Development of diagnostic platforms using gold nanoparticles for early detection of *Xanthomonas arborícola juglandis* responsable of apical necrosis in walnuts

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Introduction

Xanthomonas arborícola juglandis is the main causative microorganism of brown apical necrosis in walnuts (*Juglans regia L.*), in addition to secondary fungal pathogens such as *Fusarium* and *Alternaria* species. This pathology is responsible of premature drop fruit and economic losses of over 70%, were detected in 2012 in Rio Negro valley.

Objetive

This study aims to develop methods that allow early diagnosis anticipate infection by microorganisms and act quickly.

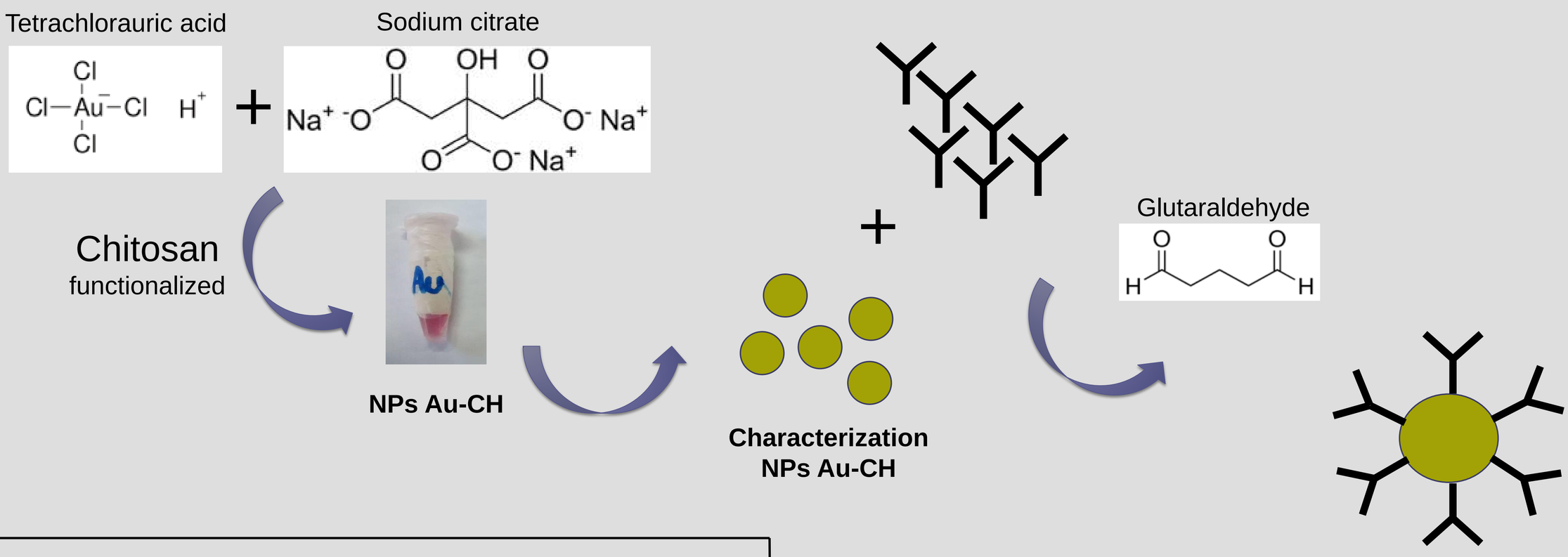
Materials and Methods

For this, gold nanoparticles were synthesized by chemical reduction using tetrachloroauric acid and sodium citrate, and functionalized with chitosan.

For this, gold nanoparticles were synthesized by chemical reduction using tetrachloroauric acid and sodium citrate, and functionalized with chitosan. Nanoparticles (NPs Au-CH) were subsequently characterized by several techniques. The results of UV-visible spectroscopy tests showed a characteristic band at 530 nm; studies of scanning electron microscopy (SEM) showed homogeneous and spherical morphology and particules size of 15±5 nm; energy dispersive spectrometry (EDS) assay showed a characteristic spectrum of 2 keV and X-ray fluorescence (XRF) with characteristic peaks between 37° and 38°. Finally, *Xanthomonas arboricola* antibodies were immobilized on the NPs Au-CH surface using glutaraldehyde, obtaining as result a nanostructured platform for the development of an immunosensor for early detection of this microorganism.

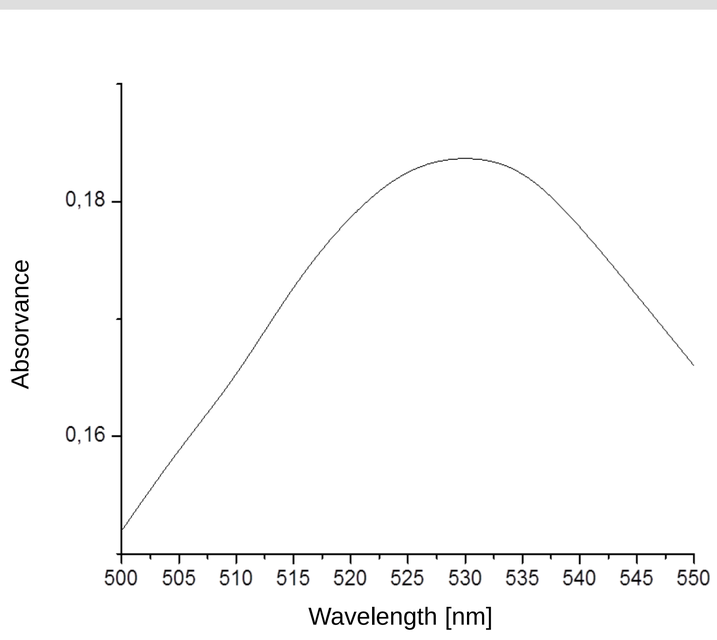
Nanoparticules Synthesis and Characterization

Schematic Experimental Model of Nanoparticles Synthesis

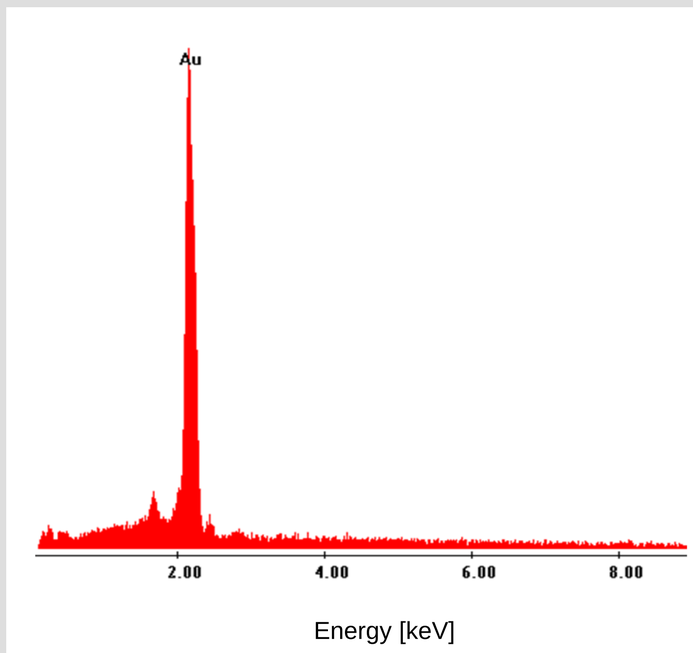


Results

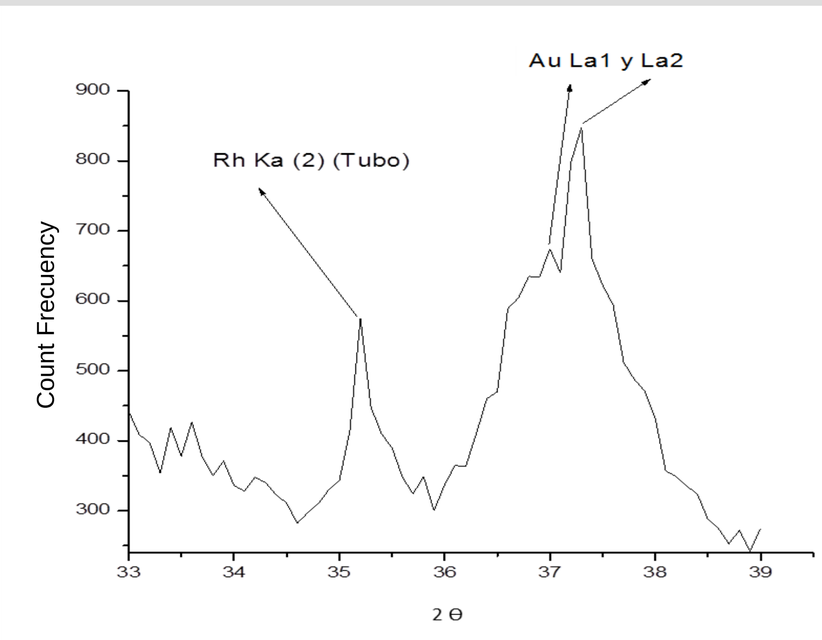
Surface Plasmon Resonance Spectroscopy (SPR)



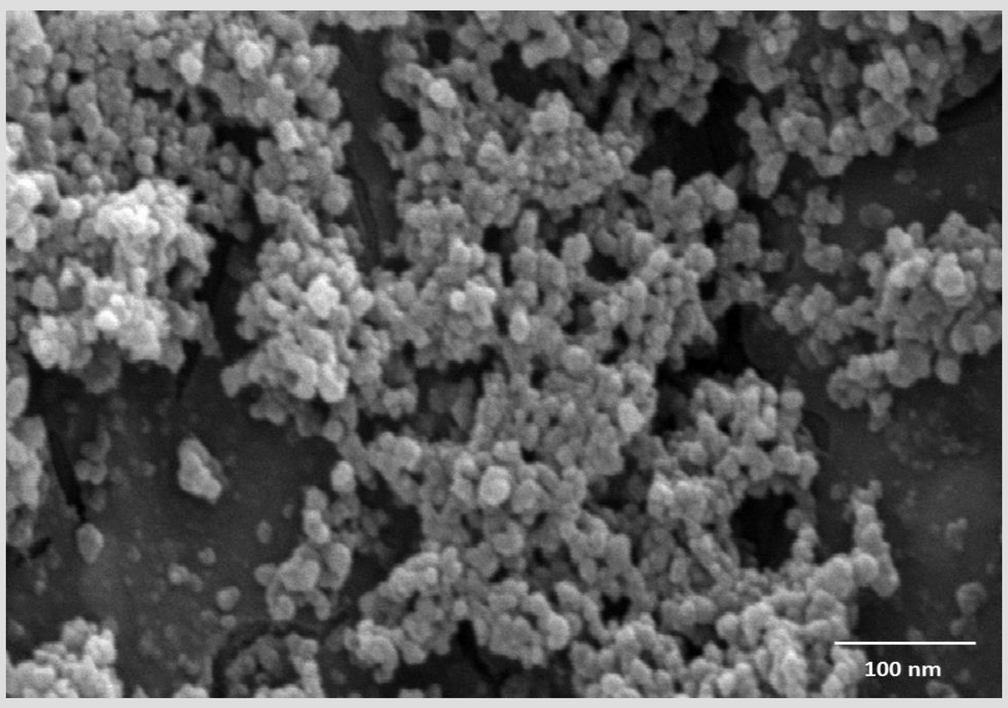
Energy Dispersive Spectrometry (EDS)

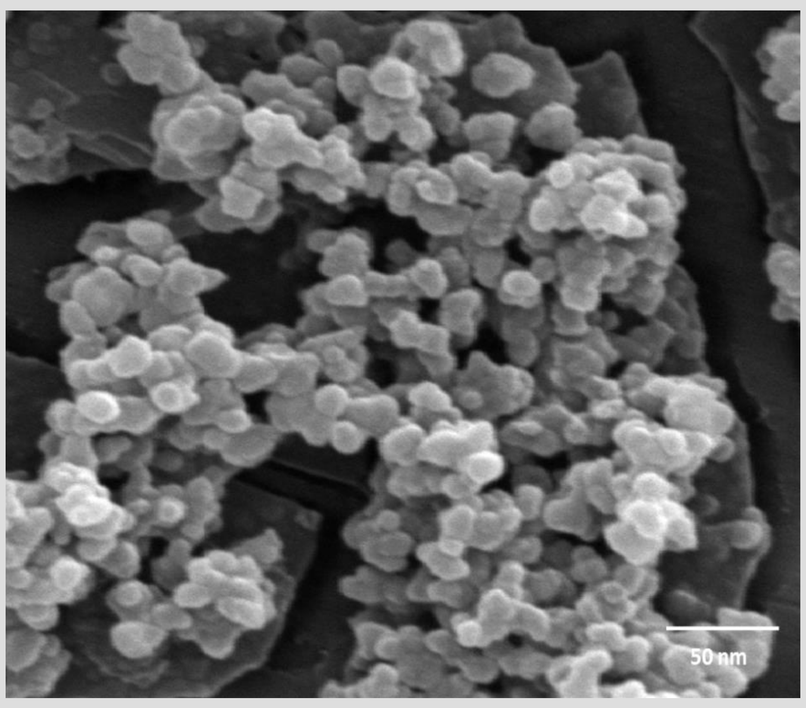


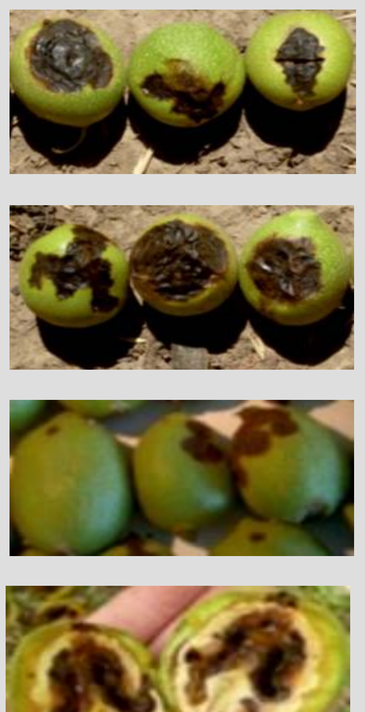
X-Ray Fluorescence (XRF)



Scanning Electron Microscopy (SEM)







Brown Apical Necrosis

Conclution

We concluded that the nanostructured platform can be used to attach different specific biomolecules that recognize microorganisms responsible of apical necrosis and thus make early detection before that occur physic manifestation of the symptomatology.

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