

***Syzygium aromaticum* Bud Extracted Core–Shell Ag–Fe Bimetallic Nanoparticles: Phytotoxic, Antioxidant, Insecticidal, and Antibacterial Properties**

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Abstract: Today, there is the roar of sustainable material development around the globe. Green nanotechnology is one of the extensions of sustainability. Due to its sustainable approach, the green fabrication of nanoparticles has recently surpassed their classical synthesis in popularity. Among metal nanoparticles, contemporary findings have demonstrated that bimetallic nanoparticles possess more potential for different applications than monometallic nanoparticles due to the synergistic effects of the two metals. So, we are presenting facile, one-vessel, and one-step phyto-fabrication of Ag–Fe BMNPs using the bud extract of *Syzygium aromaticum*. The synthesized nanoparticles were characterized by UV-VIS, XRD, EDX, FTIR, and SEM. The synthesized NPs and the extract underwent biological studies. The radical scavenging potential of the NPs and the extract was found to be 64% and 73%, and the insecticidal potential was found to be 80% and 100%, respectively. Similarly, the NPs and the extract both exhibited good antibacterial activity. The zone of inhibition using 100 mg/mL of extract and NPs was found to be 1 cm against all bacterial species, i.e., *K. pneumonia*, *E. coli*, and *S. aureus*. It was 1.5 cm, 1.3 cm, and 1 cm against *K. pneumonia*, *E. coli*, and *S. aureus*, respectively, showing that the antibacterial activity of the extract is higher than that of the NPs. So, this study unlocks the synthesis of Ag–Fe bimetallic nanoparticles using eco-safe, cost-

effective, facile, and least-harmful green methodology with potential applications of both NPs and SA extract in medical and agricultural fields, a step towards sustainability.