

SYNTHESIS, CHARACTERIZATION, AND ANTIOXIDANT ACTIVITY OF THE COPPER(II) COMPLEXES WITH NOVEL LIGAND: *N*-[4-({2-[1-(PYRIDIN-2-YL)ETHYLIDENE]HYDRAZINECARBOTHIOYL}AMINO)PHENYL]ACETAMIDE

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Introduction

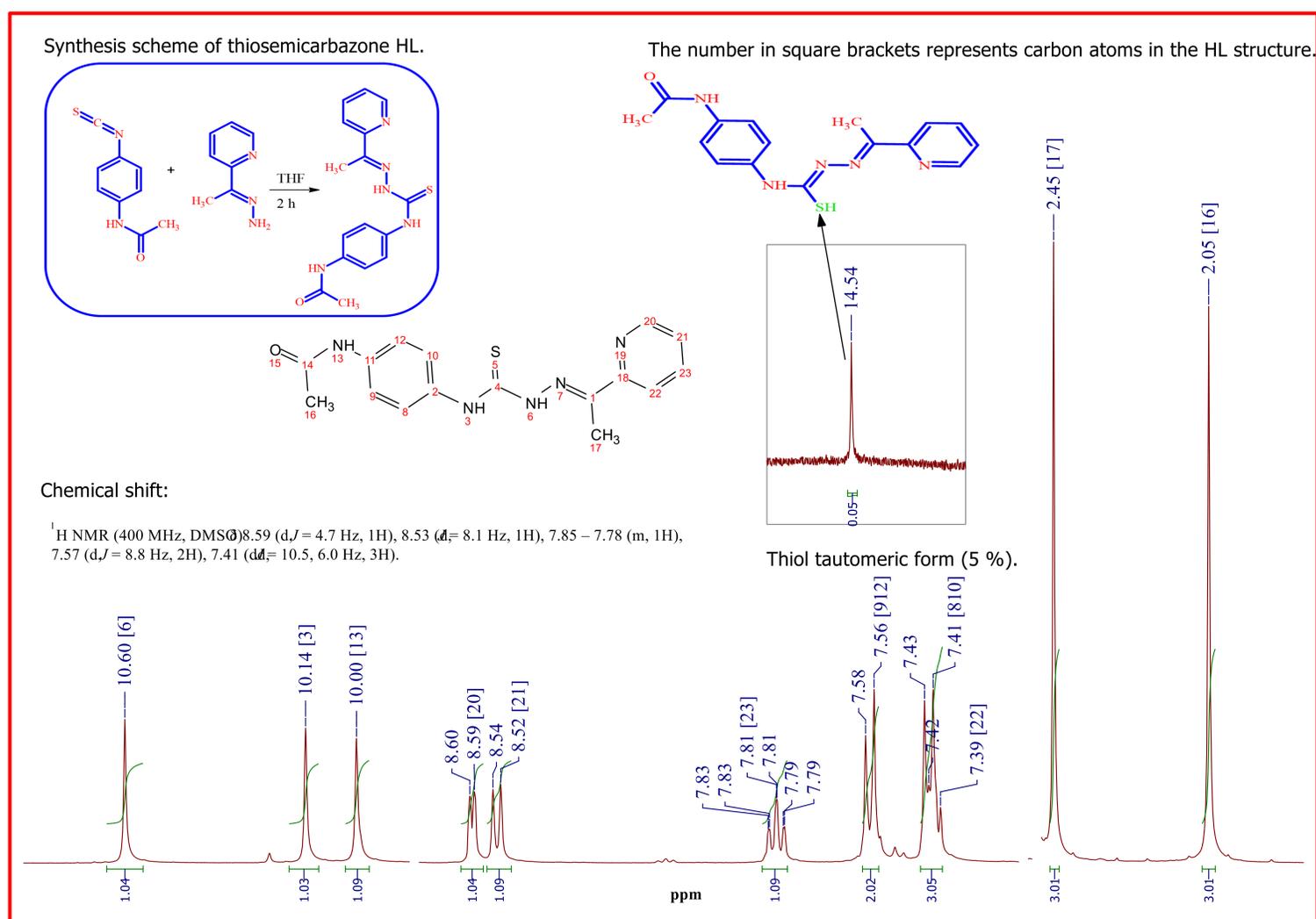
Free radicals play a significant role in various detrimental biological processes, including protein denaturation and lipid peroxidation, contributing to the development of numerous human dis-eases. Hence, investigating the antioxidant activity (AOA) of the synthesized compounds becomes crucial to determine whether they can mitigate the levels of free radicals and provide protection against oxidative stress in the human body.

Results

The aim of the present investigation is the synthesis, characterization, and study of AOA of the new ligand: *N*-[4-({2-[1-(pyridin-2-yl)ethylidene]hydrazinecarbothioyl}amino)phenyl]acetamide (**HL**) and Cu(II) coordination compounds with **HL**: [Cu(L)CH₃COO] (**1**), {[Cu(L)Cl]₂·H₂O} (**2**), [Cu(L)H₂O·DMF]NO₃ (**3**).

The new thiosemicarbazone based on 4-aminoacetanilide was synthesized, and functionalized according to the organic synthesis procedure: synthesis of the isothiocyanate group and hydrazone following the nucleophilic addition reaction with the formation of the **HL** ligand.

The **HL** was characterized by NMR, FTIR spectroscopy, and X-ray crystallography. Single crystal X-ray diffraction analysis elucidated the structures of **HL** as well as complexes 1-3.



Antioxidant activity

The AOA against ABTS^{•+} was evaluated for the compounds under examination: **HL** and 1–3. The **HL** and complexes 1–3 possessed notable antioxidant activity with IC₅₀ of 8.5±1.5, 47.44±1.9, 24.3±1.3, 23.3±0.9 μM, respectively.

Thus, the ligand **HL** and complexes 2, 3 exhibit remarkable antioxidant activity, surpassing the activity of Trolox. The ligand **HL** demonstrates activity that is four times higher than that of Trolox. Among the copper(II) complexes, the AOA follows this sequence: [Cu(L)H₂O·DMF]NO₃ ≥ {[Cu(L)Cl]₂·H₂O} ≥ [Cu(L)CH₃COO].

Table. Antioxidant activity of the ligand **HL** and copper(II) complexes 1–3 against ABTS^{•+} cation radical.

Compound	IC ₅₀ (μM)
HL	8.5±1.5
(1) [Cu(L)CH ₃ COO]	47.4±1.9
(2) {[Cu(L)Cl] ₂ ·H ₂ O}	24.3±1.3
(3) [Cu(L)H ₂ O·DMF]NO ₃	23.3±0.9
Trolox	33.3±0.2

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