ANTI INFLAMMATORY ACTIVITY OF SELENIUM NANOPARTICLES SYNTHESISED USING PTEROCARPUS SANTALINUS

RUNNING TITLE : Anti inflammatory activity of Selenium Nanoparticles.

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Abstract:

Introduction: Inflammation is a biochemical response of the immune system that can be caused by a wide range of factors, including bacteria, infected cells and toxic substances. Pterocarpus santalinus L. f. (Fabaceae) is most commonly referred to as red sandalwood in English, but it also has several common names in many languages , *Pterocarpus* is derived from the Greek words pteron (wing) and karpos (fruit), which refer to the winged pod, while santalinus originates from the Latin sandal and inus.The aim of the study was to evaluate the anti inflammatory activity of *Pterocarpus Santalinus.*

Materials and Methods: The plant extract was prepared and then the selenium nanoparticles were further synthesized. This has been regularly found in UV-vis spectrophotometers. This assay has the potential to calculate extracts by adding hydrogen to DPPH radicals. Pterocarpus Santalinus at different concentrations measured by the inhibition of albumin denaturation assay. In recent times, attention has continued to be paid to natural products and drugs as anti-inflammatory, based on reactions with free radicals and other reactive species. Further , increase in the concentration in turn increases the percentage of inhibition.

Results:In the present study, it was found that the biosynthesized selenium nanoparticles had potent anti-inflammatory activity.

Keywords: Pterocarpus Santalinus, anti-inflammatory activity; UV-vis spectroscopy; selenium nanoparticles; nanotechnology.

Introduction:

Inflammation is a complex phenomenon that is mostly associated with pain and inverse events such as increased vascular permeability, increased protein denaturation and modification of the membrane (1). When the cells in the body are affected by bacteria, physical agents or chemical agents, the harm is caused by stress. Inflammation of the skin is due to stress reactions.It is a difference in response characterized by redness, discomfort and heat and swelling and lack of function in the injured region.

Pterocarpus santalinus L. f. (Fabaceae) is most commonly known as red sandalwood in English (2). It is an endemic and endangered species , commonly found in the Southern portion in the Eastern Ghats. Belonging to the Fabaceae family, it is the most efficient medicinal plant species among all the rich heritage medicinal plants (3).Wood is used as an astringent, tonic, as an external application for burns, cuts and inflammations, in the treatment of headaches, skin disorders, fever, acne, scorpion sting and to improve vision (4). Red wood produces natural santalin, which is used as a coloring agent in medicinal formulations, food products; fruit extract is used as an astringent, diaphoretic, inflammatory, headache, skin diseases (5).Bioactive compounds found in the plant heartwood have been shown to have a broad variety of biological activities,(6) indicating the ability of P. santalinus for the treatment of different diseases (7). In vitro and in vivo studies showed the heartwood exhibited antidiabetic , antimicrobial and anti inflammatory and hepatoprotective properties.In ayurveda, a decoction of fruit is used as an astringent tonic in chronic dysentery (8) & (9).

Nanoparticles also attracted interest from scientists to be used as a professional biochemical operation (10). Metals in the shape of nanoparticles pose long-term challenges to the

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development of a new class of anti-inflammatory agents. The biological activity of metal-derived nanoparticles is dependent on their physical and chemical activity (11). Nanoparticles also attracted interest from scientists to be used as a professional biochemical operation (12). Metals in the shape of nanoparticles pose long-term challenges to the development of a new class of anti-inflammatory agents. The biological activity of metal-derived nanoparticles is dependent on their physical and chemical activity.

Anti-inflammatory agents block other inflammation-causing molecules in the body and are used to prevent and diagnose cancer (13). Selenium nanoparticles may also have adverse effects in our body (14). Selenium nanoparticles also have cytotoxic effects that lead to a variety of cell fates (15).Our team has extensive knowledge and research experience that has translate into high quality publications (16)(17,18)(19)(20)(21)(22)(23)(24)(24,25)(25)(26).The aim of this analysis is to test the anti-inflammatory properties of Pterocarpus Santalinus synthesized selenium nanoparticles.

Materials and Methods:

Synthesis of Selenium nanoparticles:

Red sandal extract of 0.5g was measured, and to this 50 ml of distilled water added. Now, the measured extract is boiled for 10 min at 55 degree celsius . Further, the extract was filtered , to which sodium selenite was added.

Albumin Denaturation Assay :

Anti-inflammatory activity:

The anti-inflammatory activity for *Pterocarpus Santalinus* was tested by the following convention proposed by Muzushima and Kabayashi with specific alterations.0.05 mL of Pterocarpus Santalinus of various fixation (10µL,20µL,30µL,40µL,50µL) 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. DMSO is/ was utilized as a control.

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Percentage of protein denaturation was determined utilizing following equation,

% inhibition= Absorbance of control- Absorbance of sample×100 /Absorbance of control

RESULTS:

Figure 1: Synthesis of *P.santa* mediated selenium nanoparticles .

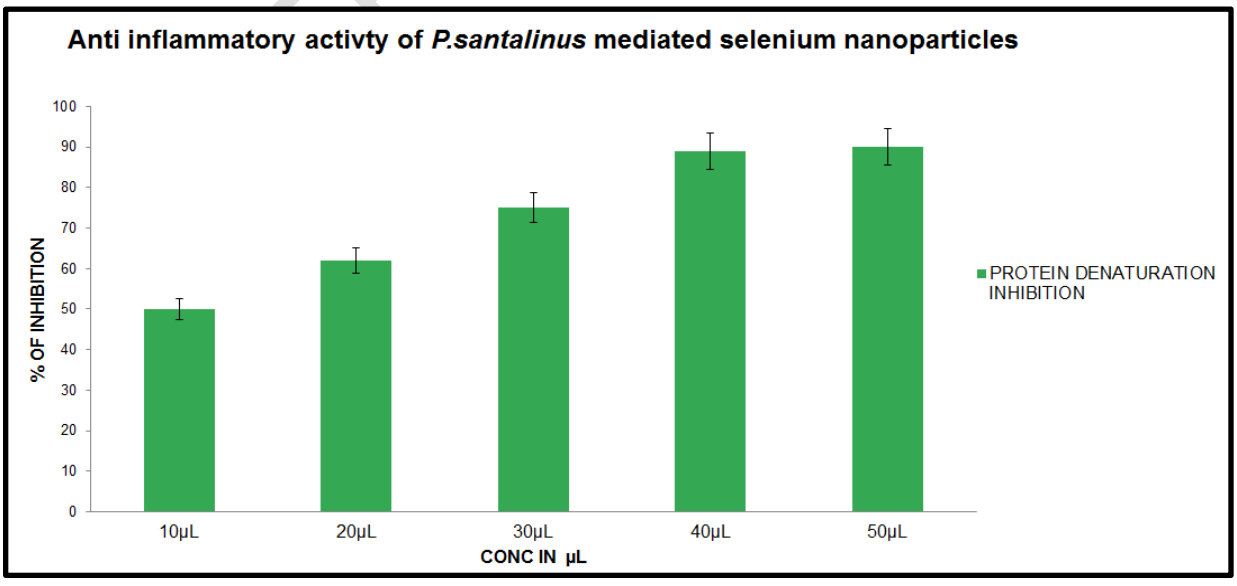

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Figure 2:The bar graph represents the anti- inflammatory activity of selenium nanoparticles synthesised from extract of *Pterocarpus Santalinus*. X axis represents the concentration in the microliter and Y axis represents the percentage of inhibition, data implies as mean±SEM .

In this analysis, the anti-inflammatory efficacy was evaluated at five separate reaction mixture concentrations of 10 µL, 20 µL, 30 µL, 40 µL and 50 µL. Anti-inflammatory activity with varying inhibition percentages, such as 50 %, 72 %, 78 %, 85 % and 90 %. Selenium nanoparticle induced plant extract at a concentration of 50 µL showed strong anti-inflammatory efficacy of 90 %, which was very similar to standard consistent with the study done previously (27).

Discussion:

In the study done by Panayi, it is known that Anti-inflammatory effects of lignan compounds derived from *P. santalinus* heartwood have been studied in RAW264.7 cells and splenocytes (28) also from the study done by Kwon et al.,(5). Specific lignans, namely savinin, calocedrus and eudesmane, were identified in the P. santalinus heartwood extract. These compounds have been shown to suppress TNF-5-007 and have also demonstrated antiproliferative effects. Many experiments have carried out this activity, but with other nanoparticles such as copper, silver, etc. (29)-(30)(30,31). The benefit of the Selenium nanoparticle is that it is cost-effective, produces high reactions and consumes less time.In ancient cultures, physicians relied on herbs to improve the body's immune systems. Over a number of countries, *Pterocarpus Santalinus* and its derivatives have strengthened the immune system. Previously our team had conducted various research studies (21)(22)(32)(33)(33,34)(35)(36)(37)(38)(39)(40)(41)(42) (43) (44) (45) (46) (47) (48) (49) (50) (51) (52) (53) (54)

In the study done by (55)-(56) *Pterocarpus erinaceus* extracts inhibited both phases of pain induced by formaldehyde injection , showing positive outcomes on anti-inflammatory , anti analgesic and pyretic activities standing similar to our study. The selenium nanoparticles have proved to show modulating the inflammatory and diabetic complications, in the study done by (57) showing the same results as the present study.

Conclusion:

The study establishes in vitro anti-inflammatory behavior of Pterocarpus Santalinus mediated selenium nanoparticles showing a promising outcome in both assays. It can also be used to

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identify new medications that are more potent with less toxicity on a long term study basis of Pterocarpus Santalinus(58)-(59). In our study , it is evident that increase in the concentration measured by Albumin denaturation assay showed positive correlation with the percentage of inhibition(60) (61) (62) (63) (64) (65) (66) (67) (68) (69) (70) (71) (72) (73) (74).The aim of this research was to find a better combination of Pterocarpus Santalinus mediated selenium nanoparticles by expressing its anti-inflammatory activity, thereby contributing to disease prevention.

NOTE:

The study highlights the efficacy of "ayurveda" which is an ancient tradition, used in some parts of India. This ancient concept should be carefully evaluated in the light of modern medical science and can be utilized partially if found suitable.

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