Thesis Abstract

Chapter I: General Introduction

PART – A: *Nutraceutical Profile of Wild Edible plants*

Nutraceutical is a portmanteau word derived from nutrition and pharmaceutical . Simply, it refers to fruits and vegetables with both nutritive and pharmaceutical values . It also includes dietary supplements , genetically engineered foods , herbal products and processed products .It has proven health benefits for both the treatment and prevention of diseases .

The nutraceutical profile indicates both the anti-oxidant properties and the proximate composition. The anti-oxidant properties are total phenolic content , DPPH radical scavenging activity , ABTS radical scavenging activity , flavonoid content , flavonol content and Fe(III) reducing property . Whereas , the proximate composition includes ash content , moisture content , fat content , fibre content , protein content , carbohydrate content and energy content .

Anti-oxidants are reported to prevent oxidative damage by free radicals and in fact , they interfere with the oxidation process by reacting with free radicals , chelating catalytic metals etc .The reactive oxygen species are free radicals that results in many chronic diseases like Parkinson's disease , arthritis , stroke , cancer etc .The plant materials are rich sources of anti-oxidants of varied chemical identities and polarities . Thus the consumption of plant based anti-oxidants has been linked to the reduction in the incidences of oxidative-stress related diseases .

The wild edible plants contain various active constituents like phenolic compounds , flavones , isoflavones , flavonoids , anthocyanins , coumarins , lignans , catechins and isocatechins which have multiple biological activities , including antioxidant activities . Thus the consumption of herbaceous plants generally terminates the action of free radicals and protects the body from different diseases .

The estimation of proximate composition indicates that these wild edible plants are rich in minerals like sodium, potassium, calcium, copper, zinc, magnesium, iron and manganese. The protein content, fibre content and energy content are also appreciable and are sometimes better than common vegetables.

PART – B: *Synthesis of Gold nano particles of plant extract*

Nanotechnology has wide applications in every sphere of human life and especially in the field of biomedical devices and biotechnology . During the last few decades , metal nanoparticles have drawn much interest due to their distinct physical , chemical and biological properties .Recently , the plant-mediated bio-synthesis of nanoparticles is gaining importance due to its simplicity and eco-friendliness . Such biological synthesis has the advantage over other methods as it is simple , one step , cost-effective , environment friendly and easily reproducible . The metallic nanoparticles display various size and shape-dependent optical properties which are useful in various biomedical applications , such as , imaging of specific target cells and tissues , drug delivery , bio-sensing , catalysis and bio-optics .

Among different types of nanomaterials, noble metal nanoparticles gained considerable attention due to their special catalytic, electronic, and optical properties.

Nanoparticles are of immense interest due to their extremely miniscule size and high surface area to volume ratio, which lead to both chemical and physical differences in their properties compared to the bulk having the same composition . The interest in Gold nanoparticles (AuNPs) is largely due to the relative ease of their synthesis, with good control of their sizes and shapes, their optical characteristics and their good bio-compatibility. Plant-based synthesis of AuNPs, via the reduction of Au (III), is relatively faster, and safer and, the mixture of AuNPs and green reductants may possibly result in synergistic biological activities. Various plant parts (roots, stems, bark, leaves and petals) can be exploited as reducing as well as stabilizing agents in the green synthesis of AuNPs.

Chapter II : Green synthesis of gold nanoparticles using *Wendlandia wallichii,* a potent wild edible plant consumed by the tribal of North-Eastern region in India

The present study was designed for one–step green synthesis gold nano particles (AuNPS) with the methanol extract of the leaves of *Wendlandia wallichii*, a potent wild edible plant collected from the north-eastern region in India. The nutritive value, minerals content and antioxidant properties in different solvent extracts of the plant has been carried out. The quantitation of polyphenolics in the leaves of *W. wallichii* were carried out by High Performance liquid chromatography (HPLC) method . The result of investigation showed the presence of moderate amount of protein, carbohydrate and different minerals. The methanol extract of plant was found to contain total phenolic (TPC) and flavonoid 5050.00±1.14 GAE mg/100 gm and 454.34±0.51 mg/100 gm respectively. The HPLC analysis also indicated the presence of phenolic acids and polyphenolics in various amounts in this wild edible plant. The abundance of protein, fat, carbohydrate, minerals and natural

antioxidant components in this plant makes it a considerable source of nutrition and could be consumed as a regular diet. The formation of gold nano particles with this plant (WW-AuNPs) was confirmed by surface plasmon resonance spectroscopy, high resolution transmission electron microscopy (HRTEM) and X-ray diffraction (XRD) analyses . The bio-synthesised WW-AuNPs find potentially useful in pharmaceutical and biomedical applications.

Chapter III : Nutraceutical evaluation of *Rhynchotechum ellipticum*, a potent wild edible plant consumed by the tribal of North-Eastern region in India and green synthesis of gold nanoparticles using its leaf extract :

The nutritive value, minerals content, *in vitro* anti-oxidant properties of different solvent extracts and the quantitation of polyphenolics in the leaves of *Rhynchotechum ellipticum* were carried out by High Performance liquid chromatography (HPLC) method. The present study showed the presence of very good amount of protein (7.76±0.038%), carbohydrate (46.49±0.46%) and various amount of minerals. The methanol extract of plant was found to contain total phenolic (TPC) and flavonoid 617.30 ±3.31 GAE mg/100 gm and 265.93±0.82 mg/100 gm respectively. The HPLC analysis also indicated the presence of phenolic acids and polyphenolics in various amounts in this wild edible plant. The abundance of protein, fat, carbohydrate, minerals and natural antioxidant components in this plant makes it a considerable source of nutrition and could be consumed as a regular diet of the human being. The phytochemicals present in the leaves extract of *R. ellipticum* were utilized for the one-step green synthesis method of *R. ellipticum* conjugated AuNPs (RE-AuNPs). The formation of RE-AuNPs was confirmed by Surface Plasmon Resonance

spectroscopy (SPR), high resolution transmission electron microscopy (HRTEM) and X-ray diffraction (XRD) analyses . The RE-AuNPs can be potentially useful in pharmaceutical and biomedical applications.

Chapter IV : Green Synthesis and characterization of Gold nanoparticles using *Bursera serrata* fruit extract .

Nano-chemistry is an emerging field with its presence felt in every sphere of life . The synthesis of nanoparticles using plant extract is alternative to the conventional methods with deleterious effects on the environment . The different antioxidants present in plant extract act as reducing and stabilising agent for the nanoparticles . The fruits of *Bursera serrata* are well-characterized nutritive potential , mineral content and antioxidant properties in different solvent extracts . The quantitation of polyphenolics in the fruits of *Bursera serrata* are carried out by High Performance liquid chromatography (HPLC) method . The HPLC analysis also indicated the presence of phenolic acids and polyphenolics in different amounts in this wild edible plant . There are moderate amount of protein , carbohydrate and different minerals . The phytochemicals present in the fruits extract of *B. serrata* were utilized for the one-step green synthesis method of *B. serrata* conjugated AuNPs (BS-AuNPs). The formation of BS-AuNPs was confirmed by Surface Plasmon Resonance spectroscopy, high resolution transmission electron microscopy (HRTEM) and X-ray diffraction (XRD) analyses . The BS-AuNPs obtained by these biogenic syntheses have potential biological and medical applications depending on their size and aqueous stability.