

Abstract

The primary objective of the present study is to synthesize metallic and non-metallic nanoparticles and to explore the potential applications of the same which are indispensable for the day-to-day life. To be specific, the studies carried out in detail are the synthesis of metallic nanoparticles (Gold, Silver, Zinc oxide) and non-metallic nanoparticle (reduced graphene oxide) using twenty one potential reducing agents. The reducing agents chosen are selected plant extracts, cereals and pulses washed water and a keratinous waste source. The synthesized nanoparticles were further investigated for their pharmacological, biological, cosmetic and nano-switching applications. The gold nanoparticle synthesis was optimized by performing different synthesis methods. Silver nanoparticles were synthesized by solar irradiation method. Zinc oxide nanoparticle is prepared by sol-gel method and reduced graphene oxide by reflux method. The analytical characterizations of nanoparticles were carried out. The gold nanoparticle of TB shows inhibition against clinical isolated *Bacillus subtilis* and *Enterococcus faecalis*. TB aided silver nanoparticles shows inhibition against only clinical isolated *Staphylococcus aureus* and hence taken for coating on ear phone bud. The gold and silver nanoparticles synthesized from cereals and pulses washed water shows inhibition to *Klebsiella pneumoniae*, *Bacillus cereus*, *S. aureus* and *Escherichia coli*. The gold and silver nanoparticles synthesized from cereals and pulses washed water shows cytotoxicity against A375 skin cancer cell lines. The best sample is also screened for genotoxicity assessment by *Allium cepa* root tip toxicity assay, which doesn't show any genotoxicity. The same samples behave as DNA intercalators when interacted with ct-DNA is determined by spectrophotometric method. The gold nanoparticles synthesized from keratinous waste and zinc oxide nanoparticles synthesized from cereals washed water were incorporated in lotion formulation and tested for sun protection factor efficiency by spectrophotometric method and found to be efficient. The nano switching ability of gold nanoparticles/ reduced graphene oxide incorporated in carbon paste electrodes in presence of ammonia, cyanide, and melamine by colorimetric/electrochemical method was carried out. Hence, the finding in this thesis focuses on the utilization of biogenic precursors for the economic, sustainable and rapid green synthesis of metallic and non-metallic nanoparticles and utilization of the same for the real life applications.