

BIOFABRICATION OF ZINC OXIDE NANOPARTICLES USING CINNAMON AND LODHRA BARK FORMULATION AND ITS ANTI INFLAMMATORY ACTIVITY.

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ABSTRACT:

Aim:The aim of this study is to analyze the anti-inflammatory effect of zinc oxide nanoparticles using lodhra and cinnamon bark extract .

Introduction: In the current situation, focus on plant research has been increased all over the world and much evidence has been collected to show the potential of medicinal plants. They are used for treating various bacterial and fungal infections and could lead to development of potential herbal medicine. They are more effective for the treatment of infectious disease with least side effects. Plant extract has the significant anti-inflammatory nature of which helps in the quick recovery of the patients and much research has been done.

Materials and methods: Fresh lodhra bark and cinnamon powder was collected. 1g of freshly collected Lodhra and cinnamon bark extract is mixed with 100 ml of distilled water thoroughly and boiled for 3-5 mins in a heating mantle then filtered by using filter paper. Zinc Nitrate powder is added in 500 ml of distilled water and to this lodhra bark extract has been added. The solution is kept in a shaker and the reading was taken for every 2 hrs for analyzing the synthesis of nanoparticles. Lodhra and cinnamon mediated copper nanoparticles were characterized by UV-Visible spectrophotometer and TEM. Further the Lodhra and cinnamon mediated nanoparticles were subjected to DPPH assay to determine the antioxidant activity.

Results: Lodhra and cinnamon bark mediated zinc oxide nanoparticles were biosynthesised with ease and showed good anti-inflammatory properties. From the results, It is evident that as the concentration of the nanoparticles increases the anti inflammatory activity also increases.

Conclusion: From this study, it is seen that zinc oxide nanoparticles using lodhra and cinnamon bark extract showed significant anti-inflammatory activity against Bovine Serum Albumin and EA assay.

KEYWORDS: Cinnamon,Zinc oxide,Lodhra bark

INTRODUCTION:

In the current scenario, focus on plant research has increased all over the world and much evidence has been collected to show the immense potential of medicinal plants. They are used to treat bacterial and fungal infections and could lead to development of potential herbal medicine(1).They are more effective for the treatment of infectious disease with least side effects. Plant extract has the significant anti inflammatory of the extract which helps in the quick recovery of the patients and many researches have been done.Symplocos Racemosa are popularly commonly known as lodhra is found in the order Ericales , containing a about 250 species which have the native of Asia, Australia and the America(2). There are many traditional uses associated with leaves, fruits and bark of the plant in which bark has the astringent,

expectorant and anti-inflammatory property(3).It is also useful in eye disease, asthma, bronchitis and treating various other gastrointestinal disturbances.Lodhra is also used to reduce the fever and to treat skin disease such as leprosy and drug of choice in gynaecological disorders (4).Cinnamon has also been used for thousands of years in Ayurvedic medicine for treating aching joints and numb pain. It is still used for similar purposes in India, presumably because of its anti-inflammatory property(5).

It is understood that inflammation is a physiologic reaction to tissue injury. Edema can arise during inflammation at the injury site as a result of an increase in blood vessel wall permeability and immune cell migration(6).Inflamed cells and tissues experience an increase of a number of enzymes and signalling proteins. Inflamed cells and tissues experience an increase of a number of enzymes and signaling proteins(7).Cinnamomum has demonstrated anti-inflammatory effects through a number of methods, including by blocking nitric oxide (NO). The chemical cinnamaldehyde is regarded as safe and well tolerated in both humans and animals, despite possible toxicity at large dosages. The Food and Drug Administration recommends a daily dose of 1.25 mg kg⁻¹.(8).

Engineering, chemical, and medicinal sciences are just a few of the domains where nanoparticles (NPs) are of significant interest. Due to their high surface-to-volume ratio and distinct characteristics from chemical species with the same makeup(9).Changes in thermal and electrical conductivity, catalytic activity, optical absorption, melting point, and antibacterial characteristics are only a few examples of the variances(10).Nanoparticles have a number of fascinating uses in a variety of industries, including medical, pharmacy, drug delivery systems, and formulations for the treatment of cancer (11).

There is no such study conducted previously in which properties of zinc oxide nanoparticles reinforced lodhra and cinnamon bark have been assessed. Hence the aim of the study is to analyze the anti-inflammatory properties using lodhra and cinnamon bark formulation.The motive of this study is that no study has been conducted previously in which properties of zinc oxide nanoparticles reinforced lodhra and cinnamon bark have been assessed. Hence the aim of the study is to evaluate the anti inflammatory properties using lodhra and cinnamon bark formulation.

MATERIALS AND METHODS:

1) Collection of Plants and preparation of plant extract:For extraction and isolation purposes, cinnamon and lodhra bark plant extract were collected, shade-dried, and powdered.The powdered dry plant matter and 100 ml of distilled water was used to dilute 1g of lodhra bark and 1.017g of cinnamon powder before they were incubated for 9 minutes at 60–80°C under vacuum. After that, Whatman's filter paper is used to filter it, and plant extract is made(fig 1).



FIG1:Preparation of lodhra and cinnamon bark extract.

2) Green synthesis of Nanoparticles:0.0169 g of zinc nitrate [Zn(NO₃)₂] solution is prepared for the production of zinc oxide nanoparticles. A 90 ml portion of distilled water is added to the produced solution. The 10 ml of plant extract solution is now added to it. So, 100 cc of the combined Zinc nitrate, *Symplocos racemosa* and cinnamon solution are obtained. (fig2). In order to prevent zinc nitrate from being

contaminated and photo inactivated, the flask is incubated at 37 degrees Celsius. The resulting zinc nanoparticles are then further purified using centrifugation for 15 minutes at 10,000 rpm. For roughly 72 hours, preliminary readings were taken every two hours. Fill the six 12 ml centrifuge tubes with the ZnNp plant extract after 72 hours, and centrifuge for approximately 10 minutes.



Fig 2: Preparation of lodhra and cinnamon assisted zinc oxide nanoparticles extract.

Anti-inflammatory Activity:

2 ml of 1% of BSA (Bovine Serum Albumin) was mixed with 400 μ l of plant extract in different concentrations of (10-50 μ l/ml) and the pH was adjusted. The reaction mixture was incubated at room temperature for 20 mins and then heated for 55°C for 20 mins in a water bath and later cooled at room temperature, the absorbance value was recorded at 660nm. An equal amount of plant extract was replaced with DMSO for control. Diclofenac sodium in different concentrations was used as standard. The experiment was performed in triplicate

Results and discussion:

From the Graph 1 it is seen that, when the concentration of nanoparticle is 10 μ L the anti inflammatory activity was 45%, 20 μ L showed the anti inflammatory activity was 55%, 30 μ L of nanoparticle showed 65% of anti inflammatory activity, 40 μ L of nanoparticle showed 75% of inhibition, 50 μ L of nano particle showed 85% of anti inflammatory activity and the standard which is aceclofenac showed maximum of 80% against BSA assay.

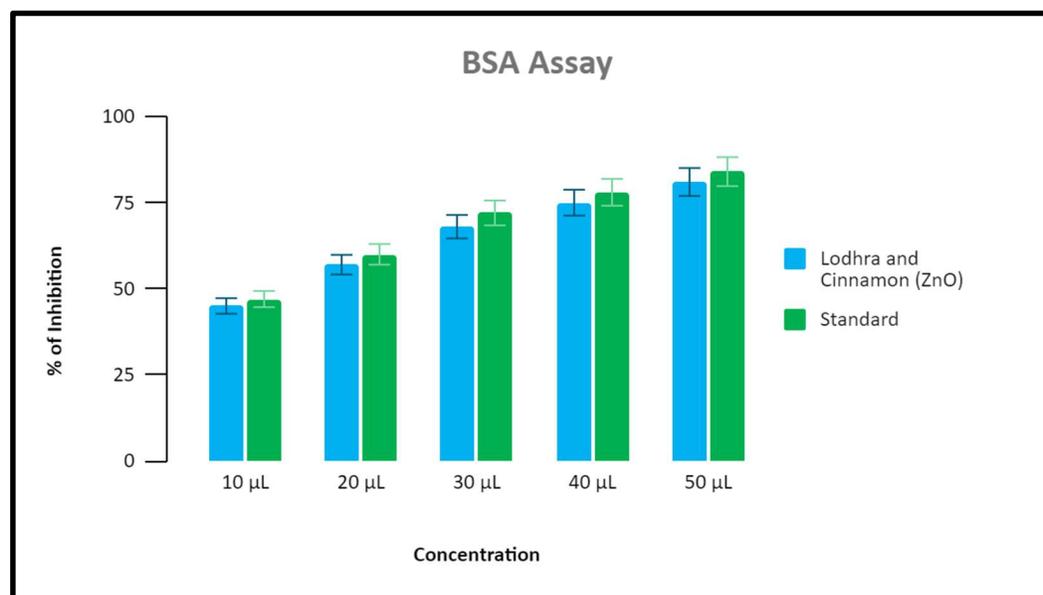


FIG1: Graph showing anti-inflammatory activity of lodhra and cinnamon assisted ZnNPs.

Figure 2:

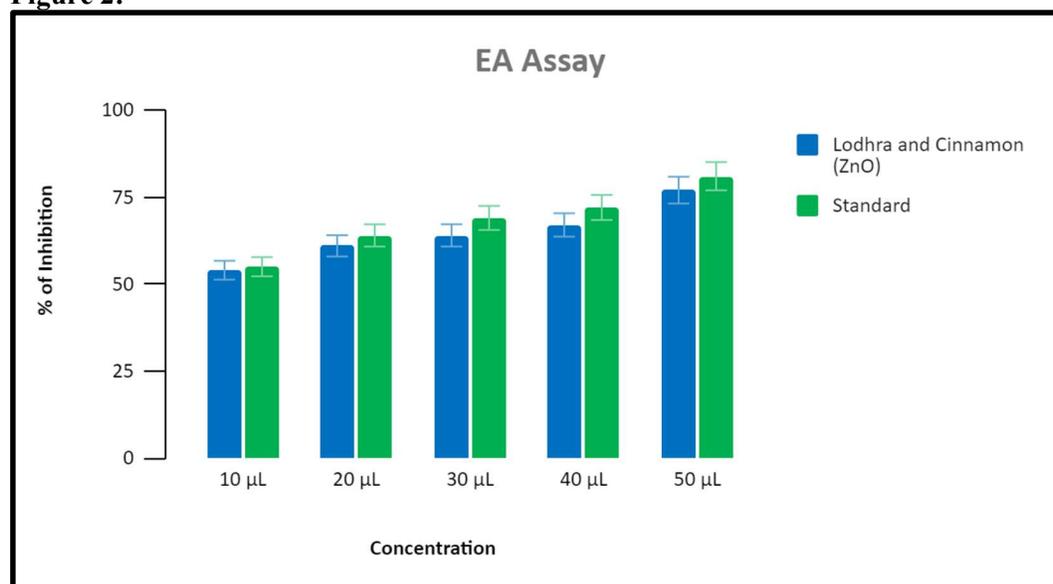


FIG 2: Graph showing anti-inflammatory activity of lodhra and cinnamon assisted ZnNPs.

The graph 2 shows the Anti Inflammatory activity against EA assay, it is showed that concentration of the nanoparticle is 10µL the anti inflammatory activity was 50% , 20µL of nanoparticle showed 60% of antioxidant activity, 30µL of nanoparticle showed 68% of anti inflammatory activity , 40µL of nanoparticle showed 73% of anti inflammatory activity , 50µL of nanoparticle showed 80% anti inflammatory activity and the standard which is the aceclofenac showed maximum of 90% anti inflammatory activity.

DISCUSSIONS:

The synthesis of zinc oxide NPs using plant extracts is gaining more and more supporters due to the fact that it provides environmentally friendly conditions. The still-growing popularity of this method is determined not only by ecological but also economic considerations due to the easy and almost cost-free availability of raw materials.(12) Many studies have been conducted on different nanoparticles against various plant extracts as they are cost effective and eco friendly(13).

There has been a rapid evolution of nanoparticle synthesis recently as compared to the earlier time. In order to maintain stability, conventional physical and chemical methods are enforced as capping agents and it takes less time to synthesize large amounts of nanoparticles, which in turn causes environmental toxicity(14). ZnONPs potential offering towards anti-inflammatory activity like stable nature, selective targeting has been discussed briefly. The present study highlights the potential of ZnONPs as an anti-inflammatory drug molecule or a vector for drug delivery. The concentration of the nanoparticle is 10µL the anti-inflammatory activity was 45%, 20µL showed the anti inflammatory activity was 55%, 30µL of nanoparticle showed 65% of anti inflammatory activity, 40µL of nanoparticle showed 75% of inhibition, 50µL of nano particle showed 85% of anti inflammatory activity and the standard which is aceclofenac showed maximum of 80% against BSA assay. In this study, results shows that as the concentration increased the anti inflammatory activity of the nanoparticles increased. The highest percentage was at 50 µL concentration of Zinc Oxide nanoparticles reinforced with lodhra and cinnamon extract. The values for anti inflammatory properties of Zinc Oxide nanoparticles was lesser than the standard values at all concentrations.

Previous study shows that the chemicals, thermal, and electrical induced inflammatory pain models were extensively used in the preclinical research(15). In previous studies it is noted that ZnO induced a reduction

of cytokine production as the results are in line with the observation about its immunomodulatory capacity previously made by other authors(16). In fact, it has been demonstrated that the reduced level of circulating Zn is observed in increased IL-6, IL-8 and TNF- α serum levels(17).

CONCLUSION:

From the above result it was observed that, as the concentration increases the rate of protein denaturation inhibition also increases indicating a good anti-inflammatory activity. It was concluded that Lodhra and cinnamon assisted zinc oxide nanoparticles approach is a fast, green and economical method which produces highly stable ZnO NPs. Plant is known to contain flavonoid, oleanolic acid and coumarins compounds that seem to play an important role in synthesis, stabilization of ZnONPs. This would be a cost-effective, simple and environment-friendly approach to ZnO NP production, which could expand its use into various pharmaceutical industries. Our study requires in vivo experiments to better understand ZnO NPs toxicity and future biomedical applications.

CONFLICT OF INTEREST:

There is no conflict of Interest

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