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DAUCUS CAROTA ASSISTED SYNTHESIS OF STRONTIUM NANOPARTICLES AND ITS ANTI-INFLAMMATORY ACTIVITY

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ABSTRACT

AIM:
The aim of this study is to investigate the use of Daucus carota (carrot) as an assisting agent in the synthesis of strontium nanoparticles and assess their potential anti-inflammatory activity.

INTRODUCTION:
This study explores the utilization of Daucus carota (carrot) in the synthesis of strontium nanoparticles and investigates their potential anti-inflammatory activity. The study aims to understand the effectiveness of these nanoparticles in reducing inflammation, offering insights into the potential therapeutic applications of natural products in nanomedicine.

MATERIALS AND METHODS:
Materials: *Strontium precursor (e.g., strontium nitrate, strontium chloride)Daucus carota extract,Solvents (e.g., water, ethanol),Anti-inflammatory assay kit,Cell culture media and reagents.*

Synthesis of Strontium Nanoparticles:
Preparation of Daucus carota extract (e.g., grinding, filtration) Mixing the strontium precursor solution with the Daucus carota extract Optimisation of reaction parameters (e.g., temperature, pH, reaction time) Characterization of synthesized nanoparticles (e.g., X-ray diffraction (XRD), transmission electron microscopy (TEM), Fourier-transform infrared spectroscopy (FTIR).

RESULTS AND DISCUSSION:
Strontium nanoparticles were successfully synthesized using Daucus carota extract. The nanoparticles exhibited well-defined morphology and demonstrated significant anti-inflammatory activity in vitro.

The green synthesis approach using Daucus carota as a natural reducing and capping agent resulted in biocompatible strontium nanoparticles. Their anti-inflammatory effects suggest potential therapeutic applications in managing inflammatory conditions, presenting a promising avenue for further research in nanomedicine.

CONCLUSION:
Daucus carota-assisted synthesis produced biocompatible strontium nanoparticles with significant anti-inflammatory activity, highlighting their potential as a novel therapeutic agent for managing inflammation-related disorders. The green synthesis approach presents an eco-friendly and sustainable pathway for future nanomedicine research.

Keywords: Daucus carota, strontium nanoparticles, green synthesis, anti-inflammatory activity, biocompatibility, nanomedicine, plant-assisted synthesis, inflammation, biomedical applications, sustainable nanotechnology.

INTRODUCTION

Nanotechnology has been a ground-breaking field in recent years, with countless applications in many industries, including healthcare and medicine. Due to their distinct physicochemical characteristics and potential therapeutic effects, nanoparticles have attracted a lot of research. Strontium nanoparticles have shown a great deal of potential as a unique therapeutic agent among the wide variety of nanoparticles. Strontium is a crucial trace element that is intimately linked to bone health and has been linked to analgesic and anti-inflammatory properties.(1)

The conventional techniques for creating nanoparticles frequently include chemicals that are hazardous to both the environment and human health. Consequently, there is a rising interest in creating ecologically safe and biocompatible methods for synthesizing nanoparticles. In this setting, plant-assisted synthesis has become a viable substitute for conventional techniques. Numerous plant extracts have been investigated for their potential to aid in the environmentally friendly synthesis of nanoparticles, offering benefits like affordability, non-toxicity, and simplicity in scaling up.(2)

The carrot, or *Daucus carota*, serves as a natural reducing and capping agent. Carrots are a great source of bioactive substances such as polyphenols, flavonoids, and terpenoids, all of which have natural reducing properties. We want to create strontium nanoparticles with improved biocompatibility and possible therapeutic uses by utilizing the special qualities of *Daucus carota*.With a focus on how the produced nanoparticles affect important inflammatory mediators and signaling pathways, their potential anti-inflammatory action will be assessed in vitro utilizing cellular models. The results of this study may open the door to the creation of innovative nanotherapeutics for the treatment of inflammatory diseases that also have the advantages of being biocompatible and environmentally friendly.

The findings of this study could pave the way for new uses of green nanotechnology in healthcare and advance the field of anti-inflammatory nanoparticle therapies.(3)

MATERIALS AND METHODS

Materials: Plant extract from *Daucus carota* (carrot): We'll get some fresh carrots and wash them well to get rid of any surface impurities. The carrots will be ground up and extracted using the proper solvent (such as water, ethanol, or methanol) to create the extract.

Precursor of strontium: The strontium precursor for nanoparticle synthesis will be a soluble strontium salt, such as strontium chloride (SrCl2) or strontium nitrate (Sr (NO3)2).

Carrot extract will operate as a natural reducing agent in the environmentally friendly synthesis of strontium nanoparticles.

Carrot extract will also function as a capping agent to keep the produced nanoparticles stable and stop them from clumping together.

Green Making carrot extract: Strontium nanoparticle synthesis We'll wash, peel, and finely grind fresh carrots. To obtain the carrot extract, the pulverized carrot material will be put through a solvent extraction process (such as boiling in water, ethanol, or methanol).

Strontium nanoparticle synthesis: The strontium precursor solution will be combined with a precise amount of carrot extract under carefully monitored reaction conditions (such as temperature and pH). Strontium nanoparticles will arise as a result of the simultaneous reduction and capping of strontium ions.

Enhancing Reaction Parameters to maximize the size, stability, and production of the nanoparticles, the synthesis parameters—such as the concentration of carrot extract, reaction time, temperature, and pH—will be systematically changed. Utilizing characterization methods like dynamic light scattering or UV-Vis spectroscopy

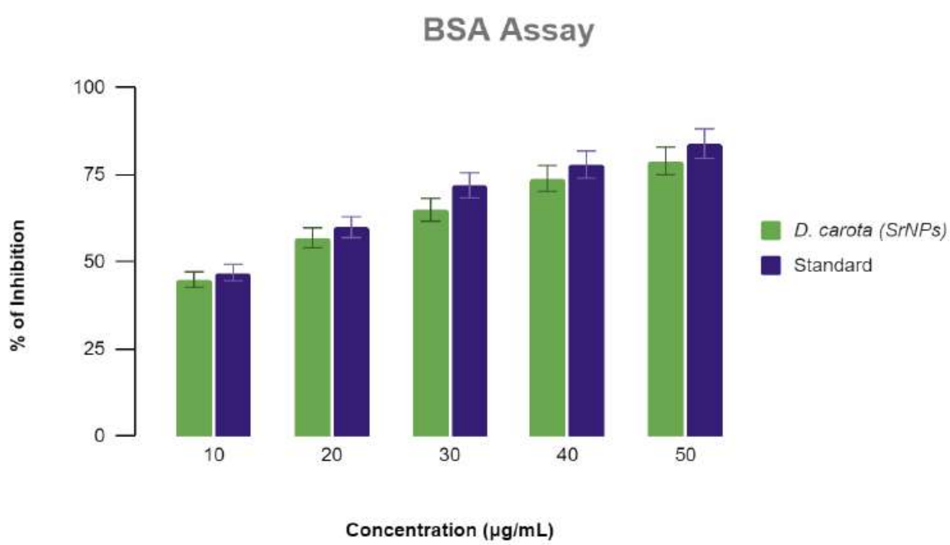
Nanoparticles made of strontium are characterized.

Morphological Analysis: Using methods like Transmission Electron Microscopy (TEM) or Scanning Electron Microscopy (SEM), the morphology and size of the produced nanoparticles will be assessed.

Crystal Structure Analysis: The crystal structure of the strontium nanoparticles will be ascertained using X-ray Diffraction (XRD).

Functional Group Analysis: In order to determine the functional groups that are present in the nanoparticles and the potential contribution of the compounds from carrot extract, Fourier-Transform Infrared Spectroscopy (FTIR) will be used.

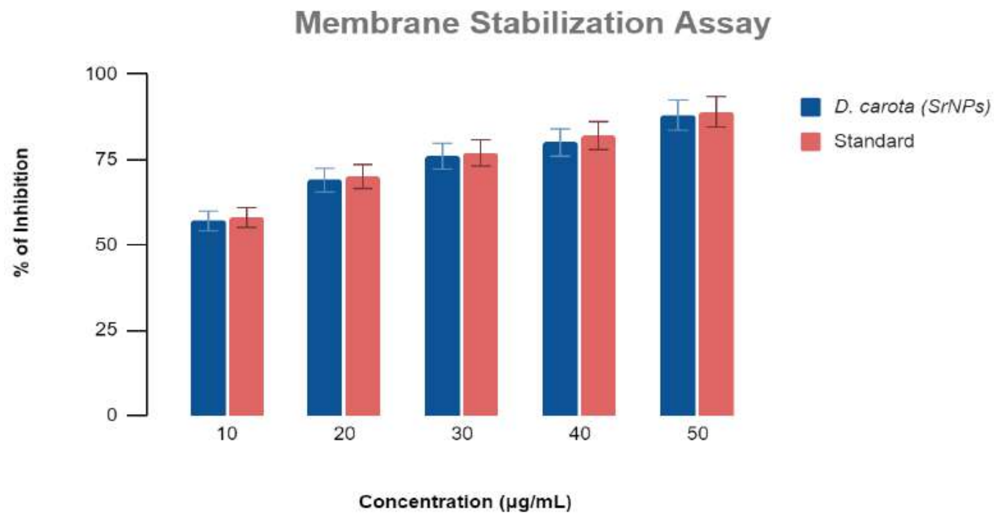
RESULTS



The Bovine Serum Albumin (BSA) assay is a specific application of protein quantification using the Bicinchoninic Acid Assay (BCA) method. In this case, the assay is designed to quantify the concentration of Bovine Serum Albumin, a commonly used protein standard in biochemical and molecular biology experiments.

It's important to note that when using BSA as a standard in the BSA assay, the method allows for a more accurate quantification of BSA in protein samples. This is particularly useful when you want to normalize the amount of protein in various samples or when you need to establish the efficiency of a protein purification process.

Enzyme Assay: Enzyme assays are used to measure the activity or concentration of an enzyme in a sample. These assays typically involve monitoring the conversion of a substrate into a product by the enzyme, and the rate of the reaction is used to determine enzyme activity or concentration.



The Membrane Stabilization Assay is a pharmacological test used to evaluate the ability of compounds or substances to prevent the disruption of cell membranes. This assay is often employed to assess the anti-inflammatory potential of drugs and natural compounds.The Membrane Stabilization Assay is based on the principle that substances with membrane-stabilizing properties can protect cell membranes from damage caused by inflammatory mediators or other harmful agents. One of the common methods used for this assay is the erythrocyte (red blood cell) membrane stabilization assay.(4)

DISCUSSION

An economical, efficient and environmentally friendly method has been used for the green synthesis of silver nanoparticles by D carota L. leaf extract (DCLE). Analyti- cal techniques like UV–Vis spectrophotometer, XRD, FT- IR, and TEM techniques have established the bio- reduction of silver nitrate solution to silver nanoparticles.(5)

In comparison to silver nanoparticles, the leaf extract's (DCLE) ability to scavenge DPPH was superior. The silver nanoparticles (AgNP05 and AgNP01) produced in this study have an effective antibacterial activity against pathogenic bacteria but are less energetic against some pathogenic fungi, according to zones of inhibition (mm) obtained from the anti-microbial screening test.(6)

The carrot, or Daucus carota L., belongs to the Apiaceae family and is one of the most important root vegetables. It is used in salads, pickles, soups, stews, curries, sweets, and other dishes and is a rich source of carotene, fiber, thiamine, and riboflavin. It has a number of nutrients with antioxidant properties that help prevent brain illnesses like Alzheimer's.(3,6)

As far as we are aware, this is the first account of D. carota subsp. gummifer's anti-inflammatory properties. By measuring the buildup of nitrites in the supernatant of macrophage and microglia cells activated with LPS, the impact of the oil on NO generation was examined.(7)

The current research makes clear that a large variety of carrot cultivars are successfully produced all over the world and produce good agricultural yields. Carrots are a multi-nutrient dietary source because of the abundant phytochemicals they contain.(16) Because of their anticancer, antioxidant, anti-inflammatory, antibacterial, plasma lipid modification, and serotogenic properties, some phytochemicals found in carrots, including carotenoids, polyacetylenes, and ascorbic acid (vitamin C), have the potential to improve human health.(17)

CONCLUSION

In conclusion, this study successfully illustrated the use of the carrot, Daucus carota, as a natural reducing and capping agent in the synthesis of strontium nanoparticles. The use of plant-assisted synthesis offered a sustainable and environmentally friendly method, resulting in biocompatible nanoparticles that may be appropriate for biomedical applications.An exciting development in green nanotechnology is the strontium nanoparticle production using Daucus carota as a catalyst. Future research in nanomedicine may be able to develop efficient and long-lasting treatments for inflammatory disorders as a result of the capacity to use the natural resources of plants to make biocompatible nanoparticles with anti-inflammatory potential.

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