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Nanotechnology

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MSc. Nano-biotechnology

Lab. 3: Green synthesis of silver nanoparticles using *E. coli* bacteria

In natural environment, microbes produce nanomaterials as part of their metabolism; the use of microorganisms in the synthesis of nanoparticles emerges as an eco-friendly and exciting approach.

Biologically synthesized nanoparticles have wide application like biosensors bio-labelling, in cancer therapeutics and in coating of medical appliances.

► Green synthesis is **an alternative approach** for synthesizing nanoparticles (NPs) using natural resources such as **microorganisms** and **medicinal plants** as reducing agents. NPs synthesized by the green method are **highly stable**, **environmental friendly**, **biocompatible**, **cost effective**, **less toxic** and **safe for diagnostic and therapeutic purpose.**

► Biosynthesis of nanoparticles occurs when the microorganisms pull target ions from their environment and then turn the metal ions into the **element metal** through **enzymes** generated by the cell activities.

► The biosynthesized nanoparticles have been used in a variety of applications including drug carriers for targeted delivery, cancer treatment, gene therapy and DNA analysis, antimicrobial agents, biosensors, enhancing reaction rates, separation science, and magnetic resonance imaging (MRI).

Materials and Methods

Materials: 24 hours old *Escherichia coli* culture; Sterile Nutrient broth; Distilled water; 1 mM Silver nitrate.

A) Production of biomass:

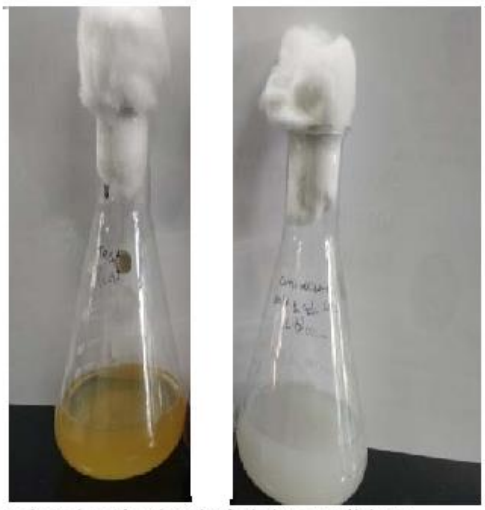
1. *Escherichia coli* strain culture in nutrient broth media for biomass production.
2. Incubate the culture on a rotary shaker at 27°C and agitate at 100 rpm.
3. After 24 h of growth, harvest the biomass by centrifugation at 12,000 rpm for 10 min.
4. Collect the supernatant and pellet for further reaction to synthesize silver nanoparticles.

B) Synthesis of silver nanoparticles

1. Add the collected biomass into the reaction vessel containing 1 mM of silver nitrate.
2. Run the control containing only **silver nitrate in water** and run the blank containing only **biomass**.
3. Carry out the reactions in bright condition for 24 hours.

Results

Color change from **yellow** to **brown** in the silver nitrate containing flask indicated the formation of silver nanoparticles, whereas no color change was observed in control and blank flask



Before incubation in bright conditions

After incubation in bright conditions.