Synthesis and Characterization of Novel Schiff's base derivatives and Evaluation of their Biological activities

[1]YALAMANCHILI PRAHARSHA, [2]G. SOWMYA SREE, [3]D. DEVI SRI SATYA, [4]J. DINESH NAYAK, [5]D. MOUNIKA

[1]Assosiate Professor
Department of Pharmaceutical Chemistry,
Marri Laxman Reddy Institute of Pharmacy
Mandal Qutubullapur, Dundigal, Hyderabad–500 043, Telangana, India

***Abstract*- Over the past decade, the synthesis of heterocyclic compounds has become one of the main areasof interest in synthetic chemistry owing to their potential role in various biological activities as anti-inflammatory, anthelminthic,analgesic, antioxidant, antibacterial, antifungal agents and many more pharmacological activities. Thus, in view of the diverse therapeutic activity and pharmacological significance of these compounds present study aimed at synthesizing the same by a simple and efficient procedure using substituted aldehydes and aromatic amines and also evaluation of their *invitro* anti-inflammatory and *invitro* antioxidant properties. We have been successful in synthesizing novel Schiff's bases and proved to have potent biological activities.**

***Index terms:* Schiff's base, Substituted aromatic amines, aldehydes, *invitro* anti-inflammatory and *invitro* antioxidant activities.**

I. Introduction:

Schiff bases are aldehyde or ketone like compounds in which the carbonyl group is replaced by an imine or azomethine group. These are widely used as they exhibit a broad range of biological activities like anti-inflammatory, antibacterial, analgesic, antifungal. So we aimed to synthesis novel Schiffs bases using various aldehydes and substituted aromatic amines. We also focused in evaluating these novel Schiff's bases for antibacterial, anti-inflammatory and antioxidant activities.

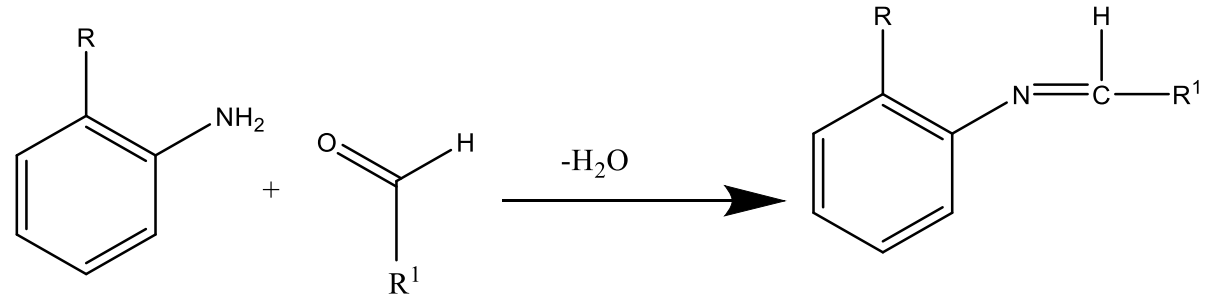
II. Materials:

All chemicals used in this work were of laboratory grade procured from Hi-Media, E-Merck, and Loba chemicals etc. The percentage yield was based upon the products obtained after purification and recrystallization. The melting points of the compounds were determined in one-end open capillary tubes and are uncorrected. Porous silica gel plates activated at 110°C for 30 min. were used for thin layer chromatography (TLC) and were developed with Iodine vapours. I.R spectra were recorded on Perkin Elmer Model 283B using potassium bromide (KBr) pellet and the wave numbers were given in cm^{-1}.

III. Methodology [1,2]:

Scheme:

The scheme specified below is employed for synthesizing novel Schiff's base derivatives.



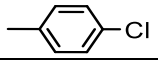
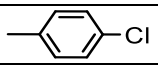
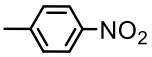
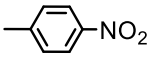
Substituted amine substituted aldehyde Schiff's base derivatives

Various aldehyde (0.01mol) and substituted aromatic amine (0.01mol) were taken in mortar and water (10ml) was added and reaction mixture was ground for 15-30 minutes. On completion of reaction, water (5ml) was added and stirred. Separated solid was filtered and allow it to dry in hot air oven or air dried to give corresponding Schiff bases. Purification is carried out by recrystallization method and yield is calculated. The complete reaction process was monitored by TLC method.

IV. Results:

The compounds that were synthesized using the above scheme are as follows:

Table:1 List of compounds synthesized.

S.No	Compound	R	R_1	% Yield	Solubility	Melting point
1	1a	-H		72%	Methanol	50-55 ℃
2	1b	$-NH_2$		65%	Methanol	150-153℃
3	2a	-H		82%	Ethanol	80-84℃
4	2b	$-NH_2$		82%	Ethanol	196-199℃
5	3a	-H	-H	58%	Ethanol	60-62℃
6	3b	$-NH_2$	-H	52%	Methanol	57-60℃

***Invitro* anti-inflammatory activity[3,4]:**

Invitro anti-inflammatory activity of synthesized derivatives was tested by Protein Denaturation method. % inhibition of denaturation was measured taking synthesized compounds at a concentration of 10, 20, 30 and 40µg/ml. % inhibition of denaturation of test compounds were compared with standard i.e 10µg/ml Ibuprofen.

***Invitro* Antioxidant activity[5,6]:**

A solution of hydrogen peroxide (40mM) was prepared in phosphate buffer (pH 7.4). Different concentrations (10, 20, 30 and 40 µg /ml) of the synthesized compounds were added to hydrogen peroxide solution (0.6mL, 40mM). Absorbance of hydrogen peroxide at 230nm was determined after 10 minutes against a blank solution containing phosphate buffer without hydrogen peroxide. Ascorbic acid was used as the positive control. The ability of the compounds to scavenge the H_2O_2 was calculated using the following equation:

H_2O_2 percentage scavenging activity $=[(A_0-A_1)/A_0] \times 100$

where: A_0 = Absorbance of control, A_1 = Absorbance of sample.

Table: 2 FT-IR Characterization of synthesized Schiff's base derivatives

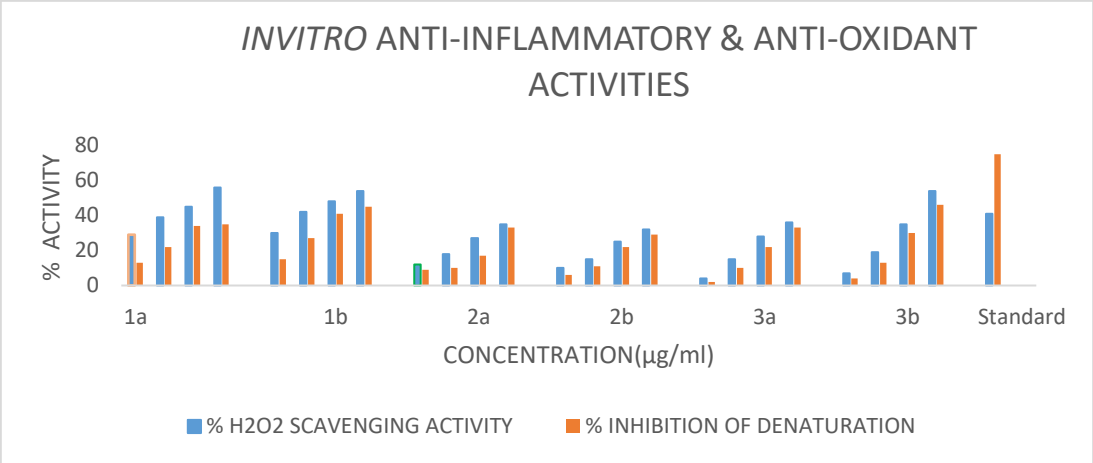
S.No	Compound	IR-cm^{-1} (KBR)
1	**1a**	826 (C-Cl), 1620 (C=C), **1579 (C=N),** 1402(C-N), 3061 (C-H).
2	**1b**	826(C-Cl), 1627(C=C), **1597 (C=N)**, 1340 (C-N), 2854 ($N-H_{stretching}$), 1627($N-H_{bending}$), 3060(C-H).
3	**2a**	**1590 (C=N),** 1620 (C=C), 3010(C-H), 1350(C-N), 1525(N-O $_{stretching}$)
4	**2b**	**1590 (C=N),** 1620(C=C), 3040(C-H), 1350(C-N), 2900(N-H $_{stretching}$), 1625($N-H_{bending}$), 1525 (N=O $_{stretching}$)
5	**3a**	**1596 (C=N),** 3065(C-H), 1624(C=C), 1345(C-N)
6	**3b**	**1595(C=N),** 3065(C-H), 1620(C=C), 1350 (C-N), 1610 (N-H), 2900($N-H_{stretching}$)

Table: 3 Results of *Invitro* anti-inflammatory and *Invitro* anti-oxidant activities.

S.No	COMPOUND	CONCENTRATION (mg/ml)	**% H_2O_2 SCAVENGING ACTIVITY**	**% INHIBITION OF DENATURATION**
1		10	29	13
2		20	39	22
3		30	45	34
4	1a	40	56	35
5		10	30	15
6		20	42	27
7		30	48	41
8	1b	40	54	45
9		10	12	9
10		20	18	10
11		30	27	17
12	2a	40	35	33
13		10	10	6
14		20	15	11
15		30	25	22
16	2b	40	32	29
17		10	4	2

18		20	15	10
19		30	28	22
20	3a	40	36	33
21		10	7	4
22		20	19	13
23		30	35	30
24	3b	40	54	46
25	Standard	10	41	75

Figure 1: *Invitro* anti-inflammatory and *Invitro* anti-oxidant activities of synthesized derivatives.



V. Conclusion:

All the novel Schiff's bases synthesized were evaluated for the above screening studies and observed to have good to moderate *invitro* anti-inflammatory and *invitro* antioxidant activities. The current work concludes, among all the synthesized derivatives compound **1b** showed promising results when compared with standard for both biological activities and compound **3b** showed good *invitro* anti-inflammatory activity at 40mg/ml, **1a** showed good *invitro* anti-oxidant activity at 40mg/ml and **1b** and **3b** showed similar activities at 40mg/ml.

It was clearly demonstrated that the introduction of the appropriate electron withdrawing group on the basic scaffold lead to potent derivatives. Therefore, these compounds would represent a useful process for the development of a new class of clinically useful *invivo* anti-inflammatory and antioxidant drugs and deserve further investigation and derivatization.

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Conflict of Interest: All the authors declared that there is no conflict of interest.

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