Green production of silver nanoparticles mediated by *Codium sp.*

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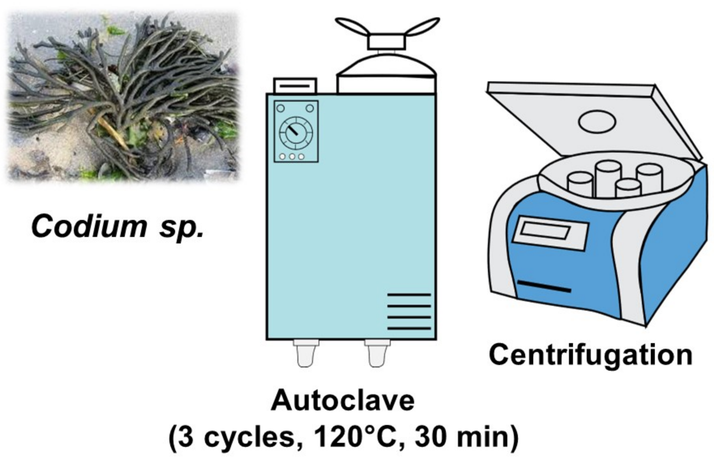
Introduction

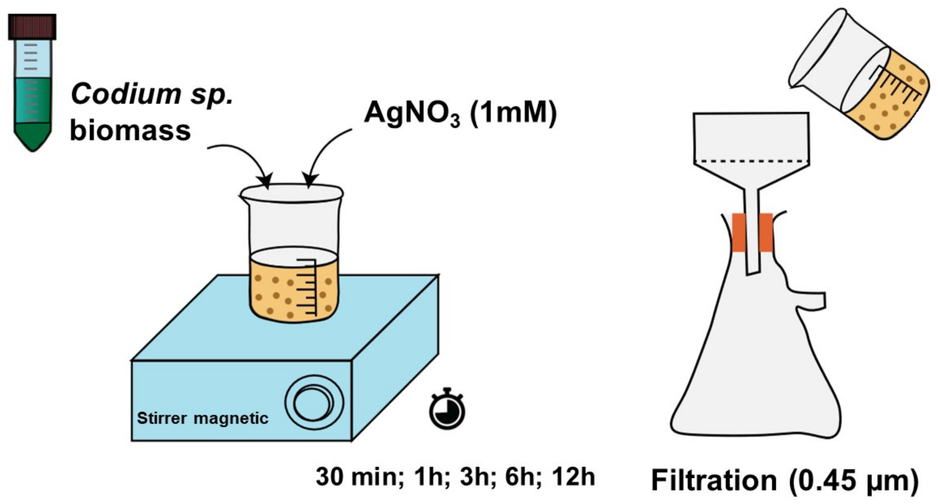
The use of algae-derived compounds for the synthesis of metal nanoparticles arises as an emerging trend since it is simple, eco-friendly, pollutant-free, non-toxic, and low-cost approach. The compounds of algae can accumulate metals and reduce metal ions, no requiring the use of toxic reducing agents commonly used in chemical methods [1]. Among the different studied metal nanoparticles, the silver nanoparticles (AgNPs) have been widely studied due to its outstanding antimicrobial activity that can be explored in different biomedical applications like surgical material coatings, prosthesis, wound dressings, food packaging and others [2]. So, the main goal of this work was to biosynthesize silver nanoparticles mediated by residual biomass, from polysaccharides extraction process, of *Codium sp*. collected in Galicia coast aimed to be used in biomedical applications.

Methods

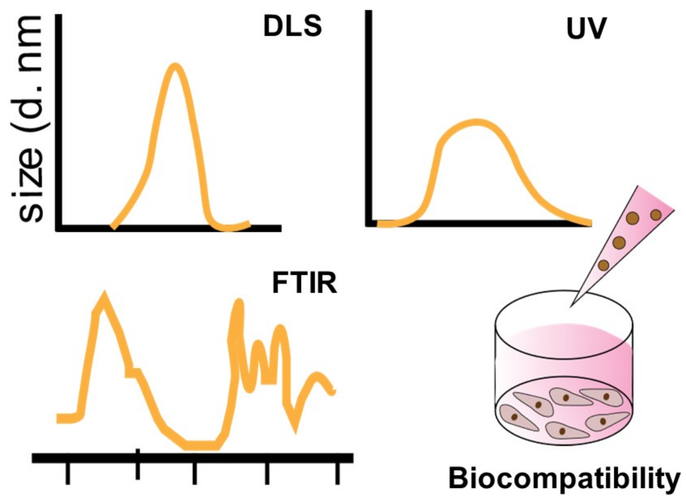
1. Preparation of biomass



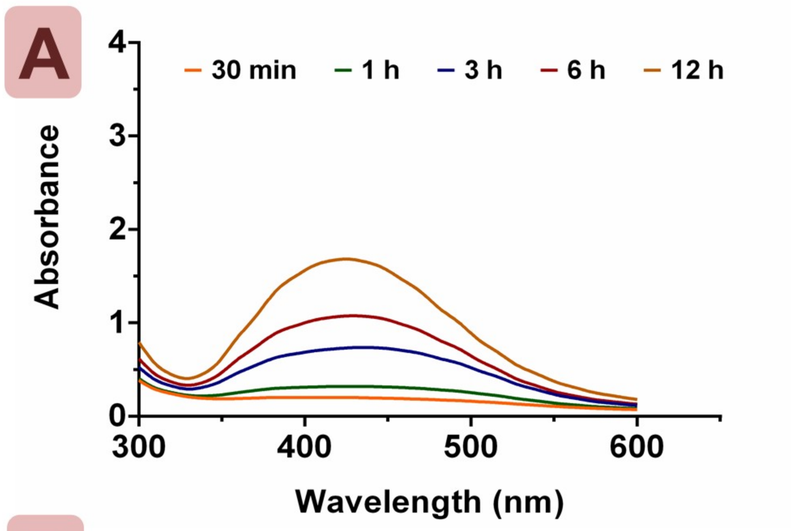
2. Biosynthesis of AgNPs

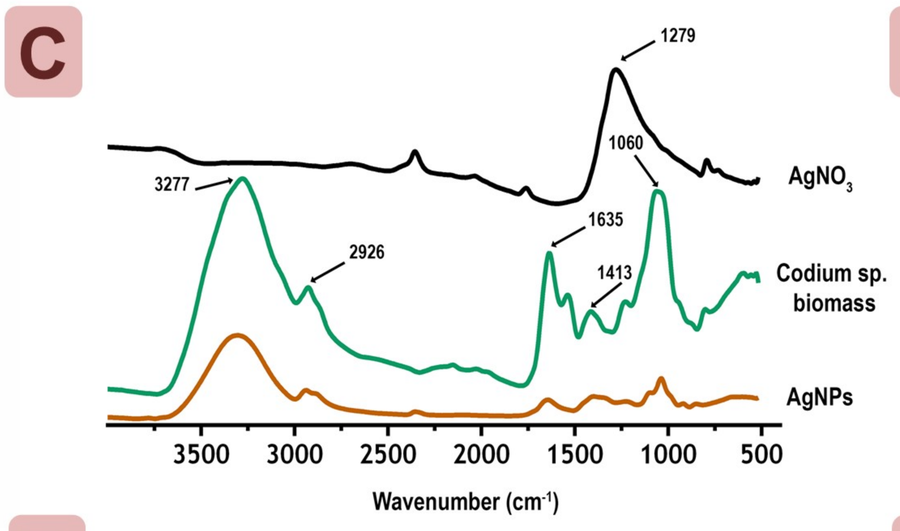


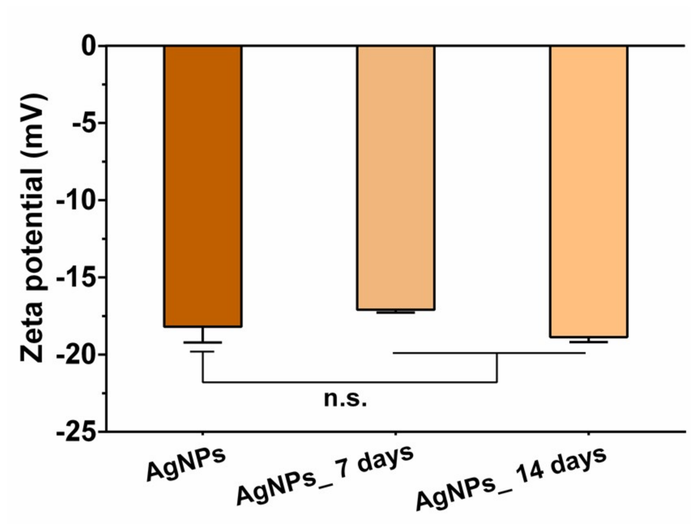
3. Characterization of AgNPs

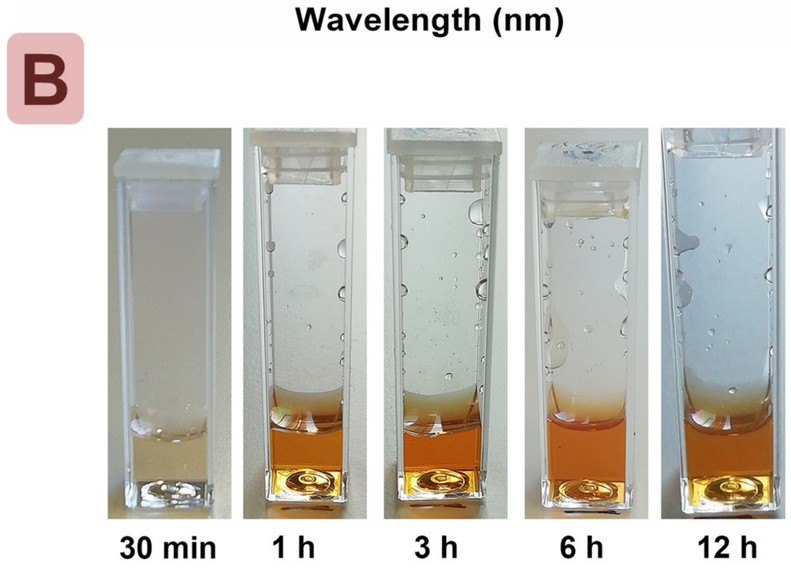


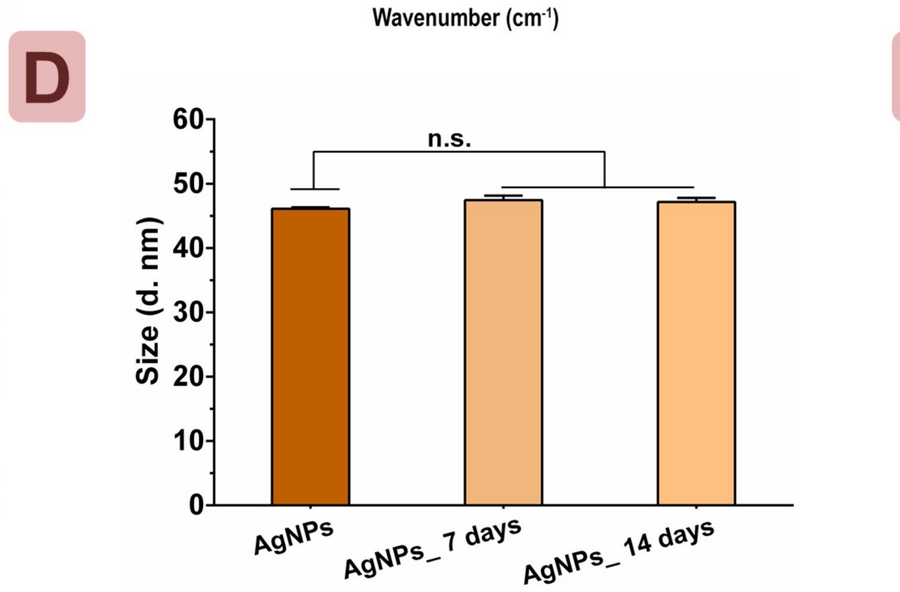
Results











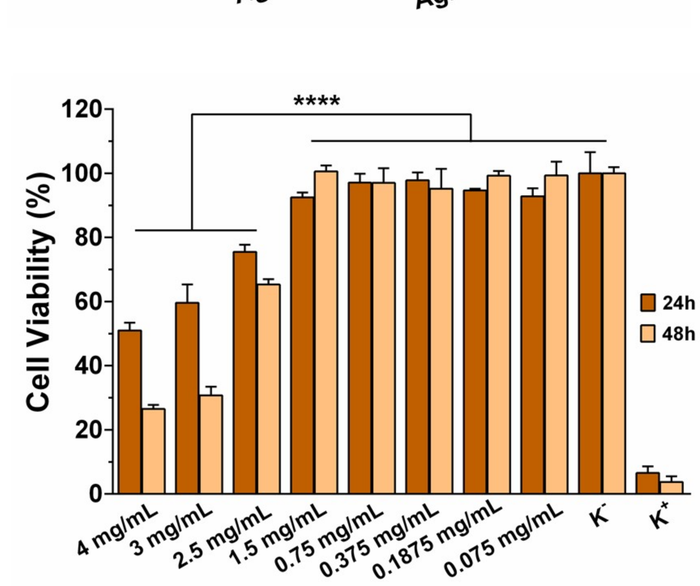


Figure 1. UV–Visible spectrum of biosynthesized AgNPs at different timepoints of reaction **(A)**; Monitorization of color solution during the biosynthesis process of AgNPs **(B)**; FTIR spectrum of silver nitrate, *Codium sp.* biomass and biosynthesized AgNPs after 3h of reaction **(C)**; Size **(D)** and surface charge **(E)** of biosynthesized AgNPs after 3h of reaction as well as after storing during 7 and 14 days at 4°C; Cell viability of fibroblasts when cultured in contact with different concentrations of AgNPs (obtained after 3h of reaction) during 24h and 48h **(F)**. (Data are presented as the mean ± standard deviation, n = 5, ****p<0.0001; n.s: non-significant).

Conclusions

- The AgNPs were successfully biosynthesized by biomass of *Codium sp.,* which was confirmed by UV and FTIR analysis;
- The FTIR spectrum demonstrated that the reduction of silver nitrate was mediated by C=N and hydroxyl groups of algae biomass;
- The AgNPs presented a mean diameter value of 46.1 ± 0.22 nm and a surface zeta potential of – 18.2 ± 1.02 mV;
- The biosynthesized AgNPs were biocompatible in contact with human fibroblasts cells at concentrations lower than 2.5 mg/mL.

References:

[1] Mahdavi *et* al 2013, *Molecules*, 18, 5954–5964
[2] Abdel-Raouf *et al* 2018, *Saudi J Biol Sci*. 26(6):1207–1215

Acknowledgements:
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