

Anti Inflammatory Activity of Silver Nanoparticles Synthesized By Using Ginger-Red Tea Herbal Formulation

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ABSTRACT:

To assess the anti-inflammatory properties of ginger red tea herbal formulation employed to synthesize silver nanoparticles. Ginger and red tea were used for the synthesis of silver nanoparticles which was confirmed by the UV-Vis spectrophotometer. The anti-inflammatory test was carried out by inhibition of albumin denaturation assay and egg albumin denaturation assay techniques and was compared with standard diclofenac sodium. Overall findings showed ginger red tea herbal formulations with AgNPs have anti-inflammatory properties. Future research on this formulation should focus on revealing its therapeutic potential, and in vivo animal models should be used to thoroughly examine the molecular pathways of AgNPs.

Keywords - Nanoparticles, Anti inflammatory, Herbal, Cancer cells.

1. INTRODUCTION-

Nanoparticles are particles that are 1 to 100 nanometers in size. These have been increasingly popular in recent years, and they have been proved to have a wide range of technological and biological applications. Silver nanoparticles are unique among noble metal nanoparticles in that they have chemical stability, anti-inflammatory, antiseptic, antimicrobial, anti-oxidant, antiviral, and antifungal action, which has piqued the scientific community's interest (1). Physical or chemical processes are commonly used to create these particles, which are not environmentally friendly and are linked to a variety of biological dangers(2)(3). As a result, there is a need to use alternative technologies that are not harmful to the environment, which has led to the green synthesis of nanoparticles using biological agents such as bacteria, fungi, and plants(4).

Even apart from being environmentally beneficial, synthesis of nanoparticles from biological agents is cost effective and does not require the use of any chemicals or energy, making large-scale nanoparticle production easy. More than 25 plant species have been reported to be used in the production of nanoparticles, including tea extract, *Acaphyla indica*, *Aloe vera*, *Citrus sinensis*, and others(5)(6).

Since the early 1970s, ginger has been known to have anti-inflammatory properties. Ginger lowers prostaglandin release and inhibits cyclooxygenase 1, 2, resulting in anti-inflammatory properties. Ginger also inhibits 5-lipoxygenase, which lowers leukotriene synthesis and so inhibits leukotrienes' pro-inflammatory effects(7). Several genes involved in inflammatory responses have been demonstrated to be inhibited by ginger extract from the Zingiberaceae family. Ginger's active ingredients, 6-gingerol and shogaol, are responsible not only for its anti-inflammatory properties, but also for its antitumor and antioxidant properties(8). In this study, ginger red tea herbal formulation was employed to synthesize silver nanoparticles and its anti-inflammatory properties were assessed.

2. MATERIALS AND METHODS-

2.1 Anti-inflammatory activity

2.1.1 ALBUMIN DENATURATION ASSAY:

The anti-inflammatory activity for ginger red tea nanoparticle synthesized extract was tested by the following convention proposed by Muzushima and Kabayashi with specific alterations (Pratik Das et al.,2019). 0.05 mL of ginger red tea nanoparticle synthesized extract of various fixation (10 μ L,20 μ L,30 μ L,40 μ L,50 μ L)was added to 0.45 mL bovine serum albumin(1% aqueous solution) and the pH of the mixture was acclimated to 6.3 utilizing a modest quantity of 1N hydrochloric acid. These samples were incubated at room temperature for 20 min and then heated at 55 °C in a water bath for 30 min. The samples were cooled and the absorbance was estimated spectrophotometrically at 660 nm. Diclofenac Sodium was used as the standard. DMSO is utilized as a control.

Percentage of protein denaturation was determined utilizing following equation,

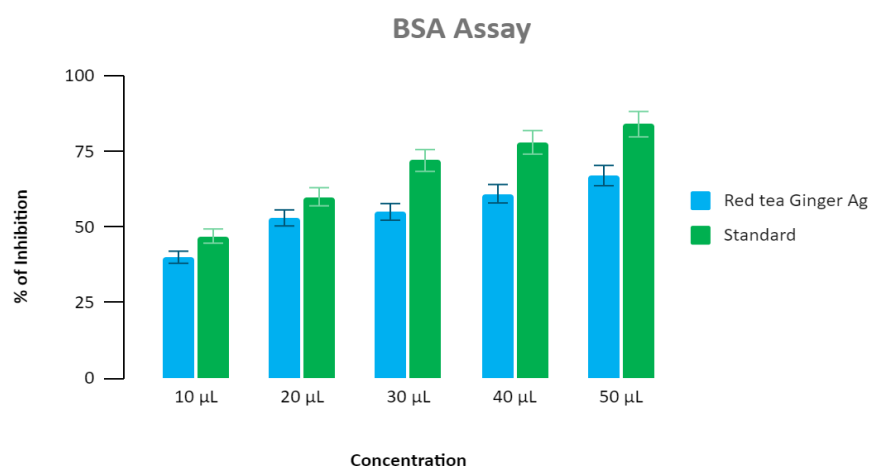
$$\% \text{ inhibition} = \frac{\text{Absorbance of control} - \text{Absorbance of sample}}{\text{Absorbance of control}} \times 100$$

Absorbance of control

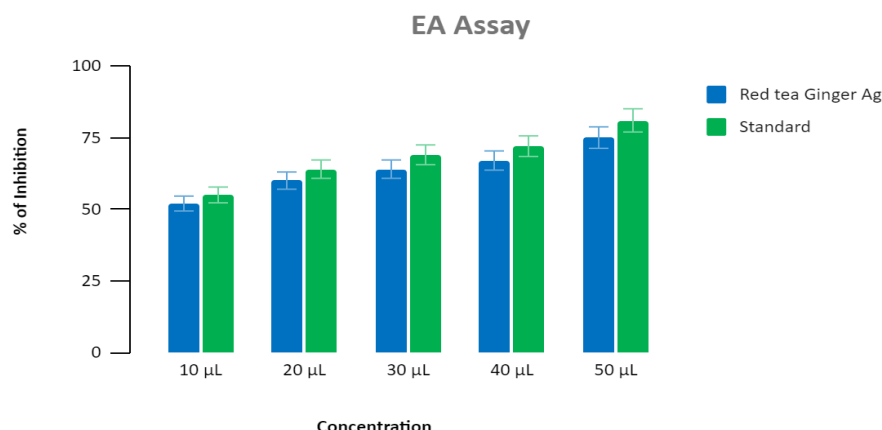
2.1.2 EGG ALBUMIN DENATURATION ASSAY:

A 5ml solution was made which consisted of 2.8ml of freshly prepared phosphate buffered saline of pH - 6.3, 0.2 ml of egg albumin extracted from hens egg. Specific concentrations were prepared separately for the synthesized extract as (10 μ L,20 μ L,30 μ L,40 μ L,50 μ L). Diclofenac Sodium was used as the positive control.. Then the mixtures were heated in a water bath at 37°C for 15 minutes. After which the samples were allowed to cool down to room temperature and absorption was measured at 660 nm.

3. RESULTS-



Graph 1- Effect of different concentrations (10-50 ML) of red tea ginger silver nanoparticles (AgNPs) on percentage inhibition in the BSA assay compared with the standard drug. The inhibition activity increased with concentration for both the sample and standard.



Graph 2- Effect of different concentrations (10-50 L) of red tea ginger silver nanoparticles (AgNPs) on percentage inhibition in the EA assay compared with the standard drug. A concentration-dependent increase in inhibition activity was observed for both the sample and standard.

4. DISCUSSIONS-

Because it is more efficient than conventional chemical synthesis, "green" nanoparticle production is exciting because it benefits the environment, saves money, is useful, and has a wide range of applications. Biosynthesized nanoparticles are a relatively new field and have a wide range of applications, including drug administration, cancer therapy, DNA analysis, gene therapy, antibacterial agents, and biosensors, as well as boosting response rates(9)(10). Electrical engineering, medical technology, biology, textiles, and chemistry all use nanoparticles. Numerous applications, including the creation of magnetic and electronic devices, the healing of wounds, the expression of antimicrobial genes, and the creation of bio composites, depend on the form and size of colloidal metal particles(11).

The presence of functional groups like alkyl halides, alkynes, aromatic and aliphatic amines, esters, ethers, alcohol, carboxylic acids, and nitro compounds, which may have served as capping and reducing agents for the synthesis of the AgNPs, was detected in the FTIR spectra of the plant extract and AgNPs(12). The results of the FTIR study agreed with those of earlier ones.

Several diseases, such as atherosclerosis, arthritis, asthma, heart disease, cancer, and others, are greatly influenced by inflammation. The two primary classes of medications used to treat inflammation are steroids and non-steroidal anti-inflammatory medications(13). It has become vital to find alternative anti-inflammatory medications that function similarly but do not have any side effects, such as GI issues and leukopenia(14,15). The anti-inflammatory effects of known doses of produced AgNPs and herbal extract were evaluated using a protein denaturation assay. The extracts' anti-inflammatory effects in vitro were on par with those of the common medication, diclofenac sodium.

AgNPs have a better structure, are more stable, and have a larger surface area than other bulk materials. Comparatively speaking, the physical and chemical pathways of synthesis are more dangerous. In recent years, the effectiveness of physical, chemical, radiation therapy, chemotherapy, and surgical procedures for the treatment of cancer has declined. Cancer cells developing resistance to medications is a major factor in why treatments do not work. Because of its negative effects, toxicity, and high cost, developing new medications to block the proliferation of cancer cells is difficult(16).

In recent years, AgNPs toxicity to human tissues has received substantial study, and it has been determined that it is safe for use in pharmaceutical formulations. AgNPs have recently received attention for their uses in the food, textile, anti-infective therapy, wound care, tissue engineering, pharmaceutical, and cosmetic industries(17). The results of the current study are in accordance with those of earlier studies that have described the numerous biomedical uses for AgNPs. Nanotechnology has therefore substantially advanced the field of healthcare. Nanoparticles are used by researchers in anti-inflammatory, tumor targeting, medical imaging, and drug delivery systems. Nanoparticle-based medications have a variety of applications; they can both identify abnormal cells and deliver drugs to treat them.

5. CONCLUSIONS-

The study has proved that ginger red tea formulation can be used for the eco-friendly green synthesis of silver nanoparticles and as ginger red tea mediated silver nanoparticles showed good used anti-inflammatory activity, it may be used for various inflammatory conditions.

6. ACKNOWLEDGEMENT:

The authors would like to thank the Department of Microbiology and Orange Lab for their participation for their kind cooperation throughout the study.

7. AUTHOR CONTRIBUTIONS:

Bharath kumar.N : Literature search, experimental data collection, analysis, manuscript writing

Dr. Geetha : Study design, data verification, manuscript drafting.

8. CONFLICTS OF INTEREST:

The authors declare that there are no conflicts of interest in the present study.

9. SOURCE OF FUNDING

The present project is supported by

- Saveetha Institute of Medical and Technical sciences,
- Saveetha Dental College and Hospitals,
- Saveetha University and
- Dhan Consultants.

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