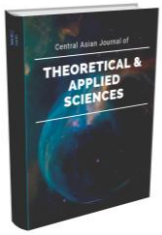

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Article

Synthesis of Some New Hydroquinone Compounds Derived From 2-Amino Benzothiazole and Study Their Biological Activity

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Abstract: Substituted 2-amino benzothiazoles (w1-W3) were produced in the current study via a reaction involving potassium thiocyanate and aniline that had been substituted with the assistance of a broom. Schiff bases are produced by reacting substituted 2-amino benzothiazoles (w4-W6). The products of the reaction between anthranilic acid and Schiff base were hydroquinone compounds (w7-9). Each new compound was identified using spectral (IR, 1H-NMR) and physical techniques. The antibacterial activity against gram-positive and gram-negative microorganisms was evaluated vitro using the disc diffusion assay method. The minimum inhibitory concentration (MIC) was ascertained using standard drugs as a reference. The findings indicated that hydroquinone derivatives exhibited superior activity against the proliferation of gram-positive and germ-negative bacteria compared to the drug.

Keywords: Hydroquinone, 2-Amino Benzothiazoles, Schiff Base.

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1. Introduction

A heterocyclic compound, benzothiazole exhibits a multitude of biological activities. It is currently of considerable scientific interest. Benzothiazoles are rings with fused members composed of a benzene ring fused to a thiazole ring. Widespread in bioorganic and medicinal chemistry, they find utility in investigating new drugs [1]. Compounds containing benzothiazole constituents exhibit various biological activities, including antifungal [2], anticancer [3], and analgesic properties. [4] anti-inflammatory agents that inhibit COX [5]

Schiff base derivatives have demonstrated a diverse array of biological and pharmaceutical ecological activities, including antitumor [6], antiviral [9], anti-oxidant [8], anti-parasites [7], and anti-proliferative [8].

Schiff bases were employed to introduce pharmacologically significant heterocyclic substances, such as six-member rings. Hydroquinones, which possess anticancer properties, have prompted the development of numerous synthesis procedures. Anthelmintic, antiviral, anti-HIV, anti-protein, anti-tubercular, antioxidant, antimicrobial, anti-inflammatory, anticancer, antimalarial, antidiabetic, Antitubercular, antiarrhythmic, and antiparkinsonian derivatives have been published in abundance [10], [11], [12], [13], [14], [15].

2. Experimental

Purification was unnecessary because all the compounds and solvents used in the experiment were Fluka and Aldrich products. A Stuart melting point device was used to record the uncorrected melting points in an exposed capillary tube. A Shimadzo FTIR-8100 spectrophotometer equipped with KBr discs was utilized to obtain infrared spectra, and 1H NMR was employed. DMSO-d6 was the solvent used in the spectra analysis using the MHZ spectrometer.

Synthesis of Hydroquinone [16] (w7-w9)

Combine 0.001 mole of prepared Schiff base [w4-w6] (0.04 Mol) with anthranilic acid in a hand mill. After that, the mixture must be heated on a plate for ten to twenty minutes, or until it melts, in a suitable heat-resistant glass beaker. Table 3 shows how the resistant substance's color and appearance will change as it melts, influencing the melting point and the volume of the formed product.

Evaluation of biological activity:

The diffusion method is used to calculate the biological function. On the other hand, the military lifetime increases by 0.1 in the Ager Muller Hinton Dishe and by 5 minutes in the Cork Porur holes, according to the Kirbi Baura group's biological function calculation [17], [18], [19], [20]. As a control sample, the fourth hole—created by mixing one milliliter of DMSO with five millimeters per pore diameter—was kept at 37°C for twenty-four hours [21], [22], [23]. The diameters of the container zones surrounding each hole have been measured in millimeters using Prescott's method.

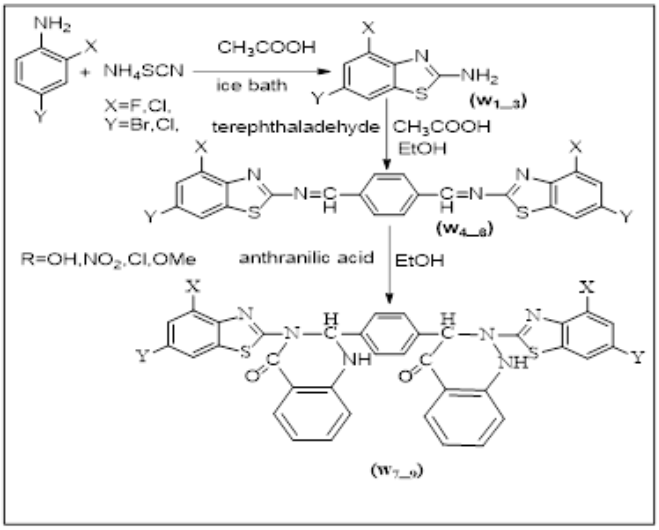


Figure 1. Route for preparing combination [W7–W9].

3. Results and Discussion

Characterization of hydroquinone (W_7):

Compounds (W7-9) were produced when anthranilic acid and Schiff base reacted. These compounds' stretching (C C) group was the cause of a band that was visible in the IR spectral data at (1535 cm-1). The group at (1658 cm-1) is the C=N band. A band for the (Ar-H) group at (308). Aband for the (NH) group and the remaining bands at (3274 cm-1). The compound exhibits a signal at 6.72 ppm for (NH), 7.35 to 8.35 ppm for (Ar-H), and 5.40 ppm for (CH) in its ^{1}H-NMR spectrum (CDCl3) (W7) aliphatic. Additionally, the IR data from Fig. (1) are shown in Table (2). The signal for (CH)benzothiazole is shown in FIG. (2) Characteristics of the ^{13}C NMR spectra of all compounds (W7) (cf. Exper. Section). In the 166.5 ppm range, the carbon thiazole ring (C-A) resonance displayed the following

signals: The 13C NMR signal from (carbon -E) δ=(148), the signal from (carbon -F) at δ=129 ppm, and the singlet signal at δ=39.49 owing to -40.49 ppm DMSOd6 were all measured at 116 ppm [24]. δ was 116 ppm; δ = 134 ppm from (carbon -B), δ = 148 ppm from (carbon -C), and δ = due from (carbon -D).

Evaluation of Biological Activity:

Some formulations (W7, W8, W9) were evaluated against a range of bacteria, including gram-negative bacteria like Escherichia coli and gram-positive bacteria like Staphylococcus aureus, using the vial plate agar diffusion technique [25], [26], [27]. The microbial cultures were incubated at 37º C for eight hours before being diluted with 0.8% sterile saline. For the chemicals utilized in DMSO, the solution's concentration was kept at 100µg/mL [28], [29], [30], [31]. The reference drugs are streptomycin and DMSO, whereas Ciprofloxacin is the standard medication [32], [33], [34], [35]. There was a negative control. A measurement was made of the inhibition of bacterial growth surrounding the disc [36], Table 3.

Table 1. Prepared compounds' physical characteristics and elemental analysis [W7-W9].

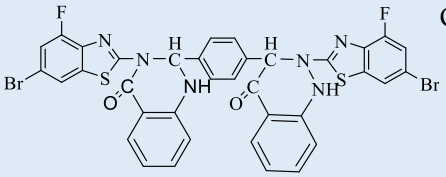
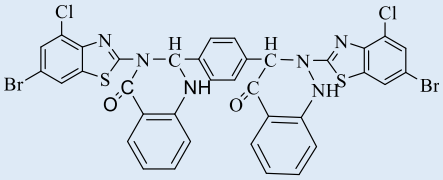
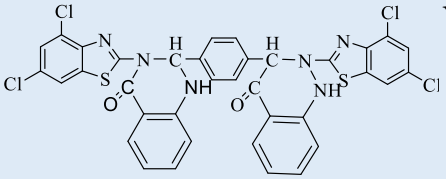
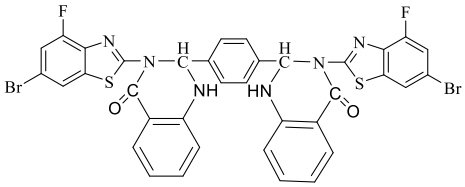
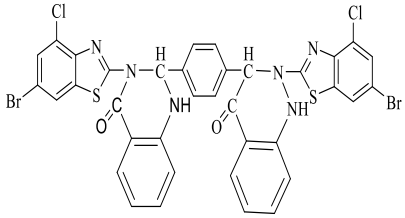
Comp. No.	hydroquinone	Color	M.P (C⁰)	T. Ref. (hr.)	Yield (%)	R.f. EeOH	found / (calc.) % C%	H%	N%	S%
W7		Orange	174	8	53	0.67	51.94 (52.06)	2.32 (2.43)	13.00 (10.12)	7.32 (7.72)
W8		Dark orange	183	8	61	0.71	49.98 (50.08)	2.13 (2.33)	11.94 (11.93)	7.08 (7.43)
W9		Yellow	169	8	63	0.57	55.01 (55.83)	2.13 (2.60)	10.06 (10.85)	8.10 (8.28)

Table 2. FT-IR measurements of produced compounds [W7-W9].

Comp. No.	R	IR (KBr) cm⁻¹					
	Characterization of hydroquinone [W7-W9]	**ν(C=O) Lactam**	**ν(C-H) Arom**	**ν(C=N)**	**ν (NH)**	**ν (C=C) ester**	**Others**
W7		1658	3008	1658	3274	1535	ν(C-F) *asy.,sym.* 1172
W8		1679	3019	1669	3311	1506	ν(C- Br) *asy.,sym.* 1051

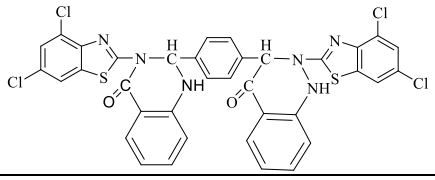
W9		1676	3053	1683	3351	1490	ν(C-Cl) *asy.,sym* 1021

Table 3. The produced compounds' antibacterial activity [W7–W9] and the control antibiotic.

Comp. No.	E. Coil Conc. mg/ml			Proteus ssp Conc. mg/ml		
	0.01	0.001	0.0001	0.01	0.001	0.0001
W7	16	23	29	17	30	26
W8	14	21	31	27	22	18
W9	21	24	30	19	16	20
Ciprofloxacin	2	3	3	2	2	4
Blank disk	0	0	0	0	0	0

15–18 mm for slight activity, 18–20 mm for moderate activity, and 21–25 mm for strong activity; MIC stands for minimal inhibitory concentration (g/mL).

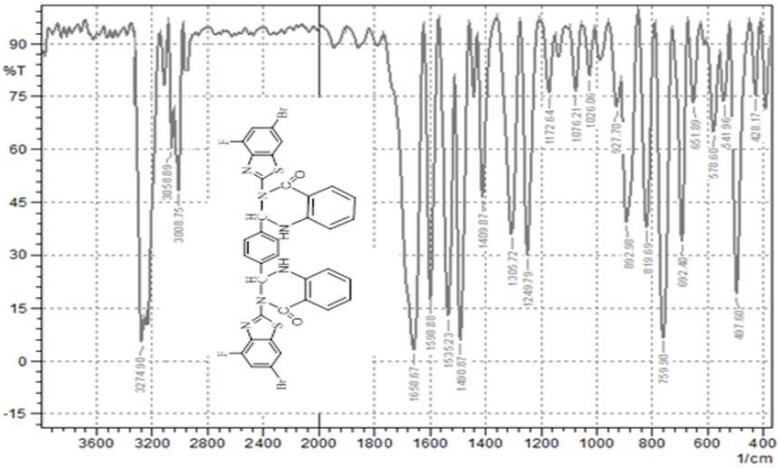


Figure 2. FT-IR spectrum of compound [W7].

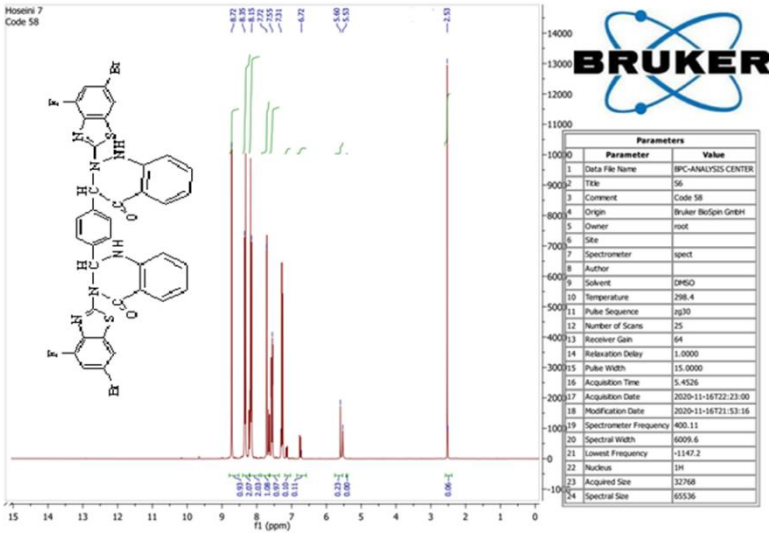


Figure 3. 1H-NMR spectrum of compound [W7].

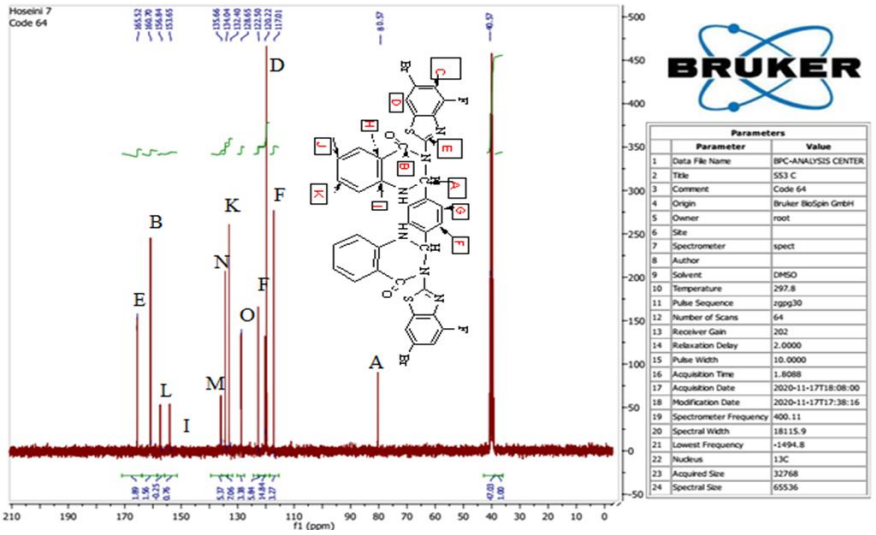


Figure 4. CNMR spectrum of compound [W7].

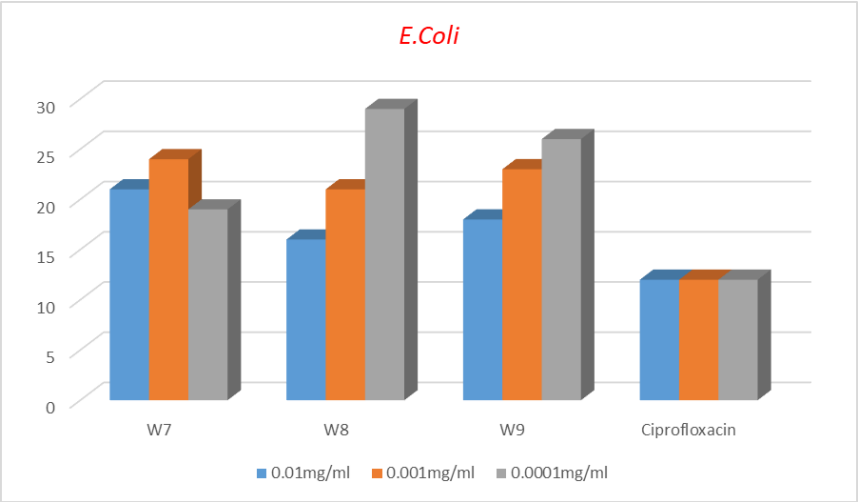


Figure 5. Assessment of Escherichia coli compounds' inhibitory activity.

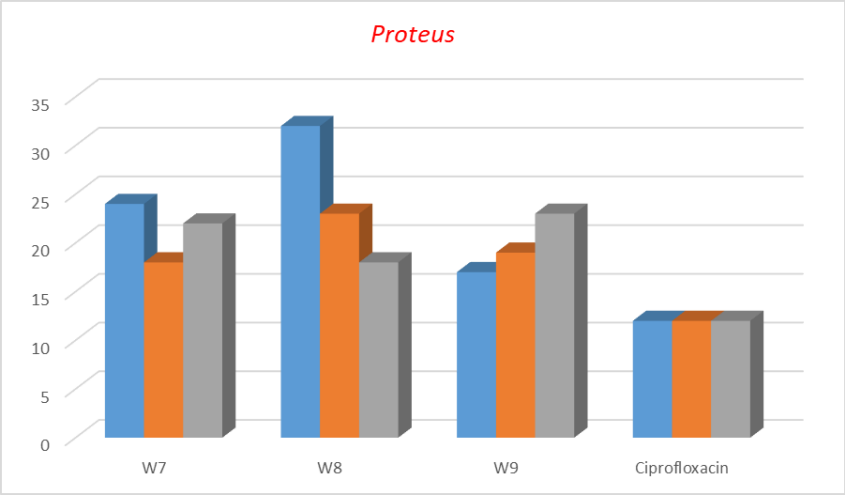


Figure 6. Assessment of the compounds' inhibitory effect on Proteus ssp.

4. Conclusion

The reaction of azomethine with anthralinker always results in a six-membered ring derived from quinazoline. Spectroscopic measurements confirmed this synthesis method, showing the disappearance of the characteristic Schiff base azomethine. This indicates the completion of the reaction and the formation of the ring targeted by the research, a finding further confirmed by spectroscopic measurements. Biological activity demonstrated that quinazoline compounds possess high antibacterial activity, exceeding that of antibiotics. This qualifies these compounds as potential future antibiotics.

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