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Research Article

Synthesis, Characterization and Antimicrobial Activity Analysis of Some New Schiff Bases.

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ABSTRACT
Schiff bases are generally one of the most commonly used organic moieties. They shows wide variety of applications in diverse fields including biological, analytical and inorganic chemistry they used as catalysts, pigments and dyes, intermediates in organic synthesis. Herein we report novel fluorine containing Schiff bases from 3-(5-bromothiophen-2-yl)-1-(4-fluorophenyl)-1H-pyrazole-4-carbaldehyde and fluoroaniline. All synthesized Schiff bases were well characterized by spectral analysis and were screened for antimicrobial activity and successfully reported to show moderate activity.

KEYWORD
Schiff bases, Pyrazole aldehyde, fluoroaniline, antimicrobial, Gram+ve and Gram–ve microorganisms.

1. INTRODUCTION

Hugo Schiff invented Schiff base, which was named after him. These are the compounds with a functional group those possess a carbon-nitrogen double bond in which the nitrogen atom is connected to an alkyl or aryl group, not to hydrogen. Generally Schiff bases represented as the general formula R1R2C=NR3, where R is an organic side chain. A few of them are restricted to the secondary aldimines (like azomethines in which carbon is attached to a hydrogen atom) with general formula RCH=NR'[1-3]. Schiff bases are the bimolecular condensation products of primary amines and aldehydes represent important intermediates in organic synthesis and at the same time compounds with a variety of applications[4]. Schiff bases are significant class of compounds because of their flexibility, structural similarities with natural biological substances and secondly due to presence of imine (N=CH-) which imports in elucidating the mechanism of racemization and transformation reaction in biological system[5].These compounds might be act as valuable ligands whose biological activity has been shown to increase on complexation[6].

Among the organic reagents essentially used, Schiff bases possess outstanding characteristics, structural similarities with natural biological substances, comparatively simple preparation procedures and the synthetic flexibility so as to enables design of suitable structural properties[7,8].

Schiff-bases are considered as extremely important class of organic compounds which showing a large application in numerous biological aspects, visual pigments, proteins, enzymatic aldolization and decarboxylation reactions[9]. Schiff bases shows the number of biological applications including antibacterial [10-15], antifungal [12-15] and antitumor activities [16,17].

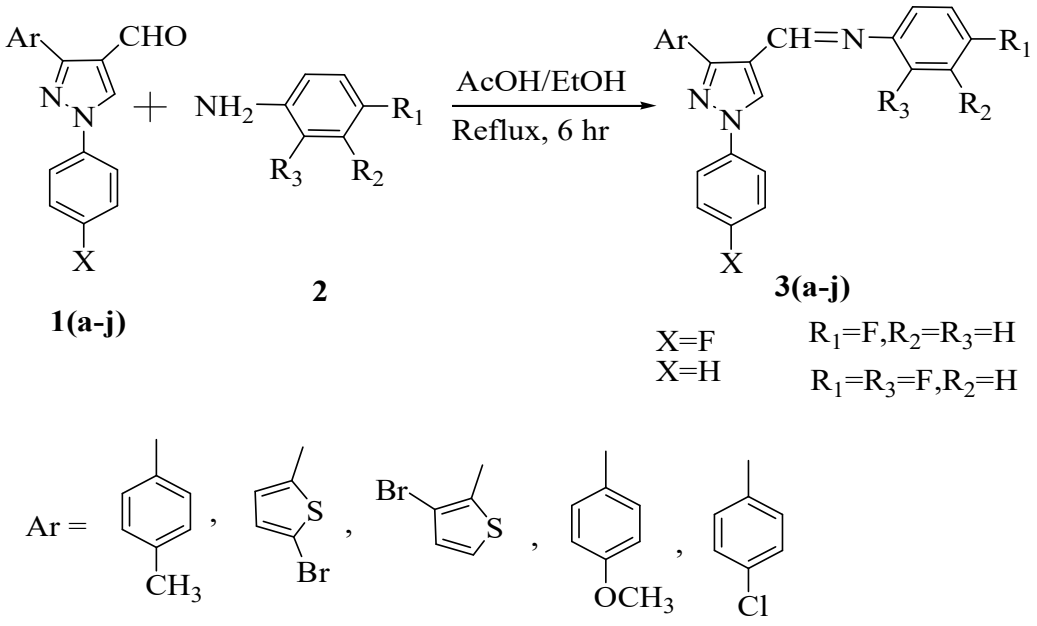
2. MATERIALS AND METHODS

For the synthesis of the compounds, all chemicals used were obtained especially from SD Fine chemicals and Sigma Aldrich. Using simple open capillaries, Melting points were recorded and which are uncorrected. By using DMSO-d_6 as solvent and TMS as an internal standard, ^{1}H NMR spectra were recorded in 400 MHz NMR Spectrophotometer. By using FT-IR Spectrophotometer Model RZX (Perkin Elmer), the infra-red spectra were recorded. Mass spectra were recorded on Macromass mass spectrophotometer (Waters) generally using electro-spray method (ES). The purity of the prepared compounds was checked by TLC. TLC silica gel coated plates generally obtained from Merck whereas stationary phase and mobile phase were the mixture of ethyl acetate/hexane (20:80).

2.1. General procedure

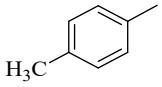
In 10ml ethanol containing few drops of glacial acetic acid, a mixture of 4-formyl pyrazole 1(1.0gm, 0.0030mol) and aniline 2 (0.39ml, 0.0036mol) was refluxed for 3-5hr. After the completion of reaction (checked by using TLC), the remaining solvent was removed on rotary evaporator to yield solid. This product was washed with petroleum ether and recrystallized in ethanol. The compounds 3(a-j) were prepared by following the above general procedure. Physical data are recorded in Table 1. Their structures have been confirmed by using IR, ^{1}H NMR and Mass spectra.

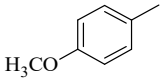
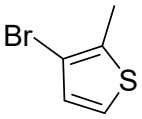
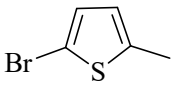
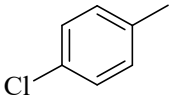
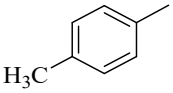
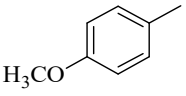
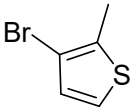
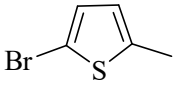
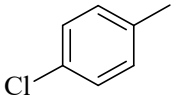
IR (3d) (cm^{-1}): 1097 (Ar-Br), 1215(C-F), 1559 (C=N), 1615(C=C).
^{1}H NMR (3d) (DMSO)δ ppm: 7.2352-7.2573 (m, 2H, Ar-H), 7.2735-7.2873(m,1H, Ar-H), 7.2946-7.3573 (m, 2H, Ar-H), 7.3911-7.4350 (m, 2H, Ar-H), 7.9557-8.0092 (m, 3H, Ar-H), 8.5421(s, 1H, -CH=N-), 9.1295(s, 1H, Pyrazole-H).
ES-MS (3d) (m/z): 443 (M+1), 445 (M+3).
IR (3i) (cm^{-1}): 1097 (Ar-Br), 1218(C-F), 1560 (C=N), 1615(C=C).
^{1}H NMR (3i) (DMSO)δ ppm: 7.1420-7.1499 (m, 1H, Ar-H), 7.2975-7.3433(m, 1H, Ar-H), 7.3591-7.4130 (m, 4H, Ar-H), 7.9747-7.9975 (m, 2H, Ar-H), 8.0037-8.0675 (m, 1H, Ar-H), 8.7080(s, 1H, -CH=N-), 9.1628(s, 1H, Pyrazole-H).
ES-MS (3i) (m/z): 462 (M+1), 464 (M+3).



Scheme 1: Synthesis of series of various fluoro-N-((1-phenyl-1*H*-pyrazol-4-yl)methylene) benzenamine.

Table 1. Physical data of compounds 3(a-j).

Comp.	Ar	X	R_1	R_2	R_3	M.P. (^oC)	Yield (%)
3a		H	H	H	F	118-120	69

3b		H	H	H	F	110-112	70
3c		H	H	H	F	132-134	68
3d		F	H	H	F	106-108	74
3e		F	H	H	F	168-170	71
3f		H	F	H	F	116-118	66
3g		H	F	H	F	102-104	78
3h		H	F	H	F	122-124	69
3i		F	F	H	F	78-80	77
3j		F	F	H	F	148-150	65

3. RESULTS AND DISCUSSION

Around 10 new Schiff bases have been synthesized successfully having good yields. The newly synthesized compounds have been confirmed using ^{1}H NMR, melting point range, Mass, IR spectral analysis. By using disc diffusion method, all newly synthesized compounds were screened for antimicrobial activity.

Table 2. Antimicrobial analysis Data of 3(a-j).

	Bacterial pathogens										**Fungal pathogen**		
	Gram negative pathogen						**Gram positive pathogen**						
Compounds	*Salmonella typhi*	*Enterobacter aerogenes*	*Escherichia coli*	*Pseudomonas aerogenosa*	*Salmonella abony*	*Shigella boydii*	*Bacillus subtilis*	*Bacillus Megaterium*	*Staphylococcus aureus*	*Bacillus cereus*	*Candida albicans*	*Saccharomyces cerevisiae*	*Aspergillus niger*
3a	09	-	09	10	-	-	-	10	06	07	11	13	12
3b	10	09	11	12	12	09	-	13	06	09	10	-	09
3c	12	-	09	15	14	11	10	12	12	-	11	07	14
3d	-	-	-	-	10	09	-	13	20	-	-	05	20
3e	-	-	10	14	13	-	-	10	-	08	17	-	19
3f	-	-	09	-	15	-	-	09	20	06	20	09	15
3g	-	-	12	-	16	-	10	-	20	13	10	-	15
3h	-	09	11	-	13	-	10	09	11	09	16	06	13
3i	-	07	13	19	-	10	11	12	19	-	-	-	-
3j	-	-	07	-	06	-	10	-	11	10	-	06	11
DMSO	-	-	-	-	-	-	-	-	-	-	-	-	-
STND	22	20	20	33	21	26	25	20	30	25	24	20	25

*Standard for bacterial pathogens-tetracycline, for fungal pathogens-nystatin

3.1. Antimicrobial activity

Compounds 3(a-j) were screened for their antimicrobial activity against Gram positive (*Salmonella typh, Enterobacter aerogenes, Escherichia coli, Pseudomonas aerogenosa, Salmonella abony, Shigella boydii)* and Gram negative pathogens(*Bacillus subtilis, Megaterium Bacillus, Staphylococcus aureus, Bacillus cereus*) by paper disc diffusion method using tetracycline as a reference standard drug. Using Nystatin as standard drug, antifungal activity was screened against *Candida albicans, Saccharomyces cerevisiae, Aspergillus niger* at 100

µg/ml concentration. Muller Hinton agar was culture media. The zone of inhibition was measured in mm, after the 24 hr of incubation at 37^{o}C. Microbial data for 3(a-j) are summarized in Table 2.

4. CONCLUSION

All newly synthesized compounds were screened for their antimicrobial activity against Gram negative as well as Gram positive bacterial strains and these compounds showed moderate activity as compared to standard drug. The obtained data through the present work showed a good agreement between the experimental and computed spectral data.

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