IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 1, July 2025
Impact Factor: 7.67

Synthesis, Characterization and Antimicrobial Potential of Transition Metal Complexes Derived From (2-Hydroxy-5-Nitrophenyl) (Phenyl) Methanone

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Abstract: *A novel Schiff base ligand, HNPMDNP, was successfully synthesized through the condensation reaction between 2,4-dinitrophenylhydrazine (2,4-DNP) and (2-hydroxy-5-nitrophenyl)(phenyl)methanone. The resulting ligand was subsequently complexed with acetate salts of Mn(II), Co(II), Ni(II), and Cu(II) to yield their respective metal complexes. The structural characterization of both the ligand and its metal complexes was carried out using elemental analysis, Fourier-transform infrared spectroscopy (FT-IR), proton nuclear magnetic resonance (^{1}H NMR), and thermogravimetric analysis (TGA). Spectral data confirmed the successful coordination of metal ions through the azomethine nitrogen and phenolic oxygen atoms of the ligand, indicating a bidentate coordination mode. The thermal behavior and decomposition profiles studied via TGA further substantiated the formation of stable metal complexes. The in vitro antimicrobial activity of the ligand and its complexes was evaluated against various bacterial strains, including Escherichia coli, Salmonella typhi, Staphylococcus aureus, Pseudomonas aeruginosa, and Klebsiella pneumoniae, as well as fungal species such as Aspergillus niger and Candida albicans. The metal complexes exhibited significantly enhanced antimicrobial activity in comparison to the free ligand, with the Cu(II) complex displaying the most potent inhibitory effects against both bacterial and fungal organisms. These results suggest that the HNPMDNP ligand and its transition metal complexes possess promising antimicrobial properties and merit further investigation for potential pharmaceutical application.*

Keywords: HNPMDNP, antimicrobial efficacy, agar well diffusion, coordination behavior