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Screening of Different Growth Medium for Extracellular Bacterial Synthesis of Silver Nanoparticles: Ecofriendly Method

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ABSTRACT

Objective: The aim of present study was to select suitable growth medium for bacteria capable of silver nanoparticle synthesis. **Background:** The synthesis of silver nanoparticles (AgNPs) has received considerable attention with their potential applications in field of life sciences. Silver nanoparticles (SNPs) have extensive applications in civil, therapeutic and industrial areas as catalyst, cryogenic superconductor, biosensor, microelectronic and bacteriostatic materials. Currently, there is a growing need to develop environmentally benevolent nanoparticle synthesis processes that do not use toxic chemicals in the synthesis protocol. Among the various known synthesis methods, biosynthesis of silver nanoparticles is preferred as it is environmentally safe, low cost and less toxic. **Methods:** In the present study we have screened different culture medium for the growth of bacteria capable of silver nanoparticles synthesis. Different growth medium were screened on the basis of colour and UV-Visible spectrophotometric analysis. **Results:** Only one culture medium Basal salt medium containing glucose was found to be suitable for synthesis of silver nanoparticles on the basis of colur and UV-Visible spectrophotometric analysis. **Conclusion:** Basal salt medium containing glucose is suitable for growth of bacteria responsible for ecofriendly synthesis of silver nanoparticles.

KEYWORDS: Nanoparticles, Biosynthesis, Screening, Nanotehnology

INTRODUCTION

From the last two decades, paramount importance is given to research in the field of nanotechnology owing to its applications in various fields. Nanoparticles have distinct properties compared to the bulk form of the same material. Silver nanoparticles (AgNPs) have been known to be used for numerous physical, biological and pharmaceutical applications. Silver nanoparticles are the most used nanoparticles among the commercially existing nanosized particles[1] because of distinctive properties, such as good conductivity, chemical stability, catalytic , antibacterial activity, antifungal, anti-viral, anti-inflammatory[2,3]. Many studies have been reported related to synthesis of silver nanoparticles. The need for cost effective and ecofriendly approach for the synthesis of silver nanoparticles has promoted search for biological synthesis method. Many studies have been reported related to biosynthesis of silver nanoparticles[4-8]. In this study we have screened different culture medium for the growth of bacteria responsible for synthesis of silver nanoparticles by extracellular method.

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MATERIALS AND METHODS

Screening of Media for the synthesis of silver nanoparticles

All chemicals used were of analytical grade purchased from Himedia Laboratories Pvt. Ltd., India. Isolation of bacteria capable of AgNPs synthesis was carried out by serial dilution method[9] . Thirteen different culture medium such as Basal Salt Media (BSM) + Glucose (20g/L), Nutrient broth, Lactose broth, Brain Heart infusion (BHI) broth, Muller Hinton Broth (MHB), Luria Bertani (LB) broth, Lactobacillus broth, Maconkey broth, Coliform broth, MR-VP broth, Eosin Methylene Blue (EMB) broth, Malt Extract broth, Sabouraud dextrose broth were screened for the biosynthesis of silver nanoparticles. The composition of BSM was (in g/L) $(NH_4)_2SO_4$, 1.0; K_2HPO_4, 0.1; $MgSO_4$, 0.2; $FeSO_4.7H_2O$, 0.001; NaCl, 1.0; Na_2MoO_4, 0.0033. All the thirteen culture medium were sterilized by autocalve method. Different culture medium were mixed with silver nitrte (1mM) in ratio of 9:1(9 ml silver nitrate + 1 ml culture medium) and incubated under bright condition for 24 hr. Samples were analyzed for colour change by visual observation.

UV-Visible Spectrum analysis of different growth medium

The different samples were analysed by UV-Vis spectroscopy using

Figure 1Visual observation of thirteen culture mediums

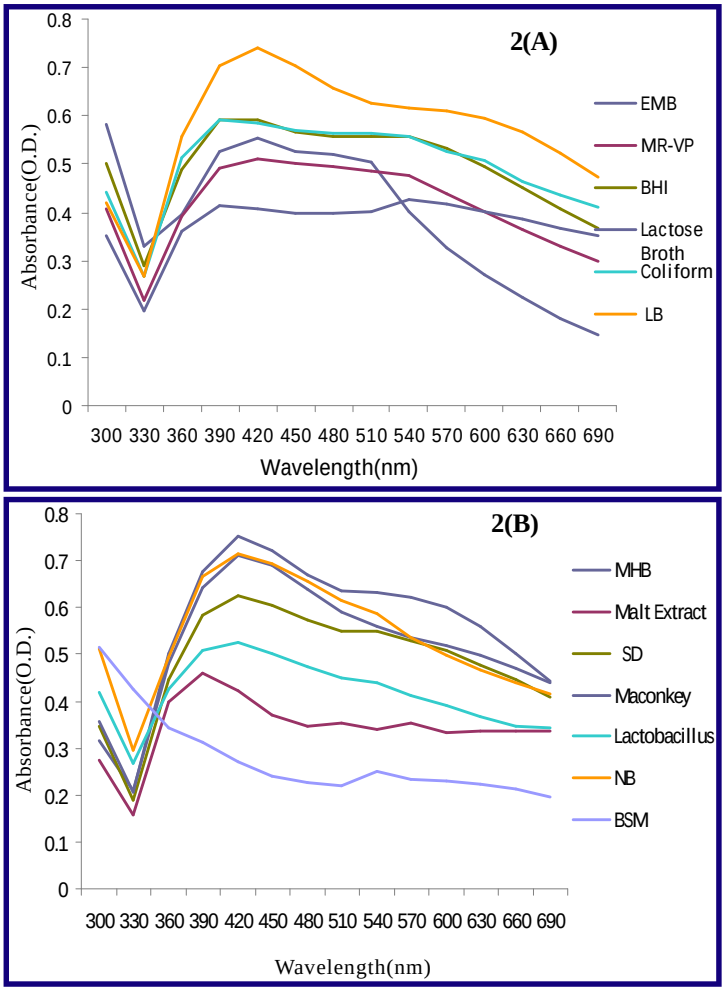

Figure 2(A) &2(B) UV Visible Spectrum of biologically synthesized silver nanoparticles

UV-Vis spectrometer (Shimadzu, UV Pharma spec 2550 with a resolution of 0.72 nm). The spectrum analysis was carried out between 300 and 900 nm. Deionized water was used as blank for all measurements.

RESULTS AND DISCUSSION

All the thirteen bacterial culture except one i.e. Basal Salt Media were yellow in colour whereas Basal salt Media is colourless as shown in fig 1. UV-Visible spectrum of culture medium after addition of silver nitrate with culture medium is shown in Fig. 2(A) & Fig. 2(B). Out of 13 culture mediums screened for the biosynthesis of silver nanoparticles, only Basal Salt Media (BSM) + Glucose did not show peak at 420 nm i.e. characteristic of AgNP. Nutrient Broth, Lactose Broth, Brain Heart infusion (BHI) broth, Muller Hinton Broth (MHB), Luria Bertani (LB)broth, Lactobacillus broth, Maconkey broth, Coliform broth, MR-VP broth, Eosin Methylene Blue (EMB) broth, Malt Extract broth, Sabouraud dextrose broth culture medium show peak around 420 nm when incubated with silver nitrate (1mM) even in the absence of bacterial culture. Some other studies have reported the extracellular biosynthesis of AgNPs by using nutrient broth medium, but formation peak was observed even when only the nutrient broth was added to silver nitrate solution. In the present study, BSM was used as a culture medium and synthesis of silver nanoparticles was not observed when only BSM was added to silver nitrate solution. So, BSM can be used for extracelluar biosyntheis of silver nanoparticles. This is the first study that reports the real biosynthesis of AgNPs.

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