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Photosynthesis vs. Traditional Chemical Synthesis for Obtaining Biocompatible Drug Delivery (dds) Nanoparticles: A Review

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Recently, the applications of nanoparticles (NPs) in nanomedicine have gained a lot of interest. They can be used for biological labeling, biosensors and as therapeutic agents. As a result, there is an urgent need to develop synthesizing techniques that can result in more biocompatible NPs, suitable for biomedical applications. Chemical methods for the preparation of NPs are simple, easy to perform and very variable. However, their main disadvantages are the use of toxic chemicals. In the search of better pathway for synthesizing metal NPs that can overcome these limitations, researchers have turned to biological systems. Biosynthetic (biogenic) techniques employ proteins, microbes or plant extract for nanoparticles production. The target is to implement safer and biocompatible synthetic methods that eliminate using harmful chemical reagents, thus has no/less harmful impact on human beings. Photosynthesis of NPs using plant extracts have been extensively investigated. Plant extract contains intrinsic phytochemicals such as saponins, terpenoids, proteins, polyphenols and flavonoids, having the properties of stabilizers/emulsifiers. It can be used for the synthesis of biocompatible, monodispersed NPs of minimum particle size. In comparison to other biological synthesis techniques, NPs synthesized using plants are more stable and the synthesis rates are more rapid. Problems associated with complex treatments (e.g. microbial isolation, culturing, maintenance) are resolved in the case of photosynthesis. Furthermore, the controlled flexibility in the size and morphology of obtained NPs are considered higher in case of photosynthesis due to the diverse candidates of plants. This review provides an overview of recent trends in the photosynthesis of NPs, expected mechanism for the biosynthesis process, and their potential advantage in the field of drug delivery.

Key words: Green Chemistry, nanoparticles, drug delivery, mono-dispersed.