

# Synthesis, Characterization, and Anti-Microbial Exploration of 2, 4, 6-Trinitrophenol Derivative Sythesized from 4-Acetamidophenol.

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**Abstract:** *In this study, a novel derivative of 2,4,6-trinitrophenol was synthesized using 4-acetamidophenol (commonly known as paracetamol) as the starting material. The synthetic pathway involved strategic nitration and subsequent derivatization reactions to obtain the target compound with enhanced functional properties. The synthesized compound was subjected to comprehensive structural characterization using Fourier-transform infrared spectroscopy (FTIR), proton nuclear magnetic resonance ( $^1\text{H}$  NMR), and mass spectrometry (MS) to confirm its molecular structure and purity. The biological efficacy of the synthesized trinitrophenol derivative was evaluated through its antimicrobial activity against a panel of Gram-positive and Gram-negative bacterial strains, as well as selected fungal pathogens. The antimicrobial screening was performed using the agar well diffusion method, and minimum inhibitory concentration (MIC) values were determined to quantify its potency. The results demonstrated significant antimicrobial activity, particularly against Staphylococcus aureus, Escherichia coli, and Candida albicans, suggesting potential for pharmaceutical or biocidal applications. This research contributes to the growing interest in designing nitroaromatic compounds with biomedical relevance and highlights the viability of utilizing readily available pharmaceuticals like 4-acetamidophenol as precursors for value-added chemical entities with potential therapeutic applications.*

**Keywords:** 4-Acetamidophenol, 2,4,6-Trinitrophenol, Nitration, Antimicrobial activity, Structural characterization

