**Mustansiriyah University**

**College of Sciences**

**Biology Department**

**Nanotechnology**

Suhad Abbas Abid

MSc. Nano-biotechnology

# Lab. 4: synthesis of nanoparticles by fungi

Synthesis of NPs using fungi is one method of bottom-up strategy where a major reaction based on **reduction** or **oxidation** of the substrate causes an increase of colloidal structures.

► Fungi are a favorable option for NPs synthesis since fungi are filamentous by nature and able to withstand the pressure of flow and mixing in the bioreactor trough. By contrast, the bacterial fermentation process involves numerous additional steps to obtain a clear filtrate of colloidal broth. In addition, fungi can accumulate metals by biological and physicochemical means.

► Fungi are an excellent choice for large-scale production as biocatalysts because of their ability to secrete extracellular enzymes. Due to their properties of high production of specific enzymes, metabolites, rapid growth, easy handling and low cost for large scale production.

► Biological synthesis of nanoparticles by fungi can by **Reducing enzyme** (**Intracellular** or **Extracellular**) and the procedure of biomimetic mineralization.

► There is a large quantity of fungi, which can efficiently synthesize **silver NPs**, such as *Aspergillus clavatus* (*A. clavatus*) or *Trichophyton mentagrophytes*. **Gold NPs** are synthesized using *A. clavatus*. $BaTiO_3$ NPs, CdS NPs, $Fe_3O_4$ NPs are

synthesized by *F. oxysporum*, Mg NPs or ZnO NPs are produced by *Aspergillus terrus.*

**Synthesis of silver NPs by fungi (Materials and methods)**

**Fungal species**

Fungal organisms namely, *Aspergillus fumigatus*, *Aspergillus flavus*, *Candida albicans*, *Penicillium italicum*, *Fusarium oxysporum* and *Aspergillus ochraceus* can be used for Ag NPs synthesis.

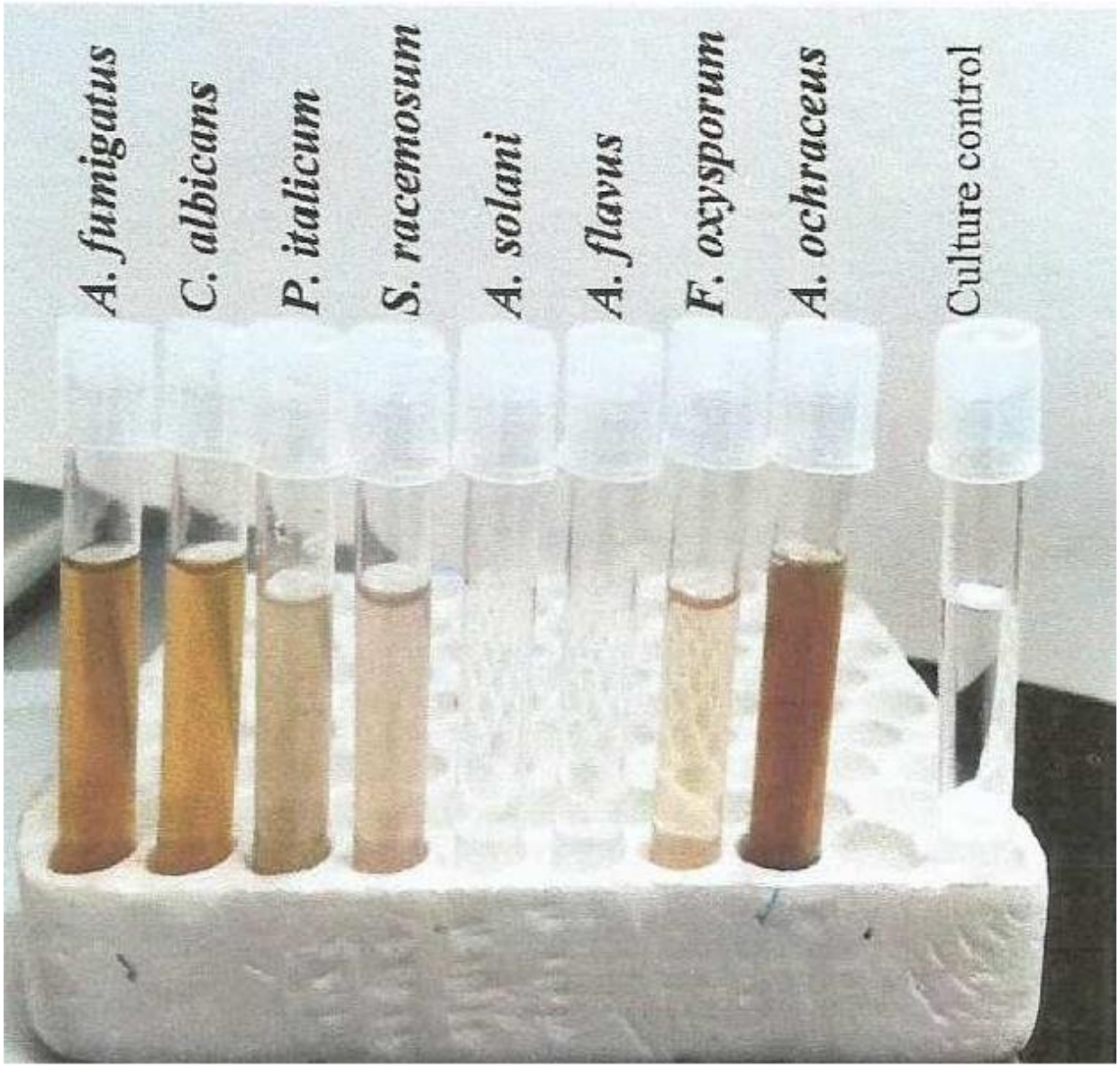
**Biomass preparation**

1. Fungi were grown on malt extract broth at 28°C on a rotary shaker (120 rpm) for 96 h.
2. The biomasses were harvested by filtration using Whatman filter paper No. 1.
3. washing with distilled water to remove any components of the medium.
4. The biomass (25 g) wet weight was placed in individual flasks containing 100 ml water and incubated for 24 h.
5. Filter The biomass and collect the cell filtrate to be used for biosynthesis of AgNPs.

**Biosynthesis of AgNPs**

1. Mix 50 ml of cell filtrate with 10 ml $AgNO_3$ solution (1mM) and make reaction mixture without $AgNO_3$ as control.
2. Incubate the prepared solutions at 28°C for 24 h. (keep all solutions in dark to avoid any photochemical reactions during the experiment.
3. Purify the AgNPs by centrifugation at 10,000 rpm for 10 min twice (to remove impurities), and collect NPs for further characterization.
4. Re-suspended the residue of AgNPs in 1ml sterile water.

5. Use UV-visible spectrophotometer after 24 hrs to notice the change in colour of the cell free filtrate incubated with silver nitrate solution.




Colour observed in fungal extract of different fungal