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# Green synthesis of silver nanoparticles using *Morus alba* leaf extract and it's synergistic effect with moxifloxacin and ofloxacin

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The present study was carried out to synthesize the silver nanoparticles by biological process (green synthesis) where the biomass of *Morus alba* leaf extract (cold water, Ethanol extract and hot water) was treated with1mM silver nitrate, the color of the solution changed from light yellow which after 48hrs of incubation into dark yellow indicated that the leaf biomass were reduced by silver nitrate into the silver nanoparticles. The instrumental analysis by Uv- Vis spectrophotometry showed the sharp bands of silver nanoparticles at 418 nm in case of *Morus alba* and confirmed that the leaf extract has more potential to reduce Ag ions into Ag nanoparticles. It was found that when the increase in time period occurs the intensity of absorption peak increases [1,2]. The metal particles were observed to be stable in solution even 4 weeks after their synthesis.

Disc diffusion method was employed to analyze the antibiotic potency of AgNPs against *Streptococcus aureus, Escherichia coli, Vibrio cholera* and *Proteus vulgaris*. Further, the AgNPs were tested against pathogenic bacteria in combined with two antibiotics, Ofloxacin and Moxifloxacin to find out the synergistic effect of both (Table 1).

Table 1: Combined antibiotic effect of AgNPs from *Morus alba* with Moxifloxacin and Ofloxacin

| Pathogens | Mox. (10mcg) | Mox+ AgNPs | Oflox (10mcg) | Oflox+ AgNPs | AgNPs |
|---|---|---|---|---|---|
| *B. cereus* | 25± 1 | 30± 1 | 15± 1 | 15±1 | 11± 1 |
| *P. vulgaris* | 30± 1 | 25± 1 | 15± 1 | 20± 1 | 11± 1 |
| *V.cholerae* | 35± 1 | 40± 1 | 25± 1 | 36± 1 | 20± 1 |
| *E. coli* | 30± 1 | 32± 1 | 26± 1 | 25± 1 | 20± 1 |
| *S. aureus* | 35± 1 | 40± 1 | 25± 1 | 26± 1 | 20± 1 |

The synergistic effect of silver nanoparticles represented the highest percentage of increase in inhibition among all the pathogens [3]. Ofloxacin showed good activity against *Staphylococcus aureus* (26±1) followed by *Proteus vulgaris* (20±1), *Vibrio cholerae* (36±1), *Escherichia coli* (25±1) and *Bacillus cereus* (15±1), while Moxifloxacin showed good activity against *Bacillus cereus* (25±1) and *Staphylococcus aureus* (40±1) followed by *Proteus vulgaris* (30±1), *Escherichia coli* (32±1), *Vibrio cholerae* (40±1).

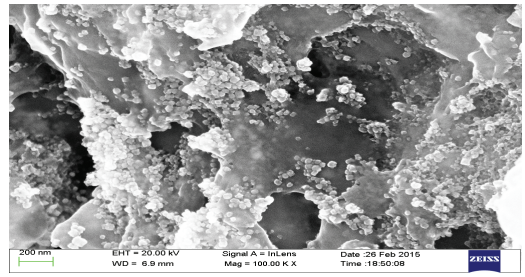


Figure 1: FESEM micrograph of AgNPs of *Morus alba*

The nanoparticles appearance showed by FESEM that they were spherical to ovate in structure with having average dimensional size in the range of 30-50nm. The study concluded the rapid biological synthesis of silver nanoparticles using *Morus alba* leaves extract provides environmental friendly, simple and efficient route for synthesis of silver nanoparticles. The synthesized nanoparticles were of spherical and sheet shaped and the estimated sizes were 30-45 nm. The size were bigger as the nanoparticles were surrounded by a thin layer of proteins and metabolites such as terpenoids having functional groups of amines, alcohols, ketones, aldehydes, etc., which were found from the characterization using UV-vis spectrophotometer, FESEM, XRD, and FTIR techniques. These biologically synthesized nanoparticles showed good antibacterial activity against test pathogen like *S. aureus, E. coli, P. vulgaris, B. cereus* and *V. cholera* at par with the antibiotics, but the synergistic mode was wonderful to control the pathogens. The combined form of AgNPs and the drugs can reduce the doses of antibiotics which will be a new convention towards the drug discovery but needs further study [1].

## References

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