat wounds for pathogens free environment up to longer version of time. So this study opens the gate for further research on plant extracts due to non-toxicity, degradability and good characteristics property which made it as a reliable source as wound dressings. The developed hydrogel films will respond to acute and chronic wounds with high pH and elevated temperature.

Conclusion: This work reveals that the hydrogel films loaded with synthetic drugs and plant extracts are found to be effective against various pathogens. The optimized hydrogel films of CP1 and CP3 revealed that the polymers used are compatible to each other. High amount of CS gave response to pH, added amount of PNIPAm made CP1 temperature sensitive and CA provide strength to CP3. The in-situ forming wound dressings reported in this investigation employs a very simple method to prepare hydrogel films that combine the beneficial properties of both synthetic drugs and plant extracts to become active wound dressings. The hydrogel film encapsulated with GS and *S. alba* leaves ethyl acetate extract showed both antibacterial and antifungal activities in disc diffusion method and in MIC. Since these properties are the most important properties for ideal wound healing materials. So, GS and *S. alba* extract incorporated hydrogel films could be used as a potential wound healing materials. The antimicrobial study of TCL loaded hydrogel film gave big zone of inhibition and on increasing the concentration of TCL zone of inhibition also increased. *P. aeruginosa and C. albicans* were the most susceptible strains while *E. coli* and *C. tropicalisis* were the most resistant strains to *J. regia* leaves extract. These hydrogel films were very soft and therefore cause no disturbance during the application.