Summary and Conclusions

The bacterial resistance to the antibiotics is the one area where foremost progression in work is required. Quaternization is a method to enhance the application spectrum of polymers in biological activity. Quaternized products are highly consumed in day to day life and used in industries in manufacturing soaps, detergents, antiseptics and disinfectants. Many of these quaternary ammonium compounds are petroleum based or main structure is pyridinium, which is carcinogenic. Recently, stress has been given on synthesizing green or eco-friendly quaternary ammonium compounds. Materials of renewable origin are more attractive option for economically attractive materials as these are ecofriendly, biocompatible and biodegradable. Polysaccharides are abundantly available renewable bio-material, which are useful for various applications. They are rich reservoir of structurally and functionally different moieties available for simple modification through chemical reactions.

In the present study, quaternary ammonium compounds have been synthesized from chitosan, cyclodextrin and sucrose. The synthesis follows green protocol with respect to zero waste generation and the reagents used. Choline chloride has been used to integrate quaternary ammonium group in biopolymer, which is basically a green reagent. The structure function relationships of the synthesized compounds have been characterized by analytical estimation, FTIR, elemental analysis (CHN) and SEM-EDX. The results support the success of the applied protocol with highest degree of quaternization 75.1% for QS-C10-II, 73.7% for QCD-C10-II and 72.3% for QC-C10-II. The synthesized compounds have also been tested for antimicrobial activity against Gram positive (S. aureus) and Gram negative (P. aeruginosa) bacteria by well diffusion method, minimum inhibitory concentration (MIC) method and colony forming unit (CFU) method. The results are concluded with good results for antibacterial study. MIC results show minimum inhibitory concentration of 12.5 µg/mL for QC-C10-II against Gram positive S. aureus and Gram negative P. aeruginosa. CFU results show highest %kill of 99.32% by QC-C2-II against S. aureus while QCD-C10-II confirm minimum %kill of 95.17%. Though the QACs are already well commercialized products and being used in different fields, yet greener synthesis of these compounds is the one area where major progression in work is required. Present study is the one such step to highlight the synthesis of biogenic quaternary ammonium compounds with high modification yield.