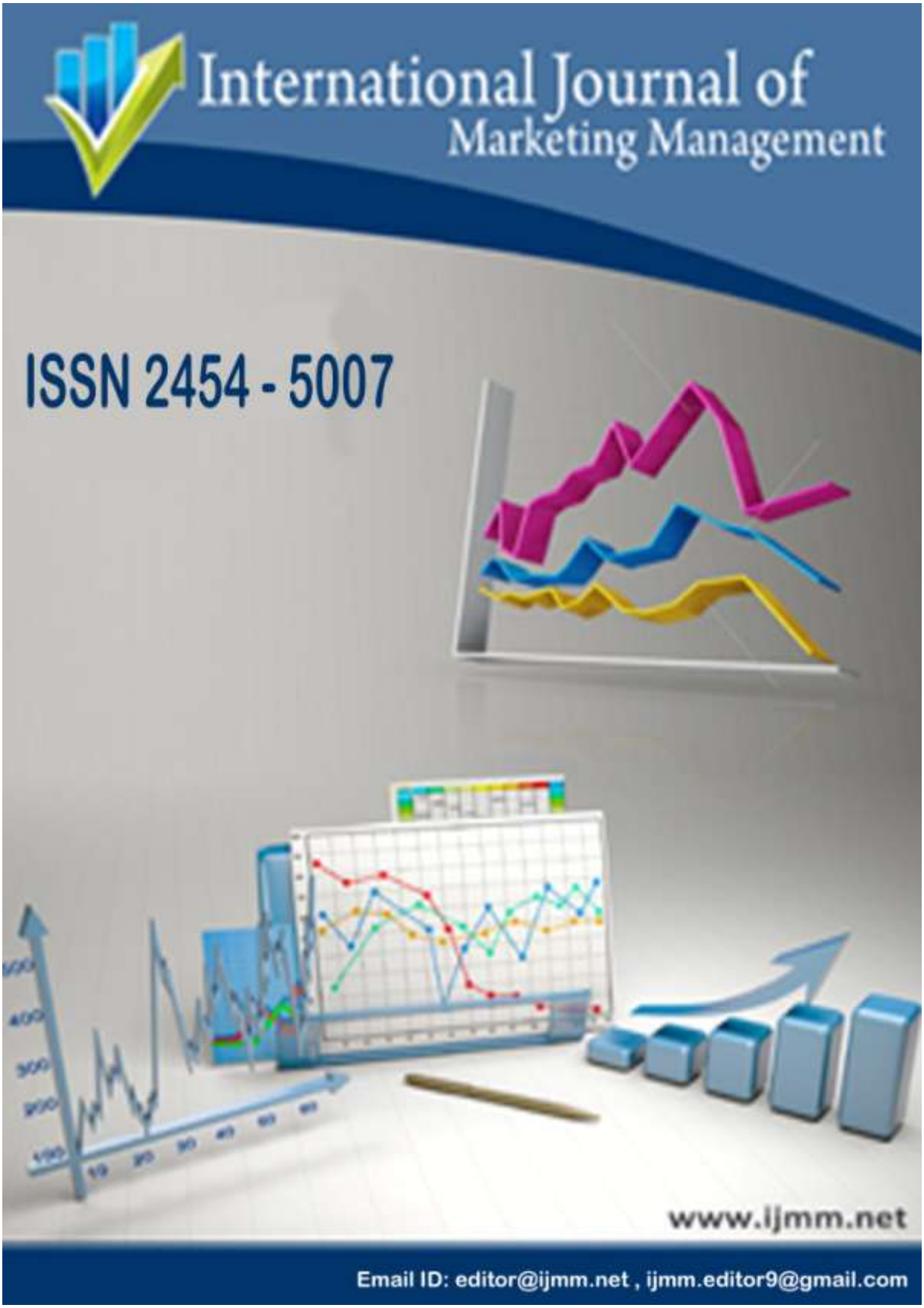
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EvaluationofAntimicrobialPotentialofSilverNanoparticlesUsingOsmiumSanctumFicusBengalensisagainstTwoPathogenicBacteria

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Abstract: AgNP has been synthesized from Osmium sanctum and Ficusbenghalenis plants in this study and tested for antibacterial efficacy against a wide range of microorganisms. The Herbal approach was used to manufacture AgNP. XRD and FTIR were used to characterize nanoparticles. Diffusion discs and diffusion wells were used to measure antibacterial activity. Antibacterial activity in the form of zone of inhibition was discovered in AgNPs. Water and 70% ethanol were used to dissolve silver nanoparticles (AgNPs). E. coli and Staphylococcus aureus were inhibited by both solvents containing silver nanoparticles. At 0.4 gm of Osmium sanctum AgNPs + 70% Ethanol, a maximum inhibition zone of 1.9 cm was obtained against S. aureus using the well diffusion method. Disk diffusion was used to detect the lowest concentration of FicusbenghalenisAgNPs + water required to prevent E. coli growth. In the development of antibiotic treatments for various bacterial illnesses, Osmium sanctum AgNPs have emerged as a key strategy in nanobiotechnology applications.

Keywords:E. coli and S. aureus have been shown to be resistant to AgNPs nanoparticles.

INTRODUCTION

In terms of medical plants and plant products, Indian vegetation is the most cost-effective. Throughout Ayurveda's history, these therapeutic plants have played an important role. Both chemical reduction and catalysis are made possible by the unique features of nanomaterials. In addition, it has the ability to reduce both the time and cost of remediation (Agrawal, 2005).It took a lot of effort, money, and environmental impact to make the nanoparticles. Laser ablation, lithography, and chemical approaches all begin with silver salt precursor (disorganized in solvent) that is nanoparticles (AgNPS) that can be employed in the medical sector are a huge defiance. Bacteria (Tolaymat, et al., 2010), fungi (Nanda, et al., 2009), and plants (Tolaymat, et al., 2010) have all been shown to produce it (Bhainsa et al., 2006). It was discovered earlier this century that different plants might be used to agglutinate nanoparticles. Plant extracts are widely used in the manufacture of silver nanoparticles to smear a large number of phytochemicals, enzymes, proteins, and other lack mediator substances with electron-huttling molecules. Nanoparticles have been synthesized using a variety of plants since that time.

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ThenanoparticlesmayalsopenetrateinsidethecellcausingdamagebyinteractingwithphosphorusandsulfurcontainingcompoundsuchasDNAanddprotein.Anotherpossiblecontributiontothebactericidalpropertiesofsilvernanoparticlesistherleaseofsilverionsfromparticles(Kulharnietal., 2011).

MATERIALANDMETHODS

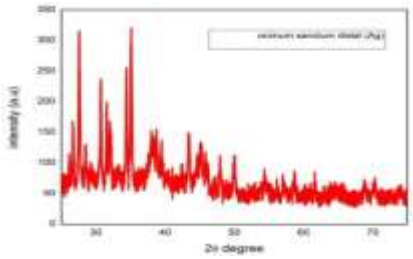
Bacterialgenera

Thefollowingtwobacterialgenerawereusedforpresentinvestigation:-

Escherichia ColiStaphylococcusaureusi.

Plants

Thefollowingtwoplantswereusedforsynthesisofnanoparticels:-



Osmiumsanctum(Tulsi)

Ficusbenghalensis(banyan)

SynthesisofSilvernanoparticles

Synthesesofnanoparticlsfromplantsweredonebymethoddescribedby(Chandranetal.,2006).

Antibacterialtest

Antibacterialtestwasdonebydiscdiffusionandwelldiffusion(Nastasijietal.,2002).

Media:

Thefollowingmediawereusedforpresentresearchwork:-

- **NutrientagarforE.coli.**
- **ManittolsaltagarforS.aureas.**

Characterizationofnanoparticles:-

CharacterizationofnanoparticleswasdonebyXRDandFTIRmethodof(Markova,2010;Usmanetal.,2012andKrithigaetal., 2013).

ResultsandDiscussion:

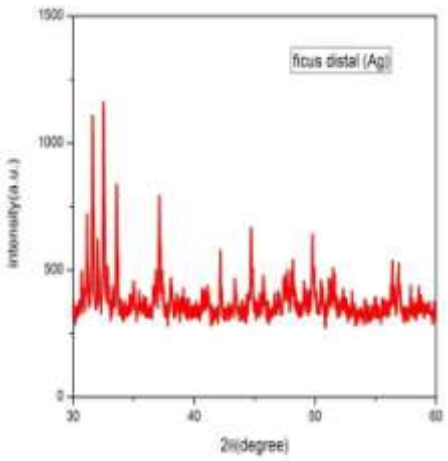
XRDofosmiumsanctumAgNPS:-

Fig.1showedtheXRDpatternofthecompacted Ag-NPssample.Thediffractionpatternconsistofmanypeakbutoursamplepeakare39.24˚,38.19˚,43.36˚,49.92˚,53.83˚and62.19˚ina2θscale,whichcanbeindexedto(111), (111), (200), (210), (211)and (210),Reflection of fcc Silver, indicating cube phase of silver metal. No otherAgO or Ag2O impurity peaks were observed in the spectra, suggesting that the synthesized particles were ofhighpurity.

Itisknownthatsilvernanoparticlesrapidlyoxideonexposuretotheatmosphere,whichcanresultinparticleaggregation(Usmanetal.,2012)andcould,affectedtheantimicrobialpropertiesofAg-NPs.Scherequationwasusedtocalculatecrystallitesizegivingapproximately96.56andlatticeconstantaswas1.45Å.

Fig1-XRDofOsmiumsanctumAgNPS

XRDofFicusbenghalensisAgNPS



The XRD pattern of the compressed Ag-NPs sample can be seen in Figure 2. This pattern contains several distinct features, however our sample's most prominent features are (111), (111), (200), (210), (211), and (220)reflection of the cube phase of silver metal. As the spectra showed no further peaks for AgO or Ag2O impurities, this strongly suggests that the produced particles were of extremely high purity. When exposed to air, silver nanoparticles rapidly oxidize, which can lead to particle aggregation (sman et al., 2012) and alter their antibacterial capabilities (Ag-NPs), which has been well-documented. Crystallite size was determined using the Scherer equation, which yielded a value of about 124.76 and a lattice constant of 1.45.

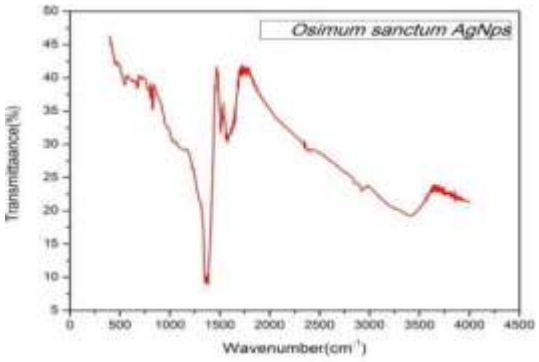
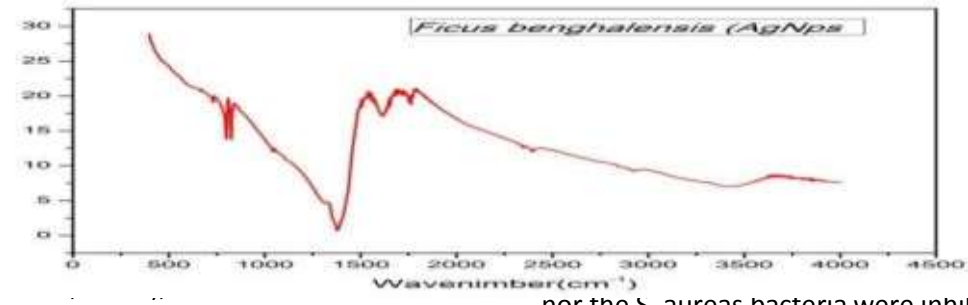


Fig:-3OsmiumsanctumAgNps

FTIRofSilverNanoparticlesFicusbenghalensis

Silver nanoparticles were analyzed using FTIR, and the results are shown in Figure 4: 3420.16 N-H stretch, 2917.920 single aldehyde, O-H, 2391.58 C-C, 1615.93 C-C, and 1102.02 C-O. Silver nanoparticales have been discovered to have a comparable peak by (Markova, 2010).



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nanoparticales was confirmed.

Antibacterialactivityofsilvernanoparticles:

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her E. coli
nor the S. aureas bacteria were inhibited.

Silver nanoparticles produced from Osmium sanctum have been shown to have antibacterial properties against a variety of microorganisms.

S.No.	Nameof	**ZoneofinhibitionunderDiskdiffusionmethod**

	Bacteria	Con.ofwater+silver nanoparticlesingm/ml				Con.of70%&Ethanol+silver nanoparticlesingm/ml			
		0.1gm	0.2gm	0.3gm	0.4gm	0.1gm	0.2gm	0.3gm	0.4gm
1.	*E.coli*	0.3	0.4	0.6	0.8	0.2	0.5	0.7	0.9
2.	*S. aeurus*	1.1	1.3	1.5	1.6	0.8	1.1	1.7	1.8

Graph5:-AntibacterialactivityofOsmiumsanctumderivedsilvernanoparticlesagainstdifferentbacteria.

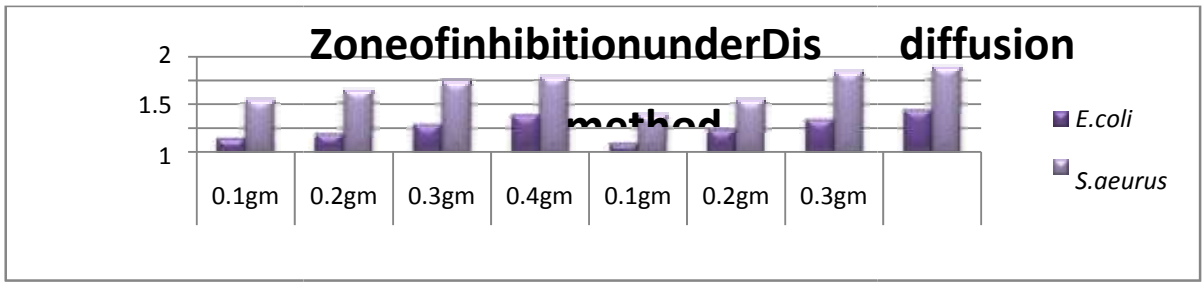
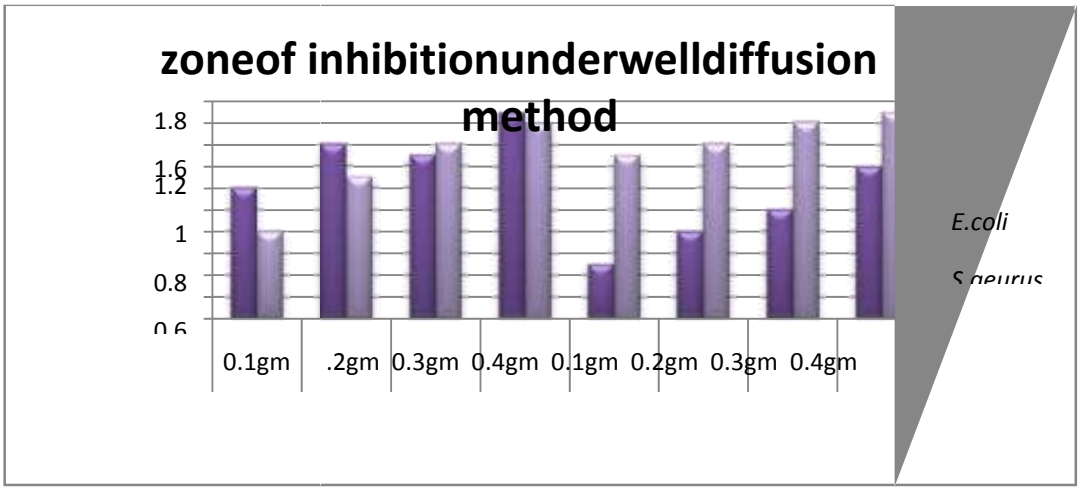


Table:-2AntibacterialactivityofOsmiumsanctumderivedsilvernanoparticlesagainstdifferentbacteria.

S.No.	Nameof Bacteria	**Zoneofinhibitionunderwelldiffusion**							
		Con.Ofwater+silver nanoparticles				Con.Of70%&Ethanol+silver nanoparticles			
		0.1gm	0.2gm	0.3gm	0.4gm	0.1gm	0.2gm	0.3gm	0.4gm
1.	*E.coli*	1.2	1.6	1.5	1.9	0.5	0.8	1.0	1.4
2.	*S. aeurus*	0.8	1.3	1.6	1.8	1.5	1.6	1.8	1.9

Graph6:-AntibacterialactivityofOsmiumsanctumderivedsilvernanoparticlesagainstdifferentbacteria.



Diskdiffusionmethod:-

Silver nanoparticles and water from Ficusbenghalensis were detected in disk diffusion. zone of resistance against

different microorganisms 0.1cm, 1.2cm, 1.4cm, and 1.6cm against S. aureus and 1.0cm, 1.2cm, 1.4cm, and 1.6cm against MRSA.

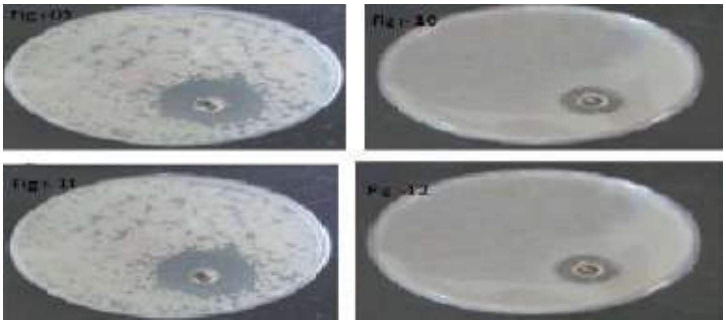
3 centimeters on each side of E.

respectively.

Pseudomonas with various concentrations of

0.2, 0.3, and 0.4 grams)

Different microorganisms were inhibited by Ficusbenghalensis silver nanoparticles + 70% ethanol in disk diffusion. S. aureus was inhibited at concentrations of 0.1gm, 0.2gm, 0.3gm, and 0.4gm, whereas E. coli was inhibited at concentrations of 1.2cm, 1.4cm, 1.6cm, and 1.8cm.Different microorganisms were inhibited by Osmium sanctum silver nanoprticles + water in disk diffusion. Different concentrations of inhibitors inhibited S. aurues and E. coli in different zones of inhibition of 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0.Bacteria were inhibited by Osmium Sanctum silver nanoparticles+70% ethanol when they were tested in disk diffusion. For E. coli, the zone of inhibition was 0.2cm,0.5cm,0.7cm,0.7cm and 0.9cm with 0.1gm, 0.2gm, 0.3gm and 0.4gm of concentration correspondingly..



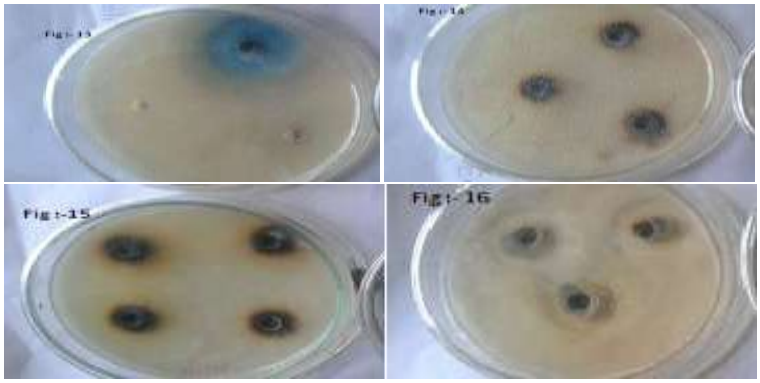
Figs: - 09, 10, 11 and 12 shows antibacterial activity of Ficusbenghlensissilver nanoparticles against bacteria Discdiffusionmethod.

Welldiffusionmethod:-

Ficusbenghalensis silver nanoprticles + water revealed a zone of inhibition against several bacteria in well diffusion studies. It was found that the inhibition zone against S. aureus (0.6cm) and E. coli (0.5cm), at varied concentrations (0.1gm, 0.2gm, 0.3gm and 0.4gm) were both 0.6cm and 0.9cm, respectively.Different microorganisms were inhibited in well diffusion by Ficusbenghalensis silver nanoparticles + 70% ethanol. S. aureus was inhibited at concentrations of 0.1gm, 0.2gm, and 0.3gm, whereas E. coli was inhibited at concentrations of 0.6cm, 0.7cm, 0.8cm, and 1.0cm.

Different microorganisms were inhibited by Osimum sanctum silver nanoparticles and water in well diffusion. S. aureus was inhibited at concentrations of 0.1gm, 0.2gm, 0.3gm, and 0.4gm, whereas E. coli was inhibited at concentrations of 0.8cm, 1.3cm, 1.6cm, and 1.8cm.

Different microorganisms were inhibited by Osimum sanctum silver nanoparticles + 70% ethanol in well diffusion. 0.5cm, 0.8cm, 1.0cm, and 1.4cm, respectively, against S. aureus and 1.5cm, 1.6cm, 1.8cm, and 1.9cm, respectively, against E. coli with varied concentrations (0.1gm, 0.2gm, 0.3gm, 0.4gm).



13,14,15and16showsantibacterialactivityofFicusandOsimumsilvernanoparticlesagainstbacteriaDisc diffusion method.

For E. coli and S. aureus, silver nanoparticles revealed a zone of inhibition against both solvents utilized in this experiment (well diffusion method). S. aureus was inhibited at a dose of 0.4 gm Osmium sanctum AgNPs + 70% ethanol with a maximum inhibition zone of 1.9 cm. At 0.1 gm of FicusbenghalenisAgNPs + water, the smallest zone of inhibition was seen against E. coli.

The antibacterial properties of nanoparticles generated for this study were demonstrated. Following nanoparticle treatment, it was found that nanoparticles had penetrated the bacteria and caused damage by interacting with compounds like DNA that contain phosphorus and sulfur (Shetty et al., 2006). DNA replication power and cellular proteins may have been reduced or rendered inactive as a result of this interaction. As a result, nanoparticles may be stifling cell development and mitosis. The bactericidal efficacy is further enhanced by the nanoparticles. Because heavy metals are poisonous, they bind protein molecules, which inhibits cellular metabolism, leading to microorganisms' demise (Moghaddam et al., 2009).

Silver nanoparticles have been proven to be effective against a wide range of microbes, including antibiotic-resistant bacteria, by a number of researchers. Consequently, silver nanoparticles have been dubbed a new generation of antibacterial agents. a team of scientists tested silver nanoparticles for their antibacterial properties (Lansdown et al., 1997).

Inrecentyears,plant-mediatedbiologicalsynthesisofnanoparticlesis gainingimportancedueto itssimplicity and eco-friendliness. These biosynthesis of gold nanoparticles by plants such as alfalfa(Shettyet al.,2006;Ahmed et al., 2002) Aloe Vera (Gupta et al., 2006) Cinnamomumcamphora(Singh et al.,1996) Azadirachtaindica(Samjonet al., 2007) Embicaofficinal's(Soodet al., 2006) lemongrass (Sharma et al., 2002). Tamarinds indica L/n(Kantaket al., 1992) have also been reported. In the present investigation too Osmium sanctum and FicusbenghalenisAgNPs showed antibacterial activity against E. coli and S. aureus. Thus corroborate withfindingofpreviousauthorsthatplantmediatednanoparticlesmaybegoodantibacterialagent.

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