5.1. Summary

In the present study, three different polymers namely seed husk of Isapgol, Tamarind seeds polysaccharide and Pigeonpea polymer were isolated, characterized and tested for antibacterial as well wound healing activities in rats. Clear mucilage obtained from Isapgol was highly cross-linked and used as it was isolated without any further chemical cross-linking. Whereas Tamarind seeds polysaccharide and Pigeonpea polymer were chosen for chemical cross-linking by using epichlorohydrin in order to produce film formulations.

The polymers isolated were characterized by both preliminary qualitative analyses and FTIR spectral studies. Qualitative chemical tests confirmed that the polymers isolated were carbohydrate polymers (polysaccharides). FTIR spectra of seed husk of Isapgol showed characteristic peaks that are well matched with literature values. Similarly, FTIR spectra of Tamarind seeds polysaccharide isolated also showed all corresponding peaks due to xyloglucan polysaccharide. Characteristic FTIR peaks of Pigeonpea polymer indicated the presence of hydroxyl groups and polysaccharide chain.

The isolated polymers were also subjected to NMR spectral studies and the data obtained further confirms the chemical structure and chemically modified structures of the isolated polymers.

Two different formulations were prepared for each polymer viz., gel and film formulations. Gel formulations were evaluated for rheological studies such as torque, shear stress, shear rate and viscosity. Gels showed rheological properties which were in optimal range that is considered as an ideal wound healing gel.
Wound dressing films produced were transparent, smooth and flexible. Scanning electron micrographic studies indicated homodisperse nature of films. Film formulations were characterized for necessary physicochemical properties such as film thickness, elongation (elasticity), tensile strength, swelling and water vapor transmission rates (WVTR). The results obtained were in optimal ranges that are essential for ideal wound dressing materials.

Povidone iodine loaded film formulations were evaluated for antibacterial activity using bacterial strains. Also these formulations were screened for wound healing activity in rats.

Films exhibited significant antibacterial activity against both gram positive and gram negative bacteria. Also shows significant wound healing activity as compared to control groups.

Gel formulations showed significant wound healing property as compared to control group with a faster epithelialization and greater rates of wound contraction.
5.2. Conclusion

Wound dressing materials based on hydrogels were effectively used for healing diversity of the wounds as these materials protect the wounds from environmental and microbial attack. Also they promote the healing process by providing an optimum microenvironment.

Existing wound dressing materials used in healing of wound may cause disturbance during removal, leading to further injury. Natural polymer based wound dressing materials become soft when in contact with the body fluid and overcome the difficulty of existing wound dressing material. Hence, in the present research work, three different naturally occurring polymers were isolated namely seed husk of Isapgol, Tamarind seeds polysaccharide and Pigeonpea polymer were evaluated and screened for antibacterial activity and wound healing activities. Film formulations loaded with povidone iodine showed significant antibacterial activity and wound healing activities. Thus present findings indicate the possibility of exploring new materials isolated from the natural origin as an effective wound healing dressings.

Thus present findings indicate the possibility of developing further newer formulations loaded with different antibacterial, antifungal and antimicrobial drugs for enhanced therapeutic efficacy using these natural polymers.