## *INTRODUCTION*

The field of nanotechnology is one of the most active researches in modern material science. In recent years green synthesis of metal oxide nanoparticles is an interesting subjects of the nanoscience and nano biotechnology (Muthuchudarkodi R.R[1*] et, al, 2016). Synthesis of metal nanoparticles used for plant materials like leaf, stem, root, seeds etc. The green synthesis of nanomaterials less harmful then compared to physical and chemical method (S. Murugan et al 2012) .Silver is nanotoxic safe inorganic antibacterial agent that is clever of killing about 650 types of disease causing microorganism. There is an increasing interest in silver nanoparticles on account of the antimicrobial properties that they display. They are even being projected as future generation antimicrobial agents (Haytham M.Met, al, 2015).Because of increasing pressure of consumer and legal authorities, the food industry has tended to reduce the use of chemical preservatives in their products to either completely null or accept more natural alternative for the keep or general of product shelf life (Behzad j et, al, 2016). Iron oxide nanoparticles induce antimicrobial activity directly via nanotoxic wavelength radiation that is readily absorbed by toxic stimuli of reactive oxygen species production ( Pasupuleti Visweswara Rao et, al,2016) green synthesis of zinc oxide nanoparticles using Aloe vera (sangeetha G. et,al2011),gold nanoparticles by alfalfa (Gardea –Torresdey et,al,2002), neem (Shiva Shankar et,al,2004) The present study aims to synthesize silver nanoparticles by a green biological gross, using an extract derived from amaranthus spinus leaf , and characterization of the synthesized nanoparticles utilizing UV visible spectroscopy, scanning electron microscope (SEM).The current investigation focuses on the development of a simple method for synthesis of iron nanoparticles by utilizing plant leaf extract and study its bacterial activity (Nileshpaulet al.2016). Besides, their antimicrobial activity against representatives of human pathogenic microorganisms was investigated (Haytham M.Met, al, 2015)

## *MATERIALS AND METHOD*

### *COLLECTION OF PLANT*

Amaranthus spinus leaf was collected from perungudi, Madurai District. The collected leaf was filled with appropriate bag and then transfer to the research laboratory. The Amaranthus spinus leaf extract was washed several times with de-ionized water and kept under room temperature for one day only.

***PLANT EXTRACT PREPARATION***

Fresh leaves washed several times with double distilled water to remove the dust particles, 50g of the fine cut leaves were taken in a 250 ml of glass beaker with 100ml of the distilled water. These were boiled for 60min the colour of aqueous solution turned from green to light green. The extract collected to room temperature and filter using filter paper. The extract was stored in the refrigerator for further use.

***SYNTHESIS OF Ag- $Fe_2O_3$ NANOPARTICLES***

Various concentration ferrous sulphate of metal ion solution where mixed of the Amaranthus spinus leaves extract and added to silver nitrate solution after few minutes depending on the metal ion concentration and volume of Amaranthus spinus leaves extract the colour of the solution changed from brown to black colour indicating formation of silver iron oxides nanoparticles (Fig.1) The product was filtered and washed with water and then dried at ro

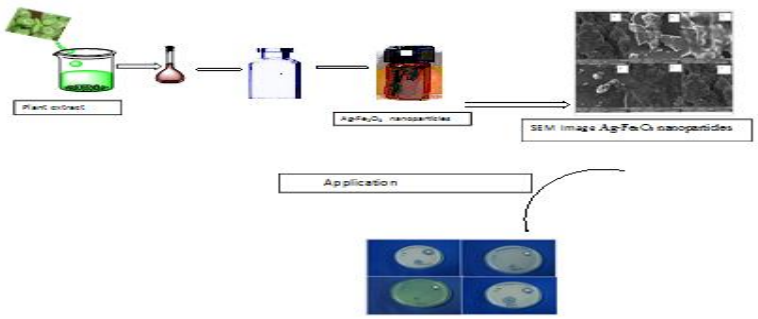


Fig 1. Schematic diagram of Ag-$Fe_2O_3$

***MICRO-ORGANISM AND GROWTH CONDITIONS***

The bacterial strains E.coli, Pseudomonas fluorescence, Staphylococcus aureus, Shigella flexneri was provided by the venture lab, Madurai.

## CHARACTERIZATION OF NANOPARTICLES

***UV-SPECTROPHOTOMETER ANALYSIS***

The synthesized iron nanoparticles were characterized through UV-Vis Spectrophotometer (ELICO –SL 159). The iron nanoparticles range from 200-1200 nm was monitored by UV-Spectrophotometer.

### *SCANNING ELECTRONIC MICROSCOPY (SEM)*

The nanoparticles morphology and size were determined by SEM. The SEM analysis were established by using (JSM-5600LV)

## RESULT AND DISCUSSION

### *UV-VIS SPECTRAL ANALYSIS*

To the homogenized leaf extract and precursor of 1ml ferrous sulphate and 4 ml of silver nitrate solution was added with constant stirring. The oxidation of iron and reduction of $Ag^{+}$ to $Ag^{0}$ was monitored by UV-Visible spectrometer. The absorption spectra of Ag doped $Fe_2O_3$ nanoparticles the recorded after 12hrs. The silver nanoparticles and gives rise to an absorption band at 449nm (2.7ev) and the silver doped $Fe_2O_3$ nanoparticles and gives rise to an absorption band at 520nm (2.3ev).

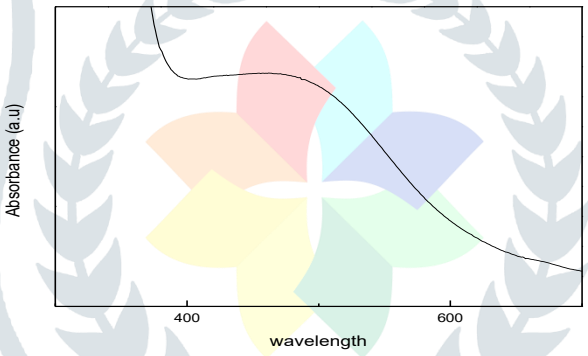


Fig.2 UV-Vis spectrum of Ag-$Fe_2O_3$ nanoparticles

### *SCANNING ELECTRONIC MICROSCOPY (SEM)*

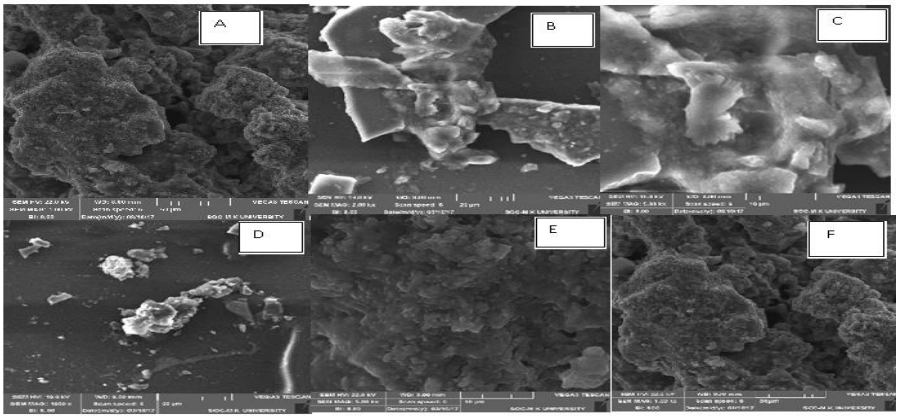


Fig.3 SEM of Ag-$Fe_2O_3$ nanoparticles

The Fig 2. SEM technique was employed to visualize the size and shape of silver doped $Fe_2O_3$ nanoparticles. Scanning electron microscopy analysis was complete using ZESS EVO 50 SEM machine. Thin films of the sample on the were ready on a carbon covered tape by just place a very small amount of the sample on the grid, extra sample removed using a blotting paper and then the film on the SEM grid were allowed to dry by putting it under a mercury lamp for 5 minutes structure it was conformed in the range around 300nm. The SEM analysis was used to determine the structure of the reaction products that were formed. SEM image has showed individual Ag –$Fe_2O_3$ particles as well as aggregates.

***EDAX ANALYSIS***

EDAX spectra recorded from the silver doped $Fe_2O_3$ nanoparticles were shown in fig 3. From EDAX spectra, it is clear that iron nanoparticles reduced by amarnthus have the weight percentage of nano iron. The shapes of the silver porous in nature

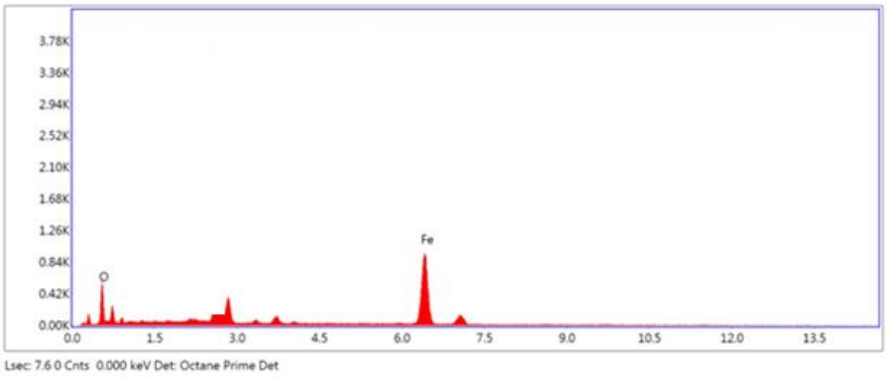


Fig 4. EDAX Ag-$Fe_2O_3$ nanoparticles

**ANTIBACTERIAL ACTIVITY OF BARE $Fe_2O_3$ AND Ag-$Fe_2O_3$**

***ANTIBACTERIAL ACTIVITY OF BARE $Fe_2O_3$***

Antibacterial activity of the extract of compounds was determined using well diffusion method. It was performed by sterilizing Mueller Hinton agar media. After solidification, wells were cut on the Mueller Hinton agar using cork borer. The test bacterial pathogens were swabbed onto the surface of Mueller Hinton agar plates. Wells were impregnated with 25 µl of the test samples. The plates were incubated for 30 min to

allow the extract to diffuse into the medium. The plates were incubated at 30ºC for 24 hours, and then the diameters of the zone of inhibition were measured in millimetres. Each antibacterial assay was performed in triplicate and mean values were reported.

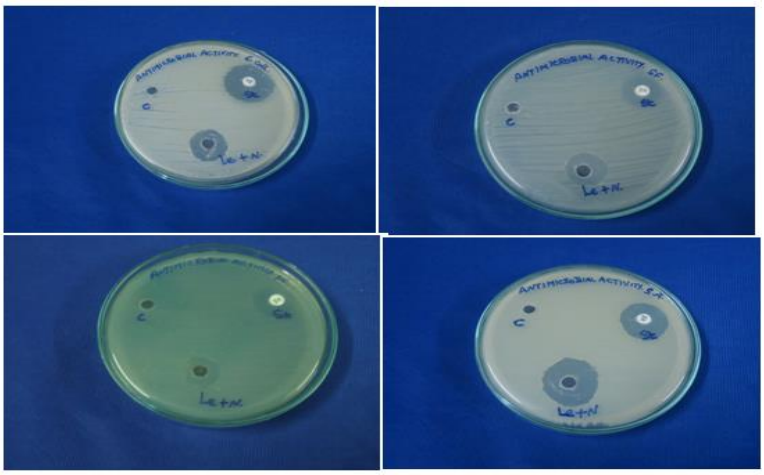

Fig.5 Antibacterial activity of bare $Fe_2O_3$

***ANTIBACTERIAL ACTIVITY OF Ag-$Fe_2O_3$***

Antibacterial activity of the extract of compounds was determined using well diffusion method. It was performed by sterilizing Mueller Hinton agar media. After solidification, wells were cut on the Mueller Hinton agar using cork borer. The test bacterial pathogens were swabbed onto the surface of Mueller Hinton agar plates. Wells were impregnated with 25 µl of the test samples. The plates were incubated for 30 min to allow the extract to diffuse into the medium. The plates were incubated at 30ºC for 24 hours, and then the diameters of the zone of inhibition were measured in millimeters. Each antibacterial assay was performed in triplicate and mean values were reported.

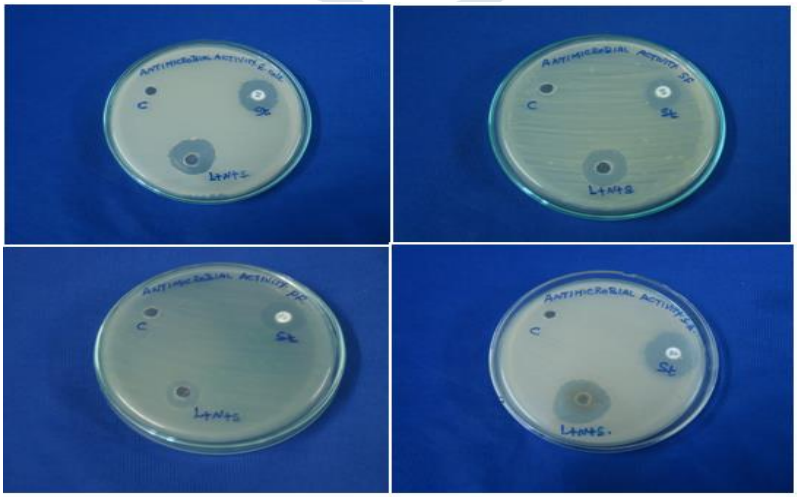

Fig.6 Antibacterial activity of Ag-$Fe_2O_3$

***COMPARISON BETWEEN BARE $Fe_2O_3$ AND Ag-$Fe_2O_3$ ANTIBACTERIAL ACTIVITY***

| Test organisms | Zone of inhibition in millimeter (in diameter) | | | |
|---|---|---|---|---|
| | Leaf+ Bare $Fe_2O_3$ Nanoparticles | Lea f+ Ag- $Fe_2O_3$ Nanoparticles | Solvent control | Standard Streptomycin 30µg |
| *E. coli* | 19 | 39 | NZ | 26 |
| *Pseudomonas fluorescence* | 15 | 19 | NZ | 21 |
| *Staphylococcusreus* | 26 | 31 | NZ | 29 |
| *Shigellaflexner* | 18 | 23 | NZ | 25 |

Fig.7 Comparison between bare Fe2O3and Ag-Fe2O3 Antibacterial Activity

***CONCLUSION***

Ag – $Fe_2O_3$ Nano composite have been synthesized using a precipitation method. The structure characterization was performed by UV, EDAX, and SEM. The Ag – $Fe_2O_3$ sample good crystallization and high BET surface area than compare to bare $Fe_2O_3$. Ag – $Fe_2O_3$ nanocomposite was successfully synthesized via environment-friendly hydrothermal method and used to kill E.coli, Pseudomonas fluorescence,Staphylococcus aureus and Shigella flexneri. Ag – $Fe_2O_3$ displays excellent antimicrobial activity that increases with increasing nanocomposites with leaf extract content of the samples. Furthermore, the antibacterial activity towards E.coli, Pseudomonas fluorescence, Staphylococcus aureus, Shigella flexneri. Such nanocomposites structure composite could have promising applications as antibacterial materials for microbiocides.

***ACKNOWLEDGEMENTS***

The authors extend their sincere thanks to the management and staff of Saraswathi Narayanan College Perungudi Madurai for providing the facilities in carrying out the work.

***REFERENCE***

1. Muthuchudarkodi R.R and Rajalaxshmi A, Research Journal of Material Science, vol4 (2), 1-6, 2016.

2. Murugan S, Colloids and Surfaces B: Bio interfaces, vol98, 112– 119, 2012.

3. Haytham M.M, journal of Radiation Research and Applied sciences, 265-275, 2015.

4. Behzed J and Sani A M, Bio Technology an Indian Journal, vol2, 2016.

5. pasupuleti Visweswara Rao, Oxidative Medicine and Cellular Iongevity, vol2016,15,2016

6. Sangeetha G, Rajeswari S and Venckatesh R, Materials Research Bulletin. Vol46 (12), 2560-2566, 2011.

7. Gardea –Torresdey J.L, persons J.G,Gomez E and Peralta Videa .J, Nanolettrs 2(4), 397-301,(2002)

8. Shiva Shankar S, Ahmad A, and Sastry M, Journal of Colloidal and Interface Science, vol275 (2), 496-502, 2004.

9. Nilesh paul, International Research Journal Pharmacy, vol7 (6), 99-102, 2016.

10. Haytham M.M, Journal of Radiation Research and Applied Sciences, vol2, 6527, 2015.