

Synthesis of substituted (oxazepine, Diazepine, tetrazole) via Schiff Bases for 2- Aminobenzo Thiazole Derivatives

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Abstract:

This work includes synthesis of several Schiff bases by condensation of 6- methoxy – 2- amino benzothiazole with some aldehydes and ketones (2- hydroxyl benzaldehyde, 4- hydroxyl benzaldehyde, 4- N,N –dimethy amino acetophenone, benzophenone) to obtain schiff bases (1-5). These schiff bases were found to react with phthalate anhydride to give oxazepine derivatives (6-10) that were reacted with primary aromatic amines to give Diazepine derivatives (11-15). Besides, we prepared new tetrazole derivatives (16-20) from the reaction of the prepared Schiff bases with sodium azide in the prepared compounds that were characterized by physical properties, FT-IR and some of the ¹H-NMR and ¹³C –NMR spectroscopy.

Key words: - 2-amino benzeothiazol , oxazepine , diazepine ,tetrazole.

Introduction:

2- amino benzothiazole derivatives have been studied extensively and found to have diverse chemical reactivity and broad spectrum of biological activity such as antitumor agents⁽¹⁻²⁾, antimicrobial, analgesics, anti – inforatory⁽³⁾. It was reacted with selected aldehyde and ketone and testing give Schiff bases and it is complexest important biological activity⁽⁴⁾. Schiff bases are characterized by the N=CH (imine) group which are important compounds in medicinal and pharmaceutical field⁽⁵⁾. Schiff base reacts with phthalic anhydride, Maleic anhydride and substituted phthalic anhydride to give and test its biological activity Oxazepine derivative introduced in 1965 foruse in relief of the psychonenroses characterized by anxiety and tension⁽⁶⁾. The reaction of

oxazepine with primary aromatic amine gives corresponding 1, 3 – diazepine -4, 7 – dione. Many of the benzodiazepines and their oxides show interesting sedatives, muscie relaxant and anticonvulsant properties, in animals. Then Schiff bases react with sodium azide to give tetrazoles⁽⁷⁾. They are aromatic five membered ring containing four nitrogen atoms. The first tetrazole was reported over a century ago. Tetrazoles have been found to exhibit antibacterial, antifungal and antihistamine, and anti-inflammatory properties⁽⁸⁾.

Materials and methods:

General

Melting points were determined in Gallen Kamp melting point apparatus and were uncorrected. ¹H- NMR and ¹³C- NMR spectra were recorded on Bruker specrospin ultra shield magnets

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300 MHz instrument using tetramethyl silane (TMS) as an internal standard and DMSO – d₆ as a solvent in Ahl-Albate University in Jordan. FT-IR spectra were recorded on Shimadzu FT-IR 8400 Fourier Transform infrared spectrophotometer as KBr disc.

Preparation of Schiff Bases (1-5)⁽⁹⁾

A mixture of 6-methoxy, 2-amino benzo thiazole (0.002 mol) and different aldehydes or Ketones (0.002 mol) in ethanol (30 ml) was refluxed for 5 hrs. The precipitate was filtered and recrystallized from ethanol. Melting points, Yield% data are listed in Table (1)

Preparation of Oxazepine (6-10)

A mixture of Schiff bases (0.0012 mol) and phthalic anhydride (0.0012 mol) was dissolved in (25 ml) dry benzene. The mixture was heated for 7 hrs in water bath at (80°C) and excess solvent was distilled.

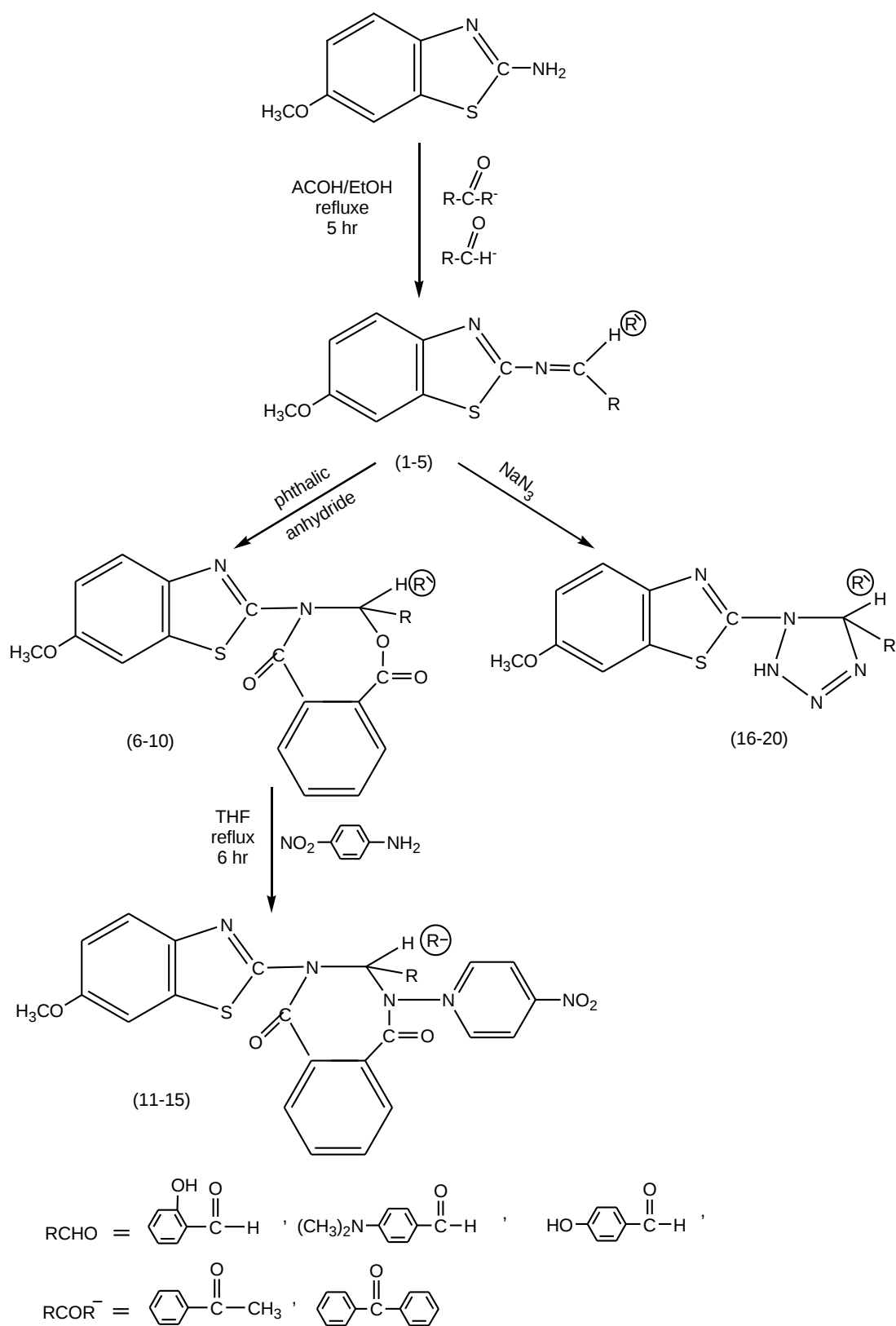
The precipitate was filtered and recrystallized from ethanol.

Preparation of Diazepine derivatives (11-15)

A mixture (0.01 mol) of oxazepine compounds and (0.01 mol) of p-nitro aniline in (40 ml) of dry benzene was placed. The reaction mixture was refluxed in water bath at 80 °C for 6 hrs then allowed to cool at room temperature and separated crystalline was filtered and recrystallized from Ethanol. Melting points and yield% data are listed in Table (1)

Preparation of Tetrazoles Derivative (16-20)⁽¹⁰⁾

Compounds of (1-5) (0.002 mol) were dissolved in (30 ml) tetrahydrofuran and mixed with (0.002 mol) sodium azide. These mixtures were heated in water bath at 80°C for 7 hrs. The precipitate was filtered and recrystallized from ethanol. The end of reaction was checked by TLC in methanol*. Melting points and Yield% data are listed in Table (1).



(Scheme1)

Results and Discussion:

New five Schiff bases were synthesized from the reaction of 6-methoxy-2-amino benzothiazole with substituted aldehydes and ketone shown in Scheme (1). These Schiff bases possess good biological activities. The % yield of the prepared Schiff bases ranged (64- 82). These compounds were identified by FT-IR, UV, ^1H -NMR and ^{13}C -NMR spectroscopy. FT-IR spectrum of Schiff base (3) showed clear absorption bands at $(3232)\text{ cm}^{-1}$, $(2827-2904)\text{ cm}^{-1}$, (1531) , 1581 cm^{-1} and $(1492)\text{ cm}^{-1}$ due to (C-H) aromatic, $\nu(\text{C-H})$ aliphatic, $\nu(\text{C}=\text{C})$ aromatic, $\nu(\text{C}=\text{N})$ and (C-N) respectively as shown in Table (2), Figure (1). The reaction was followed by disappearance of NH_2 absorption band at $(3346-3200)\text{ cm}^{-1}$ and appearance of $\text{C}=\text{N}$ absorption band in the IR spectra of the products. The FT-IR absorption bands are given in Table (2). UV. Spectrum of compound (2) showed an absorption λ_{max} at (280) nm, (370) nm which attributed to $(\pi - \pi^*)$ and $(n - \pi^*)$ the absorption is listed Table (2) Figure (5).

The second step included Oxazepine compounds (6- 10) that were synthesized from the reaction of Schiff bases (1-5) with phthalic anhydride in dry benzene shown in the scheme. These Oxazepine compounds possess good biological activities. The percentage yield of the prepared Oxazepine compounds ranged (59-72) % These compounds were

identified by FT-IR, UV., ^1H -NMR and ^{13}C -NMR spectroscopy. FT-IR spectrum of oxazepines (6-10) showed clear absorption bands at $(1720)\text{ cm}^{-1}$ and $(1168)\text{ cm}^{-1}$ due to $\nu(\text{C}=\text{O})$ ketone, imide and $\nu(\text{C-O-C})$ respectively. While disappearance of $\nu(\text{C}=\text{N})$, the FT-IR absorption bands are given in Table (2) Figure (2).

UV. Spectrum of compounds (7) showed an absorption λ_{max} at (265) nm, (305) nm which attributed to $(\pi - \pi^*)$ and $(n - \pi^*)$ The absorption is listed in Table (2) Figure (6).

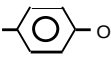
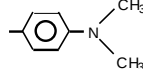
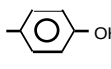
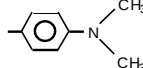
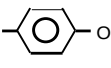
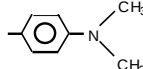
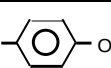
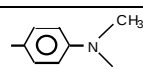
^1H -NMR spectra data of compound (9) multiplet signals at (7.2- 7.7) ppm due to aromatic protons, and singlet signal at (3.7) ppm due to CH_3 group. ^{13}C -NMR spectra of compound (9) showed signals at (121- 129) ppm due to aromatic carbons and signal at 169 ppm due to $(\text{C}=\text{O})$. While, in the third step including reaction derivatives of oxazepine (6-10) with P- intro aniline (primary aromatic amines) to give new five Diazepine compounds (11-15) These compounds were identified by FT-IR and UV. Spectroscopy. FT-IR spectrum of compounds (13) showed characteristic absorption bands at $(1716)\text{ cm}^{-1}$, $(3414)\text{ cm}^{-1}$ and due to $\nu(\text{C}=\text{O})$, $\nu(\text{N-H})$, respectively as shown in Table (2), Figure (3).

The structure of substituted Oxazepine is a combination of both lactone and a 7-membered heterocyclic ring. This is indicated by the appearance of the characteristic (C-N) lactone C-N lactam absorption band at (1172- 1182) cm^{-1} . In their FT-IR spectra, the lactone group (cyclic ester) can be converted in to lactam group (cyclic amide) by reaction with aromatic primary amines. UV. Spectrum of compound (12) showed an absorption λ_{max} at (320) nm, (355) nm which attributed to ($\pi-\pi^*$) and ($n-\pi^*$). The absorption is listed in Table (2). Figure

(7). Finally, tetrazoles compounds (16-20) were synthesized from the reaction of Schiff bases (1-5) with sodium azide in THF. The % yield of the prepared tetrazole compounds ranged (39-51)%, FT-IR spectrum of tetrazoles (16-20) showed clear absorption bands at (1630-1647) cm^{-1} due to ν (N=N).

UV. Spectrum of compound (7) showed an absorption λ_{max} at (385)nm which attributed to ($\pi-\pi^*$). The absorption is listed in Table (2), Figure (8).

Table (1): Physical Properties for all Product

No. of Comp.	R	R'	Formal	Colour	% Yield	m.p.	Solvent
1.		H	C ₁₅ H ₁₂ N ₂ O ₂ S	Dark green	80	160	ethanol
2.		H	C ₁₅ H ₁₂ N ₂ O ₂ S	Yellowish green	77	200-202	ethanol
3.		H	C ₁₇ H ₁₇ N ₃ OS	Brown	64	193-194	ethanol
4.		CH ₃	C ₁₆ H ₁₄ N ₂ OS	Grey	70	170	ethanol
5.			C ₂₁ H ₁₆ N ₂ OS	Grey	82	45-50	ethanol
6.		H	C ₂₃ H ₁₆ N ₂ O ₅ S	Dark green	65	82-85	1,4-Dioxan
7.		H	C ₂₃ H ₁₆ N ₂ O ₅ S	Light green	72	140-144	1,4-Dioxan
8.		H	C ₂₅ H ₂₁ N ₃ O ₄ S	Yellowish brown	60	Oil	1,4-Dioxan
9.		CH ₃	C ₂₄ H ₁₈ N ₂ O ₄ S	Grey	59	150-153	1,4-Dioxan
10.			C ₂₉ H ₂₀ N ₂ O ₄ S	Dark brown	62	Oil	1,4-Dioxan
11.		H	C ₂₉ H ₂₀ N ₄ O ₆ S	Yellowish green	57	118-120	ethanol
12.		H	C ₃₀ H ₂₀ N ₄ O ₇ S	Yellowish green	46	60-64	ethanol
13.		H	C ₃₁ H ₂₅ N ₅ O ₅ S	Red	60	Oil	ethanol
14.		CH ₃	C ₃₀ H ₂₂ N ₄ O ₅ S	Greyish green	55	100-104	ethanol
15.			C ₃₅ H ₂₄ N ₄ O ₅ S	Bronish green	48	Oil	Ethanol 1,4-
16.		H	C ₁₅ H ₁₃ N ₅ O ₂ S	Yellowish green	40	320 dec.	Ethanol 1,4-
17.		H	C ₁₅ H ₁₃ N ₅ O ₂ S	Yellowish brown	43	300 dec.	Ethanol 1,4-
18.		H	C ₁₇ H ₁₈ N ₆ OS	yellow	51	198-200	Ethanol 1,4-
19.		CH ₃	C ₁₆ H ₁₅ N ₅ OS	Violet	42	300 dec.	Ethanol 1,4-
20.			C ₂₁ H ₁₇ N ₅ OS	Grey	39	319-320	Ethanol 1,4-Dioxan

Table(2): FT-IR Spectral data for all product compound

Com p No.	V(C-H) aromatic	V(C-H) aliphatic	V (C=O)	V (C=N) In out ring	V(N-H)	V(C- N)	Others	V (C=C)	Uv.	
									λ max	ABC
1.	3066	2962	—	1624	3425	1435	V(O-H) 3470	1597	220	0.244
2.	3080	2870	—	1640	3310	1440	V(O-H) 3452	1600	300 370 280	2.323 2.022 0.117
3.	3232	2827 – 2940	—	1581	3414	1492	—	1531	—	—
4.	3170	2900	—	1630	3310	1460	—	1570	—	—
5.	3097	2839	—	1647	3390	1465	—	1597	—	—
6.	3294	2835	1712	—	3294	1442	V(O-H) 3425 V(C=N) 1658	1604	240 275	0.432 0.403
7.	3078	2835	1674	—	3232	1489	V(O-H) 3410 V(C=N) 1581	1600	305 265	2.772 0.175
8.	3070	2978	1720	—	3305	1485	V(C=N) in ring 1662	1597	—	—
9.	3109	2839	1712	—	3390	1465	V(C=N) in ring 1643	1604	—	—
10.	3092 3101	2939	1720	—	—	1496	V(C=N) in ring 1604	1604	—	—
11.	3170	2993	1680	—	3371	1489	V(o-H) 3483 v(C=N) 1627	1546	360 330	2.710 1.264
12.	3067	2880	1640	—	3290	1450	N(O-H) 3460	1570	320 355	1.576 3.000
13.	3097	2943	1716	—	3414	1438	V(C=N) in ring 1581	1535	—	—
14.	3002	2871	1740	—	3360	1430	V(C=N) in ring 1585	1697	—	—
15.	3089	2993	1770	—	—	1465	V(C=N) 1621 in ring V(C-NO ₂) 1373 1546	1651	—	—
16.	3020	2954	—	—	3387	1462	V(O-H) 3468 V(N=N) 1643	1600	330 380 300	1.253 2.260 1.704
17.	3130	2870	—	—	3340	1470	V(O-H) 3470	1598	385	0.928
18.	3078	2951	—	—	3456	1458	V(N=N) 1647 V(C=N) in ring 1585	1539	—	—
19.	3090	2900	—	—	3280	1430	V(N=N) 1630 V(C=N) 1582	—	—	—
20.	3101	2924	—	—	3390	1462	V(C=N) 1647 in ring	1600	—	—

Com p No.	V(C-H) aromatic	V(C-H) aliphatic	V (C=O)	V (C=N) In out ring	V(N-H)	V(C- N)	Others	V (C=C)	Uv.	
									λ max	ABC
							V(N=N) 1546			

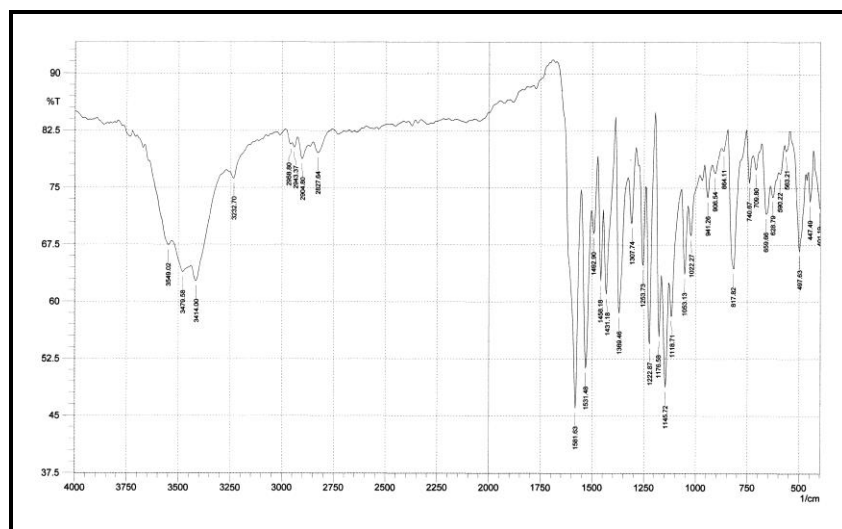


Fig (1): FT-IR Spectrum of Compound [3]

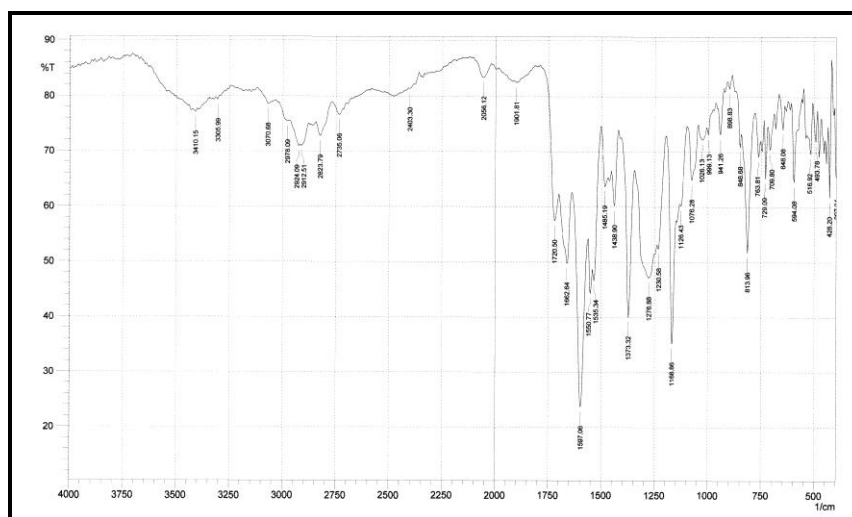


Fig (2): FT-IR Spectrum of Compound [8]

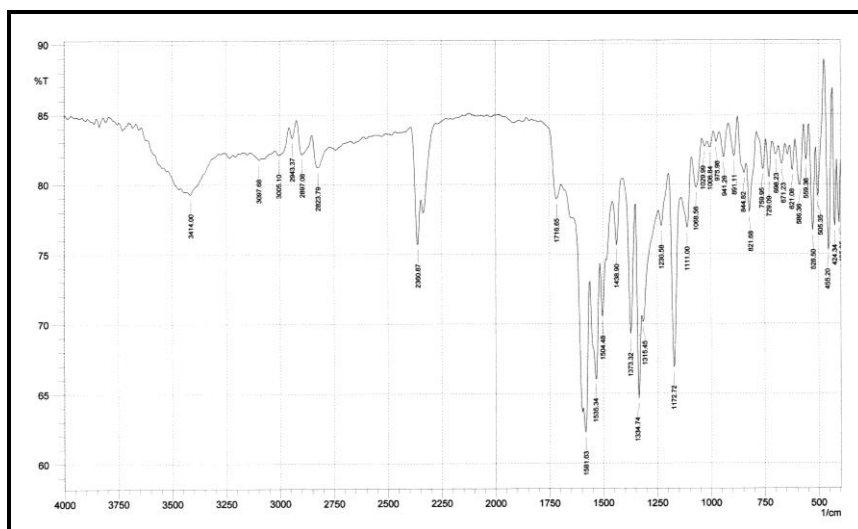


Fig (3): FT-IR Spectrum of Compound [13]

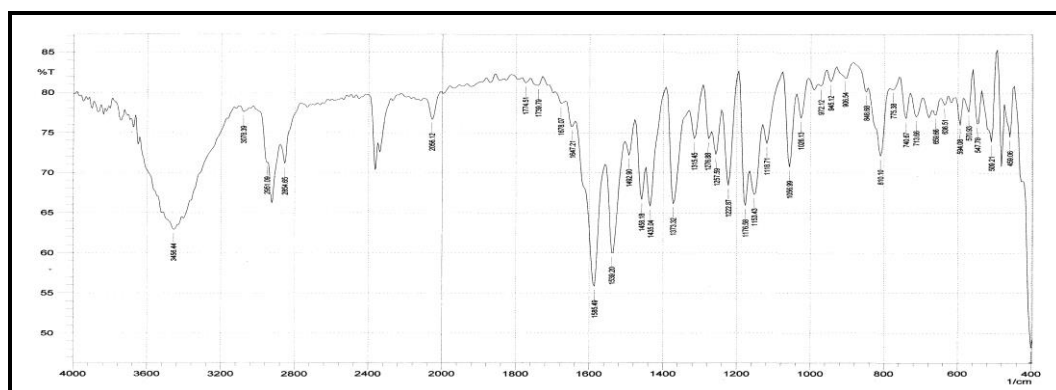


Fig (4): FT-IR Spectrum of Compound [18]

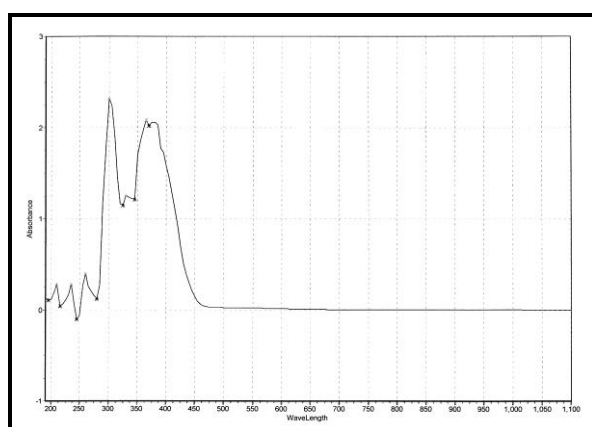


Fig (5): UV. Spectrum of Compound [2]

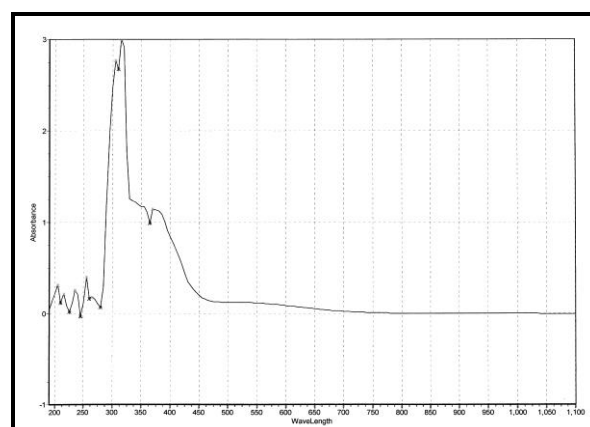


Fig (6): UV. Spectrum of Compound [7]

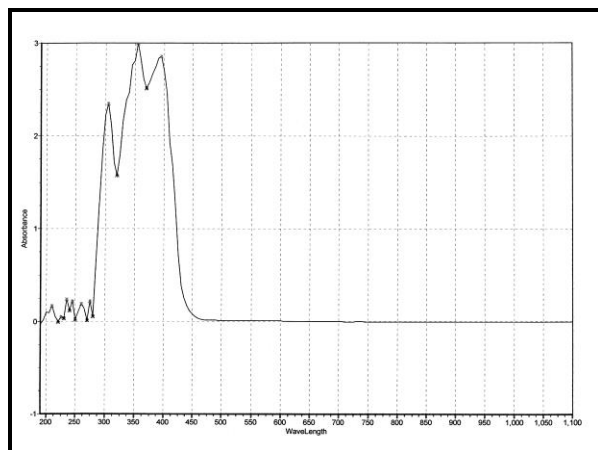


Fig (7): UV. Spectrum of Compound [12]

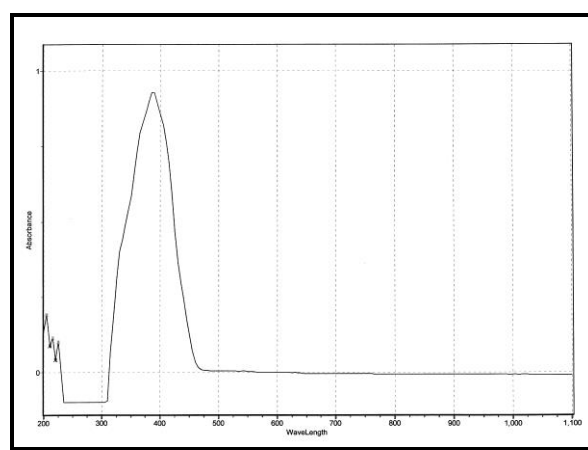
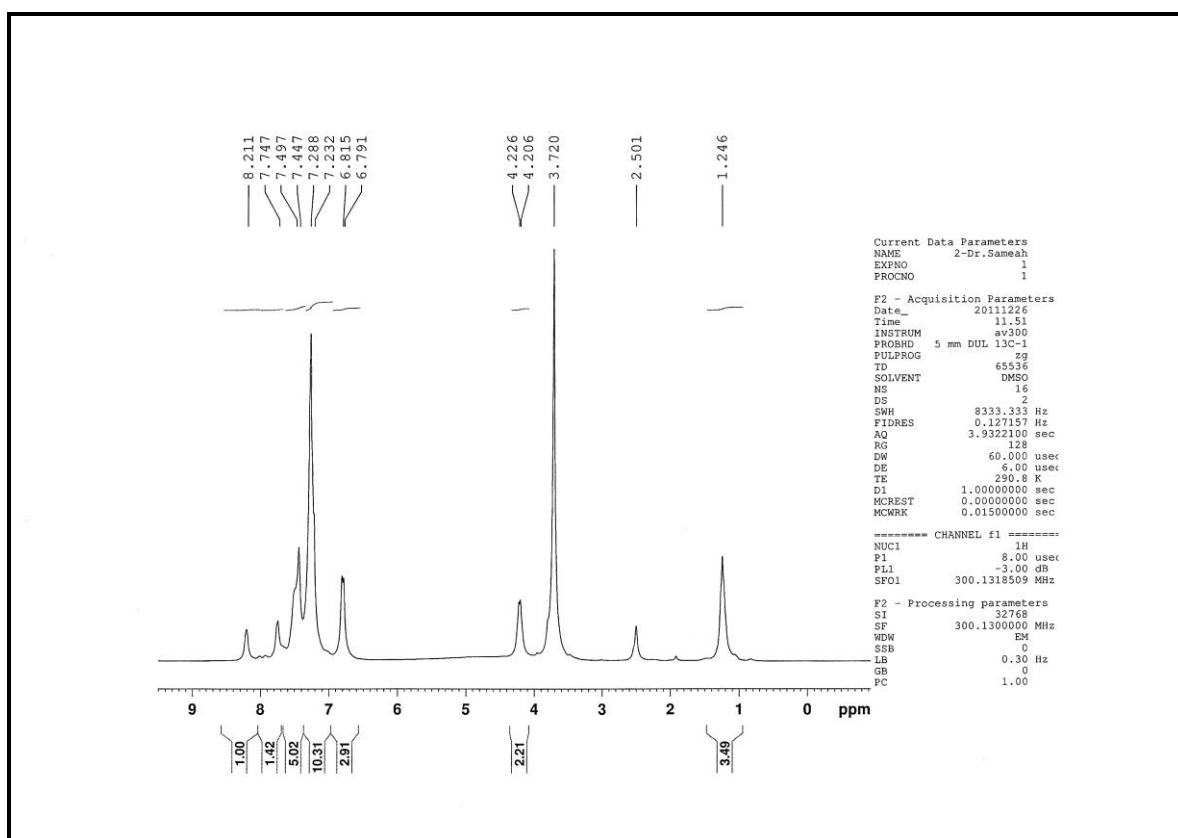
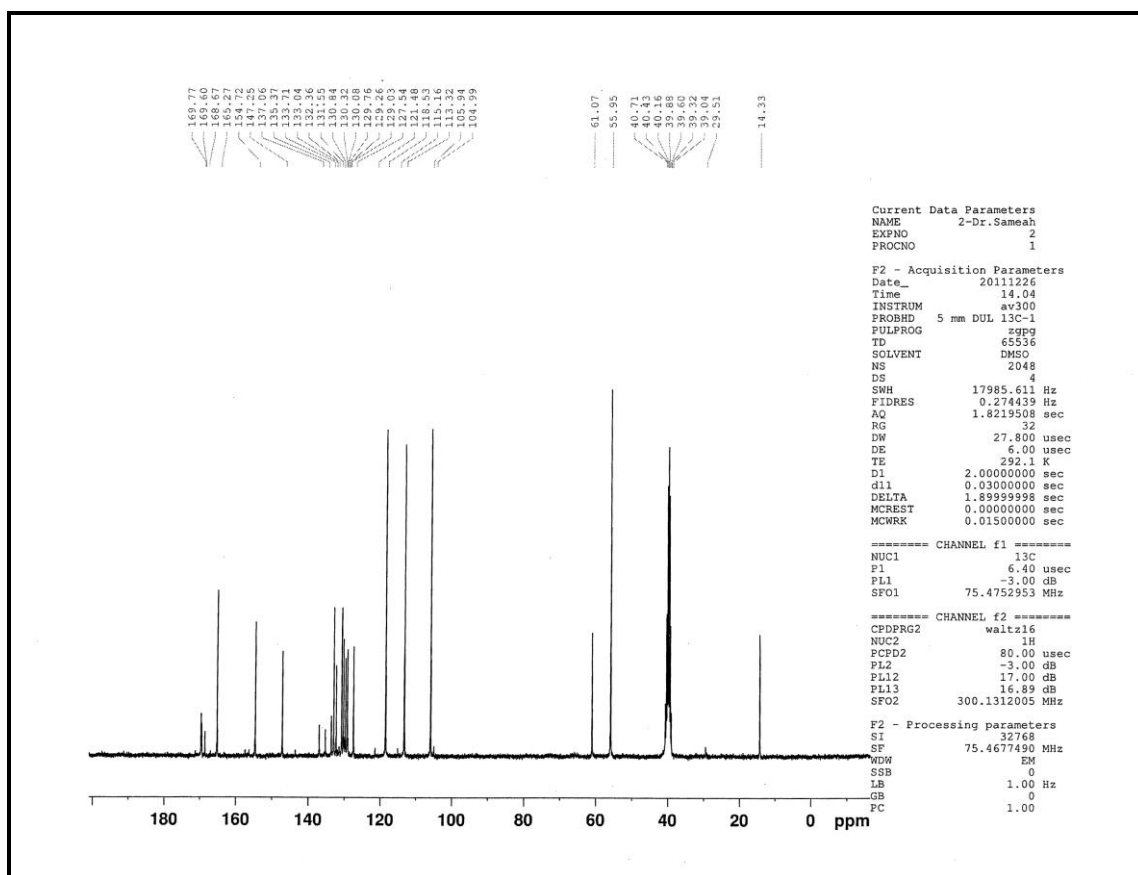


Fig (8): UV. Spectrum of Compound [17]

Fig (9): ^1H -NMR Spectrum of Compound [9]

Fig (10): ^{13}C -NMR Spectrum of Compound [9]

References

1. Chaudhary M. , Pareek D. and ,Pareek P. K. . 2011. Synthesis of some new Biologically Active benzothiazole Derivatives containing benzimidazole and Imidazoline Moieties, Bull. Korean Chem. Soc., 1 (32): 131- 136.
2. Srivatsava S.D.,and Sen J. P. .2008. Synthesis and biological evalution of 2 – amino benzothiazole derivatives, Indian J. chem.,. 47B: 1583-1586.
3. Dhahir S. A , Al-Sahib S. A., Al-Razaq W. A., Kadhim N. J.. 2010. Synthesis of some bioactive 4-thiazolidinone derivatives in corporating benzothiazole moiety, B. Sci. J., 7(1): 614-620.
4. El- Mossalamy E. H., Al- Thabati S. A., Al- Nomaiser F. M. 2005. Solvent effect on the electronic absorftion spectra and dissociation constants of some sulfa Drugs Commun. Fac. Sci. Univ. Ank. Series B, 51 (2): 21-30.
5. Vaghasiya Y. K., Nair R. , Soni, S. chanada M.2004. Synthesis, styuctural determination and antibacterial activity of compounds derived from vanillin and 4 – amino antipyrine, J. Serb. Chem. Soc., 69 (12): 991-998.
6. Wadher S. J. and , Puranik M. P. , Karande N. A., Yeole P. G.2009. Synthesis and Biological Evaluation of Schiff base of Depsone and their derivative as Antimicrobial agents, I. J. ph. T. R., 1 (1): 22-33.
7. Pathak P. , Jolly S. V. , Sharma K. .2000. Anovel approach for synthesis of substituted tetrazoles, O. J. Chem., 16 (1): 161-162.
8. Ramachandra S. H. , Huan- Ming C..2000. Synthesis and evaluation of aseries, of 1 – substituted tetrazole derivatives as astimi crobial, Molecules, 5: 164-172.
9. Al-Masry A. H. , Fahmy H. H., Abdel wahed A. S. H.2000. Molecules, 5: 429 – 439.
10. Adil Salih N., .2005. Ph. D. Thesis, College of Science, Al-Nahrain University.
11. Silverstein R. M. , Bassler G. C.1967. Spectrometric identification of Organic Compounds, John wiley and Sons Ltd, 2nd .Ed. 510.
12. Crews P., Rodriguez J. , Jaspars M. .1998. Organic structure analysis, Oxford University press, New York, 340.

تحضير معوضات (الأوكسازيبين، دايزيبين والتترازول) عن طريق قواعد شيف لمشتقات 2 - أمينو بنزو ثيازول.

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الخلاصة:

تم في هذا البحث تحضير بعض قواعد شيف بواسطة تكاثف methoxy- 2- amino benzothiazole - 6 مع بعض الألددهيدات والكيونات (2- هيدروكسي بنزالدهيد، 4- هيدروكسي بنزالدهيد، 4-N, N- مثيل أمينو بنزالدهيد والاسينوفينون والبنزوفينون للحصول على قواعد شيف (5-1) وفعلت قواعد شيف مع فثاليك انهيدريد فأعطت مشتقات الأوكسازيبين (10-6) التي تمت معاملتها لاحقاً مع امين اورماني أولي فأعطت خمسة مشتقات جديدة من الدايزيبين (11-15) وأخير تم تحضير خمسة مشتقات جديدة للتترازول (20-16) من خلال تفاعل قواعد شيف المحضرة (5-1) مع الصوديوم ازايد بوجود THF كمذيب وتم تشخيص المركبات المحضرة باستخدام بعض الطرق الطيفية 13C-NMR, 1H- NMR, FT-IR بالإضافة إلى دراسة الخواص الفيزيائية للمركبات المحضرة.