Synthesis of Some Imines and Investigation of their Biological Activity

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Abstract: Some *N*-benzylidene aniline derivatives have been synthesized and tested as antibacterial agents. The results of the *in vitro* tests showed that most of the synthesized compounds were antibacterial inactive against *E.coli*.

Keywords: Synthesis, Imines, Investigation, Antibacterial activity.

Introduction

Schiff bases such as substituted *N*-benzylidene aniline are a class of important compounds in medicinal and pharmaceutical field. They show biological activities including antibacterial¹⁻⁴, antifungal⁵⁻⁶, anticancer⁷⁻¹⁰, and herbicidal¹¹ activities. In view of the above observations, the synthesis of *N*-benzylidene aniline derivatives have been developed starting from various substituted benzylidene anilines with the aim of investigating their antibacterial activities.

Experimental

Melting points were determined in open capillaries and are uncorrected. IR spectra were recorded in KBr on Perkin-Elmer 883 spectrometer. The UV spectra were obtained by using UV-vis spectrophotometer instrument, Perkin-Elmer Lambda 20.1 nm. All the compounds gave satisfactory analysis. Benzaldehyde, 4-methylbenzaldehyde, 4-methoxybenzaldehyde, 4-nitobenzaldehyde and 4-chlorobenzaldehyde were obtained from Sigma- Aldrich Ltd and used without further purification. All the compounds were tested for their antibacterial activity against negative bacteria *E.coli* at concentration of 10 and 50 µg/disc using cup-plate method¹².

General method for synthesis of N-benzylisdeneaniline (1a), N-(4-methylbenzylidene)aniline (1b), N-(4-methoxybenzylidene)aniline (1c), N-(p-nitrobenzylidene)aniline (1d) and N-(p-chlorobenzylidene)aniline (1e)

Aniline (0.0197 mol) in 20 mL toluene was added to a solution of benzaldehyde, 4-methylbenzaldehyde, 4-methoxybenzaldehyde, 4-nitobenzaldehyde or 4-chlorobenzaldehyde (0.0197 mol), the mixture was heated under reflux for 2 h in the presence of 4A molecular

sieves. The mixture was filtered and then the solvent was evaporated. The crude products were purified by crystallization from ethanol to give compounds (**1a-1e**), as crystals, yield 60, 64, 57, 56 and 67% respectively.

General method for synthesis of benzylidene-naphthalen-1-yl-amine (2a), (4-methyl- benzylidene)-naphthalen-1-yl-amine (2b), (4-methoxy-benzylidene)-naphthalen-1-yl-amine (2c), (4-nitro-benzylidene)-naphthalen-1-yl-amine (2d) and (4-chloro-benzylidene)-naphthalen-1-yl-amine (2e)

1-Aminonaphthalene (0.0197 mol) in 20 mL toluene was added to a solution of benzaldehyde, 4-methylbenzaldehyde, 4-methoxybenzaldehyde, 4-nitrobenzaldehyde or 4-chlorobenzaldehyde (0.0197 mol). The mixture was heated under reflux for 2 h in the presence of 4A molecular sieves. The mixture was filtered and then the solvent was evaporated. The crude products were purified by crystallization from ethanol to give compounds (**2a-2e**), as crystals, yield 42, 68, 77, 69 and 49% respectively.

General method for synthesis of benzylidene-pyridin-2-yl-amine (3a), (4-methyl- benzylidene)- pyridin -2-yl-amine(3b), (4-methoxy-benzylidene)-pyridin -2-yl-amine(3c), (4-nitro-benzylidene)- pyridin -2-yl-amine (3d), and (4-chloro-benzylidene)-pyridin-2-yl-amine (3e)

2-Aminopyridine (0.0197 mol) in 20 mL toluene was added to a solution of benzaldehyde, 4-methylbenzaldehyde, 4-methoxybenzaldehyde, 4-nitrobenzaldehyde or 4-chloro benzaldehyde (0.0197 mol), the mixture was heated under reflux for 2 h in the presence of 4A molecular sieves. The mixture was filtered and then the solvent was evaporated. The crude products were purified by crystallization from ethanol to give compounds (**3a-3e**), as crystals, yield 75.6, 50.7, 51.5, 86.9 and 64.6% respectively.

1

1a= H, 1b=CH₃, 1c = OCH₃, 1d= NO₂, 1e= Cl

2

2a= H, 2b=CH₃, 2c = OCH₃, 2d= NO₂, 2e= Cl

3

3a= H, 3b=CH₃, 3c = OCH₃, 3d= NO₂, 3e= Cl

Results and Discussion

Imines products (1) - (15) were prepared from reaction of benzaldehyde, 4-methylbenzaldehyde, 4-methoxybenzaldehyde, 4-nitrobenzaldehyde and 4-chlorobenzaldehyde with aniline, 1-amino naphthalene and 2-aminopyridine which are stable products. Some physical properties, analytical and spectral data of the imines compounds are summarized in Table 1.

Table 1. Analytical and spectral data of compounds.

Compound No.	m.p., °C	UV $\lambda_{\max}$ MeOH, nm	IR band, cm^{-1}
1a	50-52	600 , 230	1610 v (N=C)
1b	35-37	600 , 230	1605 v (N=C)
1c	54-56	600 , 230	1600 v (N=C)
1d	87-89	600 , 230	1640 v (N=C)
1e	60-62	600 , 230	1615 v (N=C)
2a	118-120	600 , 230	1615 v (N=C)
2b	68-70	600 , 230	1610 v (N=C)
2c	84-86	600 , 230	1605 v (N=C)
2d	153-155	600 , 230	1660 v (N=C)
2e	90-93	600 , 230	1640 v (N=C)
3a	92-95	600 , 230	1620v (N=C)
3b	119-122	600 , 230	1615v (N=C)
3c	155-157	600 , 230	1600 v (N=C)
3d	120-123	600 , 230	1660v (N=C)
3e	82-85	600 , 230	1620 v (N=C)

The infrared spectral data of the Schiff base are in agreement with the expected range. A band at $1600\text{--}1660\text{ cm}^{-1}$ is due to C=N vibration. The UV absorption show bands for all compounds at about $\lambda_{\max}$ 600 and 230 nm corresponding to $n\text{--}\pi^*$ with conjugated system compounds (Table 1). The imines products which have been used were found to give no antibacterial activity Table 2.

Table 2. Antibacterial activity of compounds **1a-3e**.

Compound No.	10 μg	20 μg	50 μg
1a	-ve	-ve	-ve
1b	-ve	-ve	-ve
1c	-ve	-ve	-ve
1d	-ve	-ve	-ve
1e	-ve	-ve	-ve
2a	-ve	-ve	-ve
2b	-ve	-ve	-ve
2c	-ve	-ve	-ve
2d	-ve	-ve	-ve
2e	-ve	-ve	-ve
3a	-ve	-ve	-ve
3b	-ve	-ve	-ve
3c	-ve	-ve	-ve
3d	-ve	-ve	-ve
3e	-ve	-ve	-ve

This is possible due to the fact that these compounds have referred to the high electron density¹³⁻¹⁴. Therefore, on the basis of the observed antibacterial activity values of these compounds, it can be concluded that the conjugation has strong influence in the antibacterial activity, because the electrons are delocalized over the full length of the conjugated molecule and the diffusion of these compounds become difficult throw the body cell of the bacteria.

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References

1. Karia F D and Parsania P H, *Asian J Chem.*, 1999, **11(3)**, 991-995.
2. More P G, Bhalvankar R B and Pattar S C, *J Indian Chem Soc.*, 2001, **78(9)**, 474-475.
3. El-masry A H, Fahmy H H and Abdelwahed S H A, *Molecules*, 2000, **5**, 1429- 1438.
4. Baseer M A, Jadhav V D, Phule R M, Archana Y V and Vibhute Y B, *Orient J Chem.*, 2000, **16(3)**, 553-556.
5. Pandeya S N, Sriram D, Nath G and De Clercq E IL Farmaco, 1999, **54**, 624-628 .
6. Singh W M and Dash B C, *Pesticides*, 1988, **22(11)**, 33-37.
7. Hodnett E M, and Dunn W J, *J Med Chem.*, 1970, **13**, 768-770.
8. Desai S B, Desai P B and Desai K R, *Hetrocycl Commun.*, 2001, **7(1)**, 83-90.
9. Pathak P, Jolly V S, Sharma K P, *Orient J Chem.*, 2000, **16(1)**, 161-162.
10. Holla B, Rao B, Sarojini P and Akberali N Kumari, *Eur J Med Chem.*, 2006, **41**, 657-663.
11. Samadhiya S, Halve A, *Orient J Chem.*, 2001, **17(1)**, 119-122.
12. Kavanagh F, *Analytical Microbiology*, Academic Press, New York, 1963, p. 125.
13. Majed M Hania, *Asian J Chem.*, 2006, **18**, 1704.
14. Majed M Hania and Tarik Abo-Sharkia, *Int J Appl Chem.*, 2007, **3**, 13.