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Anti-diabetic activity of silver nanoparticles prepared from cumin oil using alpha amylase inhibitory assay

Preety R, Roy Anitha*, Rajeshkumar S, Lakshmi T

Department of Pharmacology, Saveetha Dental College, Saveetha Institute Medical and Technical Sciences, Saveetha University, Chennai, India

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ABSTRACT

Studies suggest that cumin oil have many health and cosmetic benefits such as weight loss, improving skin conditions and also treating cancer and diabetes. People have used these tiny black seeds of *N. sativa* as a natural remedy for thousands of years. Cumin oil contains thymoquinone, which is an antioxidant and an anti-inflammatory compound having tumor-reducing properties therefore useful in treating cancer. Plant mediated biological synthesis of silver nanoparticles has been gaining importance due to its simplicity and eco-friendliness. The aim of the present study was to prepare cumin oil mediated silver nanoparticles and evaluate it for its anti-diabetic activity .using alpha amylase inhibitory assay. The green synthesised cumin oil mediated silver nanoparticles were prepared using 1mM silver nitrate. The anti-diabetic activity was evaluated by alpha amylase inhibitory assay. The formation of the nanoparticles was confirmed both by visual colour change as well as by scanning the absorbance by UV-Visible spectrophometer between 300 nm to 700 nm. In the present study, cumin oil mediated silver nanoparticles inhibited alpha amylase in a dose dependent manner. Hence, these nanoparticles may be used for control post prandial hyperglycemia.

*Corresponding Author

Name: Roy Anitha
Phone: 9840787458
Email: anitharoy2015@gmail.com

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INTRODUCTION

Nanotechnology is an advanced field of technology which has lot of application in biomedical field such as dentistry, neurodegenerative medicine, drug delivery system and so on (Menon *et al.*, 2018; Rajeshkumar and Naik, 2018) The metal nanoparticles such as gold, zinc oxide and silver has wide and unique properties with wide range of applications (Santhoshkumar *et al.*, 2017; Agarwal *et al.*, 2018a; Rajeshkumar, 2016). Silver nanoparticles synthesized using different herbal plants are having wide range of applications in various fields (Rajeshkumar and Bharath, 2017).

Silver nanoparticles have many applications in medical field. The silver nanoparticles synthesized using root extract of *Acorus calamus* showed very good antioxidant and antibacterial effect against gastrointestinal pathogens (Chellakannu *et al.*, 2019). Silver nanoparticles from lemon grass is reported to have good antidiabetic activity (Agarwal *et al.*, 2018b). The bark extract of *Garcinia mangostana* mediated nanoparticles showed good larvicidal activity and antimicrobial activity against fungus and disease causing bacteria (Karthiga *et al.*, 2018). The aqueous leaf extract of *Clome gynandra* mediated silver nanoparticles showed peak at 420 nm and showed good antimicrobial potential (Asha *et al.*, 2017).

Many plants are reported to have hypoglycaemic (Roy *et al.*, 2011; Ashwini and Anitha,

2017; Aneesa *et al.*, 2019). *Nigella sativa* is known for its antidiabetic effect. Extensive studies on *N. sativa* have been carried out by various researchers and a wide spectrum of its pharmacological actions has been explored. Due to its miraculous power of healing, N. sativa has been top ranked among evidence based herbal medicines. Most of the therapeutic properties of this plant are due to the presence of phytochemicals like thymoquinone which is the major bioactive component of the essential oil (Wafai *et al.*, 2010).It is reported that , the presence of thymoquinone is (30%-48%), thymohydroquinone, dithymoquinone, p-cymene (7%-15%), carvacrol (6%-12%), 4-terpineol (2%-7%), t-anethol (1%-4%), sesquiterpene longifolene (1%-8%) α-pinene and thymol etc (Kanter *et al.*, 2009). Plant mediated biological synthesis of silver nano particles has been gaining importance due to its simplicity and eco-friendliness. Cumin oil was used as the sole reducing and capping agent for the synthesis of silver nanoparticles. In this study, cumin oil mediated silver nanoparticles were evaluated for anti-diabetic activity using alpha amylase inhibitory assay.

MATERIALS AND METHODS

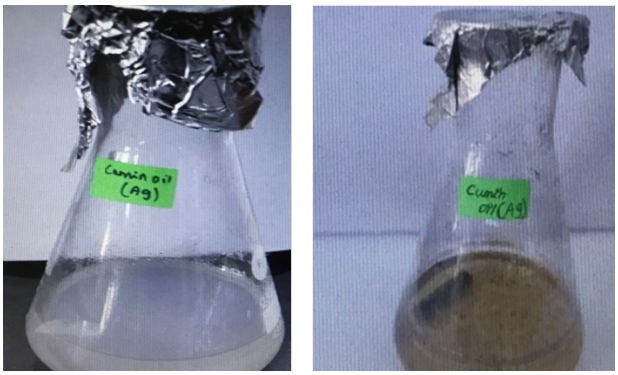

Figure 1: Visual Observation

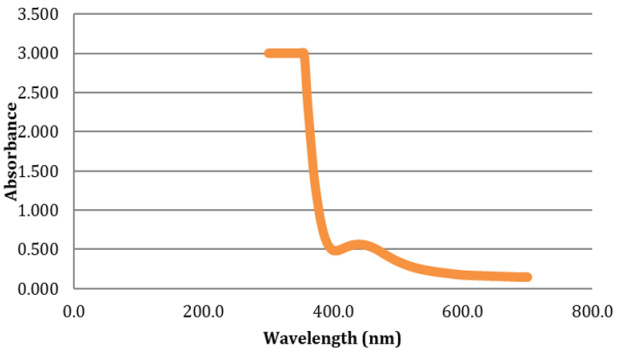

Figure 2: UV-V is Spectroscopic analysis

Synthesis of Cumin oil mediated silver nanoparticles

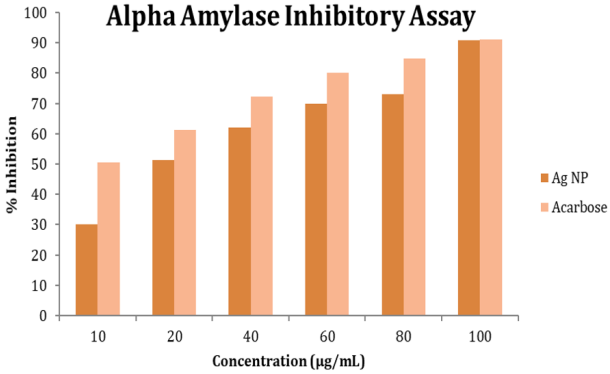

Figure 3: Alpha amylase inhibitory effect of Cumin oil mediated AgNPs

1 mM silver nitrate (90 mL) in double distilled water was mixed with 10 mL of cumin oil solution to make 100 mL and kept in an orbital shaker with magnetic stirrer for synthesis of silver nanoparticles .The colour change was observed visually and photographs were recorded.

Characterization of Silver Nanoparticles

The synthesised nanoparticles were primarily confirmed by UV-Vis spectroscopy. 3 mL of the solution was taken in a cuvette and scanned between 300 nm to 700 nm. The results were recorded for graphical analysis.

Alpha-amylase inhibitory assay

The antidiabetic activity of synthesized nanoparticles were anlysed based on our previsous studies (Roy and Geetha, 2013).

% inhibition was calculated using the formulae-

$$\%\ inhibition = \left(\frac{C-T}{C}\right) \times 100$$

Where, C= control, T= test sample.

RESULTS AND DISCUSSION

The Figure 1 depicts the image of the cumin oil mediated silver nanoparticles. There was a visible colour change in the reaction mixture indicating the nanoparticle synthesis induced by cumin oil. Figure 2 shows the UV –Vis spectroscopy of the synthesised nanoparticles. The surface Plasmon resonance peak of cumin oil mediated silver nanoparticles around nm confirmed the formation of silver nanoparticles. Figure 3 showed a dose dependent inhibitory effect of cumin oil mediated silver nanoparticles on alpha amylase enzyme. Inhibitors of this enzyme are potential compounds for management of diabetes. Plants are known for their enzyme inhibitory activity. Many plant mediated

oils were used for the green synthesis of different metal nanoparticles for their biomedical application. The present study claims the Alpha amylase inhibitory effect of cumin oil mediated silver nanoparticles.

CONCLUSIONS

Present study prove the antidiabetic activity of cumin oil mediated silver nanoparticles by its excellent alpha amylase inhibitory effect. Carbohydrate metabolizing enzyme inhibitors are a very good choice for postprandial control of hyperglycemia so the blood sugar levels are improved well.

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