Synthesis and Characterization of Five, Sevene Heterocyclic Membered Rings

Muhaned J.Mahmoud* ***Ibtisam K.Jassim****
Muhanned A.Mahmoud**

Received 27, November, 2012
Accepted 9, December, 2012

Abstract :

New compounds containing heterocyclic units have been synthesized. These compounds include 2-amino 5- phenyl-1,3,4-thiadiazole (1) as starting material to prepare the Schiff bases 2N[3-nitrobenzylidene -2 hydroxy benzylidene and 4-N,N-dimethyl aminobenzylidene] -5-phenyl-1,3,4-thiadiazole (2abc) , 2N[3-nitrophenyl, 2-hydroxyphenyl or 4-N,N-dimethylaminophenyl] 3-]2-amino-5-phenyl-1,3,4-thiadiazole]-2,3-dihydro-[1,3]oxazepine-benzo-4,7-dione] (3abc), 2N[3-nitrophenyl,2-hydroxyphenyl,4-N,N-dimethylaminophenyl]-3-[2-amino-5-phenyl-1,3,4-thiadiazole-2-yl]-2,3-dihydro-[1,3]oxazepine-4,7-dione[(4abc), 2-N-[3-nitrophenyl, 2-hydroxyphenyl or 4-N,N-dimethylaminophenyl]-3-[2-amino-5-phenyl-1,3,4-thiadiazole-2yl]-1,2,3-trihydro-benzo-[1,2-e][1,3] diazepine-4,7-dione (5abc) ,2N[2-(3-nitrophenyl,2-hydroxyphenyl or 4-N,N-dimethylaminophenyl)]-4-oxo-1,3-thiazolidine-3-yl]-2-amino-5-phenyl-1,3,4-thiadiazole (6abc), 2-N-[5-(3-nitrophenyl,2-hydroxyphenyl or 4-N,N-dimethylaminophenyl)-tetrazolo-1-yl]-2-amino-5-phenyl-1,3,4-thiadiazole (7abc) , 2-N-[5-(3-nitrophenyl,2-hydroxyphenyl or 4-N,N-dimethylaminophenyl)-3-[2-amino-5-phenyl-1,3,4-thiadiazole-2-yl]-2,3-dihydro-[1,3]oxazepine-benzo-4,7-dithione (8abc) , 2-N-[5-(3-nitrophenyl,2-hydroxyphenyl or 4-N,N-dimethylaminophenyl)-3-[2-amino-5-phenyl-1,3,4-thiadiazole-2-yl]-2,3-dihydro-[1,3]oxazepine -4,7-dithione -5-ene (9abc) and 2-N-[5-(3-nitrophenyl,2-hydroxyphenyl or 4-N,N-dimethylaminophenyl)-3-[2-amino-5-phenyl-1,3,4-thiadiazole-2-yl] -1,2,3-trihydro-benzo-[1,2-e][1,3] diazepine -4,7-dithione - (10abc) . the structures of these compounds were characterized by FT-IR, ^{1}H,^{13}C-NMR,Uv/vis spectroscopy and the melting points were determined besides the evaluation of its biological activity.

Key word: five,seven heterocyclic rings,oxazepines,thiazolidinone.

Introduction:

Thiadiazole compounds are classes of five membered rings containing two nitrogen atoms and one sulfur atom and exist with different structure formulas[1] Neslihan Demirbas[2] synthesized derivatives of 1,3,4-thiadiazole from the reaction of (4-amino-3-substituted-5-oxo-4,5-dihydro-1H-1,2,4-triazol-1-yl) acetic acid hydrazidewith phenyl isothiocyanate and the resulting thiosemicarbazide derivatives were cyclized using sulfuric acid. Wissam[3] has synthesized thiadiazole fused with triazole ring 3-(p-bromo phenomethyl)-5-mercapto-5-

triazole [3,4-b]-1,3,4-thiadiazole by using CS_2 and KOH.1,3,4-thiadiazoles are known for their broad-spectrum of biological activity such as antifungal[4,5] antibacterial[6] herbicidal[7] antiviral[8] and analgesic effect[9,10] 2-benzylamino-5-(2-pyridyl)1,3,4-thiadiazole used as antibactrial agent([11] Aromatic

*Department of Chemistry,College of Education-Ibn-Al-Haitham,University of Baghdad
**Department of Chemistry,College of Sciences for girls / University of Baghdad .

Schiff's base is considered as a chromophore due to conjucation of the electron pair on the nitrogen atom with the benzene ring of aniline and benzaldehyde [12] Biologically, Schiff's bases are important since they have biological activity against bacteria and fungi[13-16] Oxazepam (serax) is a new benzodiazepine derivative introduced in 1965 for use in the relief of the psychoneuroses characterized by anxiety and tension[17] Oxazepam (serax) is non-hom ologous seven member ring that contains two heteroatoms (Oxygen and Nitrogen). Oxazepines (serax) is used as antibiotics, enzyme inhibitors, pharmacological interest, and it has been studied much chemically[18-21] and biological studied[22-26] Diazepam (valium) is a class of drugs used as relaxants, minor tranquilizers, hypnotics and muscle relaxant because it is often seen in fortensic and clinical cases. It introduced in 1969 under brand name valium ([27-29]Diazepam (valium) is used to relief anxiety tension associated with anxiety disorder and muscle spasms as well as alcohol withdrawl[24] and other clinically uses[25,26] Thiazepine **,** many examples belonging to oxazepines, diazepines are documented, but very little is known about thiazepine [30,31]1,4-Benzothiazepine derivatives are of considerable interest because of their biological activity as a muscle relaxants[32,33] Thiazepine is one of the drugs which have biological interest due to their activity on the central nervous system, as enzyme inhibitors, anti-cancer, anxiolytic activity, anticonvulsant, muscle relaxant[33]and other uses[34] Tetrazoles have also used in other biological and non-biological applications[35] In agriculture tetrazoles serve as plant growth regulators, as herbicides and as fungicides.

Materials and methods:

1.Melting points were recorded with Stuart Melting point apparatus and were uncorrected.

2.Infra red spectra (FT-IR) were recorded on Shimadzu FT-IR-8300 spectrophotometer in Ibn Sina State Company (ISSC).

3.Uv/vis spectra were recorded on Uv/vis varian Uv-Cary-100 spectrophoto-meters in (ISSC).

4.^{1}H-NMR spectra were recorded on a BRUKER-400 MHz operating at 300 MHZ with tetra methyl silane as internal standard in $CDCl_3$ and DMSO-d_6 as a solvent, measurements were made at Chemistry Department, AL-Baath University-Syria.

5.Elemental Analysis (C.H.N.S.) was carried out with: Euroea Elemental Analyzer Italia by Chemical Department College of Science, Babylon University.

6.Thin layer Chromatography (TLC) was carried out by using alumina plates percolated with silica–gel, supplied by Merck. Spots were detected with iodine vapor.

7.The biological activity was performed by Biology Department/ College of Science, University of Tikrit.

1- Preparation of: 2-amino-5-phenyl-1,3,4-thiadiazole [1][36]

A mixture of benzoic acid (0.05 mol, 7g), thiosemicarbazide (0.05 mol, 5.22g) and (15 mL) of $POCl_3$ was refluxed for 3 hours. After that (50 mL) of water was added then refluxed for 3 hours. The mixture was cooled and the precipitate was filtered and the filtrate neutralized with KOH, washed with water and dried . M.p (196-198)°C, yield 83%, recrystalization solvent ethanol, C.H.N.S analysis in Table (1).

2 - Preparation of Schiff Bases [2][37] abc)

A mixture of equimolar amounts (0.09 mol) of appropriate aldehyde and the amines (2-amino-5-phenyl -1,3,4-thaidiazol), in absolute ethanol (15 ml) with (3) drops of glacial acetic acid was refluxed in water bath for 3 hours. (For compound 2b; it was used 14.3 g of sodium acetate). The reaction mixture was then allowed to cool at room temperature, and the precipitate was filtered and dried, recrystallized from ethanol to give yellow crystals. C.H.N.S analysis of some compounds in Table (1).m.p. for a= 190-192,b=150-152,c=175-177 ^{0}C.

3- Preparation of Compounds[3, 4(abc)][38,39].

A mixture of equimolar amounts (0.01mol) of Schiff bases [2abc] and (phthalic or maleic anhydride) respectively in dry benzene was refluxed for (4-5) hours, the solvent was removed by rotatory evaporater and the resulting colored crystalline solid was recrystallized from dry dioxane to give the title compounds. m.p. for 3a=14-142,b=145-146,c=156-158 and 4a=144-146,b=120-123,c=160-162 ^{0}C.

4 -Preparation of Compounds [5abc][40]

A mixture of equimolar amounts (0.01 mol) of Schiff bases [2abc] and phthalimide (0.01 mol) in dry benzene was refluxed for (4-5) hours, the mixture was cooled and the solvent was removed by rotatory evaporater , then the resulting crystalline solid was recrystallized from dry dioxane. M.p. for a= 162-164,b=127-129,c=140-142 ^{0}C.

5- Preparation of Compounds [6abc][41]

Mercapto acetic acid (0.001 mol, 0.1 g) in dry benzene (7.5 mL) was added slowly to (0.001 mol) of Schiff base [2]. The addition continued about (10 seconds) with stirring then the mixture was refluxed for 10 hours. Excess solvent was evaporated and the residue was treated with sodium bicarbonate to produce compounds [6] as solid precipitate and recrystallized from ethanol.m.p.for b=190-193,c=186-188^{0}C.

6- Preparation of Compounds [7abc][42]

A mixture of (0.01mole) of Schiff base (2) ,tetrahydrofuran (THF) (15mL) and sodium azide (0.01mole) was heated on a water bath. The temperature of water bath was controlled between (50-55)^{0}C. The end of the reaction was checked by (TLC) which showed the disappearance of the stating material.[m.p.for a=201-203,b=180-182,c=210-212 ^{0}C.

7-Preparation of Compounds[8, ,9, ,10(abc [43,44] .

A mixture of compounds [3, 4, 5(abc)] of oxazepine and diazepine derivatives respectively (0.002 mol) in dry dioxane (50ml) was stirred and phosphorus pentasulfide (P_2S_5) (0.004 mol) was added at once. The reaction mixture was heated under reflux with stirring for 1 hour, the reaction mixture was then allowed to cool to room temperature, the precipitate was filtered and dried, recrystallized from petroleum ether [40-60]^{0}C to give yellow crystals.(R_f=0.90 for 3b,0.94 for4a, 0.85for5a, 0.71 for7b ,0.77 for 8b, 0.83for 9a ,0.71 for 10a) in 1,4 dioxane.m.p. for 8a=207-209,b=193-195,c=220-223,and 9a=172,b=144-147,c=190-193,and 10a= 177-180,b=183-186,c=200-202 ^{0}C.

Table (1): The C.H.N.S.analysis (cal/found) for some prepared compounds.

Comp.No.	M.F.	C%	H%	N%	S%
1	$C_{15}H_7N_3S$	54.21/54.20	3.98/3.99	23.71/23.7	18.09/18.05
2b	$C_{15}H_{11}N_3SO$ 2.1	64.03/64.01	3.93/3.91	14.93/14.96	11.39/11.33
3a	$C_{23}H_{14}N_4SO_5$	60.25/60.20	3.07/3.04	12.22/12.26	6.96/6.91
6b	$C_{17}H_{13}N_3S_2O_2$	57.44/57.47	3.68/3.65	11.82/11.83	18.04/18.01
9c	$C_{21}H_{18}N_4S_3O$	57.50/57.43	4.13/4.11	12.77/12.73	21.93/21.95

Results and Discussion:

1- Synthesis and characterization of 2-amino-5-phenyl-1,3,4-thiadia zole [1]

The reaction of thiosemicarbazide with benzoic acid in presence of phosphorus oxychloride afforded 2-amino-5-phenyl-1,3,4-thiadiazole[36] The structural assignment of the product was based on it's melting point and spectral (FT-IR, ^{1}H-NMR and Uv/Vis.) data. Besides the C.H.N.S. analysis . The FT-IR spectrum of compound [1], exhibited significant two bands in the range (3275–3093)cm^{-1} which could be attributed to asymmetric and symmetric stretching vibrations of NH_2 group. Besides, band at about (1635 cm^{-1}) due to cyclic (C=N) stretching is also observed. Bands at (1512 cm^{-1}) and (1465 cm^{-1}) are due to the (N-H) bending and C-N) stretchig vibrations, respectively[45]. ^{1}H-NMR spectrum of compound [1], Fig. (1) shows the following characteristic chemical shifts (DMSO-d_6, ppm). The five aromatic protons appeared at: (δ 7.40-7.94) were due to aromatic protons. Amino protons (NH_2) signal at (δ 3.38). Furthermore, the small peak at (δ 2.5) was due to DMSO. The Uv/Vis. spectrum, gave absorption bands at different wave lengths (295, 319) nm (in chloroform), due to(n → π*) and (π → π*) transitions.

2- Synthesis and characterization of 2N[3'-nitrobenzylidene2'-hydroxybenzylidine and 4-N',N'-dimethylaminobenzylidine]-5-phenyl-1,3,4-thiadiazole [2a,b,c].

The titled compounds were synthesized from the reaction between compound [1] and appropriate aldehydes in absolute ethanol and glacial acetic acid[37]. Compounds [2], containing imine bond have been synthesized for preparing another derivatives like thiazolidin, tetrazol and oxazepines ….etc, because these derivatives have a wide range of biological activity[32] and industry[46] application. The condensation reaction of equimolar quantity of primary amine with the appropriate aromatic aldehydes is the major method to prepare series of Schiff bases. The FT-IR spectra, show the disappearance of the two absorption bands due to (-NH_2) stretching of amino thiadiazole [1] derivative [2a] as example, showed all the suggested bands for olefinic (C-H), (C=C) aromatic, endocyclic (C=N) and exocyclic imine group. Stretching vibrations in addition to out of plane bending of substituted aromatic ring. All the prepared compounds (Schiff bases) exhibited the stretching band near the region (1219-1250) cm^{-1} this due to (=N-N=C-) cyclic group. All the spectral data for other compounds are listed in table (2).

Table (2): FT-IR spectral data of compounds [2a,b,c].

Comp. No.	υ(C-H)aromatic cm^{-1}	υ(C-H) aliphatic cm^{-1}	υ(C=N) exo cm^{-1}	υ(C=N)endo cm^{-1}	Others cm^{-1}
2a	3089	2970	1612	1573	υ(NO_2) 1350-1415
2b	3093	2958	1630	1570	υ(OH) 3375
2c	3082	2920	1662	1597	υ(N-Me) 1373

^{1}H-NMR spectrum of compound [2b],fig.,(2), shows the following characteristic chemical shift, ($CDCL_3$) ppm. The OH proton rosenate at (δ 4.3), five aromatic ring protons of phenyl linked to thiadiazole and four aromatic ring protons appeared at (δ 6.8 – 8.1) ppm. Furthermore, the signal at (δ 10.1) attributed to (C-H) proton.

3- Synthesis and characterization of 2N[3'-nitrophenyl, 2'-hydroxyphenyl or 4'-N,N-dimethylaminophenyl],3-[2-amino-5-phenyl-1,3,4-thiadiazole]-2,3-dihydro [1,3] oxa zepine-benzo-4,7-dione [3a,b,c].

These compounds [3a,b,c] were synthesized from the reaction of compounds [2a,b,c] with phthalic anhydride in dry benzene[38,39]. These compounds were characterized by their melting points, FT-IR, and they were checked by T.L.C. The FT-IR spectrum of compound [3a] as example was confirmed from the appearance of carbonyl group band at (1702 cm^{-1}) and (C-H) aromatic band at (3089 cm^{-1}) and (C-H) aliphatic band at (2900 cm^{-1}) and bands at (1273 and 1072 cm^{-1}) belong to asymmetric and symmetric (C-O-C) band) shows the FT-IR spectrum of compound [3a] as an example. All the spectral data for other compounds are listed in table (3).

Table (3): FT-IR spectral data of compounds [3a,b,c].

Comp. No.	υ(C-H) Aliphatic cm^{-1}	υ(C-H) aromatic cm^{-1}	υ(C=O) cm^{-1}	υ(C=N) thiadiazole cm^{-1}	υ(C=C) cm^{-1}	Others bands cm^{-1}
3a	2900, 2854	3089, 3066, 3032	1702, 1680	1573	1531, 1435	υ(NO_2) 1315, 1435 υ(C-N) 1188 υ(C-O) 1275
3b	2924, 2854	3055, 3020	1700, 1739, 1720, 1685	1580	1535, 1459	υ(OH) 3383 υ(C-N) 1140 υ(C-O) 1260
3c	2924, 2854	3151, 3039	1710, 1635	1566	1540, 1435	υ(N-me) 1361 υ(C-N) 1168 υ(C-O) 1242

4- Synthesis and characterization of 2N[3'-nitrophenyl, 2'-hydroxy phenyl, 4'-N,N-dimethylaminophenyl]-3-[2-amino-5-phenyl-1,3,4-thiadiazole-2-yl]-2,3-dihydro-[1,3]oxazepine-4,7-dione [4a,b,c]

These compounds [4a,b,c] were synthesized from the reaction of compound [2] with maleic anhydride in dry benzene[38,39]. The FT-IR spectrum of compound [4c] as example was confirmed from the appearance of carbonyl group band at (1720 cm^{-1}) and (C-H) aliphatic band at (2924-2854 cm^{-1}), besides the (C=N) band of thiadiazole ring at (1610cm^{-1}) and bands at (1239 and 1118 cm^{-1}) belong

to the asymmetric and symmetric (C-O-C) band, shows the FT-IR spectrum of compound [4c]. All the spectral data for other compounds that are listed in table(4).

Table (4): FT-IR spectral data of compounds [4a,b,c].

Comp. No.	υ(C-H) cm^{-1}	υ(C-H) aromatic cm^{-1}	υ(C=O) Lactone cm^{-1}	υ(C=N) thiadiazole cm^{-1}	υ(C=C) cm^{-1}	Other bands cm^{-1}
4a	2924, 2854	3089, 3066	1723, 1623	1573	1527, 1458	υ(NO_2) 1315- 1438 υ(C-N) 1192 υ(C-O) 1222
4b	2918, 2854	3035	1724, 1689	1566	1539, 1462	υ(OH) 3402, 3383 υ(C-N) 1180 υ(C-O) 1215
4c	2924, 2854	3093	1720, 1633	1610	1563, 1433	υ(N-Me) 1327 υ(C-N) 1168 υ(C-O) 1239

5- Synthesis and characterization of 2-N-[3'-nitrophenyl, 2'-hydroxyphenyl or 4'-N,N-di methylaminophenyl]-3-[2-amino-5-phenyl-1,3,4-thiadiazole-2-yl]-1,2,3-trihydro-benzo-[1,2-e][1,3]diazepine-4,7-dione [5a,b,c]

Compounds [5a,b,c] were synthesized from the reaction of compound [2a,b,c] with phthalimide in dry benzene[(40)]. The FT-IR spectra, show the following common features, the appearance of the band in the region (3197 cm^{-1}) , compound (5b) is attributed to the (N-H) stretching frequency with the appearance of bands at (1724-1774 cm^{-1}) assignable to (C=O) stretching band. Disappearance of band at (1630 cm^{-1}) due to (C=N) of shiff bases, is good evidence for the structure given to these compounds. Besides this, a strong band at (1053-1087 cm^{-1}) is attributed to (=C-N-C-) bond, and (C-H) aliphatic band at (2924-2854cm^{-1}) ,(C-H) aromatic band at (3059 cm^{-1}) other bands were also absorbed in FT-IR spectra of these compounds are listed in Table (4).

Table (5): FT-IR spectral data of compounds [5a,b,c].

Comp. No.	υ(N-H) cm^{-1}	υ(C-H) aliphatic cm^{-1}	υ(C=O) cm^{-1}	υ(C-H) aromatic cm^{-1}	υ(C=N) cm^{-1}	υ(C=C) cm^{-1}	Others cm^{-1}
5a	3201	2854, 2924	1774, 1751, 1732	3089	1620	1531, 1438	υ(NO_2) 1354, 1483 υ(C-N) 1188
5b	3197	2854, 2924	1774, 1751, 1724	3059	1604	1504, 1465	υ(OH) 3433
5c	3197	2854, 2924	1780, 1760, 1732,	3093	1620	1535, 1442	υ(N-Me) 1377 υ(C-N) 1165

^{1}H-NMR spectrum of compound [5a],fig.,(3), shows the following characteristic chemical shifts (DMSO-d_6) ppm. Signal of (C-H) and (N-H) proton absorbed at (δ 9.99) and (δ 6.55), respectively. protons of *m*-

substituted, aromatic rings (3 rings) appeared at the range δ (6.7–8.3) as a multiplet peaks. The Uv/vis. Spectrum of compound [5a], shows the absorption peak at (325 nm) as a multiplate due to (n → π*) or (π → π*) transitions.

6- Synthesis and characterization of 2N[2̀-(3-nitrophenyl, 2-hydroxyphenyl or 4-N,N-dimethylaminophenyl)]-4'-oxo-1̀,3̀-thia zolidin-3̀-yl]-2-amino-5-phenyl-1,3,4-thiadiazole [6a,b,c]

Thiazolidinones play a vital role due to their wide range of biological activity and industrial importance as stabilizer for polymeric material[47.] For a long time, imines have been used successfully in the synthesis of nitrogen contaning hetrocycles. The 4-thiazolidinone derivatives [6a,b,c] were synthesized by refluxing equimolar amounts from the imine [2a,b,c] with thioglycolic acid in dry benzene. The C.H.N.S. analysis .Table (2) agres with the suggested structure. The FT-IR spectrum of compound [6a], shows the appearance of stretching band of carbonyl group at (1710 cm^{-1}) due to thiazolidinone[45] ring and this was the most characteristic evidence for the success of cyclization step. Also,the spectrum shows bands at (3089 cm^{-1}), (2924 and 2854 cm^{-1}) are attributed to υ(C-H) aromatic, and (C-H) aliphatic stretching vibrations of (C-H) group. Other characteristic bands of aromatic system are the appearance of υ(C=C) at about (1512 cm^{-1}) besides the band at (1600 cm^{-1}) due to (C=N) of thiadiazole ring.

Table (6): FT-IR spectral data of compounds [6a,b,c].

Comp. No.	υ(C-H) aliphatic cm^{-1}	υ(C-H) aromatic cm^{-1}	υ(C=O) cm^{-1}	υ(C=N) cm^{-1}	υ(C=C) aromatic cm^{-1}	Others Bands cm^{-1}
6a	2854, 2924	3089	1710	1600	1512, 1465	υ(NO2) 1350- 1456 υ(C-N) 1140
6b	2870, 2962	3066	1710	1597	1516, 1490	υ(OH) 3278
6c	2854, 2992	3089	1735	1577	1512, 1465	4-(N-Me) 1381 υ(C-N) 1172

The ^{1}H-NMR spectrum of compound [6c], fig.,(4), shows the following characteristic chemical shifts ($CDCl_3$) ppm. The methyl group absorbed at (δ 2.9) $(CH_3)_2$. Signal of (C-H) of thiazolidine appeared at (δ 10.1) and protons of (CH_2) of thiazolidinone appeared at (δ 4.4). Protons of *p*-substituted aromatic rings and other phenyl ring appeared at the range δ (7.2-8.1) as a multiplate peaks.

7- Synthesis and characterization of 2-N-[5'-(3-nitropheyl, 2-hydroxyphenyl or 4-N, N'-dimethylaminophenyl)-tetrazolo-1̀-yl]-2-amino-5-phenyl-1,3,4-thiadiazole [7a,b,c]

The synthesis and interesting pharmacological properties of tetrazole compounds were recently described [48] compound [2a,b,c] Schiff base was heated in water bath at (55 - 60°C) with sodium azide, to give the desired product. The mechanism of the reaction systematically investigated as [3+2] cyclo additions which christened as a 1,3-dipolar cycloadditions[49] It involved the addition of unsaturated systems, dipolarphiles, to 1,3-dipoles, a molecule possessing resonance contributors in which a positive and negative charge are located in 1,3-position relative to each other. The addition results in a five- member ring. Azides are a prominent class of 1,3-dipoles and azide 1,3-dipolar

cycloadditions. They are of great synthetic value and have been studied mechanistically in great detail[50] The common features of this type of reactions is best accommodated by a T.S. geometry in which the dipolarphile and its ligands lies in one plane, and the azide lies in a parallel plane above or below, so that the orbitals perpendicular to the planes interact to form bonds.

The FT-IR absorption bands were utilized to characterize the specific structure of the synthesized compounds. The disappearacnce of band at (1612 cm^{-1}), attributed to (C=N) (imine group) stretching frequency is good evidence for the success of this step of reaction. Also, the IR spectra for these compounds were devoid of a strong band at (2120–2160)cm^{-1} attributed stretching frequency of a zide group. A band at (1531 cm^{-1}) was due to the cyclic (N=N) stretching of tetrazole ring[51]The characteristic data are reported in Table (7).

Table (7): FT-IR spectral data of compounds [7a,b,c].

Comp. No.	υ(C-H) aliphatic cm^{-1}	υ(C-H) aromatic cm^{-1}	υ(C=C) cm^{-1}	υ(N=N) cm^{-1}	υ(C=N) cm^{-1}	Other Bands cm^{-1}
7a	2920	3086	1573, 1415	1531	1605	υ(NO_2) 1354,1460 υ(N-H) 3390 υ(C-N) 1192
7b	2885, 2962	3069	1590, 1465	1515	1590	υ(OH) 3271 υ(N-H) 3207
7c	2839, 2962	3093	1597, 1465	1512	1635	4-(N-me) 1354 υ(N-H) 3390, 3278 υ(C-N) 1168

^{1}H-NMR spectrum of compound [7c],fig.,(5), shows the following characteristic chemical shifts ($CDCl_3$,) ppm. The methyl protons resonate at the range (δ 3.4-3.6). Two aromatic ring protons appear as a multiplate at (δ 7.02-7.88 ppm.) (N-H) proton (tautomeric proton) absorbed at (δ 5.2-5.5). Signal at (δ 10.1) due to the (C-H) proton. Uv/vis spectrum of compound [7b], shows the absorption peaks at (218, 319, 224 nm) which may attributed to ($n \rightarrow \pi^*$) and ($\pi \rightarrow \pi^*$) transitions.

8- Synthesis and characterization of 2N[3'-nitrophenyl, 2'-hydroxyphenyl or 4'-N,Ndimethylaminophenyl]-3-[2-amino-5-phenyl-1,3,4-thiadiazole-2-yl]-2,3-dihydro-[1,3]oxazepine-benzo-4,7-dithione [8a,b,c]

The FT-IR spectrum of compound [8c], shows the appearance of band at (1220-1241)cm^{-1} attributed to (C=S) thione group, besides the disappearance of band of carbonyl group. Also, the band at (2927 cm^{-1}) due to methyl group, and at (1566 cm^{-1}). assigned to (C=N) of thiadiazole ring.

Table (8): FT-IR spectral data of compounds [8a,b,c].

Comp. No.	υ(C-H) aliphatic cm^{-1}	υ(C-H) aromatic cm^{-1}	υ(C=N) cm^{-1}	υ(C=S) cm^{-1}	Other bands
8a	2850, 2924	3066	1605	1224-1280	υ(NO_2) 1355-1435 υ(C-N) 1189
8b	2854, 2926	3057	1550	1245-1265	υ(OH) 3386
8c	2856, 2927	3040	1565	1220-1241	4-(N-me) 1363

^{1}H-NMR spectrum of compound [8b], Fig. (6), shows the following characteristic chemical shifts (DMSO-d_6, ppm). Proton of (OH) group signal at the range δ (6.3-6.9), and protons of three aromatic rings appeared at the range (δ 7.0-8.1). Signal of (C-H) appeared at (δ 10.1).

9- Synthesis and characterization of 2-N-[3'-nitrophenyl, 2/-hydroxyphenyl or 4/ -N,N-dimetylaminophenyl]-3-[2-amino-5-phenyl-1,3,4-thiadiazole-2yl]-2,3-dihydro-[1,3]oxa zepine-4,7-dithione-5-ene [9a,b,c].

The titled compounds were prepared from the reaction between compound [4] and phosphorus pentasulfide (P_2S_5) in dioxane as a solvent[43,44[The FT-IR spectrum of compound [9a], shows the disappearance of band at (1723cm^{-1}) due to carbonyl group (C=O) and appearance of band at (1222 cm^{-1}) assigned to thione group (C=S). All the spectral data for other compounds are listed in table (9). The C.H.N.S. table (2) analysis confirmed the suggested structure

Table (9): FT-IR spectral data of compounds [9a,b,c].

Comp. No.	υ(C-H) cm^{-1}	υ(C-H) aromatic cm^{-1}	υ(C=C) cm^{-1}	υ(C=N) cm^{-1}	υ(C=S) cm^{-1}	Others bands cm^{-1}
9a	2850, 2924	3068	1529, 1454	1573	1222	υ(NO_2) 1315-1415 υ(C-N) 1192
9b	2852, 2922	3033	1539, 1462	1563	1215	υ(OH) 3385, 3410
9c	2855, 2924	3039	1565, 1435	1585	1242	4-(N-Me) 1361 υ(C-N) 1168

10- Synthesis and characterization of 2-N-[3'-nitrophenyl, 2′-hydroxyphenyl or 4'-N,N-dimethylaminophenyl]-3-[2-amino-5-phenyl-1,3,4-thiadiazole-2-yl]-1,2,3-trihydro-benzo-[1,2-e][1,3]-diazepine-4,7-dithione [10a,b,c]

The prepared compounds [10] were synthesized by the reaction of compounds [5a,b,c] and phosphorus pentasulfide (P_2S_5) in dioxane[43,44] These compounds were characterized by spectral data FT-IR and the melting points and the R_f were checked, table (3). The FT-IR spectrum of compound [10a] shows the appearance of band at (1230 cm^{-1}) assigned to thione group (C=S), and disappearance of band at the range (1732-1774 cm^{-1}) due to carbonyl group (C=O). Besides the (N-H) band at (3202 cm^{-1}) and at (1533, 3089 cm-^{1}) for (C=C) and (C-H) aromatic groups. All the spectral data for other compounds are listed in table (10).

Table (10): FT-IR spectral data of compounds [10a,b,c].

Comp. No.	υ(C-H) aliphatic cm^{-1}	υ(C-H) aromatic cm^{-1}	υ(N-H) cm^{-1}	υ(C=N) cm^{-1}	υ(C=S) cm^{-1}	Other Bands cm^{-1}
10a	2854, 2925	3089	3202	1605	1230	υ(NO_2) 1355-1415 υ(C-N) 1188
10b	2854, 2915	3059	3190	1606	1230	υ(OH) 3361, 3430
10c	2854, 2928	3093	3190	1580	1232	4-(N-Me) 1377 υ(C-N) 1166

Microbiological Method

In this work, the antibacterial test was performed according to the disc diffusion method. Compounds ([2b], [5a], [7b], [8a], [9a]) were assayed for their antimicrobial activity in vitro against Gram-negative bacteria (*Escherichia coli*) and Gram-positive bacteria (*staphylococcus aureus*). Prepared agar and Petridishes were

sterilized by autoclaving for 15min at 121C°. The agar plates were surface inoculated uniformly from the broth culture of the tested microorganisms. In the solidified medium suitably spaced apart holes were made all 6mm in diameter. These holes were filled with 100µl of the prepared compounds (1mg of the compound dissolved in 1ml of DMSO solvent), DMSO was used as a solvent. These plates were incubated at 37C° for 24h for both bacteria. The inhibition zones caused by the various compounds were examined. The results of the preliminary screening tests are listed in Table (10).

Table (10): Antibacterial activities of some of the synthesized compounds.

Comp. No.	*Escherichia coli*	*Staphococcus aureus*
2b	±	-
5a	-	+
7b	±	+
8a	+	+
9a	+	+

Note:(-): No inhibition, (±) = 6 - 9 mm, (+) =10 -14 mm, (++): 15-22 mm

Conclusion: 1-For *Escherichia coli* (G-), compounds [8a, 9a] showed moderate effect on this bacteria, while compound [5a] showed no activity against this bacteria, and compound [7b] showed slightly effect on this bacteria. 2-For *Staphylococcus aureus* (G^+), all compounds have moderate effect on this bacteria except compound (2b).

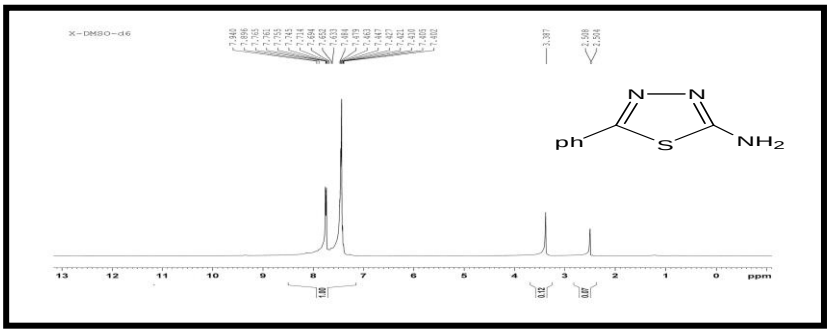


Fig. (1): ^{1}H-NMR spectrum of compound (1)

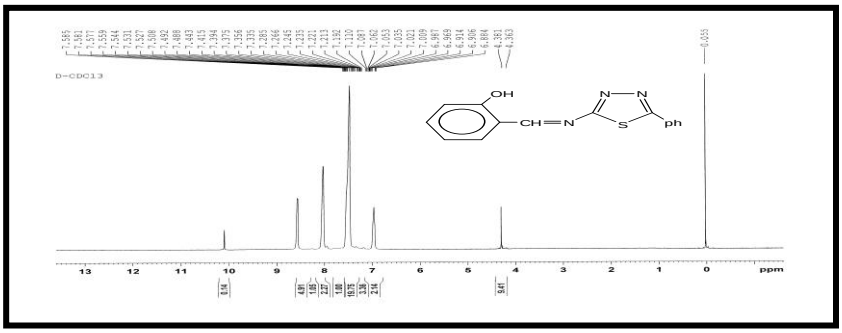


Fig. (2): ^{1}H-NMR spectrum of compound (2b).

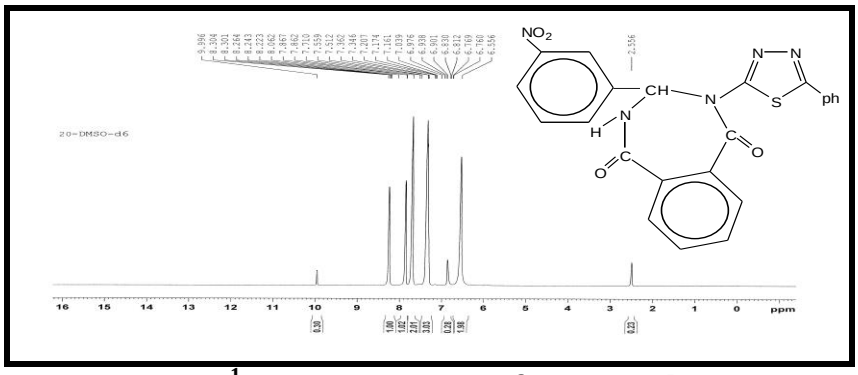


Fig. (3): ^{1}H-NMR spectrum of compound (5a).

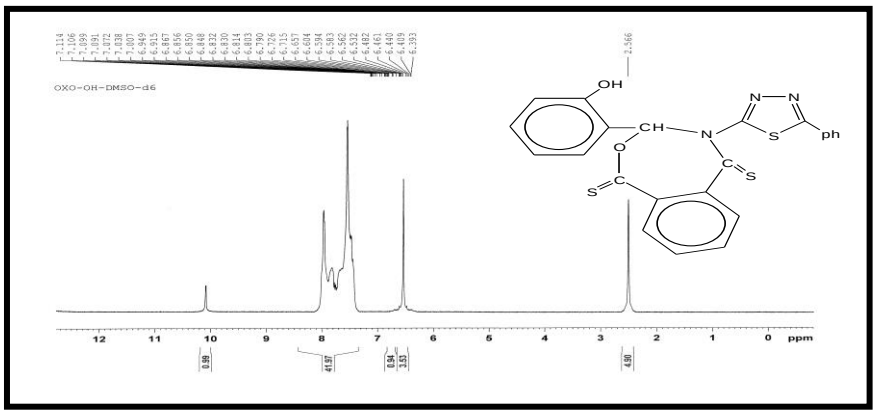


Fig. (4): ^{1}H-NMR spectrum of compound (6c).

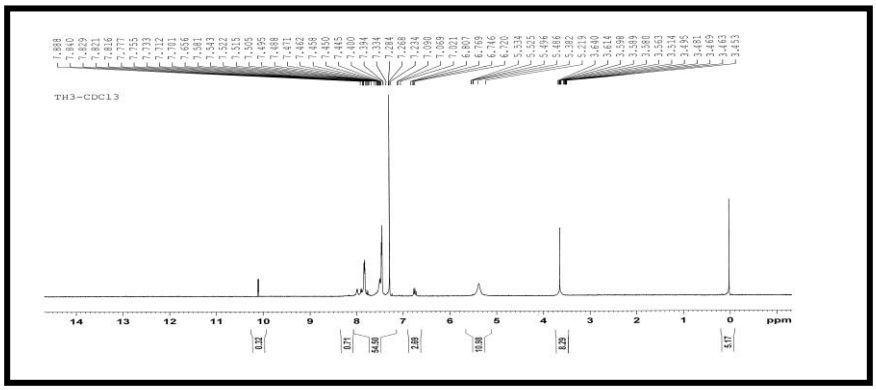


Fig. (5): ^{1}H-NMR spectrum of compound (7c).

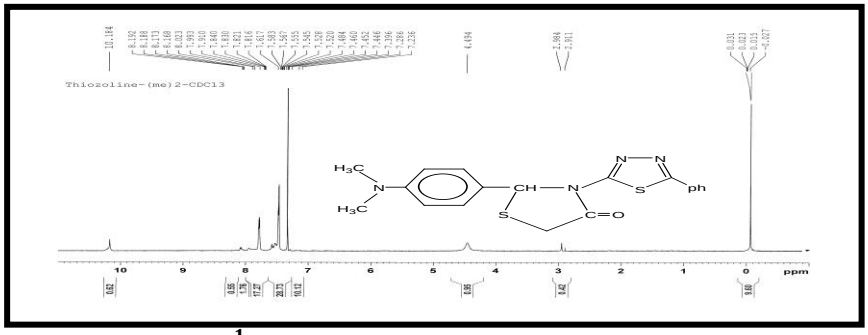
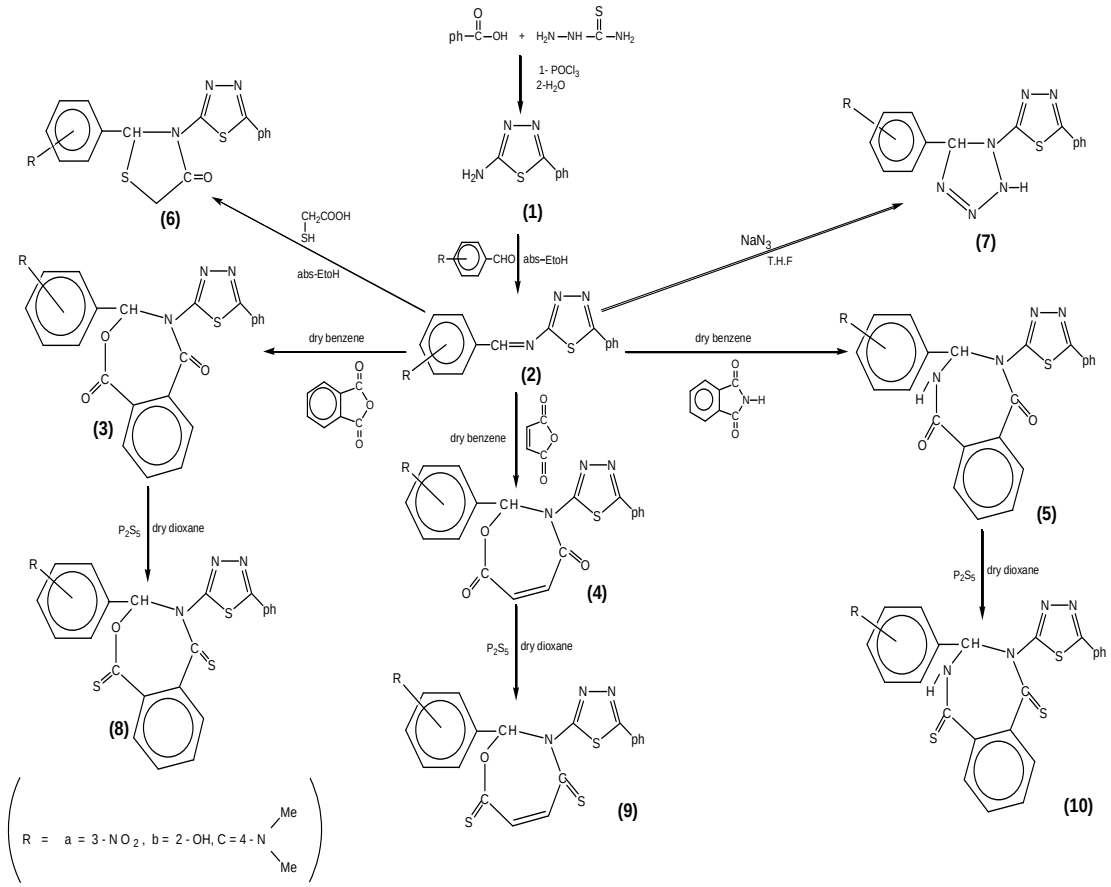


Fig. (6): ^{1}H-NMR spectrum of compound (8b).



Scheme (I)

References :

1-. Sand storm, J 1996"Advanced in Heterocyclic Chemistry", C. A. R. Katrizky and A.Bouttan, *Ed J.* Vol. 9, Academic Press. Inc. New York, P. 165.

2-Neslihan Demirbas, 2004*Eur J of Med.Chem. 39, 793*

3-. Wissam Jassim, K 2007M.Sc. Thesis, College of Ibn-Al-Haitham, University of Baghdad

4-. Mishra R. K. and Tewari, R. K. 1991J. Indian Chem. Soc. 68,110

5- Tasaka A., Tamura N., Hatashi R.and K1990. Itoh, Chemical and Pharmaceuti-cal N. A. Abdon and F. M. Amin, Mansoura J. Pharm. Sci. 6, 25

6-. Khal M. H and Nizamuddin H. 1997, Indian J. Chem., 36 B, 625

7-. Bonina L, Oralest G.,. Meredino R,. Arena A and Mastroeni. P. 1982Antimicro-bial Agents and Chemotherapy, Vol. 22, No. 6, P. 1067-1069 Dec,

8-. Zhang Z. Y,. Zhao M. Li, L,. Li Z. M and. Liao R. A, 1993 Chin. J. Org. Chem., 13, 397-402

9-. Gupta R, Sudan, S.. Mengi V and. Kachroo P. L1996, Indian J. Chem., Sect. B, 35, 621-623

10Uher -M. and Berkš D., 1999Chem., 53 (3), 215-217

11-Bulletin 199341, 1035

12-. Gargiulo, D. Ikemoto N,. Odingo J,. Bozhkova N Iwashita, T.. Berova N and. Nakanishi. K, 1994J. Am. Chem.Soc.**, 116,** 3760 .

13-. Hodnett E. M and Taim., J.1971J. Med. Chem., 14, 115.

14-. Roberts J. D and. Casserio C. M 1965, ". Basic Principles of Organic Chemistry", W.A. Benjamin P. 335

15- Varshney A. and Tenden J. P., Proc. Indian Acad. Sci. Chem., 97, 141. 1986

16- Mishra V.,. Saksenaad D. K and Jatn, M. C1987. Synth. React. Inorg. Met-Org. Chem., **17**, 987.

17- Wilson C. O. and. Givold O,1966."Text book of Organic Medicinal and pharma-ceutical Chemistry", 5th Ed., Pitman Medical Publishing Co. LTD, London coppy right. Cby. J. B. Lippin Cott Company .

18- Griffin R. J.,. Dudley C. N and. Cunuingham., M. L1996 Fundmental and Applied Toxicology, 29 (1), PP. 147-154

19-.. Bremmer B,. Brown E. J and. Davies. P. E2006, Australian Journal of Chemistry, 33 (6), PP. 1335-1343.

20-. Shalaby. A. A2003, J. Inorg. Chem., 178 (2), P. 199-210 .

21- Sabatie A.,. Vegh. D. Lonpy A and. Floch., L Arkivoc., 2001 (Vi), P. 122-128 published on the Web 14 Nov.

22- Olajos E. J. and Salem H..,2001, J. Appl. Toxicol., 21, P. 355-391

23- Moody J. D.. Zhang, , D. Heinz T. M and. Carl. E, 2000Appl. Environ Microbiol, 66 (8), P. 3646-3649

24- Bobrow R.., 2003 Family Practice., 20 (3), P. 347-349 .

25- Salzman. C., 1999 Clinical Crossroads. J. Am. Med. Assoc., 12, p. 281

26. Wang, -P. S Bohn R. L. and. Gluynn. R. J2001, Am. J. Psychiatry., 158, P. 892-898

27-. Wilson C. O and. Givold O, 1966 Text book of Organic Medicinal and pharma-ceutical Chemistry", 5th Ed., Pitman Medical Publishing Co. LTD, London coppy right. Cby. J. B. Lippin Cott Company .

28-A. Khan, P. Joyce and A. V. Jones., Newzealand Medical Journals 92, P. 94-96 . 1980

29-L. M. Matz and H. H. HillAnalytica Chimica Acta, 457, P. 235-245 . ., 2002

30-S.Bilgic J.Arkivoc, Chem ,(Xiii), 185-192. ., 2009

31-A.Vandana and S.P.Kumar. J,Heterocyclic Commun, 14,Iss 3,155-160. 2008

32- A. R. Katritzky, Y. Jiang Xu and H. Ying He., First published as an Advance Article on the Web 11th February2002

33-A. P. krapcho and K. J. Shaw.,. J. Org. Chem., 48, P. 3341-3343 . 1983

34-. Ibrahim S. S, El-gendy Z.M., Allimony H. A. and. Othman E. S. 1999, (Chem. Papers., 53 (1), P. 53-64 .

35- D. ModerhackJ1998. Prakt. Chem., **340**, 687 .

36- Coudert P., Albusson E., . Boire J. Y and Bastide, P.1994Eur. J. Med. Chem., 29, 471.

37-. Mahmoud M. J,. Al-Rubaiy Z. M. Al-Kubaisy, , R. K. Al-Najafi M. M and. Al-Jumaily, H.2005 M IBN-AL-HAITHAM. J. for pure and Appl. Sci., vol. 17(1) 103-110.

38- Amina Fayad A., 2008 Ph.D. Thesis, College of Ibn-Al-Haitham, University of Baghdad

39- Tawfiq, M. T2004. Ph.D. Thesis, College of Ibn-Al-Haitham, University of Baghdad

40-. Al-Jamali N. M2008; ph. D. Thesis, College of Ibn-Al-Haitham, University of Baghdad

41- Al-Masry, A. H.. Fahmy H. H and Ali Abdel Wahed S. H., 2000 Molecules, 5, 1429.

42 Adil Salih; -N. 2005Ph.D. Thesis, College of Science, AL-Nahrain University

43-. Billman J. H and Harting, W. F. 1985J. Am. Chem., Soc., 1508

44-. Pertow V,. Stephson O, Thomas A. J. and Wild A. M., 1985
J. Am. Chem., Soc.,1508

45-. Silverstien R. M,. Basler G. C and. Morril, ., T.C 1980"Spectroscopic Identification of organic compounds", John-Wiely and Sons, Inc. New York, 4th Ed.

46-. Meltem C., Uya U., Nurten B. D . and Rahmiya E., Turk J. 2006Chem., 30, 355-360.

47-. Brown. F. C 1961 Chem., Rev. 61, 463.

48-. Vazzona I,. Terranova E,. Mattioli F and Separator F., 2004 ARKIVOC V 364 .

49-. Mathews C. K,. Hold K. E and Ahern, K. G. 2000 "organic chemistry" 3rd Ed., Wesley Longman, Inc. Beniamin .

50-. Modzelewska B, J. Banachiewiez,. Chodkowska A and. Mazure L, 2004. Eur. J. Med. Chem., 39, 873 .

51-. Padwa A, 1984 .1,3-Dipolar cycloaddition chemistry" Genral Heterocyclic Chemistry series .Vol. land 2. John. Wiely and sons, Inc. New York .

تحضير وتشخيص مركبات غير متجانسة خماسية وسباعية .

مهند جميل محمود* ***ابتسام خليفة جاسم**** ***مهند عبداللطيف محمود*****

* قسم الكيمياء /كلية التربية –ابن الهيثم /جامعة بغداد .
** قسم الكيمياء /كلية اللعلوم للبنات/جامعة بغداد .

الخلاصة :
تم تحضير عدد من المركبات الغير متجانسة الحلقة .تشمل هذه المركبات 2-امينو-5-فنيل-4,3,1-ثايادايزول(1) ،كمادة اوليةلتحضير قواعد شف 2ن][3-نايتروبنزليدين-2هيدروكسي بنزليدين و4ن،ن-ثنائي مثيل امينوبنزليدين]-5-فنيل-4و3و1-ثايادايزول(2اب ج) ، 2ن][3-نايتروفنيل-2هيدروكسي فنيل ا و4ن،ن-ثنائي مثيل امينوفنيل] 3-[امينو-5-فنيل-4و3و1-ثايادايزول]-2,3-ثنائي هيدرو-[1,3]اوكسازبين بنزو-4,7-دايون (3اب ج) ، 2ن][3-نايتروفنيل-2هيدروكسي فنيل -[2-امينو-5-فنيل-4و3و1-ثايادايزول-2-يل]-2,3-ثنائي هيدرو-[1,3]اوكسازبين -4,7-دايون (4abc)] (4 و و 2N][3-نايتروفنيل-2هيدروكسي فنيل -[2-امينو-5-فنيل-4و3و1-ثايادايزول-2-يل]-2,3,1-ثلاثي هيدربنزو-[e] 1,2[ ]دايزبين -4,7-دايون (5اب ج)، و2ن][3,2-نايتروفنيل-2هيدروكسي فنيل او ن، ن –ثنائي امينوفنيل -4-اوكسو 1,3-ثايازوليدين -3-يل -[2-امينو-5-فنيل-4و3و1-ثايادايزول(6اب ج (6abc)])، 2ن][3-نايتروفنيل-2, هيدروكسي فنيل ا و4ن،ن-ثنائي مثيل امينوفنيل] تترازولو-1-يل) -[2-امينو-5-فنيل-4و3و1-ثايادايزول(7 (7abc)) ، و2ن][3,2-نايتروفنيل-2هيدروكسي فنيل او ن، ن –ثنائي امينوفنيل]-،2,3ثنائي هيدرو[1,3] اوكسازبين-بنزو-4,7-داي ثايون (-[2-امينو-5-فنيل-4و3و1-ثايادايزول(8اب ج)، و2ن-[5(3-نايتروفنيل-2هيدروكسي فنيل او ن، ن –ثنائي امينوفنيل]-3-[2-امينو-5-فنيل-4و3و1-ثايادايزول --،2,3ثنائي هيدرو[1,3] اوكسازبين -4,7-داي ثايون-5-ين ((9اب ج)، و2ن-[5(3-نايتروفنيل-2هيدروكسي فنيل او ن، ن –ثنائي امينوفنيل]-3-[2-امينو-5-فنيل-4و3و1-ثايادايزول --1,2,3ثلاثي هيدروبنزو[1و 2][1,3]ثايازبين -4,7--داي ثايون ((10اب ج).تم تشخيص تراكيب المركبات المحضرة بواسطة اطياف الاشعة تحت الحمراء الرنين النووي المغناطيسي وفوق البنفسجية كما تم تسجيل درجات الانصهار وتقييم الفعالية البايولوجية لها .