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RESEARCH ARTICLE

Synthesis, Characterization, Antimicrobial Activity of Some Isatin-3hydrazone Schiff base

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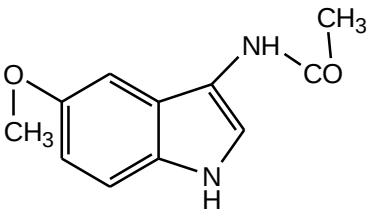
Abstract

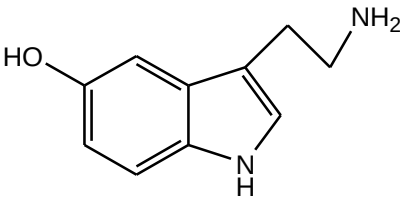
In this paper, we synthesized some isatin 3hydrazone Schiff base that are Isatin -3-(methyenel)-hydrazone, Isatin -3-(ethyenel)-hydrazone, Isatin -3-(propylidene)-hydrazone by the reaction of isatin 3 hydrazone and different aldehydes. Structural analysis was done by 1HNMR, 13CNMR, and IR data. After that its antimicrobial activity was done by disk diffusion technique. All tested compounds tested against the three bacteria and two fungi and result reveal that Schiff base Isatin -3-(propylidene)-hydrazone show good anti microbial activity compare to other synthesized Schiff base.

INTRODUCTION

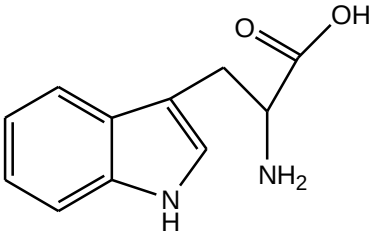
Indole is an aromatic heterocyclic compound that has bicyclic structure and it is a strong pharmacodynamic nucleus and has shown variety of important biological property such as antioxidant, anti bacterial, anti-inflammatory, anti convulsant property [1-3]. It also works as precursor of many pharmaceuticals. Indole is present in many important biological compounds like tryptophan; it is a significant indole derivative while serotonin and melatonin are biologically active molecule. Melatonin has significant role in the protection of nuclear and mitochondrial genetic material that is DNA. Melatonin works as mediator of circannual reproductive rhythms and circadian cycles [4] and it has oncostatic effect [5].



Melatonin



Serotonin



Tryptophan

And work as strong free radical scavengers, indirect antioxidant [6-7] Serotonin is a monoamine neurotransmitter and it is biochemically derived from tryptophan and known as feeling harmone.

Among the indole derivatives indole-2,3-dione(i.e. isatin) is also synthetically versatile heterocyclic compound is known to act as a potent endogenous neurochemical regulator in brain of mammals [8-9] and isatin also work as modulator of different kind of biochemical processes like inhibitor of monoamine oxidase(MAO) and later on identified as a selective inhibitor of monoamine oxidase B[10-11]. Further investigation has proved that isatin work as an antagonist of both atrial Natriuretic peptides stimulated [12] and nitric oxide stimulated guanylate cyclase activity [13]. Rat model shows that in stress condition satin level increase in blood plasma, brain, heart and also in urinary output. In vivo satin administration causes dose- dependent behavior effect, anxiety at low doses and sedation at higher doses [14-16]. This reveals that various biochemical mechanisms are involved in these diverse effects. On other hand route for synthesis and metabolism of isatin in animal tissue have not been fully recognized.

It has assumed that satin forms in the tissue from phenylalanine or tryptophan [17-18]. In recent year, the chemistry of Schiff base have received lots of attention due to their wide range of application in synthetic, biological, pharmacological, clinical purpose. They are biologically active compound and show different activity like anti bacterial, anti fungal [19-24], anti tumor [25-26]. Schiff base is easily synthesized by the condensation reaction between primary amine and different aldehydes and ketones. Schiff base is easily formed complex with metals, because they have =C=N- group in which nitrogen atom donate our lone pair of electron to the metal ions. These also have great importance in homogeneous and heterogeneous reaction and show different activity, activity of these complex varied from ligand to ligand because presence of different number and nature of coordination site. Heterocyclic compound which contain sulphur /nitrogen atom show verity of application. One of the most important heterocycles in medicinal chemistry is indole2,3 di-one. Metal complex of this compound exhibit verity of biological activity [27-29]

In this paper we are synthesise some Schiff base which are derived by the reaction between isatin 3 hydrazone and different aldehydes and done its antimicrobial study by disk diffusion technique.

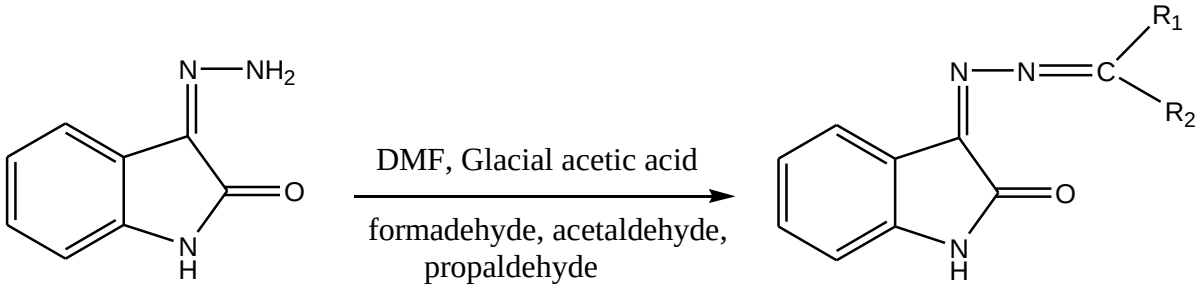
2. Experimental

2.1. Chemicals and apparatus

Chemicals purchased from Sigma-Aldrich, Himedia and used without purification. Melting point was determined by using open capillary tube melting point apparatus. The IR spectra were recorded on a FTIR Shimadzu-8400S spectrometer using KBr pellets. The 1HNMRand 13CNMR spectra were recorded on Varian 300 spectrometer taking TMS as standard and DMSO as a solvent. Sonication was done with the help of frontline sonicator (with a frequency of 22 KHz with a normal power of 225W).

2.2 Synthesis reaction scheme-

Isatin-3hydrazone and appropriate aldehydes and ketones were dissolved in 30ml DMF in presence of protonation reagent i.e. glacial acetic acid (.01ml) was kept at 60ºC on water bath for 30 min with continuing stirring. The purity of compounds was checked by TLC using Merck pre-coated gel GF aluminum plates. Benzene: chloroform: methanol taking as a mobile phase. The reaction mixture was poured into water (300ml) and recrystalization done by ethanol as a solvent.



isatin 3 hydrazone

	R1	R2
1a	H	H
1b	H	CH3
1c	H	C2H5

1(a-c)

2.3. Characterization-

2.3.1. Isatin -3-(methyenel)-hydrazone(**1a):** FTIR (KBr) (V_{max} cm^{-1}): 1340 (C-N), 1668 (C=O), 1583 (C=C), 3450 (N-H), 1222 (C-O), 3305 (N-N),1450(H-C-H) ,^{1}HNMR (300 MH_Z, DMSO, TMS, δppm): 7 (m, 8H, H_{Ar}), 3.8 (s, 2H, CH_2), 10.7 (s,, H_{enolic}), 8.3 (d, 1H, NH) ; ^{13}CNMR (400 MH_Z, $CDCl_3$, δppm) δ_c: 162,131,125, 138, 165.

2.3.2. Isatin -3-(ethyenel)-hydrazone(**1b):** FTIR (KBr) (V_{max} cm^{-1}): 1341 (C-N), 1664 (C=O), 1580 (C=C), 3445 (N-H), 1220 (C-O), 3305 (N-N),1378(H-C-CH3) ,^{1}HNMR (300 MH_Z, DMSO, TMS, δppm): 7 (m, 8.1H, H_{Ar}), 7.20

(s,CH), 2.53(s, CH3), 10.7 (s,, H_{enolic}), 8.3 (d, 1H, NH) ; ^{13}CNMR (400 MH_Z, $CDCl_3$, δppm) δ_c: 43, 162,131,125, 139, 165.

2.3.3. Isatin -3-(propylidene)-hydrazone(**1c):** FTIR (KBr) (V_{max} cm^{-1}): 1344 (C-N), 1660 (C=O), 1570 (C=C), 3405 (N-H), 1223 (C-O), 3305 (N-N), 2968(C-H2C-CH3) ,^{1}HNMR (300 MH_Z, DMSO, TMS, δppm): 7 (m, 8.1H, H_{Ar}), 7.52(s,CH), 1.54(t, CH3), 1.9(q ,CH2), 10.7 (s,1H,H_{enolic}), 8.3 (d, 1H, NH) ; ^{13}CNMR (400 MH_Z, $CDCl_3$, δppm) δ_c: 60, 163,134,124, 129, 139,

2.4 ***In vitro antimicrobial activity-***

Anti bacterial and anti fungal activity was performed by disk diffusion method. In this study we have taken three bacteria and two fungi. The tested compounds solution was prepared in DMF taking as a solvent. The bacteria which are used in this study are *Bacillus pumillus, E.coli, Pseudomonas aureuginosa,*and fungi are *Aspergillus niger* and *Candida albicance.* All bacteria were grown on Mueller-Hintongar plates(37C, 24 h) and fungi were grown on potato dextrose agar plate(26C, 48h). Result was shown by clear zone of inhibition around tested compounds. The standard drug taken for anti bacterial study is streptomycin and for anti fungal activity is Gentamycin.

2.5 RESULTS AND DISCUSSION-

Schiff base are synthesized by the reaction between isatin3 hydrazone and different aldehydes. Table 1 contain detail information related to physical data of compound like molecular weight, formula, percentage yield, melting point. The detail information about antimicrobial activity of synthesized Schiff base are given in table 2 and figure 1, result show that compound 1c show good anti bacterial as well as anti fungal activity.

Table1: physical and elemental data analysis

s.no	compound	Substituent	Molecular formula	Melting point	Molecular weight	% yield
1.	1a	HCHO	$C_9H_7N_3O$	198-201	173	85.52
2.	1b	CH_3CHO	$C_{10}H_9N_3O$	171	187	89.30
3.	1c	C_2H_5CHO	$C_{11}H_{11}N_3O$	198-200	201	79.30

Table2: data related to antimicrobial activity of synthesized compound 1(a-c)

S.No.	Microbs	COMPOUNDS (MIC Values) µg/100ml		
		1a	1b	1c
1.	*Bacillus pumillus*	500	500	50
2.	*E.coli,*	500	250	250
3.	*Pseudomonas aureuginosa*	250	500	50
4.	*Aspergillus niger*	500	250	250
5.	*Candida albicance*	250	500	250

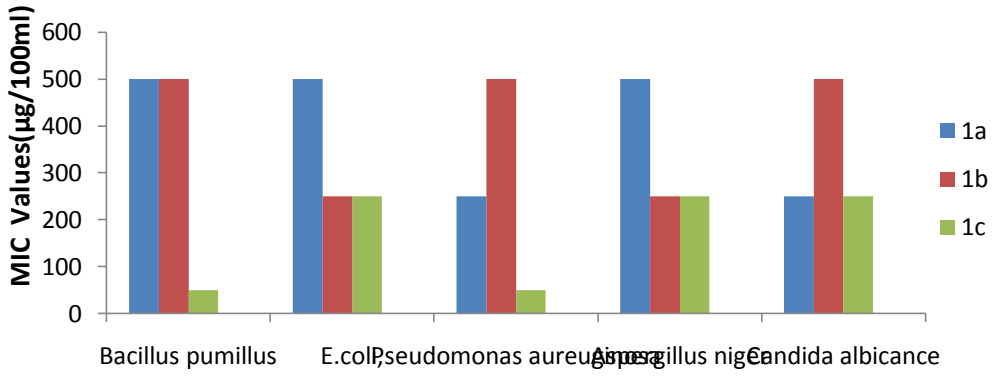


Fig1. Comparative antimicrobial activity of synthesized compound 1(a-c)

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