



Short communication

# *Rosa damascena* leaf extract mediated palladium nanoparticles and their anti-inflammatory and analgesic applications

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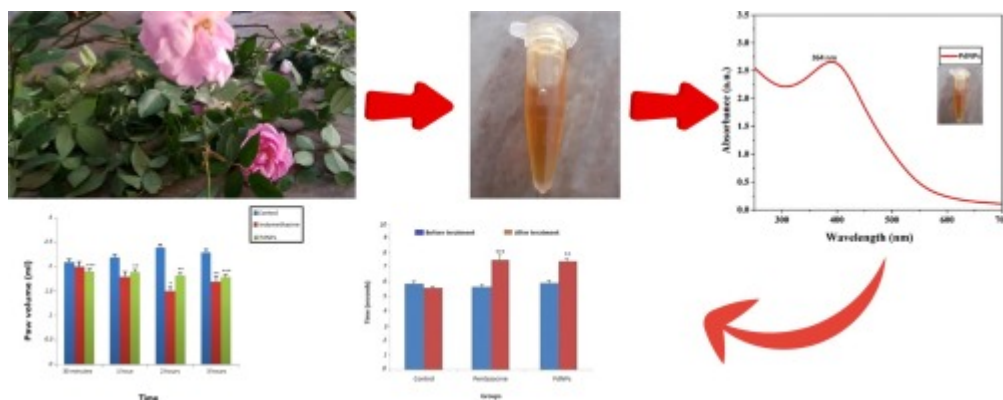
## Highlights

- This study employed *Rosa damascena* (*r.damascena*) leaf extract to effectively reduce palladium nanoparticles (PdNPs).
- The Surface Plasmon Resonance peak was recorded at 364nm in Ultraviolet–Visible analysis of biologically formed palladium nanoparticles.
- These biologically formed palladium nanoparticles demonstrated notable shown anti-inflammatory and analgesic activity.

Abstract

Palladium nanoparticles (PdNPs) were synthesized by Rosa damascena leaf extract. The nanoparticles were characterized by UV–Vis spectroscopy, Fourier Transform Infrared spectroscopy (FTIR), X-ray Diffraction (XRD), Transmission Electron Microscopy (TEM), and Dynamic Light Scattering (DLS) and Zeta Potential. Synthesized palladium nanoparticles were discovered to have approx 20–50nm in a spherical shape. This eco-friendly synthesis of palladium nanoparticles exhibits biomedical applications. Rat models were used to check the activity of the palladium nanoparticles as anti-inflammatory and analgesic agents. Even though their efficacy was lower than standard drugs, palladium nanoparticles produced favorable results for both activities. This finding indicates that *Rosa damascena* leaf extract is an excellent bio-reductant for synthesizing palladium nanoparticles and has promise for various pharmacological and biological applications.

## Graphical abstract



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### 1. Introduction

Professor Norio Taniguchi of Tokyo Science University defines nanotechnology as the precise manipulation of matter at the atomic and molecular scale, a scientific advancement in the 21st century [1]. Nanotechnology manipulates matter at the molecular and atomic scale, offering high stability, target selectivity, and plasticity. Nanotechnology is used in food packaging [2], textile [3], agriculture [4], transport [5], energy [6], and information technology [7]. Research in this field focuses on...

## Preparation of *Rosa damascena* leaf extract

All reagents (Palladium Chloride) were purchased from Sigma Aldrich Company in the experiments. The leaves were collected from the field of IFTM University Moradabad. The leaves were collected and gently washed with distilled water to remove all contamination. 10g leaves weighted and mixed into 100ml distilled water. After addition, a heating mantle was used to extract the sample. The extract was used to create nanoparticles after being removed from it [32]....

## Green synthesis of palladium nanoparticles

In the synthesis of palladium...

## FT-IR characterization

FT-IR characterization was carried out to identify the functional groups that may be responsible for the reduction of Pd ions in the *R. damascena* leaf extract. *R. damascena* leaf extracts FT-IR spectrum and spectrum of PdNPs are given in Fig. 1. *R. damascena* leaf extract showed a significant peak at  $3300.6\text{cm}^{-1}$ , the hydroxyl group exclusive to alcoholic and phenolic compounds [34]. When C=O is stretched, the peak at  $2932\text{cm}^{-1}$  signals asymmetrical C-H stretching,  $2153.3\text{cm}^{-1}$ . Aromatic compounds...

## Anti-inflammatory study through the carrageenan induced paw edema method

In anti-inflammatory activity, 4 animals were in each group (3 groups)

The rat model showed that PdNPs had a significant anti-inflammatory effect in Table 1. As seen by the decrease in paw volume between the half hour (30min), and one hour (60min), PdNPs were at their most active during the first hour. By the second (120min), there had been a noticeable decrease in activity, but the efficacy had persisted and was still quite high. Around the third hour (180min), the efficacy started to...

## Conclusion

*Rosa damascena* leaf extract was used to achieve the biogenic reduction of Pd ions because it includes phytochemicals that aid in capping and stabilization and the reduction of Pd ions to PdNPs. To ascertain the biogenic production of PdNPs from leaf extract, FT-IR, UV-Vis

spectroscopy, XRD, TEM, and DLS were all employed for analysis. For the bio-reduction of PdNPs, palladium chloride was employed as a precursor used to interact with leaf extract. The anti-inflammatory and analgesic properties...

## CRedit authorship contribution statement

**Shagufta Bi:** Conceptualization, Formal analysis, Software, Methodology, Validation, Writing – original draft, Writing – review & editing. **Rashi Srivastava:** Supervision....

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper....

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