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International Journal of Dentistry and Oral Science (IJDOS)
ISSN: 2377-8075

Antioxidant Activity of Silymarin/Hydroxyapatite/Chitosan Nano Composites - An *In Vitro* Study

Research Article

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Abstract

Nanoparticles and nano-composites are major advanced materials used in many medical and dental applications. In this present investigation, we have prepared silymarin, chitosan and hydroxyapatite based nanocomposite using magnetic stirring. The prepared nanocomposite characterized using UV-vis spectroscopic analysis. The free radical scavenging activity of prepared nanocomposites was tested using DPPH assay. The results are statically analyzed and the antioxidant results are good for nanocomposite materials. Based on the results the prepred nanocomposites may used in various dental applications.

Keywords: Nanocomposites; Antioxidant; Chitosan; Silymarin; HAP.

Introduction

The oxygen utilization characteristic in cell development leads to the age of a progression of receptive oxygen species (ROS). ROS include free radicals such as superoxide anion radicals (O^2), 2 hydroxyl radicals (OH•) and non free-radical species such as hydrogen peroxide (H_2O_2) and single oxygen [1-3].

ROS at physiological concentration might be needed for typical cell work. They are likewise equipped for damaging critical biomolecules, for example, nucleic acids, lipids, proteins, polyunsaturated unsaturated fats and carbs and may cause DNA damage that can prompt changes [4, 5].

Silymarin, a known standardized extract obtained from seeds of Silybummarianum (Milk Thistle) is widely used in treatment of several diseases. Silymarin, a plant derived flavonoid, which is named benzopyranone, is secluded from the products of the soil of the milk thorn (Silymarinmarianum) is a combination of three primary parts: silibinin, silydianine and silychristine. It has been known for its hepatoprotective antibacterial, antiallergic, antimutagenic, antiviral, hostile to neoplastic, antithrombotic specialists and vasodilatory activities. One of the significant issues with respect to silymarin is that it could be acknowledged as a natural compound [6-9].

Hydroxyapatite (HA)possess significant mechanical strength, biocompatibility, low resorbability, osteoconductivity, HA is extensively used in orthopedic and dentistry as metallic implant coating and cavity filling material and also, as the key constituent in toothpaste and mouth washes to remineralize artificial carious lesions [10].

Chitin, especially its deacetylated form, and chitosan are well known marine biopolymers, having many applications in the food industry, agriculture, biotechnology, cosmetics, medicine. The reactive functional groups of chitosan include an amino group and both primary and secondary hydroxyl groups at C-2, C-3, and C-6 positions, respectively. The biological activities of chitosan and its derivatives correlated with their structures and physicochemical properties [11, 12]. The green synthesized nanoparticles such as silver, selenium, zinc oxide and copper etc. shows very good antioxidant, antimicrobial and many more biomedical applications [13-20].

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Received: January 12, 2021
Accepted: January 22, 2021
Published: January 26, 2021

Citation: S. Aravind Kumar, Ramachandra Prabhakar, N. Raj Vikram, SP Saravana Dinesh, S Rajeshkumar. Antioxidant Activity of Silymarin/Hydroxyapatite/Chitosan Nano Composites - An In Vitro Study. *Int J Dentistry Oral Sci.* 2021;8(1):1402-1404. **doi: http://dx.doi.org/10.19070/2377-8075-21000278**

The aim of the present study is to investigate the antioxidant potential of Silymarin Hydroxyapatie and Chitosan Nanoparticles.

Materials and Methods

Preparation of Nanocomposite

The different concentration of chitosan, silymarin and hydroxyapatite was mixed in the beaker and kept in magnetic stirrer for 48 h. the colour change was observed and scanning process was done using UV-vis spectroscopy from 200 nm to 700 nm.

Antioxidant activity of Chitosan, HAP, silymarin and Nanocomposites

The antioxidant activity of nanocomposites descrbed shortly, 1 mL DPPH solution was added to all tubes. To that silymarin, HAP, chitosan and nanocomposites pellet solution was added in the range of 10 µL,20 µL,30 µL,40 µL,50 µL. And 50% methanol solution was added in the range of 1990 µL,1980 µL,1970 µL,1960 µL,1950 µL.

The tubes were incubated at dark condition for 15 -20 minutes. Photometry was taken for all tubes at 517nm and the readings were recorded.

Results and Discussion

The figure 2 shows the UV-vis spectroscopic analysis of nanocomposite prepared using Hydroxyaptite nanoparticles, bioactive compound and chitosan nanoparticles based nanocomposites. The peaks individual silymarin/chitosan and silymarin/HAP shows single peaks and broad peaks confirm the nanocomposite formation.

The figure 3 clearly shows the antioxidant activity of chitosan, HAP and silymarin materials. The increased concentration of materials shows good activity. The figure 4 shows the antioxidant activity of HAP/Chitosan/silymarin nanocomposite with good % of inhibition. It clearly shows the higher activity of free radical scavenging, when compared with remaining nanoparticles and bioactive compounds individually. The nanoparticles are very actively involved antioxidant activity in in vitro and in vivo [21-22].

Figure 1. Visual observation of formation of Silymarin/HAP Chitosan nanocomposites.

Figure 2. UV-vis spectroscopy analysis of silymarin chitosan, silymarin mediated HAP nanoparticles and Silymarin/HAP/chitosan nanocomposites.

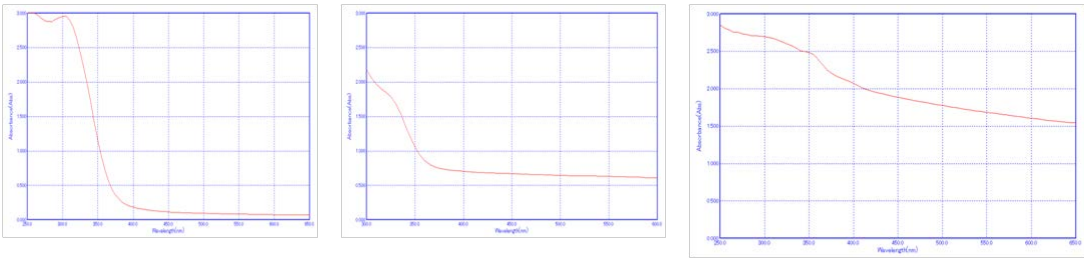


Figure 3. Antioxidant activity of Zinc oxide, silymarin, chitosan materilas.

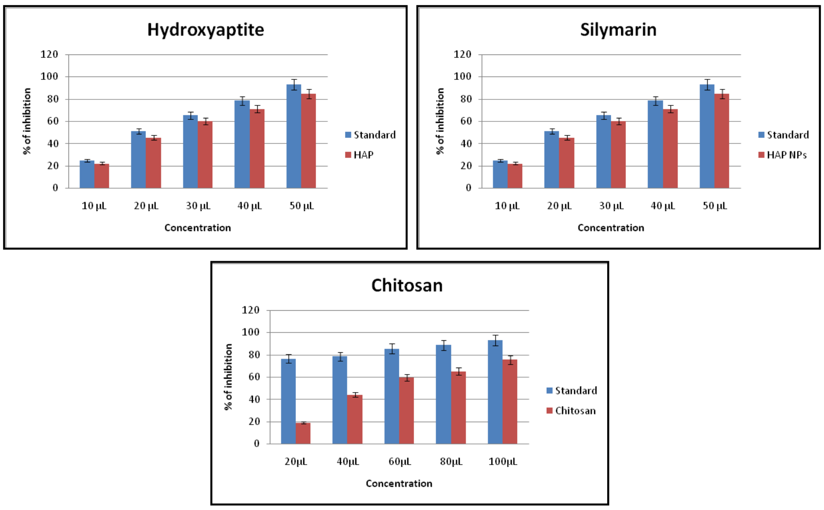
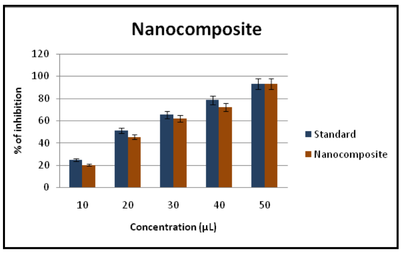


Figure 4. Antioxidant activity of nanocomposite.



Conclusion

The nanocomposite synthesized using bioactive compound silymarin, biopolymer chitosan and hydroxyapatite shows very good free radical scavenging activity using DPPH assay. Based on our results we are planning to use this nanocomposite in the orthodontic applications.

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