Synthesis of Nanoparticles from Coconut flower (Cocos Nucifera)

Mrs. Nisha Raj[1], **DR. K. Arulmozhi**[2]
[1,2]Assistant Professor
[1] Department of Hotel Management [2]Department of Food & Nutrition
[1]Yuvakshetra Institute of Management Studies, Palakkad, Kerala [2]Dr. NGP Arts and Science College, Coimbatore, Tamilnadu.

Abstract— Nanotechnology is significantly influencing Science and Economy in the 21stcentury. The use of nanoparticles in the field of nutrition is keeping pace and innovating with the ever expanding horizon of Nanobiotechnology. Flower is an important part of plant which contains a great variety of natural antioxidants, such as phenolic acids, flavonoids, anthocyanin and many other phenolic compounds. High intake of edible flowers has been reported to be associated with a lower incidence of chronic diseases such as cardiovascular disease and cancer. These health benefits are attributed to the antioxidant capacity derived from the phenolic compounds present in edible flowers. Cocos nucifera species is widely cultivated and use for different purposes, such as, nutritional, medicinal, ritual and agricultural. The present study reports the biosynthesis of nanoparticles using the flower extract of Cocos nucifera and characterized. This is the novel approach of nanoparticles produced by using the flower extract. The nanoparticles formed was confirmed by colour changes from yellow to dark brown colour and UV-visible Nanodrop spectroscopy & FTIR studies were carried out to assess the formation of nanoparticles.

Key words: UV-Visible spectrum, Extraction of bioactive compounds, Synthesis of nanoparticles, Collection of plant material

I. INTRODUCTION

Flower is an important part of plant which contains a great variety of natural antioxidants, such as phenolic acids, flavonoids, anthocyanin and many other phenolic compounds [1]. Consumption of various types of edible flowers provides excellent health benefits because they are a rich source of phytochemicals that are good for disease risk reduction. Their colours are predetermined by many chemical compounds but the contents of carotenoids and flavonoids are the most important. A high antioxidant capacity of flowers is mostly correlated just with the level of Flavonoids [2] High intake of edible flowers has been reported to be associated with a lower incidence of chronic diseases such as cardiovascular disease and cancer [3].

Coconut flower (*Cocos nucifera*) is a natural and delicious alternative to wheat and grain that's packed with dietary fiber and is a good source of protein too. Coconut flower is gluten-free and studies that show celiac disease, a genetic disease that is a severe form of gluten intolerance that results in intestinal complications, may affect as many as one in thirty-three people [4]. Coconut flower nectar is full of vitamins and minerals, many of which are lacking in most diets coconut have wonderful health benefits, but the nectar contains 17 amino acids, minerals, and vitamin C; has a broad spectrum of B vitamins (Vitamin B1, B2, B3 and B6); and is high in potassium, magnesium, zinc, and iron. It also has a high content of inulin, a prebiotic fiber, which feeds our intestinal flora and helps boost digestive and immune functions [5]. The best part about coconut flower nectar is the amazing health benefits it has. Most sugar has next to no nutrition outside of simple carbohydrates, and natural sweeteners contain a few, but coconut flower nectar is full of vitamins and minerals, many of which are lacking in most diet [6].

Coconut flower relieves stress on pancreas and enzyme systems of the body, reducing the risks associated with diabetes and pancreatitis. Reduces problems associated with malabsorption syndrome and cystic fibrosis [7].

Nanotechnology is significantly influencing Science and Economy in the 21stcentury. The use of silver nanoparticles in the field of nutrition is keeping pace and innovating with the ever expanding horizon of Nanobiotechnology [8]. The most effectively studied nanoparticles today are those made from noble metals, in particular Ag, Pt, Au and Pd. Among the various inorganic metal nanoparticles, silver nanoparticles have received substantial attention for various reasons that are the silver nanoparticles (SNPs) have various important applications, historically; silver has been known to have a disinfecting effect and has been found in applications ranging from traditional medicines to culinary items [9]. There have been several reports on the synthesis of Ag-NPs using medicinal plants such as *Basella alba*, *Helianthus annus*, [10] *Saccharum officinarum*, *Oryza sativa*, [11] *Sorghum bicolour*, *Zea mays*, *Aloe vera* [12] *Medicago sativa* (Alfalfa) *Capsicum annuum*, *Magnolia Geranium* species for pharmaceutical and biological applications [13].

The present work is aimed for the biological synthesis of nanoparticles using the flower extract of *Cocos nucifera* and characterized.

II. MATERIALS AND METHODS

A. Collection of plant material

Fresh and clean were Coconut flower (*Cocos nucifera)*, procured from Kuthanoor village, Palakkad district, Kerala during the month of July 2013 for the study.

B. Processing Of Plant Material

The flowers were collected and washed thoroughly with water to remove the earthy matters and freed from debris. Raw flowers were shade dried and powered (80% coarse: 20% fine) in a mechanical grinder.

C. Extraction of bioactive compounds

The extraction of the coconut flowers was carried out using known standard procedures. The shade dried powders were subjected to successive extraction in methanol by hot continuous percolation method using Soxhlet's apparatus. The extracts were filtered using Whattman filter paper (No.1), and were kept in sterile bottles, under refrigerated

conditions, until further use. The extract was used directly for synthesis of nanoparticles.

D. Synthesis of nanoparticles

1mM AgNO3 solution was prepared and stored in amber colour bottle. 5ml of flower extract was taken in a conical flask separately and to this 50ml of 1mM AgNO3 solution was added drop wise with constant stirring and observed the colour change. The colour of the solution as checked periodically and then the conical flask was incubated at room temperature for 48 hours. The colour change of flower extract indicated the nanoparticles synthesis from flowers of *Cocos nucifera*.

1) Visual Detection:

The filtrate treated with $AgNO_3$ were observed for the change in colour from dark green to pale yellow colour and compared with the control, which forms a visual method of detection of nanoparticle synthesis.

2) UV-Visible Spectrum (UV Nanodrop):

The reduction of metal ions was monitored by measuring the absorbance as a UV-Vis spectrum of reaction medium by drawing $1cm^3$ medium on a Perkin Elmer, Lamda-25 UV-Visible spectrophotometer. The absorbance was recorded from 350 to 450 nm at a resolution of 0.5nm for detection of synthesized nanoparticles. The peak is known as plasmon resonance peak.

3) Ph Change:

After keeping the supernatant with contact to the 1mM and 2mM of $AgNO_3$, the change in the pH of the solution with respect to the control was observed using pH meter.

4) Ftir Studies:

The aqueous filtrate containing nanoparticles and their controls was subjected to Fourier transform infrared (FTIR) spectrum using a Thermo Nicolet, Avatar 370.

III. Results and Discussion

In the present study nanoparticles were synthesized by using flower extract of *Cocos nucifera.* Rapidly within 15 min of incubation period and dark yellowish colour was developed by addition of $Ag(NO_3)_2$ to the flower extract Fig.1.

Fig. 1: Dark yellowish color change after incubation.

$AgNO3 + NaBH4 \rightarrow Ag + 1/2H2 + 1/2B2H6 + NaNO3$

The appearance of yellowish-brown colour indicates the formation of nanoparticles. The time duration of change in colour and thickness of the colour varies from plant to plant. The reason could be that the quantitative variation in the formation of Silver nanoparticles (or)availability of H+ ions to reduce the silver. Silver nitrate is used as reducing agent as silver has distinctive properties such as good conductivity, catalytic and chemical stability. The aqueous silver ions when exposed to herbal extracts were reduced in solution, there by leading to the formation of silver hydrosol. The synthesis of Silver nanoparticles had been confirmed by measuring the UV-Vis spectrum of the reaction media. The UV-Vis spectrum of colloidal solutions of Silver nanoparticles synthesized from flower of Cocos nucifera has the characteristic palsmon peak at 338 nm Fig.2.

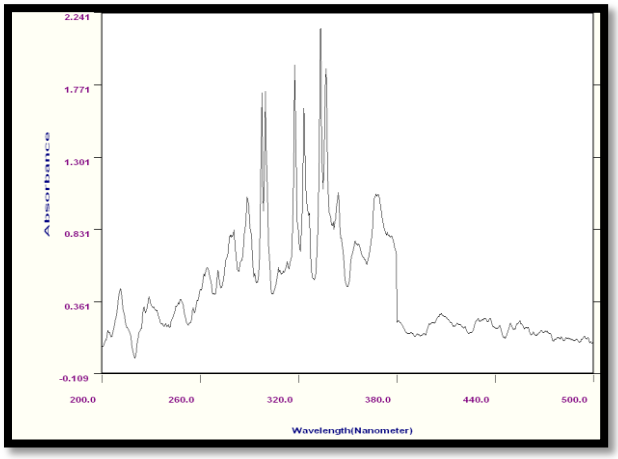

Fig. 2: UV-Vis spectrum showing the palsmon peak at 338nm.

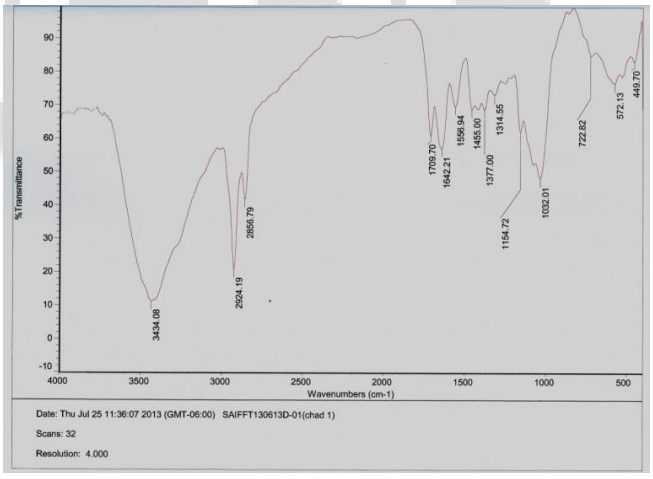

Fig. 3: FTIR spectral studies

Nanoparticles can offer significant advantages over the traditional delivery mechanisms in terms of high stability, high specificity, high drug carrying capacity, ability for controlled releases, possibility to use in different types of drug administration and the capability to transport both hydrophilic and hydrophobic molecule.

IV. Conclusion

The present study revealed the synthesis of nanoparticles using Coconut flower (*Cocos nucifera*) water extracts. The aqueous silver ions exposed to the extracts, the synthesis of nanoparticles were confirmed by the change of colour of flower extracts. These environmentally benign nanoparticles were further confirmed by using UV-Vis spectroscopy and FTIR studies.

REFERENCES

[1] M. S Alamb, Jabbar, Z. Javed, and K. Atha, "Evaluation of antioxidant activity of Cassia siamea flowers," *Journal of Ethnopharmacology*, vol. 108, 2006, pp.340–348.
[2] Shahidi F, "Antioxidants in food and food antioxidants", *Nahrung*, vol 44, 2009, pp. 158–163.
[3] Ibrahim T.A, El-Hefnawy, H.M. El-Hela, "Antioxidant potential and phenolic acid content of certain cucurbitaceous plants cultivated in Egypt", *Nat. Prod. Res*, vol. 24, 2001, pp.1537–1545.
[4] Alviano D.S, Rodrigues K.F, Rodrigues M.L, Fernández PD, "Antinociceptive and free radical scavenging activities of Cocos nucifera L. (Palmae) husk fiber aqueous extract", *Journal of Ethnopharmacology*, 2004. vol. 92, pp. 269-273.
[5] Robeerto CA, "Evaluation of the efficacity of coconut (Cocos nucifera), palm nut (Eleais guineensis) and gobi (Carapa procera) lotions and creams in indivirual protection against Simulium damnosum s.l. bites in Cote d'Ivoire, *"Bull Soc Pathol Exot"*, 2003, vol. 96(2), pp. 104-109.
[6] Trinidad TP, Valdez DH, Mallillin AC, Chua M & Maglaya A, "Coconut Flour from Coconut Residue: a Promising Functional Food", *Proceedings of the 37th COCOTECH Meeting*, July 17–21, Ho Chi Minh City, Vietnam Jakarta, 2001
[7] Kneiflova J, Slosarek M, Melicherciková. "The husk fibre of C. nucifera is a source of anti – neoplastic ctivity", *Hayati journal of bioscience*, 2008, vol.12, pp. 1206-1212.
[8] Savithramma N, Linga Rao M, Rukmini K, Suvarnalatha devi P, "Antimicrobial activity of silver nanoparticles Synthesized by using Medicinal Plants", *Int J Chem Tech Res*, 2011, vol 3, pp. 1394-1402.
[9] Thirumurugan A, Tomy NA, Jai Ganesh R, Gobikrishnan S, "Biological reduction of silver nanoparticles using plant leaf extracts and its effect an increased antimicrobial activity against clinically isolated organism", *De Phar Chem*, 2002, vol. 2, pp. 279-284.
[10] Chandran, S.P. Chaudhary, M. Pasricha, R. Ahmad, A. Sastry, "Synthesis of gold nanotriangles and silver nanoparticles using *Aloe vera* plant extract", *Biotechnol. Prog*, 2006, vol. *22*, pp.577–583.
[11] Li, S. Shen, Y. Xie, L. Zhang, L. Zhang, "Green synthesis of silver nanoparticles using *Capsicum annuum* L. extract", *Green Chem*, 2007, vol. *9*, pp. 852–858.
[12] Song, J.Y.Jang, H.K.Kim, "Biological synthesis of gold nanoparticles using *Magnolia kobus* and *Diopyros kaki* leaf extracts". *Process Biochem*., 2009, vol.*44*, pp. 1133–1138.
[13] Gardea-Torresdey, J.L Gomez, E Peralta-Videa, J.R Parsons, J.G Troiani, H.E.; Santiago, "Alfalfa sprouts: A natural source for the synthesis of silver nanoparticles", *Langmuir*, 2003. vol. *19*, pp.1357–1361.

