

Gold nanoparticle-based detection of medicinal herbs using NGS-derived species-specific marker

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Background: Medicinal herbs have been a vital source of remedies for a wide range of ailments, forming the foundation of numerous traditional medical practices in India. The increased demand for medicinal herbs has resulted in their substitution and adulteration. Accurate identification strategies can enable the proper standardization and control of herbal products, thereby minimising the rate of adulteration and its adverse effects. The study aims to develop a detection system for the identification of medicinal plants using gold nanoparticles (AuNps) and NGS-derived species-specific (SS) markers. Three sets of medicinal plants were selected along with their respective substitute plants for the study. The plant samples were collected from various parts of Karnataka and their DNA barcoding was performed with universal marker *nrITS* (nuclear ribosomal internal transcribed marker). The selected SS markers were validated in all the collected medicinal herbs and their substitute plants using PCR. AuNps were synthesised using citrate reduction method and conjugated to thiol-labelled SS markers. The conjugated AuNps were allowed to hybridise with the PCR amplicons. The detection assay was based on the colour changes due to aggregation of AuNps upon the addition of sodium chloride. DNA barcoding of all medicinal plants was successful, and the sequences were submitted to GenBank. The selected NGS-derived SS markers showed amplification only in authentic plants and can be used to differentiate between substitute plants. The detection assay using AuNps showed that the colour change (red to purple) was only observed for the substitute plants upon the addition of sodium chloride, whereas no colour changes were observed in authentic plants. The selected medicinal plant species can be distinguished from closely related species using the NGS-derived SS marker. The rapid and sensitive nanoparticle-based detection strategy can be used to surpass conventional plant identification strategies.

Keywords: *Gold nanoparticles, Colorimetric detection, species-specific marker*

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