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UV–VIS SPECTROSCOPY INVESTIGATION OF THE INTERACTION OF NEW AZOIMINE QUINOLINE DERIVATIVE TO DNA

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INTRODUCTION

A variety of analytical methods, such as electronic spectroscopy, have established a prominent role to study drug- DNA interactions because of the tests' reproducibility and high sensitivity **[1,3]**. It is commonly used to study the stability of DNA and the formation of DNA-ligand complexes. Indeed, if a molecule interacts with DNA, the absorbance and wavelength of the molecule undergoes a change following the addition of the DNA. In this work, the binding properties of a new azoimine quinoline derivative namely (1Z)-2-oxo-N'-phenyl-N-quinolin-8-ylpropanehydrazonamide (H_2L-H) with DNA has been carried out using UV–Vis spectroscopy. The results indicated that the compound interact with DNA most likely through the intercalative mode. The binding energies ΔG were evaluated to be negative which highlights the spontaneity of the binding to DNA of the investigated compound.

EXPERIMENTAL SECTION

The interaction of the H2L-H derivative with DNA is studied by UV-vis absorption titration at physiological pH (7.2) and body temperature (37°C). Spectroscopic titrations are performed in a mixed solvent of acetonitrile and phosphate buffer (pH = 7.2) (9:1) while keeping constant the concentration of the studied compound solution (10 µmol.L-1) and varying the DNA concentration from 0 to 4.37µmol.L-1. The electronic spectrum of the derivative was recorded before and after each addition of the DNA.

RESULTS AND DISCUSSION

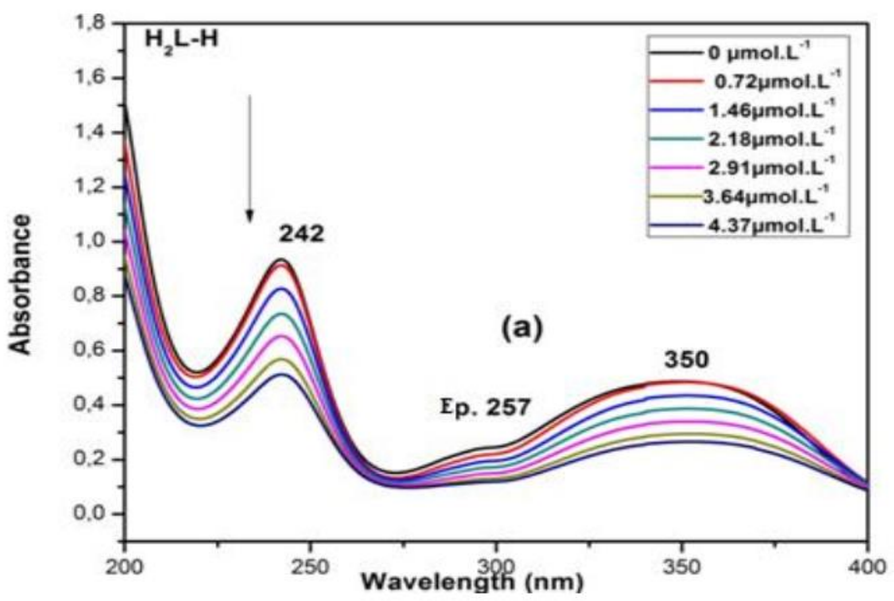

Figure 1: Electronic absorption spectra of the H2L-H (10µmol/L) in the presence of DNA (0-4.37µM), in acetonitrile/phosphate buffer at pH = 7.2 (9:1;v:v) and 37˚C

The variation of absorbance and wavelength are used for the evaluation of the binding constants and the free energy ΔG of the H2L-H –DNA adduct formed using the following equations:

$$\frac{A0}{A-A0} = \frac{\varepsilon_G}{\varepsilon_{H-G}-\varepsilon_G} + \frac{\varepsilon_G}{\varepsilon_{H-G}-\varepsilon_G}\frac{1}{k_b[DNA]}$$

Where A0 and A are the absorbances of the free compound and adduct, respectively, εG and εH-G are their molar extinction coefficients, respectively.

$$\Delta G = -RTlnk_b$$

Where R is the constant of perfect gases, T is the temperature in kelvin

BINDING PARAMETERS OF H2L-H COMPOUND

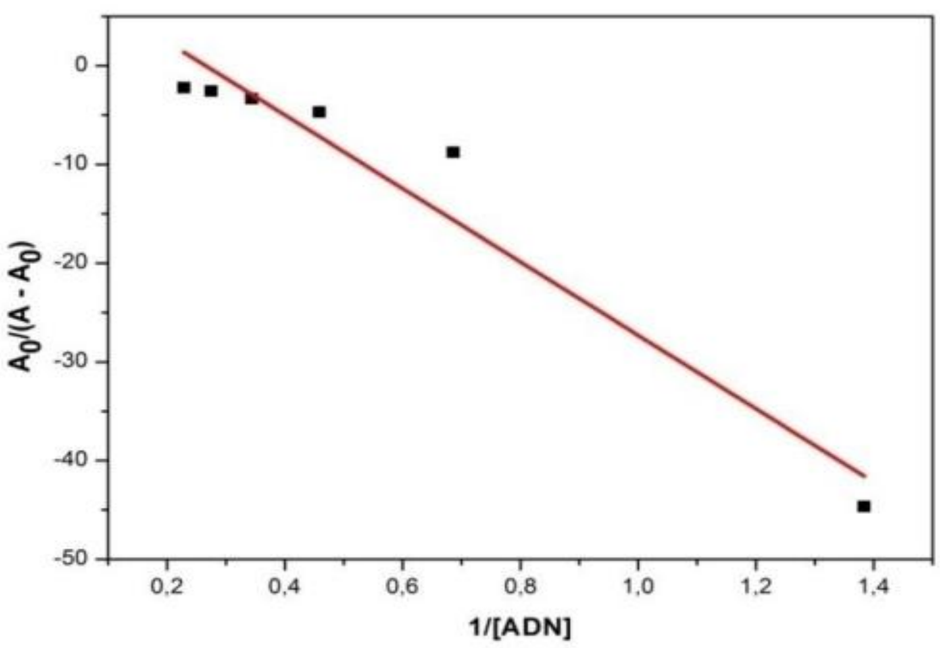

Figure 2: Plot of A0/(A - A0) as a function of 1/[DNA].

Tableau . 1. Binding parameters of H2L-H compound

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Adduct	1/ [ADN]	$A_0/(A-A_0)$	k_b ($L.M^{-1}$)	ΔG (KJ/mol)
H_2L-H-ADN	1.38341288	-44.650718	2.65×10^5	-32.16
	0.6863418	-8.7542214		
	0.4587156	-4.6988922		
	0.34364261	-3.3304782		
	0.27453672	-2.5588155		
	0.2287806	-2.2182077		

CONCLUSION

- The obtained results suggests that intercalation is the main mode of interaction between the studied quinoline derivatives and DNA .
- The value of the binding constant kb suggests that this compound had a strong binding affinity for DNA.
- The binding energy ΔG is evaluated as negative, highlighting the spontaneity of the interaction of this molecule with DNA

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