

Synthesis and characterization of Cu(II), Ni(II) and Zn(II) metal complexes of bidentate NS isomeric Schiff bases derived from S-methyldithiocarbazate (SMDTC): Bioactivity of the bidentate NS isomeric Schiff bases, some of their Cu(II), Ni(II) and Zn(II) complexes and the X-ray structure of the bis[S-methyl-β-N-(2-furylmethyl)methylenedithiocarbazato]zinc(II) complex.

Abstract

Two new isomeric Schiff bases, S-methyl-β-N-(2-furylmethyl)methylenedithiocarbazate (NS') and S-methyl-β-N-(5-methyl-2-furyl)methylenedithiocarbazate (NS'') have been prepared. Bis-chelated complexes of these two bidentate ligands, [M(NS)₂], [M=Cu(II), Ni(II) and Zn(II)], were synthesized. The Schiff bases and their metal complexes have been characterized by a variety of physico-chemical techniques. X-ray crystallographic analysis shows that the Zn(II) complex, [Zn(NS')₂], is four-coordinate and has a distorted tetrahedral structure with the ligand coordinated to the Zn(II) ion as an uninegatively charged bidentate chelating agent via the azomethine nitrogen and the mercaptide sulfur atoms. The Cu(II) complexes are paramagnetic with a square-planar stereochemistry. The Ni(II) and [Zn(NS'')₂] complexes have a square-planar and tetrahedral structure, respectively, however, they are diamagnetic. Only Cu(NS')₂ showed clear activity against the bacteria, *Subtilis* mutant (B28), while both NS' and NS'' Schiff bases were strongly antifungal against *Saccharomyces cereviceae* (20341), *Candida albicans*, *Candida lypolytica* (2075) and *Aspergillus ochraceous* (398). Cu(NS')₂ and Ni(NS')₂ showed clear inhibition of *C. albicans* and *S. cereviceae* (20341), respectively. The Cu(NS')₂, Ni(NS')₂ and Zn(NS')₂ complexes showed very good activity against human cell T-lymphoblastic leukemia [CEM-SS] cells with CD50 values of 1.6, 2.1 and 3.0 μg ml⁻¹, respectively. The remainder of the Schiff bases and complexes were inactive towards CEM-SS cells. None of the compounds showed any activity towards colon cancer cells (HT-29). Only the Cu(NS')₂ and Zn(NS')₂ complexes were highly active against cervical cancer cells (HELA cells) with CD50 values of 1.5 and 2.1 μg ml⁻¹, while the Ni(NS')₂ complex was weakly active towards HELA cells with a CD50 value of 23.0 μg ml⁻¹.

Keyword: Crystal structures of Zn(II) complexes; Cu(II); Ni(II); NS Schiff base; S-methyldithiocarbazate (SMDTC); Zn(II) complexes.