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Biosynthesis Of Silver Nanoparticles Using Rose and Jasmine and Its Anti Diabetic Potential

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ABSTRACT

Introduction: Rose (rosa canina) is one of the flowers that are much in demand by the community because besides being an ornamental flower it can also be used as a cosmetic. Traditional medicinal herbs have seen a rebound in recent years, and as a result, pharmaceutical companies are investing heavily in developing natural medications derived from plants.
Aim: To study the Anti-diabetic activity of Rose Jasmine formulation mediated silver nanoparticles.
Materials and methods: The anti-diabetic activity was tested by the following inhibition of α-glucosidase at different concentrations of the prepared extract mediated with silver nanoparticles.
Result: Using rosa and jasminum extract in the manufacture of silver nanoparticles, the nanoparticles showed remarkable anti-diabetic activity. It was discovered that the herbal effect was less harmful. Rosa jasminum extract of AgNps showed good anti-diabetic efficacy in the BSA assays.
Conclusion: Result of this study suggest that biosynthesis of silver nano particle using rose and Jasmine showed its anti diabetic activity

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INTRODUCTION

Rose is a woody perennial flowering plant of the genus Rosacea(1). They form a group of plants that can be erect shrubs, climbing or trailing with stems that are often armed with sharp prickles. Rose flowers help to breed different cultivators of roses by supplying eggs and pollen(2). The rose petals contain compounds that improve metabolism in addition to clearing toxins from the body, thereby aiding in weight loss(3). With fatigue and stress comes insomnia and restlessness that gives rise to irritability and frigidity. A simple, one step green approach was developed for synthesis of AgCl nanoparticles using rose flower extract acts as both reducing and stabilising agent. The XRD spectrum of a synthesised sample shows the presence of AgCl nanoparticles(4).

To optimise the process parameters involved in the green synthesis of silver nanoparticles (G-SNPs) by aqueous extract of Rosa damascena petals and to evaluate the biocompatibility and anti cancer activity of the synthesised silver nanoparticles against human lung adenocarcinoma. The results of the study suggest that G-SNPs can be synthesised rapidly within the first minute of the reaction; they are biocompatible and possess anticancer activity against human lung adenocarcinoma(5).

The present study was aimed at biosynthesis of silver nanoparticles (AgNPs) using ethanolic extract of rose (Rosa indica) petals and testing their potential antibacterial activity using selective human pathogenic microbes, anticancer activity using human colon adenocarcinoma cancer cell line HCT 15 as well as anti-inflammatory activity using rat peritoneal macrophages in vitro. The biologically synthesised AgNPs were also characterised by UV–visible spectroscopy, scanning electron microscopy (SEM), transmission electron microscopy (TEM), Fourier transform infrared spectroscopy (FTIR), energy-dispersive X-ray spectroscopy (EDX) and X-ray diffraction (XRD). The characterised AgNPs showed an effective antibacterial activity against Gram negative (Escherichia coli, Klebsiella pneumoniae) than Gram positive (Streptococcus mutans, Enterococcus faecalis) bacteria

Jasmine has been used for liver disease, pain due to liver scarring and abdominal pain due to severe diarrhoea(6). Jasmine is used on the skin to reduce the amount of breast milk, jasmine also plays a major role in the wound healing process. When inhaled it improves mood, reduces stress and reduces food cravings. In foods, jasmine is used to flavour beverages,frozen dairy desserts and gelatins(7). The novel jasmine bud-shaped Cu nanoparticles have been prepared by a green chemical reduction method from copper sulphate precursors. The Cu nanobuds were characterised by means of UV-Vis spectroscopy, XRD, TEM, and AFM and their antimicrobial activity has also been investigated. The results show that the Cu nanoparticles have jasmine bud-shapes and their average particle size obtained from XRD study is 6.95 nm(8).

Medicinal plants, namely, aqueous extracts of fresh leaves of Jasminum officinale L. can be used as bioreduction agents to produce clean, inexpensive, eco friendly silver nanoparticles and a safe method that has not used any toxic substance and consequently does not have side effects. Nanoparticles formation was observed by the colour change of J. officinale extract into a brownish-yellow. Colour changes that occur indicate that AgNO3 was reduced and Ag nanoparticles have been formed.The formed silver nanoparticles showed high cytotoxic activities and can be introduced as a new alternative cytotoxic medication(9).

MATERIALS AND METHOD

Study setting

Preparation of the extract

1 ml of rose and jasmine extract was mixed with 100ml of distilled water and boiled for 20 minutes. To 50ml of the extract add 20 Mm of AgNPs and it is dissolved in the 50 ml of water. The boiled extract was cooled and filtered and the mixture was kept in orbital shaper for 72 hours and centrifuged.

Synthesis of silver nanoparticles

An amount of 1 mM silver nitrate (AgNO3) in aqueous solution was prepared in 250 mL. For reduction into Ag+ ions, tepal extract was added. The mixture was microwaved at 300 W for 4 min for complete bioreduction to avoid pressure increase. While the colour changed from light to yellowish brown and then to reddish brown and to colloidal brown, the variation was observed at room temperature for at least 30 min by UV-visible spectrophotometry (in dark to avoid photoactivation of AgNO3). Experimental controls were sustained for the entire period. AgNO3 was completely reduced to Ag+ ions, established by the presence of colloidal brown colour changes. The solution was then cooled and left for about 24 h for comprehensive bioreduction. after which the mixture was stored in an airtight container for further analysis. The silver nanoparticle (AgNP) formation was confirmed by spectrophotometric analysis.

Anti Diabetic Effect

The alpha-glucosidase assay to identify inhibition of α-glucosidase by the AgNPs was carried out following the standard protocol . Inhibition percentage of α-glucosidase enzyme action was evaluated by the below equation.

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

Absorbance of control

Statistical Analysis

The data were represented as means of three independent replicates with standard deviation values. One-way ANOVA and Duncan's multiple range test were undertaken using SPSS (version 23.0, IBM Corp., Armonk, NY, USA) software. Differences by means of $P < 0.05$ were statistically considerable or significant.

RESULTS

Figure 1: Dry rosa and Dry jasminum

Figure 2: Flower Extract

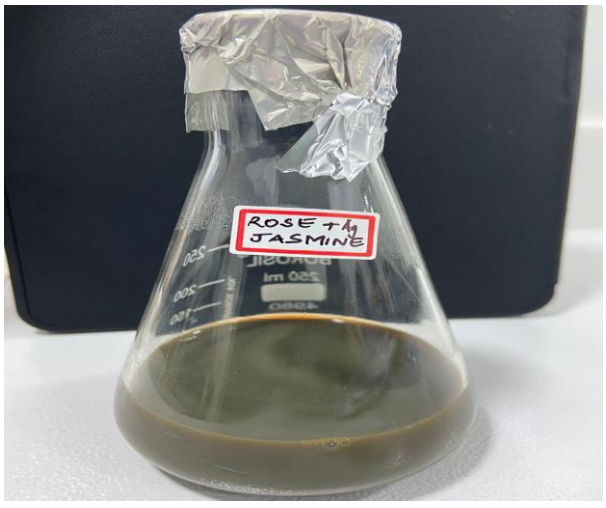

Figure 3: Silver nanoparticle formation

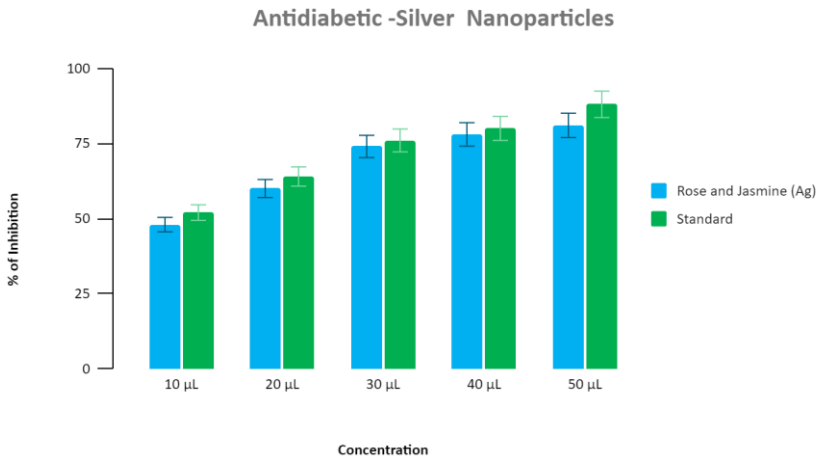

Figure 4: BSA assay of flower extraction with nanoparticle, comparing with standard drug shows the anti-diabetic activity

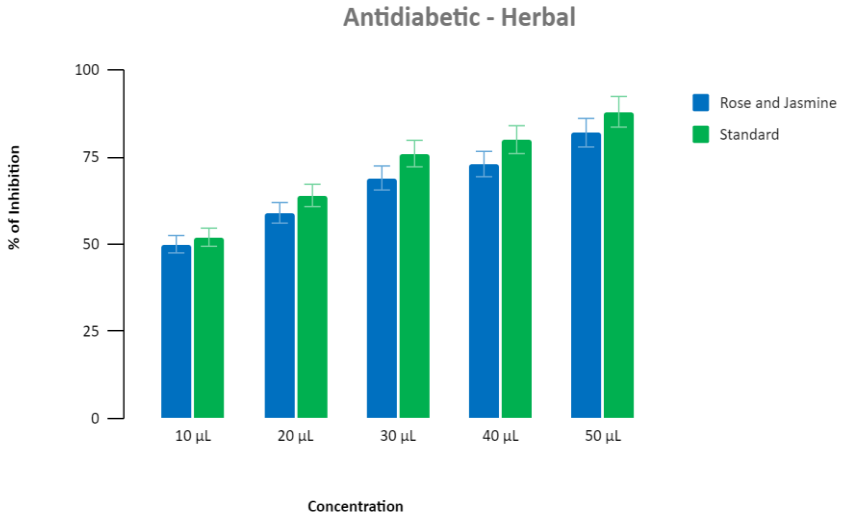

Figure 5:BSA assay of flower extraction with nanoparticle, comparing with standard drug shows the Anti-diabetic activity in herbal formulation

Using rosa and jasminum extract in the manufacture of silver nanoparticles, the nanoparticles showed remarkable anti-diabetic activity. It was discovered that the herbal effect was less harmful.It is observed that the anti diabetic activity was tested against 5 different concentrations (10ul,20ul, 30ul, 40ul and 50ul) where Rosa jasminum extract of AgNps showed good anti-diabetic efficacy in the BSA assays.

DISCUSSION

Among the several nanoparticles, silver nanoparticles are the most widely employed. Personal care items, sensors, antimicrobial creams, and biomedical applications were among its uses. The wide range of uses raises questions about their possible toxicity. Ibuprofen and diclofenac sodium, both members of the NSAID class of medications, are the anti-inflammatory medications that are taken the most frequently.Nanoparticles (NPs) are a type of material that differs from its bulk and molecular counterparts in terms of characteristics. Nanoparticles have been utilised to change and improve the pharmacokinetic and pharmacodynamic aspects of a variety of pharmacological compounds using a physical approach.Various polymers have been employed in the creation of nanoparticles for drug delivery studies in order to maximise therapeutic effectiveness while reducing negative effects(10).

Even though these medications have a favourable prognosis, they frequently cause side effects in the gastrointestinal tract that can lead to gastric ulcers and cardiovascular issue.Biosynthesized silver nanoparticles are preferable to silver nanoparticles made by other means of synthesis because

of their safety features and their use in a variety of fields, particularly biological ones. Pharmaceutical research makes use of biosynthesized AgNPs(11).Contradicting work directed by Chaudhary demonstrated that the synthesised Piper longum extract may have antioxidant properties without the use of nanoparticles(12)

A metabolic disorder known as diabetes mellitus is characterised by elevated blood glucose levels.Diabetes affects a lot of people all over the world.In this study, we compared the potential therapeutic effects of insulin treatment and zinc oxide and silver nanoparticles on diabetic rats induced by streptozotocin.Different kinds of nanoparticles are being tested for their potential as drug delivery systems(13).Silver nanoparticles have great ability to inhibit cell viability against liver cancer cell lines (HepG2) and lung cancer cell lines (A59)(14). Rajeshkumar's research also came to the conclusion that the free radical scavenging activity was also concentration-dependent.The current study found that the prepared Piper longum plant extract silver nanoparticles had a free radical scavenging property that averaged between 60% and 70% of the antioxidant activity.At the highest concentration, 50 L, the antioxidant activity was at its peak, with nearly 70% inhibition(15).

CONCLUSION

The rosa and jasminium mediated Silver nanoparticles showed remarkable and considerable anti-diabetic activity when compared with the standard values. The anti-diabetic property of the extract mediated Silver nanoparticles, was applicable in nanomedicine through the help of advanced technologies to support the medical voided fields. The properties of the synthesised nanoparticles were further implied in nanotechnology which may be useful for other sourcing fields. More research is needed to fully assess the potential of plant-mediated nanoparticles.

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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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