High-efficiency DNA extraction using poly(4,4′-cyclohexylidene bisphenol oxalate)-modified microcrystalline cellulose magnetite composite

ABSTRACT

In this study, we studied the DNA extraction capability of poly(4,4-cyclohexylidene bisphenol oxalate) following the surface modification and composite formation with that of microcrystalline cellulose (MCC) and magnetic iron oxide nanoparticles (NPs). The physical characterization techniques like scanning electron microscopy (SEM), Fourier-transform infrared (FTIR) spectroscopy, energy-dispersive X-ray analysis (EDX), and thermogravimetric analysis (TGA) were employed for the poly(bisphenol Z oxalate)-MCC-magnetite composite during different stages of its formation. The results confirmed the successful modification of the polymer surface. On testing in the presence of three types of binding buffers, a high value of 72.4% (out of 10,000 ng/μL) efficiency with a total yield of DNA at ng and absorbance ratio of A260/A280 (1.980) was observed for the 2 M GuHCl/EtOH binding buffer. These results were compared against the other two buffers of phosphate-buffered saline (PBS) and NaCl. The lowest value of DNA extraction efficiency at 8125 ng/μL of 58.845% with absorbance ratios of A260/A280 (1.818) for PBS was also observed. The study has concluded an enhancement in the DNA extraction efficiency when the polymer is in the composite stage along with cellulose and magnetite particles as compared against the bare polymer.