

Synthesis and Characterization of 2-(2-hydroxy-phenyl)-3-(6-R-benzothiazol-2-yl)-2,3-dihydro-[1,3]oxazepine-4,7-dione and 2-(2-hydroxy-phenyl)-6-methyl-3-(6-R-benzothiazol-2-yl)-2,3-dihydro-[1,3]oxazepine-4,7-dione .[1]

W.F.Hamady Al-Hity *

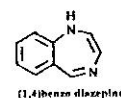
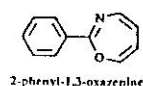
Date of acceptance 8/1/2005

ABSTRACT

2-[(6-R-benzothiazol-2-ylimino)-methyl]-phenols (*Schiff bases*) were prepared by condensation of 6-R-2-amino benzothiazol with Salicyldehyde. These Schiff bases were found to react with maleic anhydride and citraconic anhydride to give 2-(2-hydroxy-phenyl)-3-(6-R-benzothiazol-2-yl)-2,3-dihydro-[1,3]oxazepine-4,7-dione and 2-(2-hydroxy-phenyl)-6-methyl-3-(6-R-benzothiazol-2-yl)-2,3-dihydro-[1,3]oxazepine-4,7-dione. which were reacted with pyrrolidine to give anilid-pyrrolidine derivatives of maleic and citraconic

INTRODUCTION

The synthesis of 2-phenyl-1,3-oxazepine ⁽¹⁾ and the discovery of the central nervous system (CNS) activity of 1,4-benzodiazepine ⁽²⁾ by irradiation of 4-phenyl-2-oxa-3-aza bicyclo [3.2.0] hepta-3,6- dione, encouraged the chemists to look for other ways to build up the 7-membered heterocyclic ring system. One of these ways which was discovered recently , involves direct addition of maleic anhydride to the (N=C) double bond of Schiff bases . a number of 2,3-diaryl -2,3-di hydro-1,3-oxazepine-4,7-dione and 2-aryl-3-(1,5-dimethyl-2-phenyl pyrazolonyl)-2,3-dihydro-1,3-oxazepine-4,7-diones were prepared and characterized ^(3,4).



EXPERIMENTAL

Melting points were recorded with Gallenkamp Melting point Apparatus and were uncorrected. Elemental analysis were carried out with perkin-Elmer, 2400; CHN Elemental Analyzer. IR spectra were recorded with PYE UNICAM sp-300 Infrared spectrophotometer in KBr. Their ¹H-NMR spectra were recorded with BRUKER-AC-200MHZ FT-NMR in mutha University. UV-Visible spectra were re-

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corded (in ethanol) with Shimadzu Recce-160 spectrophotometer.

Preparation of 2-[(6-R-benzothiazol-2-ylimino)-methyl]-phenol

Were prepared according to known procedures⁽³⁾. Tables (1-3) list m.p.s, yield. Elemental analysis, IR, and UV-spectra.

Preparation of 2-(2-hydroxy-phenyl)-3-(6-R-benzothiazol-2-yl)-2,3-dihydro-[1,3]oxazepine-4,7-dione.[3] oxazepine-4,7-diones.

In a (100ml) round bottom flask equipped with double surface condenser fitted with Calcium chloride guard tube, was placed a mixture of 0.01 mole of 2-[(6-R-benzothiazol-2-ylimino)-methyl]-phenol and 0.01 mole of maleic anhydride in 10ml of dry benzene. The reaction mixture was refluxed in a water bath for 1.5 hr. The solvent was removed and the resulting solid was recrystallized from THF.

This experiment was repeated using different Schiff bases in order to obtain other 1,3-oxazepine

Attempted hydrolysis of 2-(2-hydroxy-phenyl)-3-(6-R-benzothiazol-2-yl)-2,3-dihydro-[1,3]oxazepine-4,7-dione.[4]

a) A mixture of 0.005 mole of 2-(2-hydroxy-phenyl)-3-(6-R-benzothiazol-2-yl)-2,3-dihydro-[1,3]oxazepine-4,7-dione and (10ml) of 10% NaOH solution was refluxed in a water bath for (20 min), then left to cool to (10C') and acidified with 2M.HCl. Whereby a crystalline solid separated out. The solid was filtered and recrystallized from THF. The product was shown to be the original starting substance(11).

b) In another experiment, 0.005 mole of 2-(2-hydroxy-phenyl)-3-(6-R-benzothiazol-2-yl)-2,3-dihydro-[1,3]oxazepine-4,7-dione was mixed with (1) 20 ml of distilled water, (2) 20 ml of 2M.HCl, (3) 20 ml of 10% NaOH solution and left at room temperature

overnight. After isolation, the recovered product in each case, was shown to be the unreacted starting compound.

Preparation of 4-Oxo-4-pyrrolidin-1-yl-but-2-enoic acid [2-hydroxy-(2-hydroxy-phenyl)-methyl]-(6-R-benzothiazol-2-yl)-amide.[5]

To a mixture of 0.005 mole of 2-(2-hydroxy-phenyl)-3-(6-R-benzothiazol-2-yl)-2,3-dihydro-[1,3]oxazepine-4,7-dione suspended in dry THF, was added an excess (0.03 mole) of dry pyrrolidine. After 10 min of stirring the mixture at room temperature, a clear solution was obtained. The solution was refluxed at (65C') in water bath for (45min) then left to room temperature and separated product was filtered, washed twice with (5ml) portion of dry THF and recrystallized from dioxane. Several other derivatives of male 4-Oxo-4-pyrrolidin-1-yl-but-2-enoic acid [2-hydroxy-(2-hydroxy-phenyl)-methyl]-(6-R-benzothiazol-2-yl)-amide were obtained following the same procedure

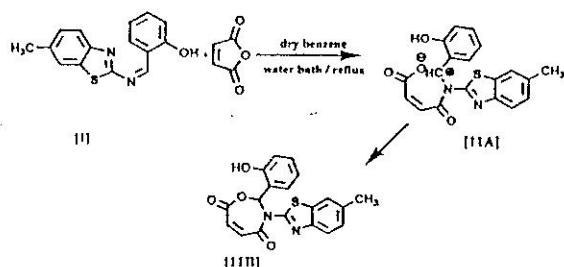
DISCUSSION

Schiff bases⁽³⁾ are prepared by condensation of 6-R-2-amino benzothiazol with salicylaldehyde to give 2-[(6-R-benzothiazol-2-ylimino)-methyl]-phenols. The reaction is followed by the appearance of (N=CII) absorption band at (1600-1610) cm^{-1} the disappearance of both (C=O) absorption band at (1670-1685) cm^{-1} and (-NH₂) absorption bands at (3400,3650) cm^{-1} in their IR spectra⁽⁴⁾. Where: R = CH₃, NO₂, OCH₃, Cl, Br 2-[(6-R-benzothiazol-2-ylimino)-methyl]-phenols are identified by their m.p.s., elemental analysis (table-1), IR spectra (table-2), and UV-Visible spectra (table-3).

It is known that Schiff bases react smoothly with acid chlorides and an-

hydrides to give the corresponding addition products^(5,6,7).

In this paper, the reaction of the cyclic unsaturated anhydride (maleic and citraconic) anhydride with 2-[(6-R-benzothiazol-2-ylimino)-methyl]-phenols can be presented as follows:



In this reaction, the nitrogen atom of the Schiff base attack one of the two (C=O) groups of anhydride yielding the dipolar intermediate (2) which collapses to the neutral species (II B) which is a combination of δ -lactone and δ -lactam in a 7-membered ring.

The reaction is followed by the disappearance of (N=C) absorption band at (1600-1610) cm^{-1} , and the appearance of the absorption bands of expected groups in the IR spectra of 2-(2-hydroxy-phenyl)-3-(6-R-benzothiazol-2-yl)-2,3-dihydro-[1,3]oxazepine-4,7-dione, and 2-(2-hydroxy-phenyl)-6-methyl-3-(6-R-benzothiazol-2-yl)-2,3-dihydro-[1,3]oxazepine-4,7-dione [11]. The (C=O) group in the IR spectra of the addition products, 1,3-oxazepine-4,7-diones and 2-aryl-3-methyl-5,6-dihydro-7H-pyrrolo[1,2-d]

[1,4]benzodiazepine-6-ones^(8,9) is absorbed in the same region (1670-1700) cm^{-1} . This conforms the assigned 7-membered ring system structure. The cycloaddition reaction is classified as 2+5 \rightarrow 7, and it is the first cycloaddition of this type, although in principle, one would predict that the pentadienyl cation might add to an olefine through a (4n+2) transition state to yield the cycloheptenyl cation⁽¹⁰⁾.

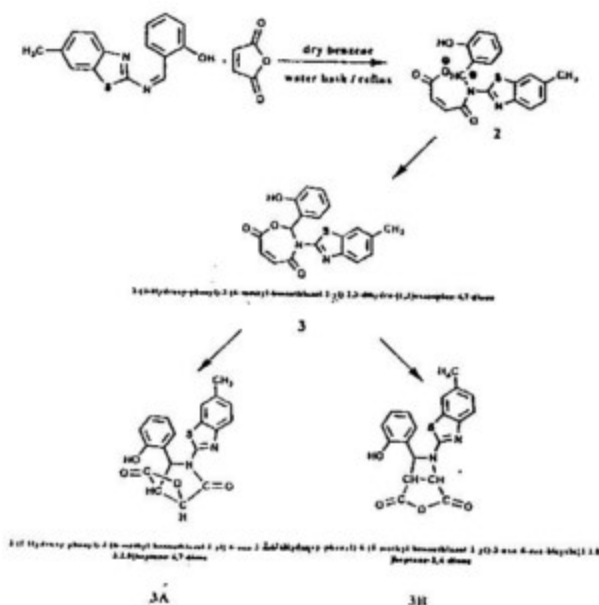
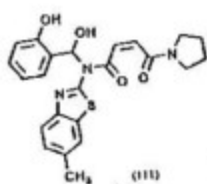
Structure [11B] is a combination of both lactone and lactam in a 7-membered cyclic ring. This is indicated by the appearance of the characteristic (C=O) (lactone/lactam) absorption band at (1660-1680) cm^{-1} in their IR spectra. Furthermore, structure (11) still maintains the (cis-CH=CH) double bond of maleic and citraconic anhydride as indicated by the absorption band at (1600-1610) cm^{-1}

and positive Br_2/CCl_4 and KMNO_4 tests. Furthermore, the UV-Visible spectra of Oxazepine derivatives show absorption maxima at (240-350) nm due to charge transfer of the cyclic 7-membered lactone-lactam combined structure [3].

Structure [3A] is unlikely, because of the high strain associated with 4-membered ring system (& - lactone ring), particularly when it is fused to another relatively small ring (δ -lactam ring). In addition, Structure [3A] is expected to show the IR absorption band of C=O (& -lactone) at 1750 cm^{-1} and of C=O (δ -lactam) at 1650 cm^{-1} . However; the lack of these absorption bands and the appearance of cis CH=CH absorption band in the IR spectrum of the lactone-lactam addition product [3] is an indicative evidence against, the structure [3A].

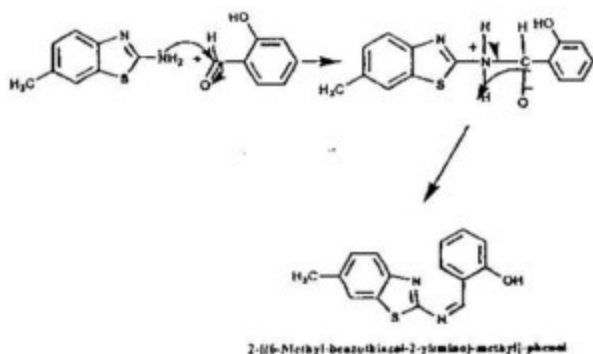
Structure [3B] which can be proposed for these products, results from the (2+2) cycloaddition of the reactants. The evidences against this structure came from the fact that the cycloaddition (2+2) reaction takes place under the influence of light and it is not expected under thermal condition. Previously, it was demonstrated that the basic hydrolysis of 2-(2-hydroxy-phenyl)-3-(6-methyl-benzothiazol-2-yl)-2,3-dihydro-[1,3]oxazepine-4,7-dione is unsuccessful due to immediate reclosure on acidification. This reclosure is easy to achieve due to the involved COOH and OH groups within the cis configuration of maleic, citra-

conic acid moiety. In order to avoid reclosure the original title compounds (π) are treated with pyrrolidine to give the open-chain anilide-pyrrolidide derivatives of maleic, phthalic and citraconic acid [4C] which still maintain the (cis-CH=CH) double bond configuration as evidenced by its IR absorption band at (1600-1610) cm^{-1} and by positive Br_2/CCl_4 and KMnO_4 tests.

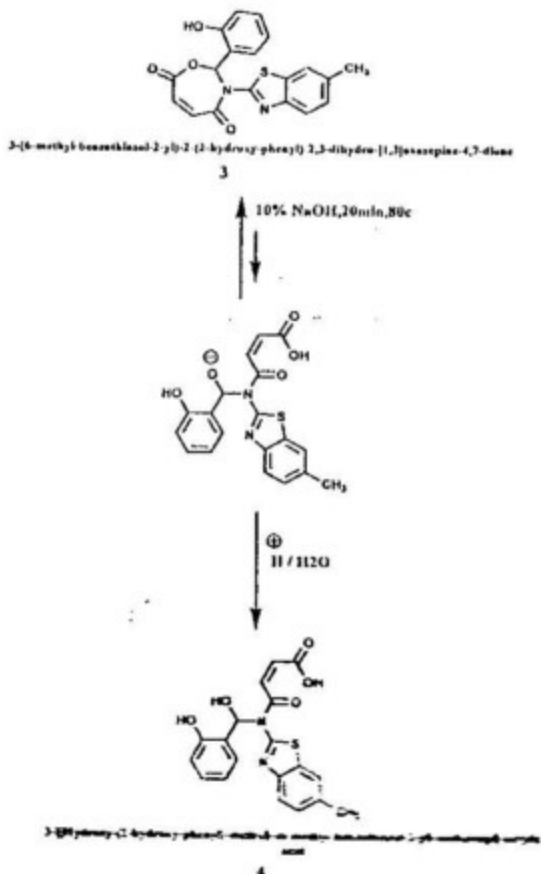


Scheme 2

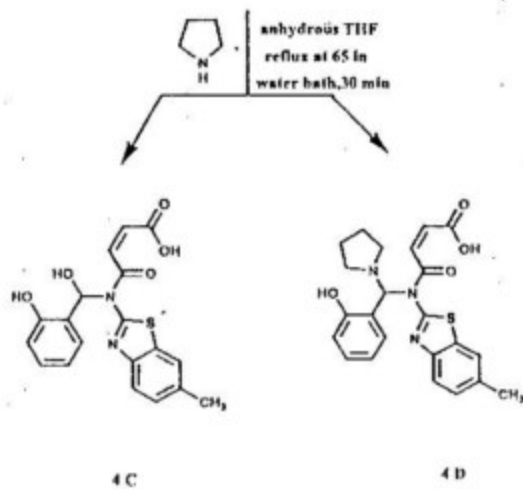
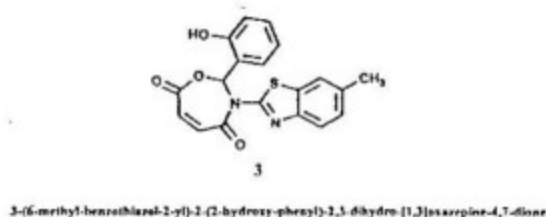
Apparently, this reaction involves an acyl-oxygen cleavage of the β -lactone ring, while N-C=O linkage is unaffected under these conditions. Since none of the two nitrogen atoms in the resulting products carries hydrogen, whereas reclosure to the cyclic diamide is not expected. Male 4-oxo-4-pyrrolidine-1-yl-but-2-enoic acid (6-methyl-benzothiazol-2-yl) -[hydroxy-(2-hydroxy-phenyl)-methyl] -amide are identified by their m.p.s. elemental analysis (table-6), IR spectra (table-7), $^1\text{H-NMR}$ spectra (table-8) and UV-Visible spectra (table-9).



(Scheme 1)

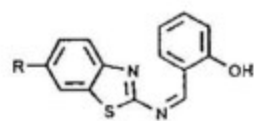


Scheme 3



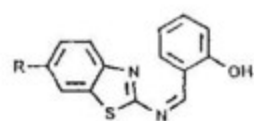
Scheme 4

Table (1) : Melting point,percentage yield, molecular formula and elemental analysis of 2-[(6-R- benzothiazol-2-ylimino)-methyl]-phenol.



Compound	R	M.P/C	Yield%	M.F	Calc.			Found		
					C	H	N	C	H	N
	CH ₃	172	86	C ₁₇ H ₁₃ N ₂ OS	67.14	4.5	10.44	67.25	4.60	10.40
	(CH ₃) ₂	188	88	C ₁₈ H ₁₄ N ₂ OS	68.06	5.00	9.92	67.99	4.89	10.04
	NO ₂	169	80	C ₁₆ H ₉ N ₂ O ₃ S	56.18	3.03	14.04	56.23	3.11	14.00
	OCl ₂	155	74	C ₁₃ H ₁₂ NO ₂ S	63.36	4.25	9.85	63.41	4.31	9.88
	Cl	174	77	C ₁₄ H ₉ NO ₂ Cl	58.23	3.14	9.70	58.11	3.22	9.67
	Br	179	75	C ₁₄ H ₉ NO ₂ Br	50.46	2.72	8.41	50.50	2.81	8.38

Table (2): The major IR absorptions (cm⁻¹) of substituted 2-[(6-R- benzothiazol-2-ylimino)-methyl]-phenol.

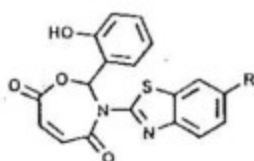


Compound	O-H str. Phenol	C-H str. Aromatic	C-H str. Alkane	C=N Imine	C-C str. Aromatic	C-H bend Alkane	C-S str.	Others
	3456	3020	2840	1600	1590,1580,1540	1470,1360	1250	
	3460	3060	2860	1620	1590,1520,1490	1460,1415	1245	
	3450	3040	---	1610	1570,1500,1480	---	1238	1335,1530 NO ₂
	3439	3010	2850	1600	1580,1510,1490	1450,1420	1234	1210 C-O-C Ester
	3440	3030	---	1610	1560,1540,1480	---	1235	730 C-Cl
	3445	3050	---	1600	1580,1550,1485	---	1245	650 C-Br

Table (3) : The UV-Visibl absorption maxima λ_{um} of 2-[(6-R- benzothiazol-2-ylimino)-methyl]-phenol.

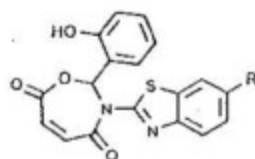
compound	UV-Visibl absorption maxima λ_{nm}
	380,300,266,225,220
	370,310,275,226
	385,315,280,244,222
	375,320,260,251,226
	380,312,245,225
	345,300,270,234,223

Table (4) : Melting point,percentage yield, molecular formula and elemental analysis of 2-(2-hydroxy-phenyl)-3-(6-R- benzothiazol-2- yl)- 2,3-dihydro-[1,3]oxazepine-4,7-dione



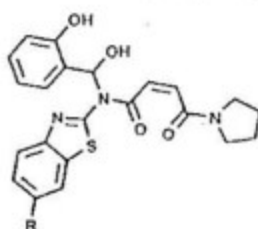
Compound	R	M.P/C	Yield%	M.F	Calc.			Found		
					C	H	N	C	H	N
1-3	CH ₃	192	77	C ₁₇ H ₁₄ N ₂ O ₄ S	62.28	3.85	7.65	62.15	4.00	7.50
2-3	4,6-(CH ₃) ₂	195	79	C ₂₀ H ₁₆ N ₂ O ₄ S	63.14	4.24	7.36	63.21	4.18	7.42
3-3	NO ₂	183	68	C ₁₇ H ₁₁ N ₃ O ₄ S	54.41	2.79	10.57	54.51	2.88	10.46
4-3	OC(=O)H	170	59	C ₁₇ H ₁₂ N ₂ O ₅ S	59.68	3.69	7.33	59.71	3.66	7.50
5-3	Cl	199	71	C ₁₆ H ₁₁ N ₂ O ₄ SCl	55.89	2.87	7.24	56.00	2.74	7.23
6-3	Br	186	69	C ₁₆ H ₁₀ N ₂ O ₄ SBr	50.13	2.57	6.50	50.27	2.60	6.35

Table (5) : The major IR absorptions (cm⁻¹) of 2-(2-hydroxy-phenyl)-3-(6-R- benzothiazol-2- yl)- 2,3-dihydro-[1,3]oxazepine-4,7-dione



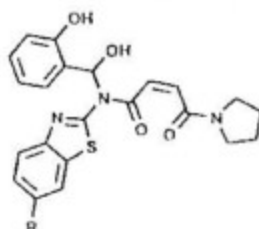
Compound	O-H str. Phenol	C-H str. Benzylic	C-H str. Olefine	C=O str. Lacton,lactam	C-C str. Olefine	C-C str. Aromatic	C-N str.	C-O str. lacton	C-H bend Aromatic	C-S str.	Others
1-3	3150	3200	3150	1670	1600	1580,1560	1410	1310	1050,770	1230	
2-3	3410	3290	3180	1670	1600	1580,1540	1415	1320	1010,870	1235	
3-3	3410	3180	3170	1678	1620	1580,1560	1450	1320	1050,920	1230	1330,1540 NO ₂
4-3	3435	3210	3150	1675	1610	1580,1555	1410	1330	1055,940	1250	1220 C=O-C
5-3	3430	3200	3160	1680	1600	1580,1565	1430	1300	1070,780	1245	750 Cl
6-3	3420	3200	3160	1675	1600	1580,1565	1450	1305	1080,770	1240	680 Br

Table (6) : Melting point,percentage yield, molecular formula and elemental analysis of 4-Oxo-4-pyrrolidine-1-yl-but-2-enoic acid (6-R- benzothiazol-2-yl)-[hydroxy-(2-hydroxy-phenyl)-methyl]-amide



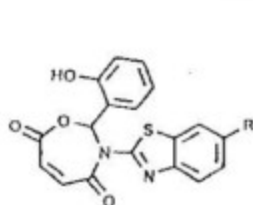
Compound	R	M.P/C	Yield%	M.F	Calc.			Found		
					C	H	N	C	H	N
1-5	H	235	69	C ₂₁ H ₂₁ N ₂ O ₅ S	63.14	5.30	9.60	63.20	5.39	9.66
2-5	(CH ₃) ₂	238	72	C ₂₃ H ₂₃ N ₂ O ₅ S	63.84	5.58	9.31	64.00	5.42	9.23
3-5	NO ₂	245	68	C ₂₀ H ₁₇ N ₂ O ₇ S	56.40	4.30	11.96	56.51	4.33	12.05
4-5	CH ₃	215	61	C ₂₂ H ₂₁ N ₂ O ₅ S	60.91	5.11	9.27	61.03	5.07	9.38
5-5	Cl	226	60	C ₂₁ H ₁₉ N ₂ O ₅ SCl	57.70	4.40	9.18	57.77	4.53	9.28
6-5	Br	220	59	C ₂₂ H ₁₉ N ₂ O ₅ Br	52.60	4.01	8.36	52.75	4.09	8.51

Table (7): The major IR absorptions (cm⁻¹) of 4-Oxo-4-pyrrolidine-1-yl-but-2-enoic acid (6-R- benzothiazol-2-yl)-[hydroxy-(2-hydroxy-phenyl)-methyl]-amide.

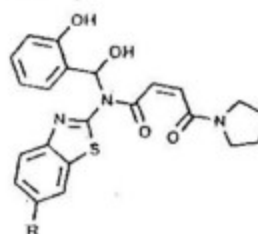


Compound	O-H str. Alcohol	O-H str. Phenol	C-H str. Olefine	C=O str. amide	C=C str. Olefine	C=C str. Aromatic	C=N str.	C-O Alcohol	C-S str.	Others
1-5	3460	3310	3140	1670	1600	1580,1490	1430	1280	1230	
2-5	3465	3320	3170	1670	1600	1580,1530	1430	1280	1235	
3-5	3480	3320	3150	1645	1610	1570,1540	1415	1270	1250	1365,1525 NO ₂
4-5	3500	3290	3150	1665	1605	1560,1530	1450	1290	1240	1210 C-O-C
5-5	3475	3300	3160	1660	1605	1580,1550	1445	1280	1230	775 C-Cl
6-5	3460	3290	3160	1660	1600	1570,1550	1415	1275	1235	655 C-Br

Table (8) :¹H.N.M.R spectrophotometry of 2-(2-hydroxy-phenyl)-3-(6-R- benzothiazol-2-yl)- 2,3-dihydro- [1,3]oxazepine-4,7-dione and 4-Oxo-4-pyrrolidine-1-yl-but-2-enoic acid (6-R- benzothiazol-2-yl)-[hydroxy-(2-hydroxy-phenyl)-methyl]-amide.



*Chemical shift =δ



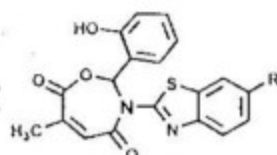
** By using DMSO-d₆ as solvent

Comp.	H-R	H-C-C-H	O-H phenol	O-H Alcohol	H-C Aromatic	Pyrrolidine ring			
						H ₂	H ₃	H ₄	H ₅
1-5	2.4	6.4,6.4	5.0	---	6.5-8.1	---	---	---	---
2-5	2.35,2.4	6.5,6.5	5.0	---	6.5-7.9	---	---	---	---
3-5	3.7	6.5,6.5	4.95	---	6.6-8.0	---	---	---	---
4-5	2.4	6.4,6.4	4.95	2.1	6.5-7.8	3.3	1.5	3.3	1.5
5-5	2.35,2.4	6.5,6.5	5.0	2.0	6.5-8.0	3.4	1.4	3.4	1.4
6-5	3.7	6.4,6.4	5.0	2.0	6.6-7.9	3.3	1.5	3.3	1.5

Table (9): The UV-Visible absorption maxima λ_{nm} of 2-(2-hydroxy-phenyl)-3-(6-R- benzothiazol-2- yl)- 2,3-dihydro -[1,3]oxazepine-4,7-dione and 4-Oxo-4-pyrrolidine-1-yl-but-2-enoic acid (6-R- benzothiazol-2-yl) -[hydroxy-(2-hydroxy-phenyl)-methyl]-amide.

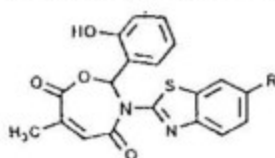
compound	UV-Visible absorption maxima λ_{nm} of oxazepine	Comp.	UV-Visible absorption maxima λ_{nm} of amidid - pyrrolidides
7-3	320,300,266,230,221	1-5	329,261,245,221
8-3	315,255,243,229	2-5	319,258,238,223
9-3	333,265,251,243,223	3-5	320,255,238,220
10-3	325,278,239,224	4-5	315,267,240,226
11-3	329,269,241,236,222	5-5	314,262,242,228
12-3	335,300,265,237,220	6-5	309,266,240,222

Table (10) : Melting point,percentage yield, molecular formula and elemental analysis of 2-(2-hydroxy-phenyl) benzothiazol-2-yl)-2,3-dihydro-[1,3]oxazepine-4,7-dione.



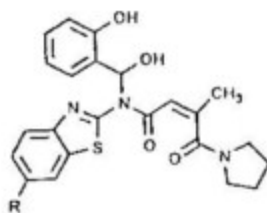
Compound	R	M.P/C	Yield%	M.F	Calc.			Found		
					C	H	N	C	H	N
7-3	CH ₃	205	77	C ₁₆ H ₁₀ N ₂ O ₂ S	63.14	4.24	7.36	63.12	4.30	7.41
8-3	(CH ₃) ₂	237	75	C ₁₇ H ₁₀ N ₂ O ₂ S	63.91	4.60	7.10	64.02	4.53	7.11
9-3	NO ₂	218	69	C ₁₆ H ₉ N ₃ O ₄ S	55.47	3.19	10.21	55.53	3.21	10.30
10-3	OC(H) ₂	193	58	C ₂₀ H ₁₆ N ₂ O ₅ S	60.00	4.07	7.07	60.05	4.12	7.00
11-3	Cl	199	66	C ₁₆ H ₉ N ₂ O ₂ SCl	56.93	3.27	6.99	57.01	3.33	7.05
12-3	Br	201	61	C ₁₆ H ₉ N ₂ O ₂ SBr	51.25	2.94	6.29	51.35	2.88	6.19

Table (11): The major IR absorptions (cm⁻¹) of 2-(2-hydroxy-phenyl)-6-methyl-3-(6-R- benzothiazol-2-yl) -2,3-dihydro-[1,3]oxazepine-4,7-dione



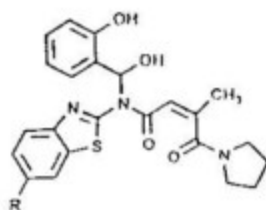
Compound	C-H str. Benzyllic	O-H str. Phenol	C-H str. Olefinic	C=O str. Lacton,lactam	C=C str. Olefinic	C=C str. Aromatic	C=N str.	C-O str. lacton	C-H bend Aromatic	C-S str.	Others
7-3	3220	3430	3130	1680	1600	1580,1530	1440	1330	1030,880	1220	
8-3	3210	3400	3180	1670	1610	1575,1560	1435	1320	1040,870	1225	
9-3	3200	3420	3130	1670	1610	1570,1550	1440	1320	1030,920	1230	1360,1550 NO ₂
10-3	3200	3450	3150	1665	1600	1580,1560	1450	1330	1030,900	1220	1210 C-O-C
11-3	3210	3430	3160	1675	1600	1570,1540	1440	1335	1040,830	1230	760 Cl
12-3	3200	3420	3130	1670	1610	1580,1530	1450	1320	1040,860	1235	660 Br

Table(12) melting points,percentage yield, molecular formula and elemental analysis of 3-methyl-4-Oxo-4-pyrrolidine-1-yl-but-2- enoic acid (6-R- benzothiazol-2-yl)-[hydroxy-(2-hydroxy-phenyl)-methyl]-amide.



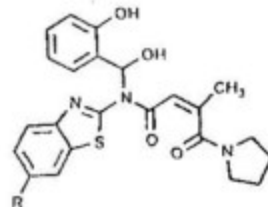
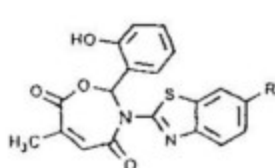
Compound	R	M.P/°C	Yield%	M.F	Calc.			Found		
					C	H	N	C	H	N
7-5	CH ₃	211	68	C ₂₃ H ₂₂ N ₄ O ₅ S	63.84	5.58	9.31	63.71	5.66	9.28
8-5	(CH ₃) ₂	229	60	C ₂₃ H ₂₁ N ₄ O ₅ S	64.50	5.85	9.03	64.48	5.90	9.11
9-5	NO ₂	244	63	C ₂₃ H ₁₉ N ₄ O ₅ S	57.25	4.60	11.61	57.36	4.58	11.66
10-5	OH	224	55	C ₂₃ H ₂₂ N ₄ O ₅ S	61.65	5.39	8.99	61.69	5.30	9.05
11-5	Cl	235	64	C ₂₃ H ₂₁ N ₄ O ₅ SCl	58.53	4.70	8.90	58.56	4.78	8.82
12-5	Br	237	67	C ₂₃ H ₂₀ N ₄ O ₅ SBr	53.49	4.29	8.14	53.52	4.33	8.09

Table (13): The major IR absorptions (cm⁻¹) of 3-methyl-4-Oxo-4-pyrrolidine-1-yl-but-2-enoic acid (6-R- benzothiazol-2-yl)-[hydroxy-(2-hydroxy-phenyl)-methyl]-amide.



Compound	O-H str. Phenol	C-H str. Olefine	C-H str. Aromatic	C=O str. amide	C=C str. Olefine	C=C str. Aromatic	C=N str.	C-O Alcohol	C-O Alcohol	Others
7-5	3150	3130	3060	1670	1670	1560,1190	1435	1380	1380	
8-5	3345	3160	3070	1675	1640	1580,1540,1470	1450	1370	1370	
9-5	3365	3175	3080	1660	1640	1580,1545,1490	1430	1390	1390	1360,1560 NO ₂
10-5	3320	3140	3050	1645	1600	1570,1520,1480	1435	1380	1380	1220 C-C-C
11-5	3340	3170	3060	1655	1600	1570,1530,1470	1440	1380	1380	730 C-Cl
12-5	3150	3175	3065	1650	1640	1580,1540	1440	1370	1370	650 C-Br

Table (14) :¹H,N.M.R spectrophotometry of 2-(2-hydroxy-phenyl)-6-methyl-3-(6-R-benzothiazol-2-yl)-2,3-dihydro-[1,3]oxazepine-4,7- diene and3-methyl-4-Oxo-4-pyrr olidine-1-yl-but-2-enoic acid (6-R- benzothiazol-2-yl)-[hydroxy-(2-hydroxy-phenyl)- methyl]-amide.



* Chemical shift =δ

** By using DMSO-d₆ solvent

Comp.	H-R	H-C=C-CH ₃		O-H phenol	O-H Alcohol	H-C Aromatic	Pyrrolidine ring			
		H ₂	H ₃				H ₄	H ₅		
7-5	2.3	1.8	6.7	5.0	---	6.5-8.1	---	---	---	---
8-5	2.42-4	1.9	6.8	4.9	---	6.5-7.9	---	---	---	---
9-5	3.7	1.8	6.75	4.9	---	6.5-8.0	---	---	---	---
10-5	2.4	1.85	6.7	5.0	2.0	6.5-7.9	3.36	1.7	3.4	1.7
11-5	2.3,2.3	1.8	6.9	4.85	1.95	6.5-8.0	3.5	1.75	3.5	1.7
12-5	3.7	1.75	6.8	5.0	2.0	6.5-8.1	3.4	1.66	3.4	1.65

Table (15): The UV-Visible absorption maxima λ_{nm} of 2-(2-hydroxy-phenyl)-6-methyl-3-(6-R-benzothiazol-2-yl)-2,3-dihydro-[1,3]oxazepine-4,7- dione and 3-methyl-4-Oxo-4-pyrrolidine-1-yl-but-2-enoic acid (6-R- benzothiazol-2-yl)-[hydroxy-(2-hydroxy-phenyl)- amide.

compound	UV-Visible absorption maxima λ_{nm} of oxazepine	Comp.	UV-Visible absorption maxima λ_{nm} of anilid - pyrrolidides
8-3	340,300,240,225	8-3	299,252,239,226
9-3	345,298,256,238,222	9-3	295,246,234,225
10-3	356,310,276,236,221	10-3	310,243,239,221
11-3	350,300,266,246,230	11-3	305,244,236,220
12-3	352,315,279,252,231	12-3	311,253,240,228
13-3	346,300,287,255,226	13-3	285,243,230,227

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- تحضير ودراسة الصفات التركيبية (٢) - (هيدروكسي-فنييل) -٣- (٦) -
 بنزوثيرازول -٢- (يل) -٢ و٣ - ثنائي هيدرو-١ و١٣ أو كسازبين -٤ و٧ -
 دايون و٢ - (٢) - (هيدروكسي-فنييل) -٦- مثيل -٣- (٦) - معوض -
 بنزوثيرازول -٢- (يل) -٢ و٣ - ثنائي هيدرو-١ و١٣ أو كسازبين -٤ و٧ -
 دايون. [١١]

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الخلاصة

تم تحضير عدد من ٢- (٦- معوض - بنزوثيرازول -٢- يل ايمينو) -مثيل] - فينول (قواعد شيف) بتكاتف مشتقات ٦- معوض -٢- ايمينو- بنزوثيرازول مع السلسلاديهيدريد. فوعلت قواعد شيف هذه مع ان-هيدريد الماليك، ان-هيدريد الستر وكونيك فأعطت- (٢- هيدروكسي- فينيل) -٣- (٦- معوض- بنزوثيرازول-٢- يل - ٣،٢- ثنائي هيدرو- [٣١] - او كسازبين ٢ -٤،٧- دايون و٢ - (٢- هيدروكسي- فنييل) -٦- مثيل -٣- (٦- معوض - بنزوثيرازول -٢- يل) -٢،٣- ثنائي هيدرو- [٣١] او كسازبين -٤،٧- دايون. فوعلت الأخيرة مع البيروالدين الجاف فأعطت مشتقات الانيليد- البيروليديد لحوامض الماليناميك و الستر اكون اميك.