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New water soluble nickel(II) and copper(II) oxime complexes containing acid group: DNA interaction investigations

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This study explores the DNA-binding and DNA-cleaving properties of two newly synthesized oxime derivative ligands and their complexes with Cu(II) and Ni(II) metal ions. Sodium salts of these compounds have been prepared to ensure water solubility. The structures of the ligands and complexes have been elucidated through various analytical techniques, including ^{1}H NMR, FT-IR, TGA, UV-Vis, SEM-EDS, and XRD analyses. The results reveal that these compounds interact with DNA without significantly altering its structure. They primarily bind to DNA grooves, particularly major grooves. The study has determined that the optimal concentration for these interactions is 75 μM. Viscometry studies show that these compounds do not substantially change DNA viscosity, suggesting groove binding as their mode of interaction without major structural modifications to DNA. Gel electrophoresis, an effective tool for elucidating DNA cleavage mechanisms, indicates that DNA cleavage activity persists in the presence of radical scavengers, although it is reduced, especially in compounds known to bind to DNA grooves. In broader terms, complexes with Ni(II) exhibit higher DNA interaction activity than Cu(II) for both ligands. Among the ligands themselves, H_2L^1 demonstrates higher activity than H_3L^2. In conclusion, this research reveals that these compounds interact with DNA, primarily through groove binding, with minimal impact on DNA structure. This has implications for biomedical and pharmaceutical applications, highlighting these compounds' potential in these fields.

Keywords: Water soluble metal complexes, Oximes, DNA interactions