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Anticariogenic activity of Rose Jasmine formulation mediated silver nanoparticles

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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 base material. Metallic silver (Ag) is a resilient transition element that has been utilised for a long time in jewellery, coinage, and silverware due to its scarcity (ranking 67th in abundance among the elements) and alluring white metallic brilliance.
Aim: To study the anticariogenic activity of Rose Jasmine formulation mediated silver nanoparticles.
Materials and methods: Muller hinton agar were utilised to identify the zone of inhibition at different concentrations of the prepared extract mediated with silver nanoparticles.
Results: It showed that the prepared extract had an average of zone of inhibition at 100ul of the prepared extract.
Conclusion: The prepared extract mediated silver nanoparticles had good anticariogenic activity at 100ul concentration.

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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 base material. Rose petals are a valuable source for the food and drug industry. Rose is a woody perennial of the Rosa genus within the family Rosaceae(1). Its accessibility is very large in different latitudes, mainly in Europe, Asia, and the Middle East and North America. Most of the compounds present in rose have valuable properties, such as antioxidant, anticancer, antimutagenic and anti-inflammatory, free radical scavenging, antibacterial, antifungal, delaying or inhibiting oxidation processes(1,2). The stems of roses are typically heavily armed with prickles of various shapes and sizes, which are sometimes known as thorns. Roses can be upright, climbing, or trailing bushes. The leaves are alternate, pinnately complex (i.e., feather-shaped), and typically have oval, acutely toothed leaflets(3). Wild roses typically have five petals on their blossoms, however cultivated roses frequently have double petals (i.e., with multiple sets of petals). Rose blossoms range in size from tiny miniatures with a diameter of 1.25 cm (0.5 inch) to hybrid flowers with a diameter of more than 17.5 cm (7 inches). Hips are the fleshy, occasionally edible, berry-like "fruit" (really the floral cup) of the rose plant. Their colour typically ranges from red to orange(3–6).

Jasmine is a genus of shrubs and vines in the olive family (Oleaceae). Jasmines are widely cultivated for the characteristic fragrance of their flowers. It contains around 200 species native to tropical and warm temperate regions of Eurasia, Africa, and Oceania. Iranian native common jasmine (Jasminum officinale), also known as poet's jasmine, has fragrant white blossoms that are used to make attar of jasmine, a perfume ingredient. It is frequently grown for its brilliant foliage and summer flowering clusters(7,8). A cover plant for hillsides is winter jasmine (J. nudiflorum), a Chinese species with lone golden blossoms. Similar in appearance, the Japanese, or primrose, jasmine (J. mesnyi) blooms in the winter with bigger blossoms. There are numerous cultivated varieties of Italian jasmine (J. humile), a vine-like shrub with yellow flowers. Jasmine tea is made from the enticing dried petals of Arabian jasmine (J. sambac)(9,10).

Metallic silver (Ag) is a resilient transition element that has been utilised for a long time in jewellery, coinage, and silverware due to its scarcity (ranking 67th in abundance among the elements) and alluring white metallic brilliance. Its antibacterial action is one of its many diverse applications and is of tremendous interest. Wine and water have likely been kept clean in silver vessels since ancient times(11). The use of silver as medicine dates back a very long time. However, extended exposure to silver can result in silver deposition in the body, which can produce argyria or argyrosis, an irreversible darkening of the skin or eyes. Due to this and the development of more readily available antibiotics like penicillin and cephalosporin, interest in silver as a medicine began to decline around the time of World War II. Pure silver is a common choice in electronics because of its strong thermal and electrical conductivity and comparatively low contact resistance(11,12). The fabrication of thin-film transistor electrodes, printed circuit board pastes and inks, optoelectronics, data storage devices, and battery-based intercalation materials have all utilised silver nanoparticles or nanowires. Since it was discovered that nanosilver may destroy hazardous bacteria, it has received a lot of attention and is now frequently used in a variety of products. Having a wide range of antibacterial properties, nanosilver can stop the growth of both Gram-positive and Gram-negative bacteria (including Escherichia coli, Pseudomonas aeruginosa and Staphylococcus aureus)(10).

Aim of the study is to find the anticariogenic activity of Rose Jasmine formulation mediated silver nanoparticles.

MATERIALS AND METHODS

Antibacterial Activity

Antibacterial activity of respective nanoparticles against the strain Staphylococcus aureus, Bacillus, and E.coli. Mueller Hinton Agar was utilised for this activity to determine the zone of inhibition. Mueller hinton agar was prepared and sterilised for 15 minutes at 121oC. Media poured into the sterilised plates and let it stable for solidification. The wells were cut using a 9mm sterile polystyrene tip and the test organisms were swabbed. The nanoparticles with different concentrations (25µL, 50 µL ,100 µL)were loaded and in the fourth well standard antibiotic amoxyrite was loaded. The plates were incubated for 24 hours at 37 °C. After the incubation time the zones of inhibition were measured.

RESULTS

It is observed that the anti-cariogenic activity was tested against 4 microorganisms: C. Albicans, E. Faecalis, S.Aureus, S.Mutans. In all the 4 culture plates, the zone of inhibition was recorded to be high in 100ul concentration of the sample. The highest recorded zone of inhibition was 12mm for C.Albicans at 100ul concentration. The activity of the antibody was higher than compared to the various concentrations of the sample except for C.Albicans.

Fig 1: The figure represents the culture plate of Candida albicans with the prepared extract Ag nanoparticles and the zone of inhibition was recorded.

Fig 2 : The figure represents the culture plate of E.Faecalis with the prepared extract Ag nanoparticles and the zone of inhibition was recorded.

Fig 3: The figure represents the culture plate of S. Aureus with the prepared extract Ag nanoparticles and the zone of inhibition was recorded.

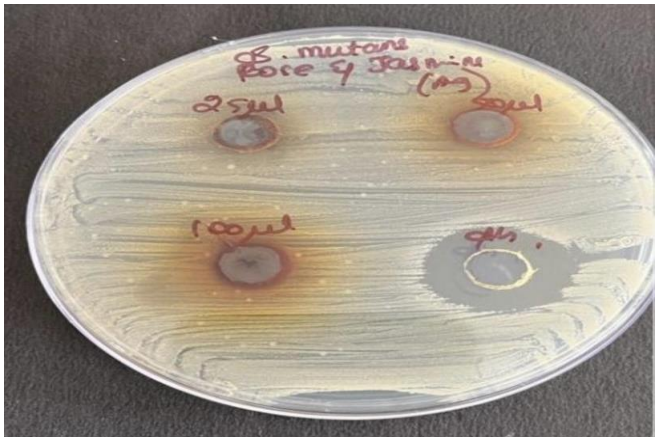
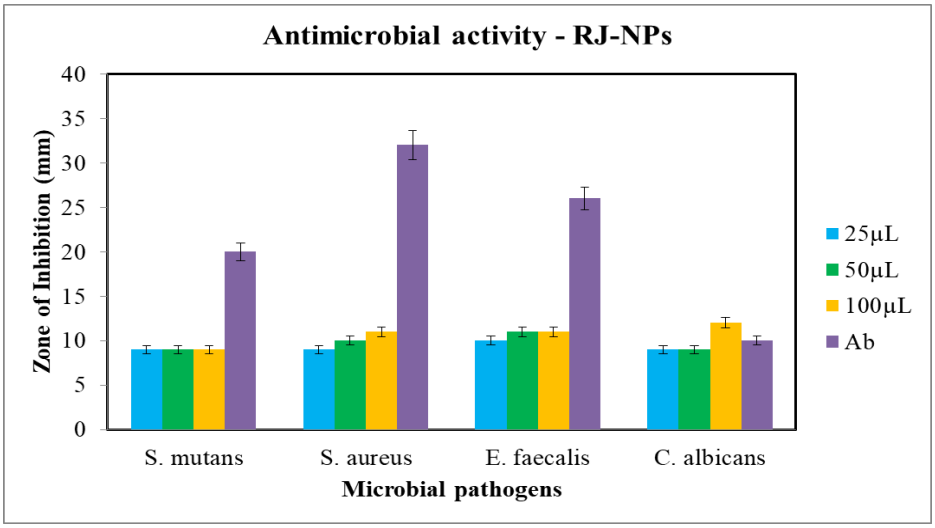


Fig 4 : The figure represents the culture plate of S. Mutans with the prepared extract Ag nanoparticles and the zone of inhibition was recorded.

Table 1: The above table represents the values of zone of inhibition of the micro organisms on reacting with different concentrations of the prepared extract mediated with silver nanoparticles.

Organism	25ul	50ul	100ul	AB
S. mutans	9	9	9	20
S. aureus	9	10	11	40
E. faecalis	10	11	11	26
C. albicans	9	9	12	10



Graph 1: In the above graph, X axis represents the different microbial pathogens used, Y axis represents the zone of inhibition. It indicates different concentrations of the extract used.

DISCUSSION

From the above results we can observe that the zone of inhibition was high when recorded with the sample concentration of 100 ul and it was observed that the zone of inhibition was 12mm for C.Albicans. Rest other organisms had lesser zones of inhibition than C.Albicans.

Previous investigations have demonstrated that a large peak in the UV-visible spectrum at 370 nm, which supports the synthesis of SeNPs, may be seen when analysing the anti-cariogenic action of selenium nanoparticles. Over time, the peak intensity grew stronger. No further substantial escalation in peak intensity was detected after 48 hours of the reaction. The peak amplitude has grown with time because of the reduction of SeO3 2- to Se0. After 48 hours, no additional peak increases were seen, indicating that SeO3 2- to Se0 conversion had reached its maximum. images taken using a transmission electron microscope (TEM) of selenium nanoparticles created after 72 hours of incubation with nutrient broth that has been supplemented with 1.0 mM selenite(13,14).

Despite the significance of using silver nanoparticles in the medical and dental fields, little is known about the effects of human exposure to these materials or their potential toxicity. However, haemolytic activity tests were carried out to compare NSF's cytotoxicity to SDF and it was discovered that neither substance damaged human erythrocyte membranes, regardless of blood type(15,16).

In previous studies it was observed that the diameter of the zone of nanoparticle inhibition at 25 L, 50 L, and 100 L was measured using S. mutans and was found to be 10 mm, 20 mm, and 20 mm, respectively. At 25 L, 50 L, and 100 L, the diameter of the zone of inhibition was observed to be 10 mm, 15 mm, and 17 mm, respectively, against E. faecalis. The diameter of the zone of inhibition against C. albicans was observed to be 10 mm, 10 mm, and 15 mm, respectively, at 25 L, 50 L, and 100 L. Thus, 150 L was the level of activity when all three reached their peak(17).

CONCLUSION

It is concluded from the study that the prepared extract mediated silver nanoparticles had good anticariogenic activity at 100 ul concentration. The micro-organism C. Albicans had more zone of inhibition than other microorganisms at 100 ul concentration of the prepared rose jasmine extract mediated with silver nanoparticles.

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CONFLICT OF INTEREST

The authors hereby declare that there is no conflict of interest in this study.

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