Synthesis of Several New Schiff Bases Linked to Sulfonamido Naphthalimide Moiety with Expected Biological Activity.

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Abstract
Several new Schiff bases linked to sulfonamidonaphthalimide moiety have been synthesized. The first step in this work involved introducing of 4-(N-naphthalimidyl) phenyl sulfonylchloride in amination reaction with hydrazine hydrate producing 4-(N-naphthalimidyl) phenyl sulfonylhydrazine. Introducing of the prepared sulfonyl hydrazine in condensation reaction with different substituted aromatic aldehydes in the second step afforded the target new Schiff bases. Structures of the prepared compounds were elucidated on the basis of FTIR, $^1$HNM$^R$, $^{13}$CNMR spectral data which agreed with the proposed structures. The newly synthesized compounds are expected to have biological activity since they are built from biologically active components including naphthalimide, sulfonylimide and Schiff base.

Key Words; Naphthalimide, Sulfonamide, 4-(N-naphthalimidyl) phenyl, Sulfonylhydrazine

Introduction
Schiff bases which contain azomethin group attract much interest in synthetic chemistry (1,2). They are used as substrate in the preparation of industrial and biologically active compounds. Moreover they are also known to have biological activities such as antibacterial, antifungal, anti-tumor and antioxidant activities (3-6).

On the other side naphthalimides first discovered by Brana and coworkers have been found to exhibit divers biological activities, some of them have shown high anticancer activity against a variety of murine and human tumor cells while others have shown analgesic properties (7-9).

Besides sulfonylimide drugs were the first effective chemotherapeutic agents to be employed systemically for the prevention and cure of bacterial infection in human beings (10,11).

Encouraged by all these observations it was thought worthwhile to synthesize new Schiff bases linked to naphthalimide through sulfonylimido group with expected biological activity.

MATERIALS AND METHODS
Melting points were determined on Thomas Hoover apparatus and were uncorrected. FTIR spectra were recorded on SHIMADZU FTIR-8400 Fourier Transform Infrared spectro-photometer using KBr discs. $^1$HNMR and $^{13}$CNMR spectra were recorded on Bruker 300MHz instrument in Al-Albate University in Jordan using DMSO-d$_6$ as a solvent and trimethylsilane (TMS) as internal reference.

RESULT AND DISCUSSION
Since both naphthalimides and Schiff bases belong to a widely used group intermediates important for production of many types of pharmaceuticals and have wide spectrum of biological applications the target of the present work is synthesis of new molecules containing these two active moieties naphthalimide and Schiff base linked together through phenyl sulfonamide component.
Steps for performing this target are shown in scheme (1).

The first step involved preparation of 4-(N-naphthalimidyl)phenylsulfonyl hydrazine [1] via reaction of 4-(N-naphthalimidyl)phenyl sulfonyl chloride with hydrazine hydrate under reflux conditions. The starting compound 4-(N-naphthalimidyl)phenyl sulfonyl chloride was prepared via reaction of N-phenyl naphthalimide with chlorosulfonic acid according to literatures (14). Compound [1] was purified by recrystallization from ethanol and was afforded as off-white crystals in (87%) percent yield and having melting point (>300)°C.

In the second step compound [1] was introduced in condensation reaction with different aromatic aldehydes producing the desired Schiff bases [2-10]. Physical properties of Schiff bases [2-10] are listed in Table (2). Structures of the prepared compounds were confirmed by FTIR, ¹HNMR and ¹³CNMR spectra data. FTIR spectrum of compound [1] showed clear absorption bands at 3417 cm⁻¹ and 3309 cm⁻¹ due to asym. And sym. ν (NH₂). Absorption bands belong to ν(N-H) amide, ν(C-H) aromatic and ν(C=O) imide appeared at 3236 cm⁻¹ and 3062 cm⁻¹ and 1705 cm⁻¹ while absorption bands due to ν(C=C) aromatic, ν(C=N) imide, asym. ν(SO₂) and sym. ν(SO₂) appeared at 1620 cm⁻¹, 1361 cm⁻¹, 1381 cm⁻¹ and 1180 cm⁻¹ respectively (15).

¹HNMR spectrum of compound [1] showed clear signal at δ = 2.27 ppm belong to (N-H) amide proton, signals at δ = (7.38-7.53)ppm belong to phenyl ring
protons, signals at $\delta = (7.84-8.51)$ppm belong to naphthyl ring protons and signal at $\delta = (8.71)$ppm belong to (NH$_2$) protons.

$^{13}$CNMR spectrum of compound [1] showed signals at $\delta = (122.14-134.95)$ ppm belong to aromatic carbons and signal at $\delta = (160.95)$ ppm belong to (C=O) imide carbons.

FTIR spectra of prepared Schiff bases [2-10] showed clear absorption bands at (3230-3260) cm$^{-1}$, (3040-3113) cm$^{-1}$ and (1701-1740) cm$^{-1}$ which are belong to v(N-H) amide ,v(C-H) aromatic and v(C=O) imide respectively (15).

Other absorption bands were appeared at (1660-1680) cm$^{-1}$, (1585-1596) cm$^{-1}$ and (1290-1350) cm$^{-1}$ belong to v(C=N) imide , v(C=C) aromatic and v(C-N) imide respectively while absorption bands due to asym. v(SO$_2$) and sym. v(SO$_2$) were appeared at (1342-1390) cm$^{-1}$ and (1178-1192) cm$^{-1}$ respectively (15).

FTIR spectrum of compound [3] showed clear absorption bands at (1087) cm$^{-1}$ belong to v(C-Cl) ,while FTIR spectra of compound [4] and [5] showed absorption bands at (1508 ,1523)cm$^{-1}$ and(1435,1438)cm$^{-1}$ belong to v(C=NO$_2$) and FTIR spectra of compounds [7] and [9] showed absorption bands at (3417, 3411) cm$^{-1}$ belong to v(OH) . All details of FTIR spectral data of Schiff bases [2-10] are listed in Table (2).

$^1$HNMR spectrum of compound [3] showed clear signal at $\delta = 5.8$ ppm belong to (N-H) amide proton, signals at $\delta = (7.65-8)$ppm belong to phenyl ring protons, signals at $\delta = (8.43-8.7)$ ppm belong to naphthyl ring protons and signal at $\delta = (8.79)$ppm belong to imine proton.

$^{13}$CNMR spectrum of compound [3] showed signals at $\delta = (122.13-137.79)$ ppm belong to aromatic carbons present in two phenyl rings and naphthyl ring. The spectrum showed also signals at $\delta = (160.73-161)$ppm belong to (C= N) carbon and signal at $\delta = (171.16)$ppm belong to (C=O) imide carbon.

$^1$HNMR spectrum of compound [5] showed signal at $\delta = 5.79$ ppm belong to (N-H) amide proton, signals at $\delta = (7.38-7.89)$ppm belong to phenyl rings protons, signals at $\delta = (8.29-8.54)$ppm belong to aromatic proton in naphthyl rings and signal at $\delta = (8.69)$ppm belong to imine proton.

$^{13}$CNMR spectrum of compound [5] showed signals at $\delta = (111.91-134.98)$ ppm belong to aromatic carbons present in two phenyl rings and naphthyl ring, signal at $\delta = (160.0)$ppm belong to (C=N) carbon and signal at $\delta = (172.2)$ppm belong to (C=O) imide carbon.

$^1$HNMR spectrum of compound [6] showed two clear signals at ($\delta = 2.98$ ppm and $\delta = 3.04$ ppm) belong to two methyl groups protons and signal at $\delta = (5.80)$ppm belong to (N-H) amide proton. Signals appeared at $\delta = (7.62-8.45)$ppm are belong to aromatic protons in two phenyl ring and naphthyl rings while the signal appeared at $\delta = (8.5)$ppm is belong to imine proton.

$^{13}$CNMR spectrum of compound [6] showed two signals at $\delta =$ (19.3 and 24.64) ppm belong to carbons of two methyl group and signals at $\delta =$ (118.13-148.14)ppm are belong to aromatic carbons of two phenyl rings and naphthyl rings. Other signals appeared at $\delta =$ (159.5-160.42)ppm and at $\delta =$ (179.66)ppm which are belong to (C=N) and (N=O) imide carbons respectively.

CONCLUSION

A series of new Schiff bases containing two biologically active components was synthesized successfully by performing two steps synthesis. The newly synthesized compounds were expected to possess high biological activity since they contain three known biologically active moieties cyclic imide, sulfonamide and Schiff base.

ACKNOWLEDGMENT

Authors are thankful to all who help in this work or share their knowledge.

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Table (2) FTIR spectral data (cm⁻¹) of Schiff bases [2-10]

REFERENCES


