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Short Communication

Green synthesis of silvernanoparticles and their bioactivity by using plant extract of *Abutilon indicum* L.

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Abstract

The green synthesis of silvernanoparticles from plant extracts has proven to be a very effective as well as alternate pathways for the nanotechology. A number of techniques has been developed for synthesis i.e. chemical reduction. This study deal with synthesis of silver-nanoparticles from leaf extracts of plant. The extract was incubated with the solution of $AgNO_3$ has showed gradual colour change of the extract from greenish to reddish brown, this visual change in colour indicates the silver nanoparticles formation. Synthesizing silver nanoparticles from Abutilon indicum L. plants is echo friendly, easy and cost effective. Silver nanoparticles have good antimicrobial efficiency against bacteria. That is why it is being widely used in medicinal application such as for the treatment of Cancer epilepsy and AIDS.

Keywords: Nanoparticles, bioactivity, plant extract.

Introduction

A natural practice for biosynthesis of silver nanoparticles has been established for exploring area of nano science research development. Silver nanoparticles have accomplished greater attention because of antibacterial properties[1]. In nanoparticles, the surface/bulk ratio of molecules increases that further increase the system's energy, that leads to reduction in the stability of system that further increases the antibacterial activity in comparison to its bulk form. Green nanopartcless can also be even used in biosensor device to detect the bacterial strains[2]. The application of silver nano-particles in medical science also provides an entirely new area for detection of many diseases[3].

By taking into consideration of our efforts we have used a weed *Abutilon indicum* L., for finding its bioactivity.

Abutilon indicum is commonly called "Thuthi" or "Kanghi" in hindi, is native of South Asia. It is used in treatment of gout, ulcers, tuberculosis, bleeding disorders etc. It is also used as diuretic, laxative, expectorant, anti inflammatory, astringent, aphrodisiac anthelmintic, etc. leaves are also used to cure boils and ulcers. *A. indicum* leaves showed the presence of fructose glucose, amino acids, galactose. Plant roots have non–drying oil consisting of vmany fatty acids including oleic, linoleic, lauric, palmitic, stearic, myristic, capric and unusual fatty acids[4].

The leaf extracts shows hypoglycemic, antibacterial hepatoprotective, and larvicidal properties[5-8]. Analgesic bioactive principles from this plant were isolated[9], and reported as effective compenent in treating diabetes, hyperlipidemia, and free radical scavengers[10-12].

Materials and methods

Plant collection, identification and extracts preparation: The leaves of plants were collected from Punjab. The shade dried leaves extraction was done with the methanol (i.e. 3:1v/w). Collected extract were then filtered with help of blotting filter paper and then were concentrated by the use of rotary evaporator. Then plant extracts was then dried in the oven at 45^0C. After this extract was used for synthesis of nanoparticle and its quantification of antimicrobial activity.

Synthesis of silver-nanoparticles: Silver nano particles synthesis has been done by using $AgNO_3$ in accordance with method given by Zargar et al.[13]. During preparation equal volume of $AgNO_3$ (0.1%) and the plant extract (1%) was mixed ratio of 1:1. The mixture was then incubated at the room temperature for about 3hours. Then the colour change was observed. Then obtained silvernanoparticles (AIAgNPs) were then centrifuged at 6,500rpm for 4 minute, then washed and dried in the vacuum chamber at 35^0C.

Antibacterial activity: Eight pathogenic bacterial strains including four gram -positive (*Bacillus pumilis* MTCC ACC NO 14884, *Bacillus subtilis* MTCC ACC NO 2757. *Staphylococcus aureus* MTCC ACC NO 96) and four gram-negative (*E.Coli* MTCC ACC NO 3261, *Pseudomnas aeruginosa* MTCC ACC NO 1035, *Shigella dysenterine* MTCC ACC NO 5, *Vibrio cholerae* MTCC ACC NO14033) was used for assay. Bacterial activity determination was done with with help of disc diffusion method given by Ruparelia et al.[14]. Petri plates and nutrient Agar were autoclaved at 121˚C. Then 30ml of growth media was poured to the petriplates. It was allowed to solidify for

15min. Then the 0.5ml of inoculation was spread on the agar plates. Sterile paper discs measured 6mm diameter that absorbed with 20µl of test sample were placed on the solidified plates under aseptic conditions. Each disc should be pressed down to ensure that there is complete contact with the agar surface. The inoculated plates were made to stand for 1hr and then plates were inverted and placed in an incubator at 37˚±1˚C for 24hr. After 24hr of incubation, each plate was properly examined and the diameter of inhibition zone was measured with help of a scale from inverted side.

Antioxidant activity: It will be determined by using DPPH asaay according to the method given by Mazhar-Ul-Islam I.A. et al[15]. DPPH solution will be mixed with sample solution in required ratio. Due to process of reduction, the violet color of solution start fading according to the amount of antioxidants present in sample. The reaction monitoring was done by recording the absorbance spectra at 515nm after equal time until the stability of absorbance.

$$\% \text{ scavenging} = \frac{\text{OD of control} - \text{OD of test sample}}{\text{OD of control}} \times 100$$

OD = Optical density.

Results and discussions

Antibacterial activity of *A. indicum* leaf extracts has been reported[16]. The highest zone of inhibition in *A. indicum* AgNPs i.e 21.7mm was observed as compared to *A.indicum* extract (Table-1). The present study revealed that *A.indicum* AgNPs was found to possess higher antibacterial activities in comparison to *A. indicum* extract. The mechanism behind this is the weakening of DNA replication and inactivation proteins[17].

The antioxidant activity of the aqueous extract as well as plant-AgNPs was evaluated by using DPPH scavenging assay. As shown in Table-2, there is a significant difference between respective values. The recorded value lowest concentration of the aqueous extract (5mg/L) was 12.64mg/L and this value was increased to 58.45mg/L with concentration increase of 20mg/L. one the other hand, these values recorded 13.92mg/L and 64.77mg/L for the two concentrations of the plant-AgNPs showing higher value that the plant extracts.

Table-1: Antimicrobial activity of A. indicum (AI) and *A.indicum* silver nanoparticles (AIAgNPs).

Bacterial strain	AI Inhibition zone (mm)	AIAgNPs Inhibition zone (mm)	Chloramphenicol Inhibition zone (mm)
Gram –positive			
Bacillus pumilis MTCC ACC NO 14884	11.8	10.7	23.3
Bacillus subtilis MTCC ACC NO 2757	14.2	16.4	28.2
Staphylococcus aureus MTCC ACC NO 96	20.6	21.7	24.9
Gram-negative			
E.Coli MTCC ACC NO 3261	13.8	15.4	28.7
Pseudomnas aeruginosa MTCC ACC NO 1035	8.4	9.8	18.7
Shigella dysenterine MTCC ACC NO 5	15.0	16.5	23.4
*Vibrio cholera*e MTCC ACC NO 14033	12.01	12.9	30.1

Table-2: Antioxidant activity of silver nanoparticles from plant extracts.

Extract	Antioxidant activity DPPH (IC_{50})		
	5g/L	10g/L	20g/L
Aqueous	12.64	23.02	58.45
AgNPs	13.92	21.06	64.77

Conclusion

Plant sources may lead to natural product in pharmaceutical, food production and cosmetic. A microbial and antioxidant activity of silver nanoparticles provide scientific evidence for use of *Abutilon indicum*. On the basis of the results obtained, it was concluded that the nanoparticles of leaf extracts of the plant have significant antioxidant and antimicrobial activity as compared to normal extracts.

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