



## Comparative cytotoxic effect of *Acacia nilotica* and its mediated strontium nanoparticles

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### ABSTRACT

**Background:** *Vachellia nilotica*, all the more generally known as *Acacia nilotica*. This plant is hostile to microbial, against plasmodial and cancer prevention agent movement and utilized for therapy of human immunodeficiency infection, hepatitis C infection and malignant growth. A medication or substance that decreases irritation (redness, enlarging, and torment) in the body. Calming specialists block specific substances in the body that cause irritation. They are utilized to treat various circumstances. A few calming specialists are being concentrated on in the counteraction and therapy of disease.

**Aim:** The aim of the study is to identify the cytotoxic effect of *Acacia nilotica* assisted strontium nanoparticles.

**Method:** In this study, a plant of *Acacia Nilotica* and strontium nanoparticles was exposed to brine shrimp.

**Results:** strontium nanoparticles synthesized using *Acacia Nilotic* extract can act as a potential cytotoxic agent. However, the antimicrobial activity of the extract varied with the different bacterial samples. The cytotoxicity of nano-materials and nanocomposites tested against brine shrimps showed minimal lethality. Strontium nanoparticles are previously reported to show potent cytotoxic activities in-vivo/in-vitro and our results are in accordance with their results.

**Conclusion:** Interestingly it is presumed that *acacia Nilotica* interceded strontium nanoparticles are strong helpful specialists to be utilized in biomedical applications both in-vivo/in-vitro. Naturally combined strontium nanoparticles show exhibitory different helpful potential which acquires significance presently.

**Keywords:** *cytotoxic effect, Acacia nilotica, strontium nanoparticles*

## INTRODUCTION

Due to their incredible medicinal potential, plants and products produced from plants have been utilized as folklore remedies for a range of medical conditions since ancient times.(1)

Acacia nilotica, also known by the common names Vachellia nilotica, babul, thorn mimosa, Egyptian acacia, and thorny acacia, is a flowering tree in the Fabaceae family. It is indigenous to the Indian subcontinent, the Middle East, and Africa.(2)

Leaves of A. nilotica were used to treat mouth, skin, and bone cancers by traditional healers, across Chhattisgarh, India. The bark and gums are also used for treating cancers of ears, eyes, or testicles in different parts of Africa.[5] Acacia spp. is the source of numerous bioactive principles such as gallic acid, kaempferol, naringenin, and catechin to name a few.(3)

Free radicals have been demonstrated to be dangerous because of how they interact with vital biological elements like proteins, DNA, and cell membranes. Free radicals, on the other hand, are necessary for immune system reactions in the body. However, an excess of these molecules has been associated with a number of chronic heart, liver, and cancer illnesses. (4) All living things have an anti-free radical defense system, which consists of antioxidants like ascorbic acid and tocopherol as well as antioxidant enzymes like catalase, peroxidase, and superoxide dismutase.(5)

At the moment, natural antioxidants derived from plant resources are of particular interest. More data point to the possibility that phytochemicals with antioxidant capabilities reduce the risk of death from numerous diseases. (6,7) It has been suggested that the phenolic chemicals, flavonoids, alpha-tocopherol, and carotenoids found in plants are what give them their antioxidant properties. Natural goods have shown to be a huge and reliable source for the creation of novel medications.(8)

The use of nanoparticles is constantly expanding in a wide range of disciplines, including biology and medicine, medication delivery, electronics, biosensors, catalysts, and industrial and

agricultural science.(9)Due to their distinct physical and chemical properties, metallic nanoparticles have attracted the most attention among all nanoparticles in recent years. Similar to calcium and magnesium, strontium is a metallic element in Group II of the periodic table. Strontium is typically employed as a bone regenerator, growth promoter, and calcium signaling stimulant.(10) Due to their shared property with calcium, strontium-based nanoparticles have since attracted interest in the fields of medicine and dentistry. Strontium-conjugated nanoparticles are also effective at removing harmful pollutants from industrial waste water and have antibacterial properties. (6) Due to their ability to trigger a sustained immune response and usage in targeted medication administration, strontium nanoparticles are effective immunotherapeutic agents. (11) Strontium nanoparticles have been used in diabetic patients, where they can manage the pathophysiology of diabetes by controlling insulin release. Additionally, strontium nanoparticles are utilized in agriculture, wastewater remediation, and as gas sensors to detect various harmful chemicals. (12)

The uses of strontium nanoparticles have likewise been tracked down in diabetic patients, where they have some control over the insulin delivery and in this way manage the pathophysiology of diabetes. (13) Strontium nanoparticles are likewise utilized in wastewater treatment, horticulture, and as gas sensors to detect a few harmful gasses. Calming movement is characterized as a specific medication or substance that decreases irritation( redness, enlarging and torment) in the body.(14) A few types of acacia contain psychoactive alkaloids, and some contain potassium fluoroacetate, a rat .

## MATERIALS AND METHODS

### *Green synthesis of strontium nanoparticles*

Strontium nanoparticles were prepared using 50 mL of 1% plant extract and 50 mL of 30 mM strontium chloride and kept in Magnetic stirrer for 24 to 48 h.

### **Brine Shrimp Lethality Assay**

#### **Salt Water Preparation**

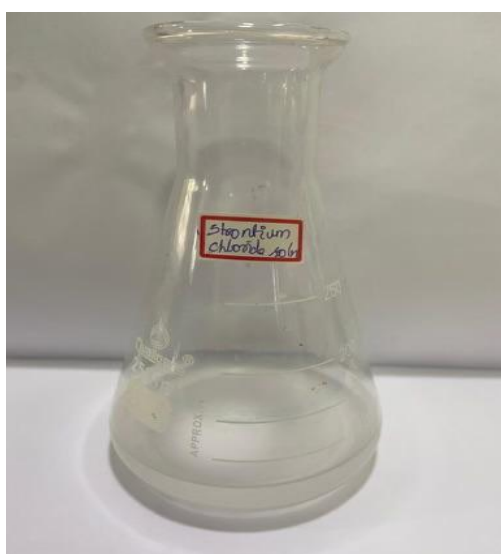
2g of iodine free salt was weighed and dissolved in 200ml of distilled water.

6 well ELISA plates were taken and 10-12 ml of saline water was filled. To that 10 nauplii were slowly added to each well (5 $\mu$ L, 10  $\mu$ L, 20  $\mu$ L, 40  $\mu$ L, 80  $\mu$ L and control). Then the nanoparticles were added according to the concentration level. The plates were incubated for 24 hours.

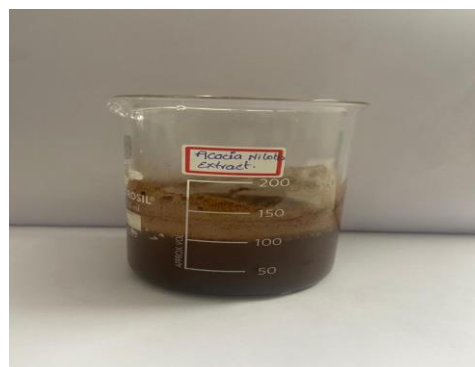
After 24 hours, the ELISA plates were observed and noted for number of live nauplii's present and calculated by using following formula,  $\frac{\text{number of dead nauplii}}{\text{number of dead nauplii} + \text{number of live nauplii}} \times 100$



**FIGURE 1:** plant preparation



**FIGURE 2:** strontium chloride solution



**FIGURE 3:** acacia nilotica extract



**FIGURE 4:** Acacia Nilotica strontium extract



**FIGURE 5:** steaming

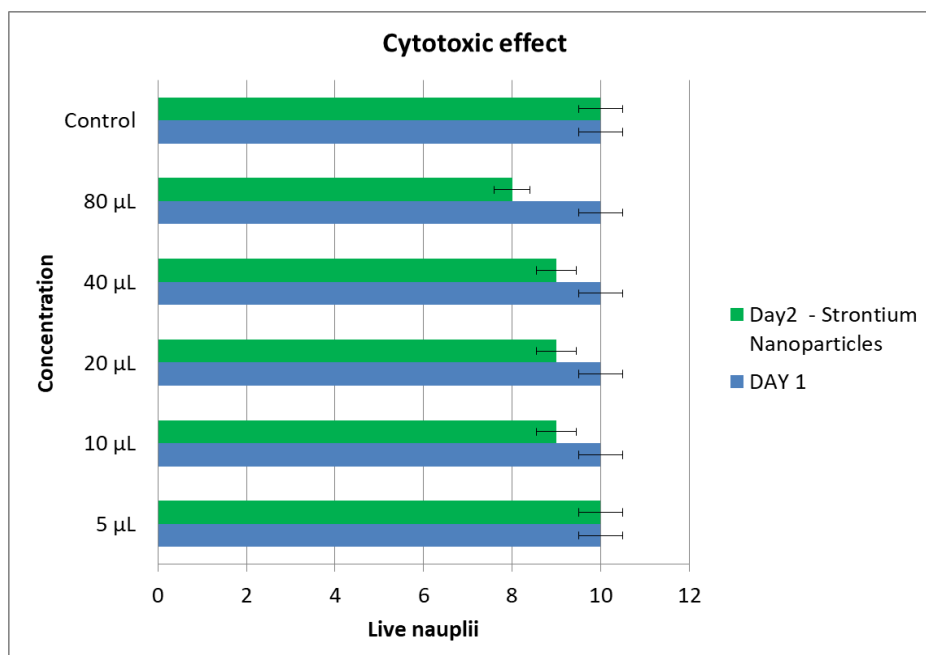


**FIGURE 6:** brine shrimp assay

## RESULT

### *Cytotoxic results of shrimps alive*

Concentration	brine shrimps alive
5µL	10
10µL	9
20µL	9
40µL	8
80µL	8
control	10



**GRAPH 1** : depicts the cytotoxic effectiveness of strontium nanoparticles augmented with acacia nilotica against the Brine Shrimp at different concentrations for 24 hours. When compared to the control, 5µl, 10µl and 20µl show high cytotoxic activity when compared to 40µl and 80µl. This demonstrates that a potential cytotoxic effect is present when acacia nilotica mediated strontium-nanoparticles are used to check the lethal assay.

### DISCUSSION

In a study conducted by Kawthar in 2022c he concluded that nilotica extract possessed anticancer activity with relative genotoxic effects at high doses (15) (16). Fahad hussain cluded in his study that the cytotoxic effect of crude extracts (n-hexane, ethyl acetate and chloroform soluble fractions) of root of Acacia nilotica was observed by brine shrimp lethality bioassay. The LC 50 values of n-hexane, ethyl acetate and chloroform soluble fraction found to be 1.956, 2.079 and 1.981 respectively indicating that some of the compounds of the extract are biologically

active. From this experiment, it was revealed that the test sample showed different responses at different concentrations. The mortality rate of brine shrimp was found to be increased with the increased concentrations of sample (17)A study by Lawaly et al., tested the hemolytic effects of Acacia pods their findings suggested that this plant could be considered as safe to human erythrocytes.

(18) (19)The benefits of nanotechnology in the clinical and restorative fields are acquiring prominence among analysts:less obtrusive, decreased risk and antagonistic impacts, quicker

activity with diminished dose because of expanded bioavailability, expanded valuable impacts, and disease has been one of the most huge explores in the field of Nanomedicine. (20) Nano meds are at present utilised in dental disciplines for nearby medication conveyance as opposed to just for lethal fundamental sicknesses like malignant growth. Dental nano research has zeroed in on utilising nanoparticles in mouthwashes, stitch materials, dental dressings, and nearby medication conveyance media. (21) Quite possibly the most pressing issue in current medication is the quest for productive medication conveyance procedures that could improve the helpful profile and adequacy of restorative specialists. (22)

Various novel medication conveyance frameworks have been made conceivable by progresses in nanoscience and nanotechnology, which have considered the manufacture of remarkable Nano-materials Nanoparticle creation has progressed rapidly in later years contrasted with the primary portion of the 100 years. (23) In spite of the fact that customary physical and synthetic methods for incorporating enormous quantities of nanoparticles take less time, perilous mixtures are used as covering specialists for dependability. Already, nanoparticles were made utilising regular techniques. Because of the use of risky substances, these methodologies adversely affected the climate. To dispose of the use of such perilous synthetic compounds, the Green Blend strategy was created, and it is currently generally utilised all through the world. (24)

Brine Shrimp lethality assay is an important tool for the preliminary cytotoxicity assay of plant extract depending on its ability to kill a laboratory cultured larvae (naupli). It is a simple, cost-effective method and requires a small amount of test material. The most commonly used organism in Brine Shrimp Lethality Assay is *Artemia salina*. (25) In the presence of salt solution (2%-4%), the shrimp eggs hatch into larvae (nauplii). Seawater is recommended for this purpose. If not available, distilled water with sea salt can be used. Tap water is not recommended for this as it contains chlorine. The ideal pH is 8.0+/- 0.5 which is adjusted using Sodium hydroxide or Sodium carbonate. At room

temperature, the nauplii hatch within 20-30 hours. (26) During the study period, the nauplii do not receive any food. The death of the nauplii may be due to the effect of the inoculated substance of starvation. To ensure the mortality effect of the subject under study, a control sample containing nauplii without inoculation of the study substance is used. The nauplii can survive for up to 48 hours without food because they still fed on their yolk sac. Brine Shrimp Lethality Assay indicates that the number of live Shrimp larvae at higher concentrations was lesser when compared to lower concentrations, and as the concentration of the strontium nanoparticles increased, the cytotoxicity was also increased which resulted in lesser number shrimp larvae which were still alive after 24 hours. (27)

A technique is both practical and naturally valuable. We directed this examination to decide the degree of risk presented by Strontium nano composite consolidating green leaf removal. Past examinations showed that a similar antibacterial movement was remarkable against oral microbes. (28) Strontium nano-composite has been demonstrated in examination to be a viable antibacterial, which is the primary supporter of this property, was utilised in this examination, with positive results. When explicit microbes come into contact with an uncovered Strontium nano-composite surface, the particles let out of the copper surface produce interior oxidative pressure in the bacterial cell wall, which prompts bacterial cell lysis. Albeit this peculiarity has been known for a very long time, experts' advantage in it has as of late returned. (29)

## CONCLUSION

From the above study, it's concluded that the strontium nanoparticles of *acacia nilotica* might represent a replacement cytotoxic source with stable, biologically active components which will establish a scientific base for the utilization in modern medicine. Use of herbal medicine is increasing worldwide. Medicinal plants are safe with no side effects and they possess effective action against bacteria and other microorganisms. Based on the results recorded in the present study, it is concluded that *acacia nilotica* has a potential cytotoxic activity on

human oral pathogenic microorganisms. Hence the present study findings provide a wonderful scientific base for some of the medicinal claims of *acacia nilotica*.

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#### CONFLICT OF INTEREST

The authors would like to declare no conflict of interest in the present study.

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