

Supplementary material

Green nanotechnology for controlling bacterial load and heavy metal accumulation in Nile tilapia fish using biological selenium nanoparticles biosynthesized by *Bacillus subtilis* AS12

Ahmed M. Saad, Mahmoud Z. SitoHy, Mohamad I. Sultan-Alolama, Khaled A. El-Tarabily* and Mohamed T. El-Saadony.

*** Correspondence:**

Khaled A. El-Tarabily
ktarabily@uaeu.ac.ae

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Figure S1. Neighbor-Joining phylogeny of the *Bacillus subtilis* species. Numbers at branch points indicated bootstrap percentages. Only species that have percentage identities greater than 99.25% are listed.

Figure S2. Characterization of bio-selenium nanoparticles (Bio-SeNPs) (A) binding energy X-ray photoelectron spectroscopy (XPS), (B) X-ray diffraction (XRD) image, (C) Scanning electron microscopy (SEM) image.

Figure S3. Fourier transform-infrared (FTIR) spectroscopy spectra of (A) active groups in bio-selenium nanoparticles (Bio-SeNPs), (B) active groups in *Bacillus subtilis* pellets supernatant.

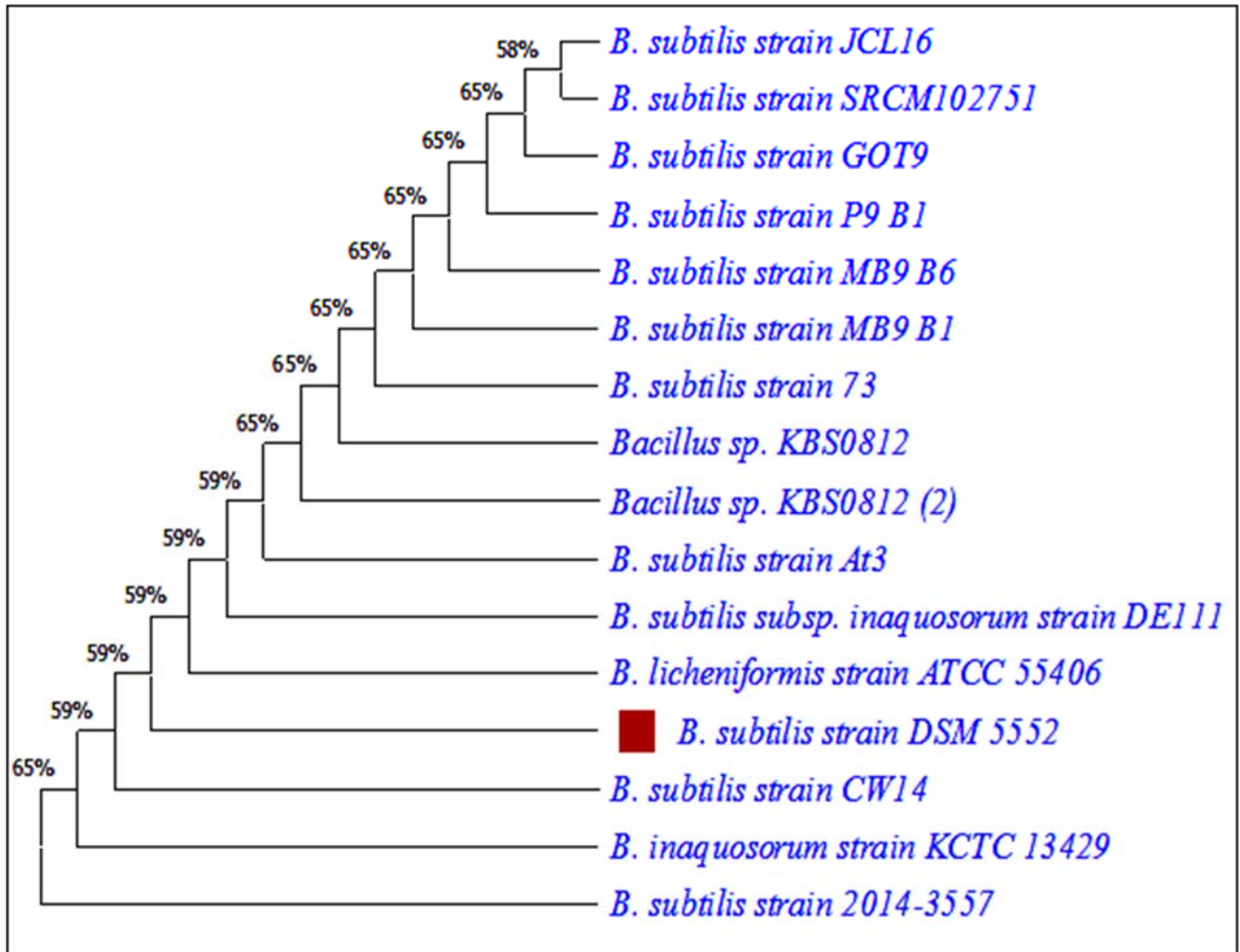


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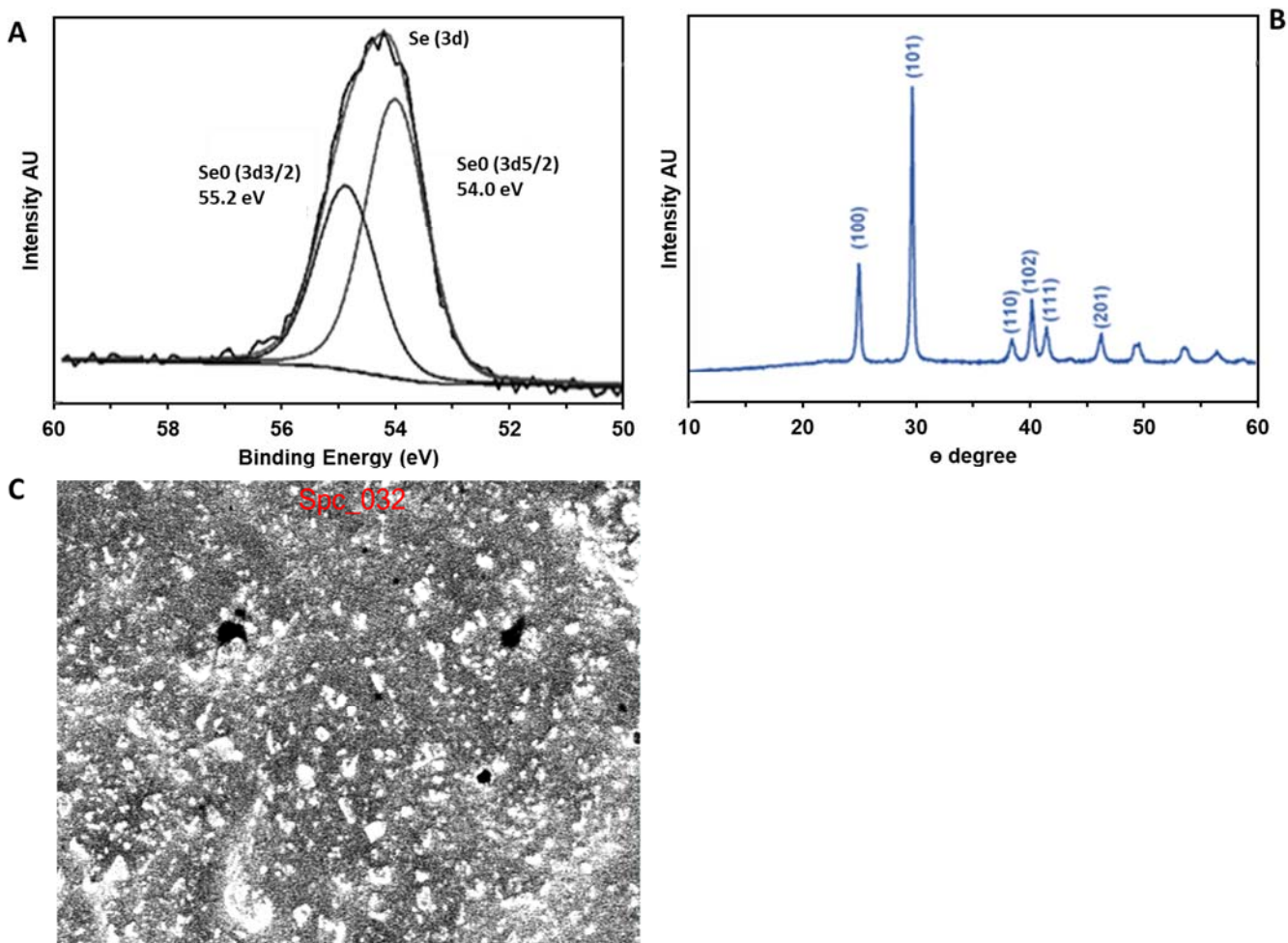


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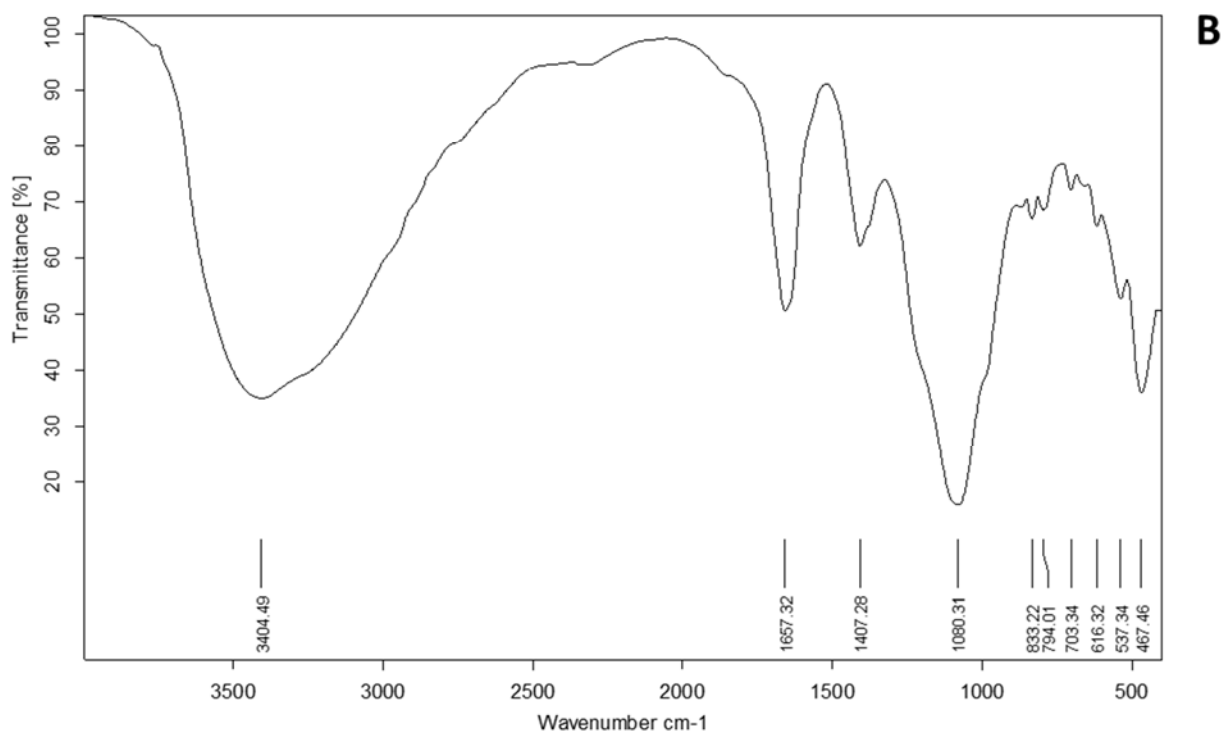
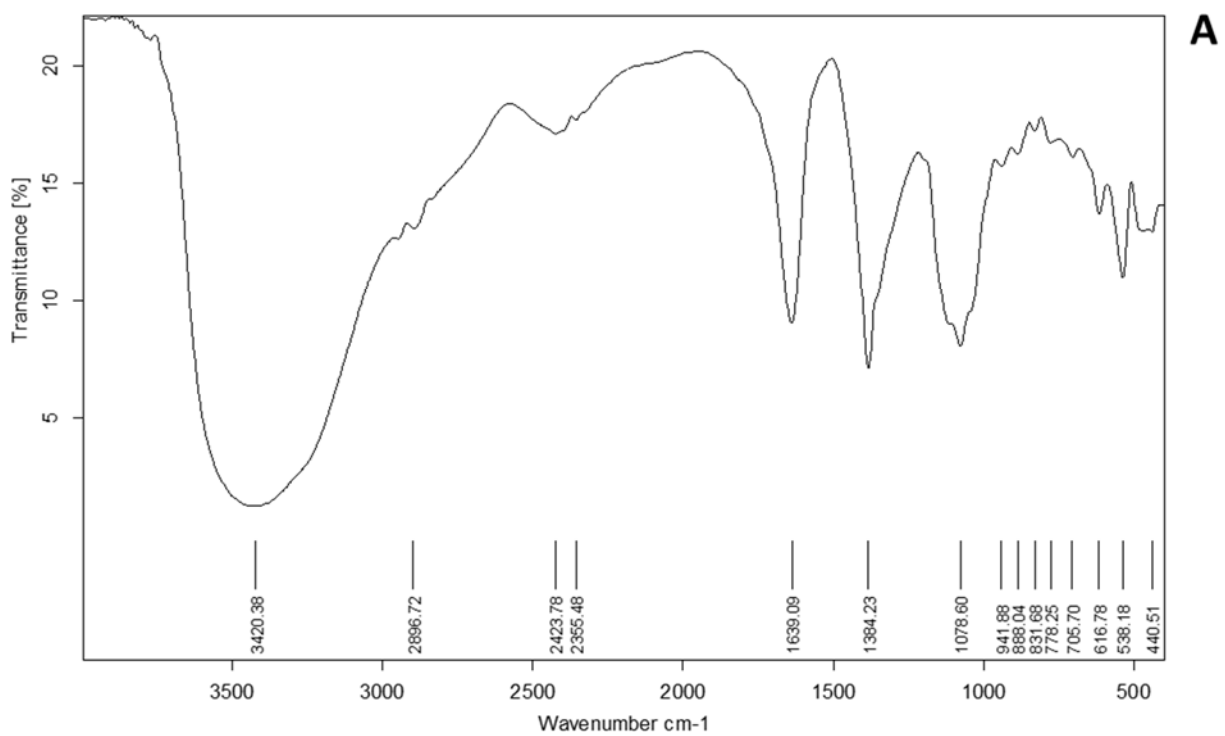


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