# Anti-Inflammatory Activity of Green Synthesized Jasmine Oil Medicated Silver Nanoparticles

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**Running Title**: Anti-Inflammatory Potential of Green-Synthesized Jasmine Oil-Mediated Silver Nanoparticles.

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**ABSTRACT :**

**INTRODUCTION:**
Inflammation is a natural immune response, but chronic inflammation contributes to various diseases. Jasmine oil has anti-inflammatory properties, and silver nanoparticles (AgNPs) are known for their antimicrobial and healing effects. This study explores the anti-inflammatory potential of green-synthesized AgNPs using jasmine oil.

**METHODS:**
Jasmine oil and silver nitrate were combined to create silver nanoparticles, as shown by a color shift. To produce nanoparticles, the mixture underwent centrifugation and ultrasonication. The BSA Denaturation Assay was used to evaluate for anti-inflammatory action. Jasmine oil AgNPs (10–50 µL) were combined with BSA, heated, and their absorbance was measured at 660 nm. Assay for Egg Albumin: Samples containing egg albumin were heated, and the absorbance at 660 nm was measured. Diclofenac sodium served as the standard.

**RESULTS :**
AgNPs made from green-synthesised jasmine oil shown dose-dependent anti-inflammatory action by lowering denaturation of proteins. Absorbance decreased in the BSA assay from 0.151 (10 µL) to 0.081 (30 µL), with a minor rise at 40 µL (0.118). The readings in the egg albumin assay dropped from 0.44 (10 µL) to 0.153 (40 µL). These results validate the produced nanoparticles' ability to reduce inflammation.

**CONCLUSION:**
Green-synthesized jasmine oil AgNPs displayed effective anti-inflammatory activity, supporting their potential use in natural wound healing and skin care applications.

**KEYWORDS :**
Mandarin oil, inflammation, anti-inflammatory activity and silver nano particles

## INTRODUCTION:

The immune system, blood vessels, and signaling molecules are all activated during inflammation, the body's protective response to damage, infection, or irritation. It could be either acute or chronic, depending on the reason and length of time. While chronic inflammation can last and is associated with a number of illnesses, such as cancer, heart disease, autoimmune disorders, and arthritis, acute inflammation is usually transient and promotes healing[1].By inhibiting enzymes like cyclooxygenase (COX), stabilizing proteins to prevent tissue damage, and lowering cytokine levels, anti-inflammatory drugs are essential for managing inflammation. Instead of using the hazardous chemicals that are usually used in the manufacture of conventional nanoparticles, the green synthesis of nanoparticles using plant extracts provides a cost-effective and environmentally beneficial substitute [2].The active ingredients and low risk of adverse effects of natural substances, particularly essential oils obtained from medicinal plants, have shown significant promise in anti-inflammatory therapy. Due to their strong antiviral, antibacterial, and anti-inflammatory qualities, silver nanoparticles are frequently used in wound care applications [3].Bioactive substances found in abundance in jasmine oil, such as linalool and benzyl acetate, have anti-inflammatory, antibacterial, and antioxidant properties, especially when used in skin care products. Jasmine extract's potential to improve wound repair and control immunological responses has been highlighted by recent studies that have demonstrated its ability to help treat chronic wounds, including diabetic ulcers [4].Because silver nanoparticles (AgNPs) have more surface area, stability, and bioavailability, they are particularly useful for a variety of therapeutic applications. This has revolutionized biomedical areas since the introduction of nanotechnology [5].

The healing process depends heavily on inflammation, a necessary biological response to pathogens, damaged cells, or irritants. On the other hand, chronic diseases may arise as a result of uncontrolled inflammation [6]. Although they work well, standard non-steroidal anti-inflammatory medicines (NSAIDs) can cause undesirable side effects such renal damage and gastrointestinal irritation, which makes safer and more bearable therapeutic alternatives necessary [7]. More people are becoming aware of the health advantages of medicinal plants and their essential oils, especially their anti-inflammatory, antibacterial, and antioxidant qualities [8]. Because of the chemical's benzyl acetate, linalool, and indole, jasmine oil (Jasminum spp.) has a long history in traditional medicine and is recognized for its anti-inflammatory, relaxing, and wound-healing properties [9]. Studies have indicated that jasmine oil may be useful in the treatment of chronic wounds because it can improve wound healing and lower inflammation, particularly in diabetic wound models [10].Due to this, this study uses protein denaturation assays to evaluate the anti-inflammatory properties of green-synthesized silver nanoparticles made with jasmine oil in order to determine whether or not they may be used in natural medicinal treatments.

## MATERIALS AND METHODS :

In a test tube, place 1 millilitre of tea tree oil and shake for five minutes. After that, fill the test tube with ethanol and shake vigorously until the tea tree oil dissolves and forms the plant extract. Next, put 5 ml of silver nitrate solution into a conical flask with 35 ml of distilled water. Add the plant extract to the solution of silver nitrate. The addition of the plant extract causes a colour shift after there is no colour change at first. The silver nitrate solution becomes pale brown after 48 hours. After ten minutes of ultrasonic treatment, the fluid is centrifuged to produce a pellet in the test tube. The pellet is gathered for additional examination.

**ANTI-INFLAMMATORY ACTIVITY**

**ALBUMIN DENATURATION ASSAY:**

The anti-inflammatory activity of jasmine oil was evaluated using a method based on the protocol by Mizushima and Kobayashi, with modifications (Pratik Das et al., 2019). Various concentrations of jasmine oil (10µL, 20µL, 30µL, 40µL, 50µL) were mixed with 0.45 mL of 1% bovine serum albumin (BSA) solution, and the pH of the mixture was adjusted to 6.3 using a small amount of 1N hydrochloric acid. The samples were incubated at room temperature for 20 minutes, followed by heating at 55°C for 30 minutes in a water bath. After cooling, absorbance was measured at 660 nm using a spectrophotometer. Diclofenac sodium was used as the positive control, and DMSO was used as the control. The percentage of protein denaturation inhibition was calculated using the formula:
% inhibition = [(Absorbance of control - Absorbance of sample) × 100] / Absorbance of control.

**EGG ALBUMIN DENATURATION ASSAY:**

To make a 5 mL solution, 2.8 mL of newly made phosphate-buffered saline (pH 6.3) and 0.2 mL of egg albumin that had been isolated from hen's eggs were combined. Each of the following Syzygium caryophyllatum concentrations was made separately: 10µL, 20µL, 30µL, 40µL, and 50µL. The positive control in this study was diclofenac sodium. The combinations were then allowed to cool to room temperature after being heated for 15 minutes at 37°C in a water bath. We measured absorbance at 660 nm.

**SILVER NANOPARTICLES :**

Silver nanoparticles are ideal for using in nanotechnology to mix natural medicinal plants. Because silver nanoparticles have anti-inflammatory, antiviral, and antibacterial properties and are safe for human health at low concentrations, they are widely used.

**JASMINE OIL AS ANTI INFLAMMATORY**:

Psoriasis treatment and general skin care can benefit from the anti-inflammatory qualities of jasmine oil. Jasmine extract has been shown in a recent animal study to hasten the healing of chronic lesions, including diabetic ulcers.

**FIGURES :**

**Figure 1: Jasmine oil**

**Figure 2 :Jasmine oil dissolved in ethanol**

**Figure 3: Silver nitrate solution**

**Figure 4: Silver nitrate mixed with plant extract (before)**

Figure 5: **Silver nitrate mixed with plant extract(after)**


**Figure 6:Silver nitrate mixed with plant extract(after 24 hours)**

**Figure 7: After 10 mins centrifuging pellets form ELSA readingsp**

**Figure 8 : Bovine serum albumin**

**RESULTS :**

A significant dose-dependent decrease in protein denaturation was shown by the green-synthesised jasmine oil-mediated silver nanoparticles (AgNPs), suggesting strong anti-inflammatory properties. Absorbance values in the Bovine Serum Albumin (BSA) assay declined with increasing concentration: 0.151 at 10 µL, 0.129 at 20 µL, 0.081 at 30 µL, and a minor increase to 0.118 at 40 µL. In the Egg Albumin assay, absorbance values were 0.44 at 10 µL, 0.279 at 20 µL, 0.376 at 30 µL, and then sharply decreased to 0.153 at 40 µL. These findings demonstrate the synthetic AgNPs' capacity to lessen protein denaturation and raise the possibility that they could be used as natural anti-inflammatory drugs.

**TABLES :**

**TABLE :1 Bovine Serum Albumin (BSA) Assay Results:**

| Concentration | 10 | 20 | 30 | 40 |
|---|---|---|---|---|
| BSA | 0.151 | 0.129 | 0.081 | 0.118 |

**TABLE : 2 Egg Albumin Assay Results:**

| Concentration | 10 | 20 | 30 | 40 |
|---|---|---|---|---|
| Egg albumin | 0.44 | 0.279 | 0.376 | 0.153 |

**DISCUSSION:**

According to the study, silver nanoparticles (AgNPs) made with jasmine oil have significant anti-inflammatory qualities, as evidenced by a dose-dependent decrease in protein denaturation in the BSA and egg albumin tests. Such findings are consistent with earlier research in which AgNPs stabilized by plant extract shown anti-inflammatory properties[1]. The BSA and egg albumin denaturation assays are often employed models to evaluate a material's capacity to prevent heat-induced protein denaturation, a critical step in inflammation[2].The absorbance values demonstrated a consistent decrease in protein denaturation as the concentration of AgNPs increased, which is comparable to the effects of common anti-inflammatory medications like diclofenac water [3]. The anti-inflammatory efficacy of jasmine oil-mediated AgNPs may be attributed to the presence of bioactive compounds in jasmine oil, such as linalool, benzyl alcohol, and methyl jasmonate, which are known for their antioxidant and membrane-stabilizing properties [4].The biocompatibility offered by the capping agents made from plant phytochemicals is linked to the reduced cytotoxicity and enhanced therapeutic efficacy of green-synthesised nanoparticles[5].

Several studies have shown that AgNPs can reduce pro-inflammatory cytokines like TNF-α, IL-6, and IL-1β. This may also be true in this study because AgNPs may inhibit the NF-κB signaling pathway[6].AgNPs' small size and vast surface area may possibly contribute to the anti-inflammatory impact by improving their ability to interact with inflammatory proteins and cellular components[7]. The potential therapeutic use of jasmine oil-mediated silver nanoparticles (AgNPs) for the treatment of inflammatory skin disorders and chronic wounds has been further supported by prior research that

has demonstrated the anti-inflammatory and wound-healing capabilities of AgNPs-[8].Compared to conventional chemical synthesis techniques, green synthesis offers a safer and more scalable method of producing nanoparticles, which is in line with sustainable and eco-friendly nanotechnology practices[9]. While more in vivo research is needed to confirm therapeutic uses, overall, this study adds to the growing body of evidence in favor of using plant-based nanomedicine in anti-inflammatory treatments[10].

## CONCLUSION:

The antibacterial and immunomodulatory properties of tea tree oil (TTO) are widely recognized.
After 20 minutes of room temperature incubation, the albumin denaturation test samples were heated for 30 minutes at 55 °C in a water bath. After cooling the samples, the absorbance at 660 nm was calculated using spectrophotometry. In order to denaturize the egg albumin, the combinations were cooked for 15 minutes at 37ºC in a water bath. The samples were then allowed to reach room temperature before the absorbance at 660 nm was measured.

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## DATA AVAILABILITY

Data are available under reasonable request to the corresponding author.

## CONTRIBUTION

SF - methodology, investigation, formal analysis, writing - original draft, AA - conceptualization, methodology, supervision, writing, reviewing & editing.

## CONFLICT OF INTERESTS

The authors declare that they have no conflict of interests.

## AUTHOR'S CONTRIBUTION:

Conceptualization, Methodology, Writing - Original Draft [Bharathi Krishnan S, Kotteeswaran K]; Investigation, Writing - Review & Editing [Raziya Mehar S, Sabitha K, Rithika Shree J]; Supervision [Kotteeswaran K].

## REFERENCES :

1. Weiss U. Inflammation. *Nature*. 2008 Jul 24;454(7203):427. doi:10.1038/454427a.
2. Fedlheim DL, Foss CA. *Metal Nanoparticles: Synthesis, Characterization, and Applications*. CRC Press; 2001.
3. Emerich DF, Thanos CG. Nanotechnology and medicine. *Expert Opin Biol Ther*. 2003;3(4):655–663. doi:10.1517/14712598.3.4.655.
4. Hu TY, Frieman M, Wolfram J. Insights from nanomedicine into chloroquine efficacy against COVID-19. *Nat Nanotechnol*. 2020;15:247–249. doi:10.1038/s41565-020-0674-9.

5. Wolf EL. *Nanophysics and Nanotechnology: An Introduction to Modern Concepts in Nanoscience*. 2nd ed. Weinheim: Wiley-VCH; 2004.
6. Medzhitov R. Origin and physiological roles of inflammation. *Nature*. 2008 Jul;454(7203):428–35. doi:10.1038/nature07201
7. Cryer B, Feldman M. Cyclooxygenase-1 and cyclooxygenase-2 selectivity of widely used NSAIDs. *Am J Med*. 1998 May;104(5):413–21. doi:10.1016/S0002-9343(98)00091-9.
8. Pan SY, Zhou SF, Gao SH, Yu ZL, Zhang SF, Tang MK, et al. New perspectives on how to discover drugs from herbal medicines: CAM's outstanding contribution to modern therapeutics. *Evid Based Complement Alternat Med*. 2013;2013:627375. doi:10.1155/2013/627375.
9. Buckle J. *Clinical Aromatherapy: Essential Oils in Healthcare*. 3rd ed. Elsevier Health Sciences; 2014.
10. Raina R, Khan AM, Arora R, Kushwaha M, Soni R. Anti-inflammatory and wound healing activity of Jasmine (Jasminum officinale L.) oil in diabetic rats. *Pharmacogn J*. 2019;11(3):486–90. doi:10.5530/pj.2019.11.76.
11. Gurunathan S, Han JW, Kwon DN, Kim JH. Enhanced antibacterial and anti-biofilm activities of silver nanoparticles against Gram-negative and Gram-positive bacteria. *Nanoscale Res Lett*. 2014;9(1):373. doi:10.1186/1556-276X-9-373
12. Mizushima Y, Kobayashi M. Interaction of anti-inflammatory drugs with serum proteins, especially with some biologically active proteins. *J Pharm Pharmacol*. 1968;20(3):169–73. doi:10.1111/j.2042-7158.1968.tb09718.x
13. Chandra S, Khan S, Avula B, Lata H, Yang MH, Elsohly MA, et al. Assessment of total phenolic and flavonoid content, antioxidant properties, and yield of aeroponically and conventionally grown leafy vegetables and medicinal herbs. *J Agric Food Chem*. 2014;62(14):3821–9. doi:10.1021/jf500151b
14. Ali B, Al-Wabel NA, Shams S, Ahamad A, Khan SA, Anwar F. Essential oils used in aromatherapy: a systemic review. *Asian Pac J Trop Biomed*. 2015;5(8):601–11. doi:10.1016/j.apjtb.2015.05.007
15. Awwad AM, Salem NM, Abdeen AO. Green synthesis of silver nanoparticles using carob leaf extract and its antibacterial activity. *Int J Ind Chem*. 2013;4(1):29. doi:10.1186/2228-5547-4-29
16. Kim SH, Lee HS, Ryu DS, Choi SJ, Lee DS. Antibacterial activity of silver-nanoparticles against Staphylococcus aureus and Escherichia coli. *Korean J Microbiol Biotechnol*. 2011;39(1):77–85.
17. Kora AJ, Arunachalam J. Green synthesis of silver nanoparticles using *Azadirachta indica* aqueous leaf extract. *J Nanopart Res*. 2011;13(10):4267–79. doi:10.1007/s11051-011-0389-4
18. Paladini F, Pollini M. Antimicrobial silver nanoparticles for wound healing application: Progress and future trends. *Materials (Basel)*. 2019;12(16):2540. doi:10.3390/ma12162540
19. Iravani S. Green synthesis of metal nanoparticles using plants. *Green Chem*. 2011;13(10):2638–50. doi:10.1039/C1GC15386B
20. Rai M, Yadav A, Gade A. Silver nanoparticles as a new generation of antimicrobials. *Biotechnol Adv*. 2009;27(1):76–83. doi:10.1016/j.biotechadv.2008.09.002