

# Supporting Information

## **1,4- $\alpha$ -glucosidase from *Fusarium solani* for controllable bio-synthesis of silver nanoparticles and their multifunctional applications**

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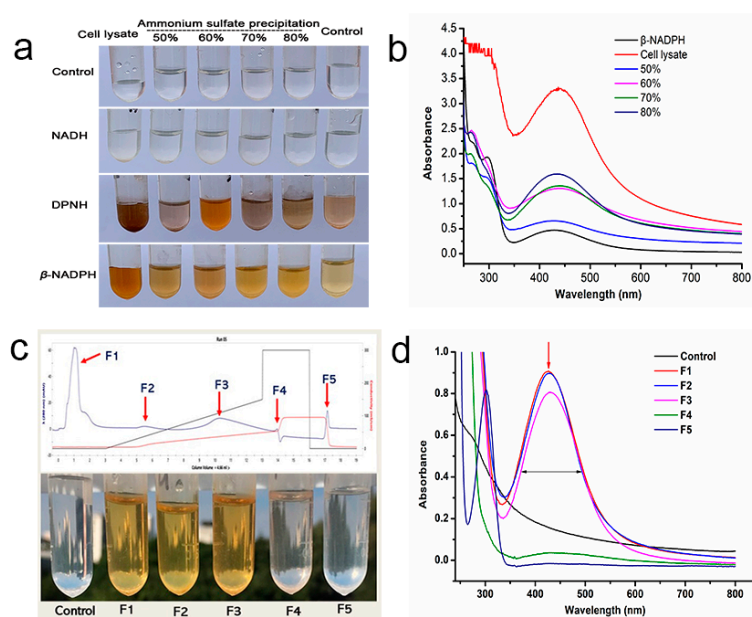
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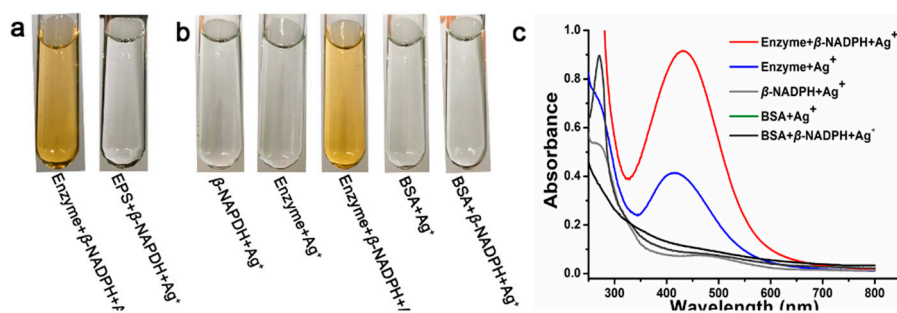
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## Synthesis of AgNPs using the protein obtained from ammonium sulfate precipitation method

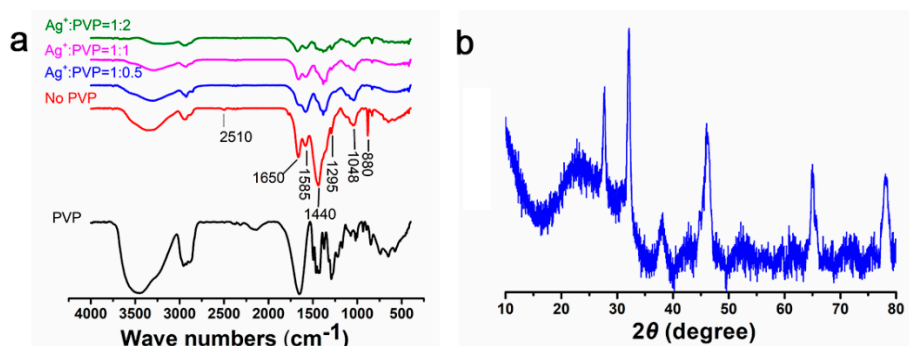
The protein fractions precipitated with saturated ammonium sulfate solution in a final saturation of 50%, 60%, 70% and 80% could be not applied to synthesise AgNPs. However, when the coenzyme DPNH and  $\beta$ -NADPH were added to reaction system, AgNPs could be formed (Figure S1a). Due to some black precipitate existing in the AgNPs solution with DPNH addition, thus the  $\beta$ -NADPH was the suitable coenzyme that was benefit for AgNPs synthesis. Moreover, the protein fraction precipitated with saturated ammonium sulfate solution in a final saturation of 80% exhibited the excellent AgNPs effect. Therefore, the 80% protein fraction was further purified by ion exchange chromatography (IEC) (Figure S1c).



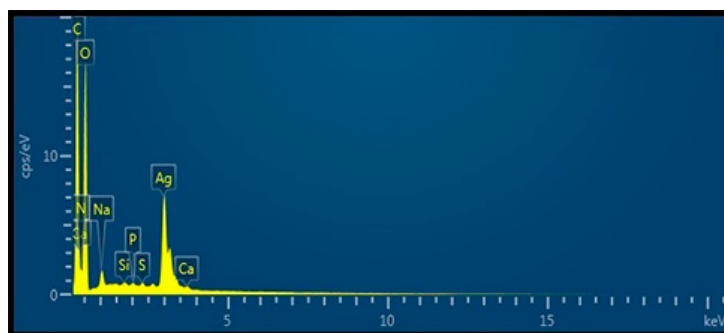
**Figure S1.** AgNPs synthesized by protein fractions precipitated with saturated ammonium sulfate solution in a final saturation of 50%, 60%, 70% and 80% with or without coenzyme addition (a); UV-Vis spectra of AgNPs synthesized by protein fractions with or without  $\beta$ -NADPH addition (b); 80% protein fraction further purified by ion exchange chromatography (IEC) and AgNPs synthesized with different collected purified fractions (c); UV-Vis spectra of AgNPs synthesized by purified protein fractions with or without  $\beta$ -NADPH addition (d).



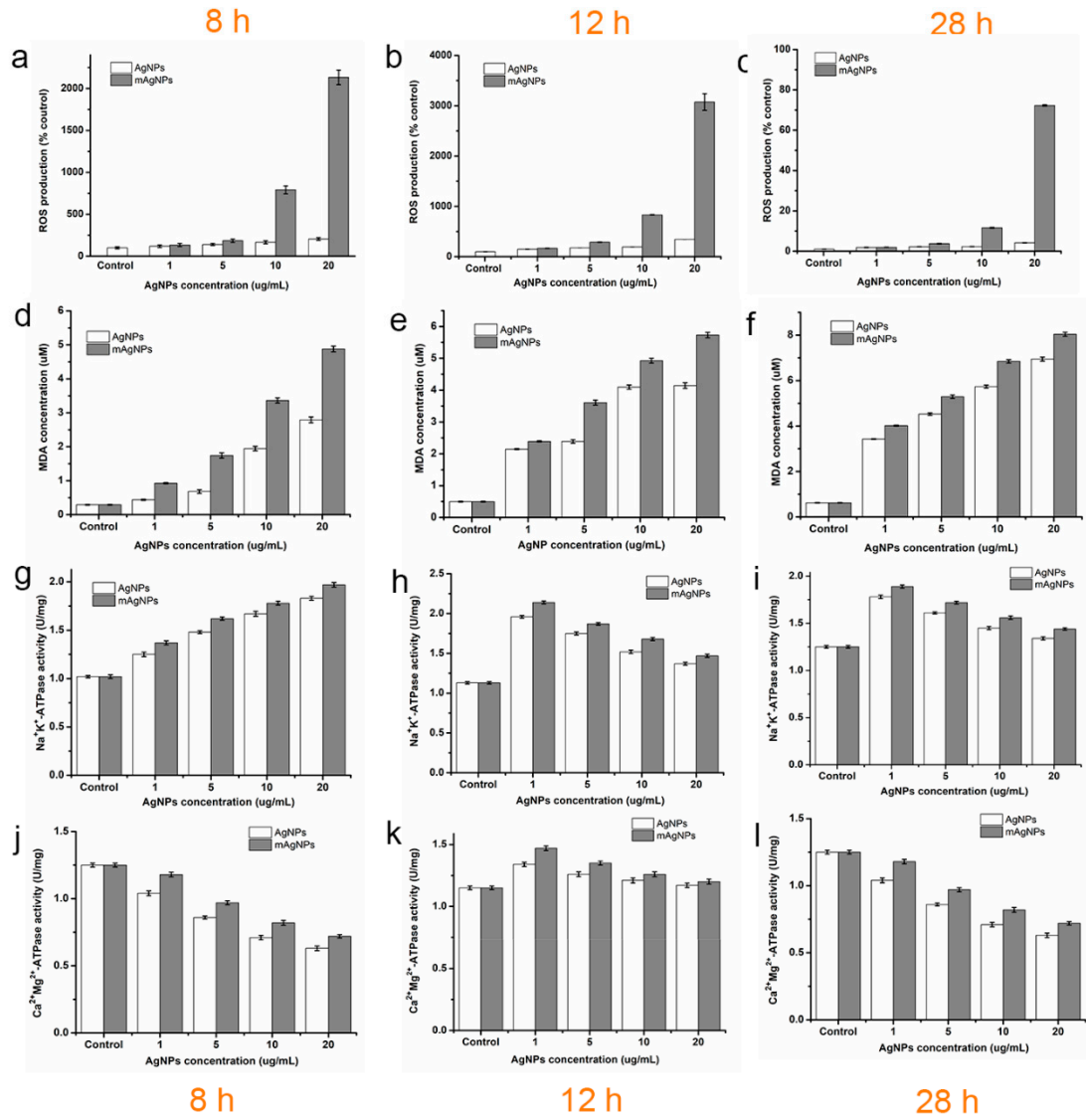
**Figure S2.** (a) Color change of AgNPs synthesized in purified protein or exopolysaccharides (EPS) solutions in presence of  $\beta$ -NADPH. (b) Comparative color change of AgNPs synthesized in purified protein and BSA solutions in presence/absence of  $\beta$ -NADPH. (c) UV-Vis spectra of AgNPs synthesized by BSA, EPS, and purified protein.



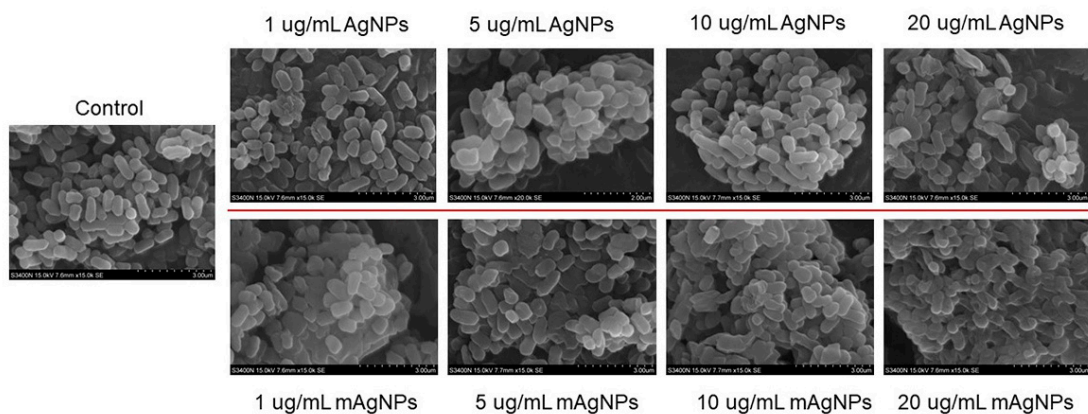
**Figure S3.** FTIR spectra of PVP and AgNPs synthesized with different mass ratio of  $\text{Ag}^+$ /PVP (a); X-ray diffraction (XRD) of AgNPs with  $\text{Ag}^+$ /PVP mass ratio of 1:1 (b).



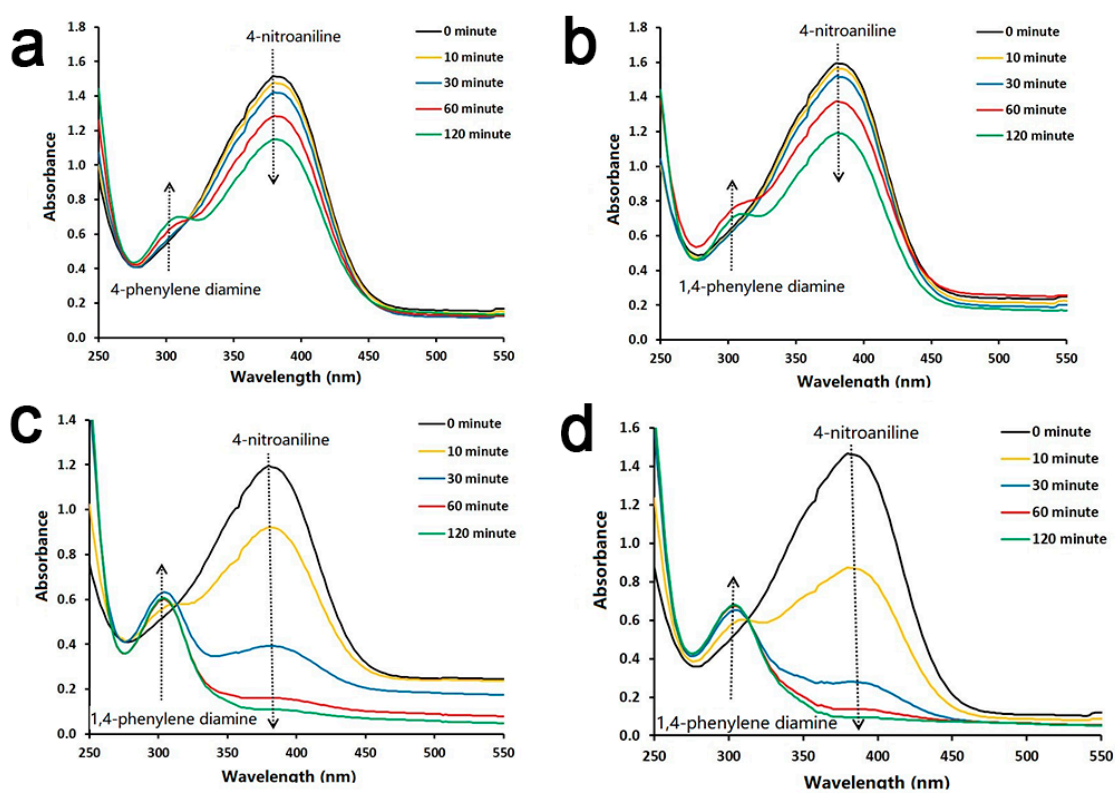
**Figure S4.** Energy dispersive spectrometer (EDS) of AgNPs synthesized in presence of PVP.



**Figure S5.** Effects of different concentrations (0, 1, 5, 10 and 20 ug/mL) of AgNPs and mAgNPs (AgNPs synthesized with the Ag<sup>+</sup>/PVP mass ratio of 1:1) on ROS contents of *E. coli* cells at 6 h, 12 h and 28 h. ROS levels of *E. coli* at 6 h (a), 12 h (b), and 28 h (c); MDA concentrations of *E. coli* at 6 h (d), 12 h (e), and 28 h (f); Na<sup>+</sup>K<sup>+</sup>-ATPase activity of *E. coli* at 6 h (g), 12 h (h), and 28 h (i); Ca<sup>2+</sup>Mg<sup>2+</sup>-ATPase activity of *E. coli* at 6 h (j), 12 h (k), and 28 h (l).



**Figure S6.** SEM images of *E. coli* treated with different concentrations AgNPs or mAgNPs.



**Figure S7.** Absorbance spectra for p-nitro-aniline after addition of the so-obtained Ag-Au nano-alloy as function of time: blank (a), 1,4- $\alpha$ -glucosidase(b), AgNPs (c) and AgNPsM (d).