
Fabrication of bioplastic using cotton waste generated from Sri Lankan apparel industries

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The apparel sector is the foremost contributor to the Sri Lankan economy. A significant amount of cotton waste is generated during different processing steps of the apparel industry which has posed a severe environmental threat. Due to its high cellulose content and substantial manufacturing volume, cotton waste has great potential for sustainable application. The main objective of this research is to fabricate bioplastic using extracted cellulose from cotton waste. Firstly, cellulose was extracted from collected cotton waste followed by a three-step purification process including alkaline pulping, bleaching, and acid hydrolysis. Bioplastic films were prepared by mixing 0.5g of dried cellulose with different ratios of carboxymethyl cellulose (CMC), and glycerol, and then the solution was cast into a glass mold. The accuracy of the isolation method and fabrication process of bioplastic film was verified by Fourier-transform infrared spectroscopy by comparing the functional groups. The biodegradability and swelling properties (water and oil) of bioplastic film were investigated. The film was dissolved immediately in water. The oil resistance of the film increased with the increasing glycerol content. The optimum level was observed in 3 % of CMC and 5 % of glycerol contents. After 20 days of soil burial, it was observed that biodegradability decreases when increasing the CMC and glycerol amount, and the maximum weight reduction of 94.5% was recorded at 1.2% of CMC and 1.5% of glycerol contents. In conclusion, cotton waste can be effectively utilized for bioplastic production which has the potential application in the packaging industry.

Keywords: cotton waste, cellulose, bioplastic, textile industry, biodegradability

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