6.1 SUMMARY

Development of natural extracts coated in different composition on a natural fiber based wound dressing material is one of the most studied area in the field of textiles. Bamboo fiber is one of the natural fibres with antibacterial property in its nature. According to surveys of available literature, many researchers have tried to utilize it for industrial and medical textile purpose. In this current research work, a detailed investigation has been made into the drug delivery system developed with different natural extracts coated on bamboo fiber based wound dressing material. The development of coated dressing material was found to be useful in terms of healing different types of wounds. The characterizations and wound healing efficacy of the developed wound dressing materials have been critically analyzed. The functional groups, compounds of the coated sample and secondary structure of different extracts coated dressing materials have been identified using FTIR. Surface and internal micro architectures of the porous nature of developed dressing materials have been examined using SEM.

The mechanical property of the developed dressing materials were evaluated to determine the strength and elongation. In the mechanism of wound healing, the capability to obtain up fluids from the wound surrounding
plays a vital role. The degradation of the developed coated dressing material is added value.

The developed coated dressing materials have high porosity structure by which the naturals extracts are more suitable for the quick wound healing process. The porosity characteristics of the developed dressing materials have been evaluated.

The developed natural extracts coated dressing materials were evaluated for antimicrobial properties to evaluate their zone of incubation against wound bacteria. The coated dressing materials were also applied on full thickness wound in rats, and wound contraction was measured using in vivo study. The developed dressing materials were applied on rats suffering burn, and wound contraction was measured using in vivo study. The natural extracts coated dressing materials were applied on rats induced with diabetes, and wound contraction was measured using in vivo study.

These results of this research work indicate that developed materials coated with different natural extracts on bamboo based dressing materials, are promising materials for wound dressings, and for sustained drug-delivery systems.

6.2 CONCLUSIONS

The selected extracts from natural materials and these extracts coated dressing materials have been investigated as one of the promising resource of biomedical materials due to its unique properties. The field of medical textile also put its demand in manufacturing the advanced fibrous medical devices and expertise of researches. Literatures underlines the strong need for medical devices that provide rapid wound healing with minimum duration. Based on these requirements for wound healing, this research
formulated and designed three different wound dressing materials coated with three different compositions of natural extracts such as leaves of aloe vera, curcumin, Chitosan for full thickness wound, leaves of calotropis gigantean, eucalyptus globules and buds of syzygium aromaticum for burn wounds, leaves of piper betel, aloe vera and neem leaf for wounds of patients with diabetes.

Wound dressing material coated with extracts of leaves of aloe vera, curcumin, Chitosan and rhEGF was developed. The antibacterial activity against *E. coli* and *S. aureus* shows the unique antibacterial property of the developed dressing materials. The wound healing efficacy of the coated dressing materials were confirmed with the animal test through albino rat’s wound environment. The natural extracts coated dressing materials were only tested out in normal rat with full thickness wound and this treatment shows guarantee in accelerating wound closure. Hence, the developed bamboo based dressing material coated with natural extracts may used as a supporting material for wound dressing to keep away from infections and further spreading of wound infection.

Burns are one of the most common forms of pain. The natural extracts coated bamboo gauze wound dressing materials proved is potential therapeutic tool in healing burn wound *in vivo* model. The rate of burn wound contraction was higher in the sample that had application of developed natural extracts coated materials. This outcome proves the drug delivery and wound healing efficacy of developed coated material. Therefore the developed coated dressing materials serves as a better clinical tool in the context of burn wound.

The wound requires instant care and healing especially in the case of diabetic patients. Based on this reason, this research aim to develop a wound dressing material which serves as a hopeful medical device to heal the
wound in diabetic environment along with biocompatible and biodegradable nature. The \textit{in vivo} result of coated dressing materials confirms the healing nature of wound in glucose-induced rats. The quick contraction of wound supports the developed dressing materials positive wound healing efficacy. Hence, the developed coated dressing material can act as an ideal wound healing agent in diabetic environment. Hence, it is proved that developed dressing material coated with combination of natural extracts would provide better therapy in the wounds of diabetics.

The above mentioned advanced natural extracts coated dressing materials are proved as a novel devices that could potentially lead to a new class of medical textile application. It is also proved as a successful wound healing replacement. In addition, the developed dressing materials were biodegradable and biocompatible nature. Therefore, this research contributed three different natural extracts coated dressing materials that could serve as a possible alternative to currently available materials used in wound healing in field of biomedical industry.

6.3 \textbf{LIMITATIONS OF THE CURRENT RESEARCH WORK}

- In the present work various numbers of natural extracts were used. The properties of these extracts may vary in a significant level with respect to the geographic location of the extracts. So the properties of the extracts should be tested carefully when the extracts are taken from different geographic locations.

- While attempting to test these dressing materials on human beings, the nature of skin should be tested carefully. If not some extracts may cause itching or rashes on the skin and it may also causes some side effects.
The cost of the drug used in the study is very high so that the commercial cost of the finished material may be high when it is carried out in small scale.

6.4 RECOMMENDATION FOR FUTURE RESEARCH

- The present study is focused on bamboo fiber based dressing material for wound healing. It may be extended to other natural fibres.
- A further study may be carried out by incorporating multiple drugs in the natural extracts.
- A study may be conducted for a long term healing process up to 3 to 6 months, using natural extracts coated dressing materials.