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Synthesis and Biological Activity a New Substituted Schiff Bases

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Abstract: Schiff bases are synthesized by different methods by the condensation between primary amines and aldehyde or ketones. From literature survey, it was cleared that many work on Schiff bases is going on. But each work is only concerns with conventional method and grinding method. But very few reports were observed on synthesis of Schiff bases by green approach. Therefore, in present work some substituted Schiff bases are prepared from primary amines and substituted aromatic aldehydes. Eight new series of biologically active variously substituted Schiff bases with general formula, R1N=CHR2. With differently substituted aromatic aldehydes were synthesized by microwave irradiation technique. Such compounds were characterized by different physico-chemical techniques like, melting point, elemental analysis, IR . The Compounds have been screened for their in vitro biological activities against bacteria and fungi.

Keywords: Schiff bases, Aromatic aldehyde, antibacterial, antifungal.

1. Introduction

A Schiff base is a nitrogen analog of an aldehyde or ketone in which the C=O group is replaced by RC=N group. It is usually formed by condensation of an aldehyde or ketone with a primary amine. Schiff bases have a large number of synthetic uses in organic chemistry. The research on the chemistry of Schiff bases has been a focus of attention for chemists for several years; due to their wide spread diversified biological activities. Schiff bases, also known as azomethines due to they have RC=N group, play important roles in biological systems. They are facing a growing interest due to their various applications, e.g. as insecticidal[1], antibacterial[2], antituberculosis[3], antimicrobia[4], anticonvulsant[5], antifeedant[6] etc.

2. Method and Material

2.1 Typical experimental procedure:

3, 4, 5 trihydroxy-benzohydrazide:

3, 4, 5-trihyydroxy benzohydrazide was synthesized by refluxing propyl gallete (0.01mol) and hydrazine hydrate in presence of 25 cm3ethanol for about 6 hrs. While refluxing 2-3 drops of conc. H2SO4 was added. After refluxing the crude compound was filtered and washed with distilled water. It was then recrystallized from ethanol. This compound is further used for the synthesis of substituted Schiff bases.

1. 3, 4, 5 trihydroxy benzoamido-4-methylimine.

0.01 mol.3, 4, 5 trihydrox y benzohydrazide was mixed with equimolar amount of p-methyl benzaldehyde. In this reaction mixture Dimethyl sulphoxide was added as solvent .It was then irradiated to microwave. After completion of reaction, the crude product was washed with distilled water and recrystallized from ethanol.

IR:(ν max) cm^{-1}**:** 3420 (OH),1617.72(C=N), 1563,1484.13 (C=C Aromatic), 1400 (-CH3)

Yield: 82%, time required for completion of reaction:40 sec.

2. 3, 4, 5 trihydroxy benzoamido-4-nitroimine.

0.01 mol. 3, 4, 5 trihydrox y benzohydrazide was mixed with equimolar amount of p-nitro benzaldehyde. In this reaction mixture Dimethyl sulphoxide was added as solvent .It was then irradiated to microwave. After completion of reaction , the crude product was washed with distilled water and recrystallized from ethanol.

IR: (ν max) cm-1**:** 3420(OH), 1596.19(C=N), 1522, (C=C Aromatic), 1289.7(NO2), 842.5(p sub)

Yield: 67%, time required for completion of reaction: 51 sec.

3. 3, 4, 5 trihydroxy benzoamido-4-hydroxyimine

0.01 mol.3,4,5 trihydroxy benzohydrazide was mixed with equimolar amount of p-hydroxy benzaldehyde. In this reaction mixture Dimethyl sulphoxide was added as solvent .It was then irradiated to microwave. After completion of reaction, the crude product was washed with distilled water and recrystallized from ethanol.

IR: (ν max) cm-1**:** 3190(OH), 1605(C=N), 1585, 1560, 1525 (C=C Aromatic), 1H.

Yield: 78%, time required for completion of reaction: 44 sec.

4. 3, 4, 5 trihydroxy benzoamido-4-chloroimine.

0.01 mol. 3, 4, 5 trihydroxy benzohydrazide was mixed with equimolar amount of p-chloro benzaldehyde. In this reaction mixture Dimethyl

sulphoxide was added as solvent .It was then irradiated to microwave. After completion of reaction, the crude product was washed with distilled water and recrystallized from ethanol.
IR: (ν max) cm-1**:** 3045(OH), 1622.18(C=N), 1588.8,1484 (C=C Aromatic), 819.6(p sub.Cl)
Yield: 69%,time required for completion of reaction: 51 sec.

5. 3, 4, 5 trihydroxy benzoamido-4bromoimine.

0.01 mol. 3, 4, 5 trihydroxy benzohydrazide was mixed with equimolar amount of p-bromo benzaldehyde. In this reaction mixture Dimethyl sulphoxide was added as solvent .It was then irradiated to microwave. After completion of reaction, the crude product was washed with distilled water and recrystallized from ethanol.
IR: (ν max) cm-1**:** 3422(OH), 1623.8(C=N), 1583, 1481 (C=C Aromatic), 699.9(Br)
Yield: 80%,time required for completion of reaction: 1min.02 sec

6. 3, 4, 5 trihydroxy benzoamido-4-fluoroimine.

0.01 mol.3,4,5 trihydroxy benzohydrazide was mixed with equimolar amount of p-fluoro benzaldehyde. In this reaction mixture Dimethyl sulphoxide was added as solvent .It was then irradiated to microwave. After completion of reaction, the crude product was washed with distilled water and recrystallized from ethanol.
IR: (ν max) cm-1**:** 3400(OH), 1630(C=N), 1506 (C=C Aromatic), 1153.7(fl)
Yield: 77%, time required for completion of reaction: 45 sec

7. 3, 4, 5 trihydroxy benzoamido-4-methoxylimine.

0.01 mol. 3, 4, 5 trihydroxy benzohydrazide was mixed with equimolar amount of p-methoxy benzaldehyde. In this reaction mixture Dimethyl sulphoxide was added as solvent .It was then irradiated to microwave. After completion of reaction ,the crude product was washed with distilled water and recrystallized from ethanol.
IR: (ν max) cm-1**:** 3305(OH), 1618(C=N), 1595, 1570, 1520 (C=C Aromatic).
Yield: 71%, time required for completion of reaction: 56 sec

8. 3, 4, 5 trihydroxy benzoamido-4-iodoimine.

0.01 mol.3, 4, 5 trihydroxy benzohydrazide was mixed with equimolar amount of p-iodo benzaldehyde. In this reaction mixture Dimethyl sulphoxide was added as solvent .It was then irradiated to microwave. After completion of reaction, the crude product was washed with distilled water and recrystallized from ethanol.

IR: (ν max) cm-1**:** 3447(OH), 1617(C=N), 1576, 1549 (C=C Aromatic), 620.5(-I)
Yield: 75%,time required for completion of reaction: 50 sec

3.Biological Activity

3.1. Antibacterial Activity

Procedure:

The antibacterial activity was measured by agar cup method. The bacterial cultures selected were, two gram negative cultures viz. Escherichia coli; Salmonella typhi and two Gram positive cultures viz. Staphylococcus aureus, Bacillus subtilis. This seeded preparation was then poured in sterile Petri plate under aseptic condition and allowed it to solidify. Cups of 10mm diameter were borered in the agar plate with sterile cork borrer. 100. ~I ·of compound solution prepared in Dimethyl Sulphoxide (1%) was added in the cup under aseptic condition with the help of micropipette. 100 ul of DMSO was also placed in one of the cup as blank (negative control). A standard antibiotic disk impregnated with 10 units of Penicillin was also placed on the seeded nutrient agar surface as standard reference antibiotic (positive control). Plates were incubated at 37°C for 24 hours. After incubation the average zone of inhibition was recorded in mm. (8-19).

3.2 Antifungal Activity

Procedure:

Antifungal activity was performed by Poison plate method. The medium used was Potato Dextrose Agar (Himedia). The medium was prepared and sterilized at 10 Psi in autoclave for 15 minutes. Then the compound to be tested is added to the sterile medium in aseptic condition so as to get final concentration as 1%. A plate with DMSO was prepared as blank (negative control) similarly a plate with 1% Gresiofulvin was prepared as standard reference plate (positive control). Aspergillus niger, Penicillium chrysogenum, Fusarium moneliforme. Aspergillus flavus were selected as test fungal cultures. They were allowed to grow on slant for 48 hours so as to get profuse sporulation. The fungal suspension was spot inoculated on the plates prepared using. Compound with the help of nicrome wire loop. The plates were incubated at room temperature for 48 hours. After incubation, plates were observed for the growth of inoculated fungi.
Method - Agar Cup method

4. Result and Discussion

4.1 Antibacterial Activity: The results of the antibacterial screening of the Schiff bases at a concentration of 20mg/ml against all bacteria have been

found. The inhibition zones were measured in mm and results are shown in following table. The results of antimicrobial screening indicate that substituted Schiff bases show significant activity against Staphylococcus aureus, Escherichia coli, Bacillus subtilis and almonella typhi. When we increase concentration, area of inhibited growth also increased.

Sr. No.		Compound	*Aspergillus niger*	*Penicillium chrysogenum*	*Fusarium moneliforme*	*Aspergillus flavus*
01	a	3,4,5trihydroxy benzoamido-4-bromoimine	+ve	+ve	+ve	+ve
02	b	3,4,5trihydroxy benzoamido-4-nitroimine	-ve	-ve	-ve	+ve
03	c	3,4,5trihydroxy benzohydrazide+p methyl benzaldehyde	+ve	-ve	-ve	+ve
04	d	3,4,5trihydroxy benzoamido-4-iodoimine	+ve	+ve	+ve	+ve
05	e	3,4,5trihydroxy benzohydrazide+p hydroxybenzaldehyde	-ve	-ve	-ve	-ve
06	f	3,4,5trihydroxy benzoamido-4-fluroine	-ve	-ve	-ve	RD
07	g	3,4,5trihydroxy benzoamido-4-chloroimine	-ve	-ve	-ve	-ve
08		+ve control	+ve	+ve	+ve	+ve
09		-ve control (Griseofulvin)	-ve	-ve	-ve	-ve

4.2 Antifungal Activity: From the results obtained by the antifungal activity it is found that the compounds e, f and g active against all tested fungi. The greater activity of these compounds is probably due to the presence of hydroxyl group, fluoro and chloro group. Compound b show good activity against all tested fungi as compared to standard drug.
The antifungal activity results are shown in Table.

Sr. No.	Compound	*Escherishia coli*	*Salmonella typhi*	*Staphylococcus aureus*	*Bacillus subtilis*
01	1	32 mm	27 mm	22 mm	18 mm
02	2	28 mm	22 mm	20 mm	17 mm
03	3	30 mm	22 mm	19 mm	17 mm
04	4	14 mm	-ve	13 mm	13 mm
05	5	23 mm	16 mm	17 mm	18 mm
06	6	-ve	-ve	12 mm	-ve
07	7	19 mm	-ve	14 mm	-ve
08	8	40 mm	32 mm	30 mm	36 mm
09	DMSO	- ve	-ve	-ve	-ve
10	Penicillin	24 mm	19 mm	34 mm	18 mm

Legends- +ve - Growth (No Antifungal Activity)
-ve - No Growth (Antifungal Activity Observed)
RG - Reduced Growth (Moderate Activity)

5. Conclusion

Schiff bases of substituted aldehydes were synthesized and characterized by analytical and spectral techniques. These compounds exhibited significant activity against all the tested microorganisms.

Referances

1. S. S. Murthy, A. Kaur, B. Sreenivasalu and R. N. Sarma, *Indian J. Exp. Biol*., **36** (1998) 724.
2. K. N. Venugopala and V. A. Jayashree, *Indian J. Pharm. Sci*., **70**(2009)88.
3. N. Solak and S. Rollas, ARKIVOC, **xii** (2006) 173.
4. S. J. Wadher, M. P. Puranik, N. A. Karande and P. G. Yeole, *Int. J. Pharm Tech Res*.,**1** (2009) 22.
5. M. Verma, S. N. Pandeya, K. N. Singh and J. P. Stables, *Acta Pharm.*, **54** (2004).
6. S. S. Murthy, A. Kaur, B. Sreenivasulu and P. N. Sarma, *Indian J. Exp. Biol*., **36**(1998)724.
7. K. Coleman, Drug Discov. Today, *Therapeutic Strategies*, **1** (2004) 455–460.

8. R. D. Smyth, *Clinical analysis, Microbiology, Remington's Pharmaceutical Sciences 18th Edition*, Mack Publishing Company Peninisilvenia, 1991, 524-527

9. *Biological Assay*, Indian Pharmacopoeia, Controller of publications, Govt. of India 1996(2): A-88.

10. Pelczar, Reid and Cohn, *Antibiotics and Other Chemotherapeutic Agent Microbiology*, TMH Edition, TATA-McGraw-Hill Publishing Houses, 1989, 466-93

11. W. Harry, *Antiseptic and Disinfectant Action, Microbes in Action*, A Laboratory manual in Microbiology 1982, 75-76.

12. W. W. Davis, T. R. Stout, *Appl Environ Microbiol*., **22(4)** (1971) 666-670.

13. M. K. Lalitha, *Manual on Antimicrobial Susceptibility Testing* (Under the Auspices of Indian Association of Medical Microbiologists).

14. Microbial Assays, *In Practical Microbiology*, (S. R. Gaud), Nirali Publication, **4** (2006) 111-116.

15. *Basics of Microbiology*, Cooper and Gunn's Tutorial Pharmacy, (S. J. Carter), *6*, CBS Publishers and Distributors: 2005, 289-366.

16. J. M. Andrews, *Jour. of Antimicro. Chemotherapy*, **48** (2001) 5-11.

17. J. P. Phair, C. Watanakunakorn, T. Bannister, *American Society for Microbiology*, **18(3)** (1969) 303-306.

18. K. L. Therese, R. Bagyalakshmi, H. N. Madhavan and Deepa P., *Indian Jour. of Med. Microbio*., **24(4)** (2006) 273-279.

19. C. R. Kokare, Pharmaceutical Microbiology, *Experiments and Techniques. 2nd ed., Career Publications*, (2007), 139-142.

20. L. M. Prescott, J. P. Harley and D. A. Klein, *Microbiology, 2nd ed., WC Brown Publishers*, Oxford, England, 1990, 328.