



# A DELVE INTO THE NOVEL FIELD OF ESSENTIAL OIL-BASED SILVER NANOPARTICLES AND ITS ANTI-INFLAMMATORY POTENTIAL

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**Abstract:** The overall interest in natural products is ever-increasing which clearly explains the involvement of various essential oils in different aspects of the day-to-day lives of common people. These pharmacologically relevant agents are categorised as secondary metabolites of plants extracted or distilled from different parts of plants, and that show pharmacological activities like anti-inflammatory, antioxidant, antimicrobial, larvicidal, etc.

The synthesis of metal nanoparticles has been developed by including different polymers, capping agents, and metal sources in the reaction. With the advancement of research, biological capping agents are being used for synthesizing metal nanoparticles like plant extracts, algae, fungi, etc. Essential oil is a newly added member of this list of capping agents. In the case of other metallic nanoparticles produced from biological capping agents, it was seen that the therapeutic activity of the plant material is also present within the produced nanoparticle. Similarly, for essential oil-derived nanoparticles, the therapeutic efficacy of the oil will be present within the nanoparticle. So, essential oils derived from plants like Eucalyptus, Clove, Lavender, etc. can be used to create nanoparticles that can act as anti-inflammatory agents. With work initiating on cumin oil and other oils like turmeric oil, it can be understood that the field of essential oil-derived nanoparticles is gaining much traction. The poster will present an accumulation of knowledge and show the available literature related to the anti-inflammatory potential of essential oil-mediated silver nanoparticle.

**Keywords:** Anti-inflammatory activity; Capping agents; Essential oils; Green synthesis; Metal nanoparticles; Silver nanoparticles.

## Anti-inflammatory Potential of Essential Oils

Name of the Plant	Part Used	Main Component	Experimental Model	Mechanism of Action	References
<i>Thymus carnosus</i> , <i>Thymus camphoratus</i>	Flowering aerial parts	T. carnosus [Borneo 1 (29%), Camphor (19.5%)] T. camphoratus [Borneo 1 (20%), 1, 8-cineole (29%)]	RAW 264.7 and HepG2 cell lines	Inhibition of nitric oxide production; T. camphoratus inhibits COX-2 & iNOS	Zuzarte <i>et al.</i> , 2018
<i>Citrus limon</i> , <i>Citrus aurantifolia</i> , <i>Citrus limonia</i>	Fruit peel	Limone, $\beta$ -pinene, $\gamma$ -terpinene	In vivo anti-inflammatory tests: Hot plate test, Formalin test; Subcutaneous air pouch (SAP) model	Reduce increased levels of TNF- $\alpha$ , IL-1 $\beta$ , IFN- $\gamma$	Amorin <i>et al.</i> , 2016
<i>Citrus aurantium L.</i>	Fresh blossoms	Linalool	Inflammatory paw edema test, cotton plate-induced granuloma	Inhibition of expression of prostaglandin synthesis through the COX pathway, inhibits formation or release of nitric oxide	Khodanakhsh <i>et al.</i> , 2015

## Anti-inflammatory Potential of Silver Nanoparticles

Biological Material Used	Characteristics of the nanoparticles	Inflammation Model used	Mechanism of Action	Reference
Leaves of <i>Salvia coccinea</i>	Size: 24nm; Shape: Spherical	THP-1 cell line	Inhibition of oxidative stress transcription factor NF- $\kappa$ B	Gobinth <i>et al.</i> , 2021
Petals of <i>Rosa indica</i>	Size: 23.52-60.83nm; Shape: Spherical	Rat peritoneal macrophages	Inhibition of the production of nitric oxide and superoxide	Manikandan <i>et al.</i> , 2015
Seeds of <i>Acrahytes aspera</i> Linn.	Size: 20-35nm; Shape: Cuboidal, rectangular	Carrageenan-induced in albino rat	Inhibition of paw edema	Vijayaraj <i>et al.</i> , 2016

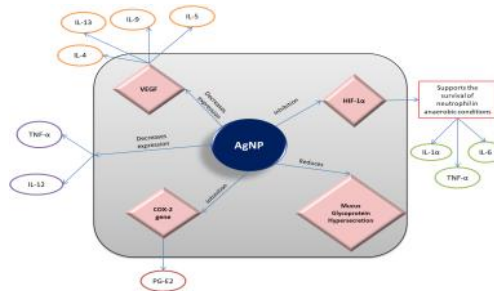


Fig: Mechanism of action of silver nanoparticles

## Anti-inflammatory Activity of Essential oil-mediated Silver Nanoparticles

Plant Name	Characterization	Experimental Model	References
Ginger ( <i>Zingiber officinale</i> )	UV-Vis spectroscopy	In vitro assay; Inhibition of albumin denaturation assay	Aafreen <i>et al.</i> , 2019
Cumin	UV-Vis spectroscopy	In vitro assay; Inhibition of albumin denaturation assay	Jain <i>et al.</i> , 2019

## Conclusion

- Essential oils can be a great alternative medicine for the treatment of inflammation with less number of side effects.
- Adding essential oil as a capping agent can act as synergistic action and show better anti-inflammatory agent than the essential oil alone.
- There is lack of proper animal study which gives the scope for research in future.

## Nanoparticles

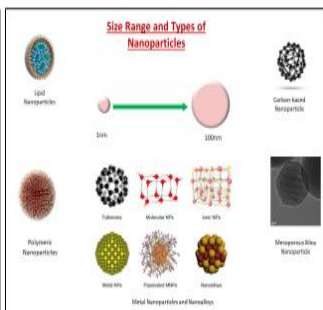
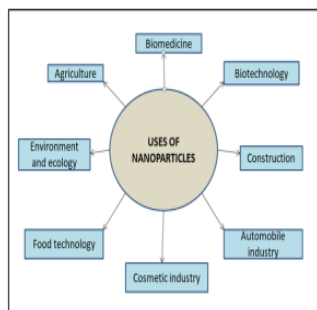


Fig: Application of Nanoparticle

Fig: Types of Nanoparticles