

SYNTHESIS, CHARACTERIZATION AND ANTI-MICROBIAL ACTIVITY OF 4-(8-HYDROXYQUINOLIDEN-5-YL)-2-(SUBSTITUTED PHENYL) OXAZOL-5-ONE.

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ABSTRACT

Various Schiff bases (3a-e) were prepared by condensation reaction of 8-hydroxy-5-quinoline carboxaldehyde¹ and different substituted hippuric acids (2a-e). The Schiff Bases (3a-e) were then reacted with acetic anhydride in sodium acetate and yielded 4-(8-hydroxy quinolinden-5-yl)-2-substituted phenyl oxazolone.

All the oxazolone derivatives were characterized by elemental analysis, spectral studies and antimicrobial activities. One of the oxazolone (4b) was then treated with transition metal salts and yield the metal chelates. All the metal chelates of 4b were characterized by metal; ligand (M:L) ratio, magnetic moment, reflectance spectra and anti-microbial activities.

Key words: Schiff bases, Hippuric acid, Oxazolone derivatives, magnetic moment, reflectance spectra and anti-microbial activities.

INTRODUCTION

Perusal of the literature reveals that the oxazolone derivatives are found to be active pharmacological agents¹⁻⁷. Most of these oxazolone rings contain phenyle rings. Hitherto there is no report been found in literature about the oxazolone derivative containing well known chelating agent say 8-hydroxy quiniline (i.e. oxine). If this compound is introduced into such oxazolone derivative it may change the biological activity upto some extent. With this point of view, the work containing schiff base based oxazolone derivatives has been undertaken. Hence the present communication deals with the synthesis, characterization and antimicrobial activities of (8-hydroxy quinolinden-5-yl)-2-aryl oxazol-5-one. The chelating properties of one of the derivative (i.e. 4b) is also summarized. The research work is shown in Scheme -1.

EXPERIMENTAL

Materials

All the chemical pertaining to this research work have been obtained from Alza chemicals, Nadiad.

Synthesis of Schiff Bases

To a well mechanical stirred and cooled suspension of 8-hydroxy-5-quinoline

carboxaldehyde (0.01 mole) and substituted hippuric acid (2a-e) (0.01 mole) in THF (50 ml) was added by triethylamine (1 ml). The mixture was kept aside with stirring for 5 hrs. at room temperature. The resultant mixture poured in cold water and acidified with dil. HCl. The greenish yellow salt was filtered off, washed with THF and then with H₂O and air dried. All the Schiff bases are directly used for the synthesis of oxazolones i.e. 4a-e.

Synthesis of 4-(8-hydroxy quinolinden-5-yl)-2-phenyloxazol-5-one (4a-e):

To a solution of Schiff Base derivative (3a-e) in ethanol and acetic anhydride at stoichiometric ratio and few ml of HAc was refluxed for 12 hours. The resultant mixture was added into cold water and the precipitates were obtained by neutralization of the mixture by dilute alkali. The product was then filtered off, washed by water and air dried. The details about all the (4a-e) derivatives are given in Table-1.

Synthesis of metal Chelates of 4b

To solution of 4b (0.02 mole) in formic acid water mixture metal acetate solution (0.01 mole) in water was added dropwise under stirring at room temperature. The mixture was then added by solid sodium acetate till the completion of precipitates of metal chelate. It was then filtered, washed by water

and air dried. The detailed analysis of metal chelates of 4b are summarized in Table - 2.

Measurements

Elemental analysis of all the compound were performed on C, H, N and O elemental analyzer. IR spectra were recorded in KBr pellets on parkin Elmer IR spectrophotometer and ^1H NMR Spectra in CDCl_3 or DMSO were scanned on FTNMR spectrophotometer. Metal contents of all the metal chelates were estimated by known method⁸. Magnetic susceptibility measurement of all the meta chelates were carried out at room temerature by the guoy method, mercury tetra thiocynato cobalt (II) $\text{HG}[\text{Co}(\text{NCS})_4]$ was used as a calibrant. The diffuse reflectance attachment MgO was employed as the reference compound.

The antifungal activity of all the copounds and chelates was carried out by the method repored earlier⁹. The plant pathogens listed in Table 3 have been selected for the study.

RESULTS AND DISCUSSIONS

All the oxazolone derivatives are in the form of amorphous yellow to dark brown powder. The

did not melt upto 250°C . The C,H,N contents of the axazolones (4a-e) are shown in Table 1 .The results indicate that the values are consistent with the predicted ones as shown in Scheme • 1. IR Spectra of Oxazolone derivatives are also identical in all aspects.The new bank at 1740 cm^{-1} are mainly due on g - lactual group. Other bands at 1427, 1484, 1507 and 1600 cm^{-1} are characterized of 8-hydroxy quinoline moiety¹⁰.

The metal chelates of 4b with different metal ions Zn, cu, Ni, Co and Mn are varying in color from light green to brown. On the basis of the proposed structure as shown in scheme - 1. which upon chelation assumed to be co-ordinates wiht one central meta atom. This has been condirmed from the results of elemental analysis of metal chelates and their arent ligand. The data of elemental analysis in Table - 2 are found in agreement with the calculated values of C,H and N based. Molecular formula of parent ligand and its metal chelates. IR spectra of all the metal chelates of 4b with those of metal chelate have revealed certain differences.

One of the significant difference to e expected is the presence of more briadened band in the region of $3300\text{--}35\text{—cm}^{-1}$ of metal chelate as the oxygen of the O-H ligand has formed

Table-1: Characterization of azazolones (4a-e)

Sample No.	Molecular Formula	Yield %	Elemental analysis					
			C		H		N	
			Cal.	Found	Cal.	Found	Cal.	Found
4a	$\text{C}_{19}\text{H}_{14}\text{O}_3\text{N}_2$	65	71.6	71.4	4.4	4.3	8.8	8.6
4b	$\text{C}_{19}\text{H}_{13}\text{ClN}_2\text{O}_3$	58	64.6	64.3	3.6	3.5	7.9	7.8
4c	$\text{C}_{19}\text{H}_{16}\text{BrN}_2\text{O}_3$	67	57.4	57.3	3.5	3.4	7.5	7.41
4d	$\text{C}_{20}\text{H}_{16}\text{N}_2\text{O}_3$	70	72.2	72.1	4.8	4.71	8.4	8.35
4e	$\text{C}_{20}\text{H}_{16}\text{N}_2\text{O}_4$	60	68.9	68.8	4.5	4.48	8.0	7.96

Table-2: Characterization of metal chelates of 4b

Metal Chelates	Elemental analysis								eff
	C		H		N		Metal content		BM
	Cal	Fou.	Cal.	Fou.	Cal.	Fou.	Cal.	Fou.	
4b – Cu ⁺²	54.80	54.71	3.10	3.05	6.70	6.66	15.20	15.10	1.94
4b - Ni ⁺²	55.40	55.31	3.16	3.11	6.80	6.71	14.20	14.15	3.06
4b - Co ⁺²	55.40	55.34	3.10	3.09	6.80	6.74	14.20	14.13	4.58
4b - Mn ⁺²	55.90	55.81	3.19	3.12	6.80	6.76	13.40	13.30	5.21
4b • Zn ⁺²	54.50	54.43	3.11	3.06	6.70	6.68	15.60	15.50	D

* Cal. = Calculated Fou. = Found D = Diamagnetic

The analysis of chelates by spectral studies is discussed in the text.

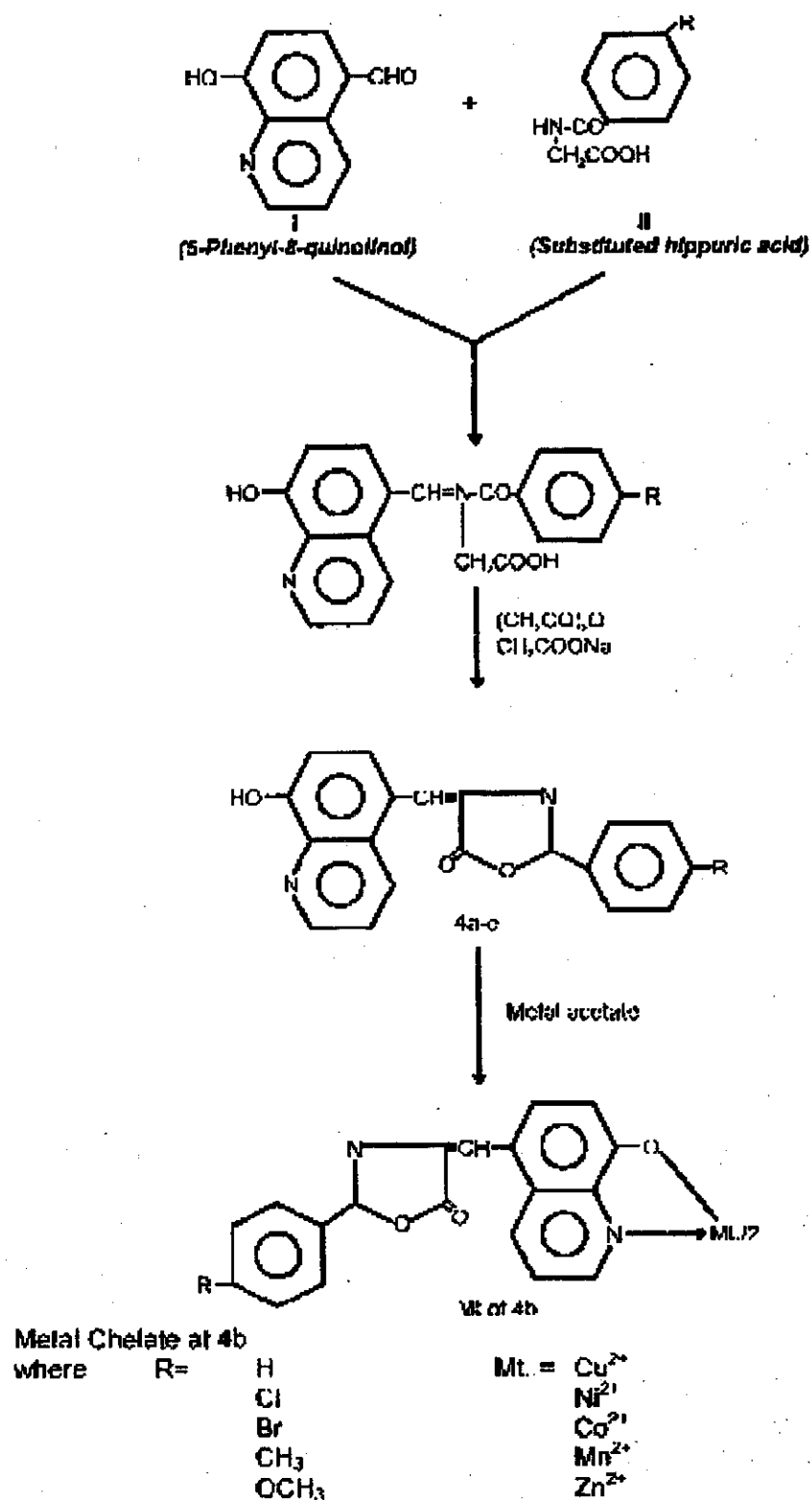


Table-3: Antifungal activities of metal chelates

Samples	Zone of Inhibition at 1000 ppm (%)				
	Pencillum Expansum	Bultryde Paldia Thlobromido	Nigrospora Sp.	Trieno Sp.	Ralzipur Nigricans
4a	74	84	69	82	88
4b	100	93	90	100	100
4c	94	98	97	98	93
4d	86	90	90	91	96
4e	89	92	86	82	89
4b - Cu^{+2}	100	100	100	93	94
4b - Ni^{+2}	97	91	10	100	100
4b - Co^{+2}	100	100	96	96	100
4b - Mn^{+2}	99	100	99	98	98
4b - Zn^{+2}	100	98	95	96	100

coordination.

Magnetic moments (μ_{eff}) of the metal chelates other than that of Zn^{+2} is diamagnetic. The diffuse reflectance spectrum of 4b- Cu^{+2} shows two broad bands at 15873 cm^{-1} and 22988 cm^{-1} due to ${}^2\text{E}_g \rightarrow {}^2\text{T}_{2g}$ transition and charge transfer respectively, suggesting a distorted octahedral structure for 4b- Cu^{+2} which is further confirmed by high values of μ_{eff} . The 4b- Ni^{+2} and 4b- Co^{+2} gave two absorption bands respectively at 15625 cm^{-1} , 22471 cm^{-1} and 16528 cm^{-1} corresponding to ${}^4\text{T}_{1g} \rightarrow {}^2\text{T}_{1g}$, ${}^4\text{T}_{1g} \rightarrow {}^4\text{T}_{1g}$ (P) transitions⁹. Thus the absorption band and the values of μ_{eff} indicate an octahedral⁹ configuration for 4b- Ni^{+2} and 4b- Cu^{+2} .

The spectra of 4b- Mn^{+2} shows bands at 14665 cm^{-1} , 19750 cm^{-1} and 25575 cm^{-1} assigned to the transition ${}^6\text{A}_{1g} \rightarrow {}^4\text{T}_{1g}$ (4G), ${}^6\text{A}_{1g} \rightarrow {}^4\text{T}_{1g}$ (4G) and ${}^6\text{A}_{1g}$ (F) ${}^4\text{T}_{1g}$ respectively, suggesting an octahedral structure for the 4b- Mn^{+2} . As the spectrum of 4b- Zn^{+2} is not well resolved it is not interpreted but its μ_{eff} value reveals it is diamagnetic as expected.

The antifungal activity of all the (4a-e) compounds and metal chelates of 4b shows that (Table - 4) all the compounds are toxic against all fungi. The halogen derivatives are more toxic and particularly Cu^{+2} chelate is more toxic. The results show that the produced samples display as garden fertilizers.

REFERENCES

- Hirao I, Yasukikokato M, Hirota T, *Bull Chem Soc Japan*, 1971, 44, (1923)
- Saikawa I and Macda T, *Jaan Patent* 7008, **862**, 1970 (cl 16E391.2)
- Maheshwari C L, Mahesh R P and Singh P, *CurrSci*, 44, 549 (1975)
- Fortschr F Eloy, *Chem Forsxh*, 4, 807 (1963)
- Clapp L B, *Adv Heterocyclic Chem*, **20**, 65 (1976)
- Aubflage Victre, *Beilsteins Handbuch Der Organischen Chemie*, 414, 9 (1926)
- Kulkarni Y D, Mohd S and Ali S Rowhani, *Jour Indian Council of Chemists*, **2**, 5-8 (1988)
- Vogel A I, *Inorganic Quantitative Analysis*, 4th Edn, ELBS : London, (1978)
- Sen H P and Ray S K, *J Ind Chem Soc*, 9, 173 (1932)
- Charles R G, Freiser H F, Priedel R, Hilliard L E, Johnson R D, *Spectrochem Acta*, 8, 1 (1958)