CHAPTER V

CONCLUSIONS

The hyperbranched dendritic polyamidoamine, synthesized according to Tomalia's well known method by repetitive reactions between Michael addition and amidation and the cationic hyperbranched dendritic polyamidoamine, obtained from quaternization of methyl ester terminated hyperbranched dendritic polyamidoamine by methylation with dimethyl sulphate were characterized by FTIR and ^{1}H NMR analysis. The result can confirm these synthesized products.

The incorporation of cationic hyperbranched dendritic polyamidoamine into chitosan backbone was carried out through the straightforward reaction of the polyamidoamine methyl ester end group and the chitosan amine group. The amide linkage was formed, as evidenced by FT-IR analysis. ^{1}H NMR results showed that cationic hyperbranched PAMAM-chitosan exhibited two signal regions corresponding to chitosan protons and hyperbranched PAMAM protons. In case of chitosan modified with excess amount of cationic hyperbranched PAMAM-ester, the obtained cationic hyperbranched PAMAM-chitosan was water soluble at neutral pH. TGA analysis provided evidence that the cationic hyperbranched PAMAM-chitosan contained bound water and a bulky side group which interfered the packing of chitosan molecule. In addition, according to XRD diffractogram cationic hyperbranched PAMAM-chitosan exhibited completely amorphous film due to the effect of a steric side group. Based on these results, it could be concluded that the presence of a bulky side group enhanced chain mobility and water solubility of the modified chitosan. In addition, pure chitosan and cationic hyperbranched dendritic PAMAM-chitosan films show excellent antimicrobial activity, cationic hyperbranched dendritic polyamidoamine could additionally enhance antimicrobial performance of chitosan attributable to its cationic character.

Coating of bulk chitosan and in-situ depolymerization of coated chitosan show that sodium nitrite treatment could partially remove chitosan coating from cotton surface. The antimicrobial activity of chitosan treated cotton fabrics, in-situ depolymerized cotton fabrics and washed fabrics show negative result.

Treatment of cationic hyperbranched dendritic polyamidoamine present that cotton fabrics treated with cationic hyperbranched dendritic polyamidoamine solution

have ability to inhibit the growth of *Staphylococcus aureus*. When the generation of cationic hyperbranched dendritic polyamidoamine increase, its antimicrobial activity decrease.

Combined treatment of cotton fabric with chitosan and cationic hyperbranched dendritic polyamidoamine indicates that chitosan plays a little role in offering synergistic effect on antimicrobial activity when co-applied with chitosan onto cotton fabric in case of G2.5. For the other generation, G3.5 and G4.5 cationic hyperbranched dendritic polyamidoamine, the corresponding antimicrobial activity is found lower than G2.5 cationic hyperbranched dendritic polyamidoamine.