Contribution ID: **12** Type: **Oral**

Microgreen-Mediated Zinc Oxide Nanoparticles: An Eco-Friendly Approach Against Food-Borne Pathogens

Food-borne diseases remain a significant public health concern due to the prevalence of pathogenic microorganisms in animal-derived foods such as poultry. In this study, microorganisms were isolated from chicken meat and subjected to pathogenicity assays, followed by identification and characterization. To develop a sustainable antimicrobial strategy, zinc oxide nanoparticles (ZnO NPs) were green synthesized using microgreens extract. Microgreens, being the early growth stage of plants, are rich in bioactive phytochemicals, vitamins, minerals, and antioxidants, offering higher metabolite concentrations compared to mature plant parts, which enhances their potential as reducing and capping agents in nanoparticle synthesis. The antimicrobial activity of the synthesized ZnO NPs was evaluated against the identified food-borne pathogens, i.e., Staphylococcus pasteuri and Aeromonas caviae, using the minimum inhibitory concentration (MIC) assay. The results demonstrated notable inhibitory effects, highlighting the potential of microgreen-derived ZnO NPs as an eco-friendly and effective alternative to conventional antimicrobial agents for mitigating meat-borne infections. This study underscores the integration of plant-based nanotechnology with food safety interventions to address microbial contamination in the meat supply chain.

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Track Classification: Biological Sciences