International Journal of Medical and Pharmaceutical Research
Website: https://ijmpr.in/ | Print ISSN: 2958-3675 | Online ISSN: 2958-3683
NLM ID: 9918523075206676
Volume: 4 Issue:4 (July-Aug 2023); Page No: 127-132

Original Article

Synthesis of Substituted Triazine and Its metal complexes , with their Study of Antimicrobial Activity

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ABSTRACT

The present work focused on synthesis of triazine and their metal complexes. Its characterisation and anti-microbial activity were studied. Widely scope in co-ordination, medicinal chemistry. Bidentate chelate complex of ML2 type have been synthesized from triazine based ligand 4-amino-1-(naphthalene-1-yl)-1,6-dihydro-1,2,4-triazine-5(4H)- one. Their spectral analysis of chelates were study. Various synthetic metal of complexes of triazine are prepared and evaluated for its biological activity. Structures of the products have been deduced from their elemental analysis and spectral data such as 1 H-NMR have studied for determination of structure of its molecule, X- ray diffraction which provide information about the arrangement of crystal and Fourier transform infrared spectroscopy has been used to detect functional group present the compound). Select new synthesized compounds were screened as antimicrobial activity against Escherichia coil, proteus mirabilis, staphylococcus aureas, and P. aeruginosa has been carried out and compared with standard one.

Key Words: *Synthesis, Triazine, Characterization, Antimicrobial activity, chelate , bidentate*

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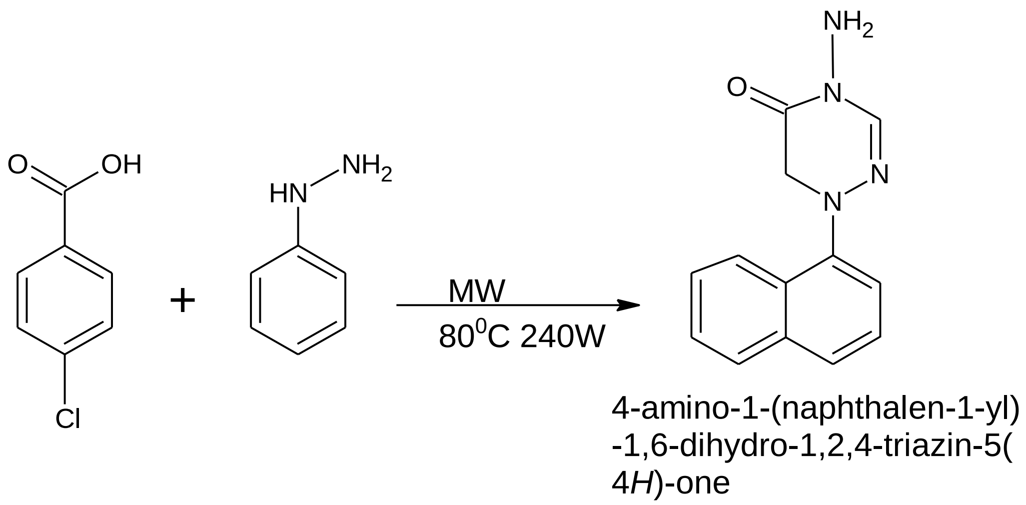
INTRODUCTION:-

The triazine has a planar six-membered benzene-like ring but three carbons are replaced by nitrogens. S – triazine derivatives have received considerable attention due to their potent biological activity such as anticancer [1], estrogen receptor modulators [2], antivirals [3], and antimalarials [4,5]. It has been reported that triazine derivatives possess potent antimicrobial activity [6,7]. The chemical reactivity of 1,2,4-triazines depends on the type of nucleophile employed, stability of adducts of transition state, site selectivity, and the dielectric constants of solvent used [8–16]. Literature reveals that there are few review articles illustrated the chemical reactivity of 1,2,4-triazines [17–22]. In continuationof our work in these area [23–27]. This work Various synthetic metal of complexes of triazine are prepared and evaluated for its biological activity.

2. EXPERIMENTAL METHOD

Scheme 1: 2.1 Synthesis of ligand 4-amino-1-(naphthalene-1-yl)-1,6-dihydro-1,2,4-triazine-5(4H)- one] (ANDT)

4 -chloro benzoic acid (10 mmol), phenyl hydrazine (10 mmol), and the addition of ethanol. The mixture was microwaved at 80^{0}C for 20 min. After add 2ml of acetic acid and. gm of sodium benzoate microwave up to 20 min at 80^{0}C at 240 W . The completion of the reaction was checked by TLC . On completion the reaction mixture was cooled at room temperature and poured into ice cold water (50 ml). A solid separated out which was collected and washed with water (10 ml) and dried. The product was recrystalized by appropriate solvent.
SCHEME I

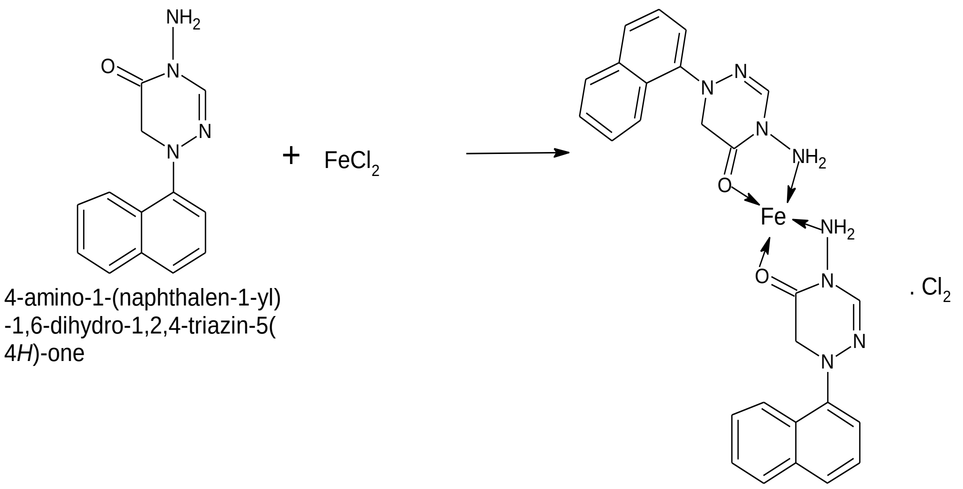


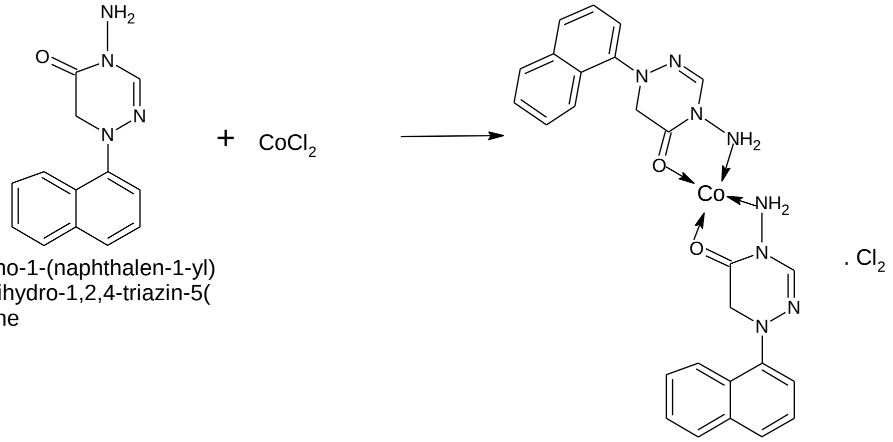
Scheme of synthesis of ligand

2.2 SYNTHESIS OF METAL COMPLEXES

An ethanolic solution of ligand [4-amino-1-(naphthalene-1-yl)-1,6-dihydro-1,2,4-triazine-5(4H)- one] was refluxed with anhydrous metal salt MX2 [M = Fe (II), CO (II)] in 20 ml ethanol for 6 hrs. The characteristics coloured complex precipitate was filtered washed with ethanol and dried in vacuum .

SCHEMEII





4-amino-1-(naphthalen-1-yl)
-1,6-dihydro-1,2,4-triazin-5(
4*H*)-one

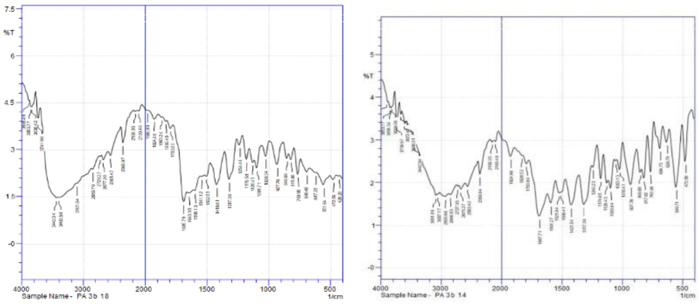
Results and discussion

FTIR analysis

IR Anylysis for ligand : The few selected IR value of ligandare as followed :- The peak of C-O occurred in the range 1660 stretching . The peak of C=N occurred in 1597 stretching . The IR spectra of compound (I exhibited that a new peak is revealed at 1630 cm^{-1} which may be due to presence of stretching frequency of C=N . The C-N peak occurred at 1490 cm^{-1}, which also suggests the development of the required compound. Peak appeared at 3447 cm^{-1} due to N-H stretching frequency. New peaks observed at 3050 cm^{-1} due to sp^2 (C-H) stretching .

IR analysis for complex Co : The few selected IR value of metal complex are as followed: 3028-3062 N-N triazine, 1639 C-O stretching , 1583 C=N stretching , 3205 (-NH_2 str) as shown in graph A

Graph -A) FTIR monograph of Co metalAnd Fe metal



IR analysis for metal complex Fe:

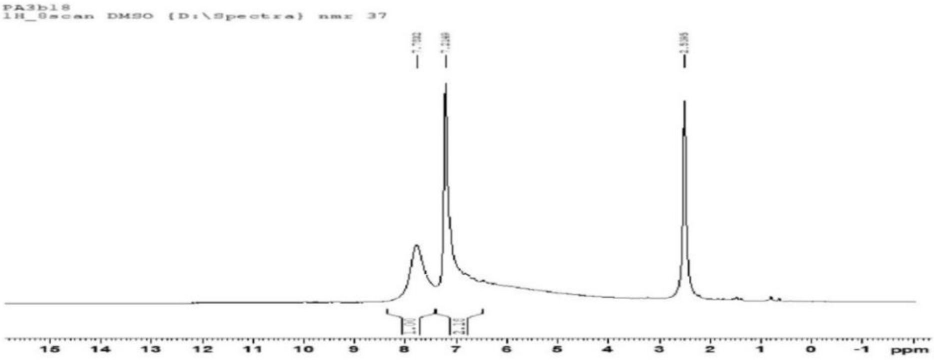
The few selected IR value of metal complex are as followed **:** 3057-3091 N-N triazine, 1687 C-O stretching , 1591 C=N stretching , 3205 (-NH_2 str) as shown in graph .

^{1}HNMR Study of ligand:

3.10 -3.18(dd, 1H, H), 3.79-3.82(dd, 1H, H), 9.4 (s , C-NH, 1H) ,5.19-5.21 (dd, 1H, H), 5.95 (s, 2H, NH2), 6.6-8.7 (m, 10 Ar-H),

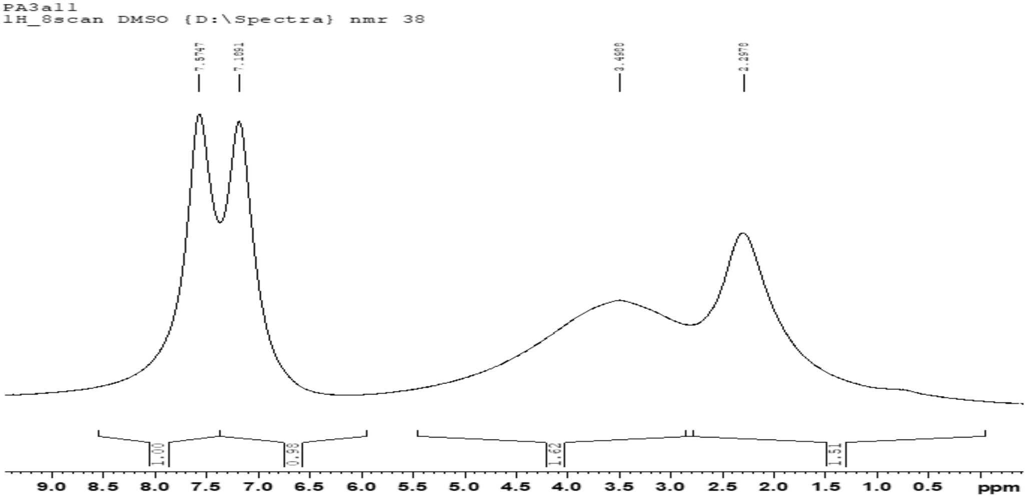
^{1}HNMR Study Co metal complex : The NMR shows following peaks 7.2 (s, 2H, NH2), 7.7 (m, 10 Ar-H), .as shown in graph **C**

C) **1HNMR monograph of Co metal**



^{1}HNMR Study Fe metal complex : The NMR shows following peaks 7.21 (s, 2H, NH2), 7.78 (m, 10 Ar-H), .as shown in graph **D**

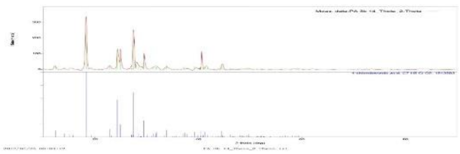
D) ^{1} H NMR monograph of Fe metal



XRD analysis of metal complex :

X-ray diffraction spectroscopy figure E and F anaylsis carried out . metal complex exhibited peak of 2 theta of cobalt complex 2theta is 18 radian peak at (112) and 2 theta of Fe complex 27 degree radian peak at (111) respectively. XRD analysis proved that complex have perfect crystalline structure**.**

E) XRD Graph for Co metal complex F) XRD Graph for Fe Metal complex :



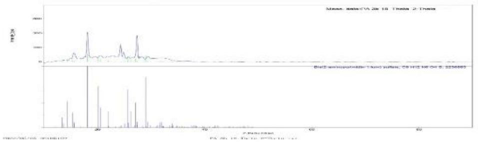


Table 1: Physical data of synthesized compound

Sr. no.	Compound	Molecular formula	Melting point	colour of compound	% yield	% of N
1	ANDT	$C_{13}H_{12}ClN_4O$	273	yellowish	68.67%	23.5
2	Fe[ANDT]$_2$.Cl$_2$ complex	$C_{26}H_{24}N_8O_2$	285	Brown	78.55 %	23.32
3	Co[ANDT]$_2$.Cl$_2$ complex	$C_{26}H_{24}N_8O_2$	289	Green	69.50%	23.32

Biological Study:

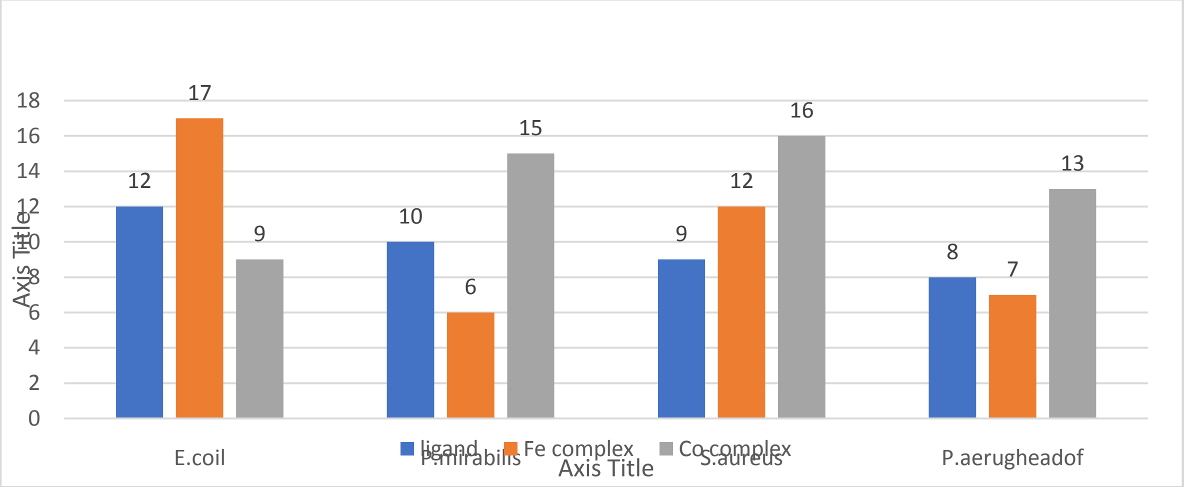
Above synthesized triazine derivatives and their metal complex have been studies for their antimicrobial activity of against Escherichia coil, Proteus mirabilis, Staphylococcus aureus ,P. aeruginosa . The culture of each species was incubated at 37 ^{O}C and the zone of inhibition was measured after 24 hr. Most of these compounds were found active. As shown in table 2 and graph G.

Table No.2- Antimicrobial activity

Sr. No.	**Compound**	**Antimicrobial activity**			
		E.coli	***P.mirabilis***	***S. aureus***	***p.aeruginosa***
1	Ligand	12	10	09	08
2	Fe Complex	17	06	12	07
3	Co Complex	09	15	16	13

Strongly active range : 15-18 mm , weakly active range : 7-10 mm Moderately active range : 11-14 mm

G) graph Antimicrobial activity :



CONCLUSION:

Characterization of synthesized triazine and their metal complex are done by FTIR ,^{1}HNMR , XRD are done as explained in result and discussion as above. Thus from above result it was observed that the heterocyclic compound were found effective against *Escherichia coil* , *proteus mirabilis, staphylococcus aureas,* and *P . aeruginosa* so all synthesized compound can easily be used for the treatment of disease caused by these above pathogens only when they does not have poisons and no other side effects.

Acknowledgement:

The authors are thankful to head of department of chemistry Government Vidarbha institute of science and Humanities, Amravati their valuable guidance and cooperation .

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