

# Using of intramolecular condensation reaction in synthesis of heterocyclics of (Se, S, N, O) - Atoms

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**ABSTRACT** - In this paper, synthesis of five and seven-membered ring which containing heteroatom (Se, S, N, O) via several steps, the first step in this reaction, 2,2-methylene-bis(4-nitro phenol) reacts with (selenium, sulphur, nitrogen, oxygen)-compounds to yield cyclic derivatives of (Se, S, N,O) which cyclized via intramolecular condensation reaction in the second step. The formed compounds [1-9] have been investigated by using various chemical techniques, such as:(H-NMR-Spectra,(C.H.N)-analysis, FT.IR-spectra) and Melting points.

**Key words** - Selenium, Intramolecular condensation, Heterocyclic

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About one century ago selenium was incorporated in the table, selenium shares with sulphur and tellurium some physical and chemical properties. Selenium, sulphur and nitrogen-compounds act as active nucleophiles which able to react with electrophiles (alkyl halides, carbonyl compounds such as aldehydes, carboxylic acids) to yield intermediates, which give various heterocyclic compounds from (Se,S,N,O), these compounds have biological activity<sup>(1,2)</sup>.

Heterocycles are found as construction units through several biological molecules, since these compounds have (Selenium, sulphur, nitrogen, oxygen), atoms in their contents which make it has many pharmaceutical interest<sup>(3,4)</sup>, dyestuffs industry<sup>(5)</sup> and other applications such as anticancer<sup>(6,7)</sup>, antioxidant<sup>(8,9)</sup>, physiology importance<sup>(10,11)</sup>, in synthesis of organic compounds<sup>(12-15)</sup>, in toxicological studies<sup>(16-18)</sup> for these reasons many methods<sup>(19-20)</sup> for preparation of different heterocyclic compounds have been developed.

## EXPERIMENTAL METHODOLOGY

- All chemicals used were supplied from Merck and BDH-chemical company.
- All measurements were carried out by:

- Melting points : Electro thermal 9300, melting point Engineering LTD, U.K.

- FT.IR-spectra: fourier transform infrared shimadzu (8300), (FT.IR), KBr-disc was performed by CO.S.Q. Iraq.

- H.NMR-Spectra and (C.H.N)-Analysis in Jordan.

### Synthesis of compound [1]:

A mixture of (0.02 mole, 2.7 g) of 4-nitrophenol with formaldehyde(0.01 mole) were reacted in presence of (4ml) of sulphuric acid (98%) and (50ml) distilled water, the precipitate formed, filtered off to give (3.4g) 82 per cent of compound [1].

### Synthesis of compounds [2-5]:

A mixture of compound [1] (0.01 mole, 2.9g) and (0.02 mole) of mercaptobutyl chloride or sodium selenobutyl chloride or aminobutyl chloride or alanine, respectively were heated for (3 hrs) in presence of ethanol, the precipitate was filtered off and recrystallized to give (80-84) per cent of compounds [2-5], respectively.

### Synthesis of compounds [6-9]:

A mixture of salicylaldehyde (0.02 mole) and (0.01 mole) of

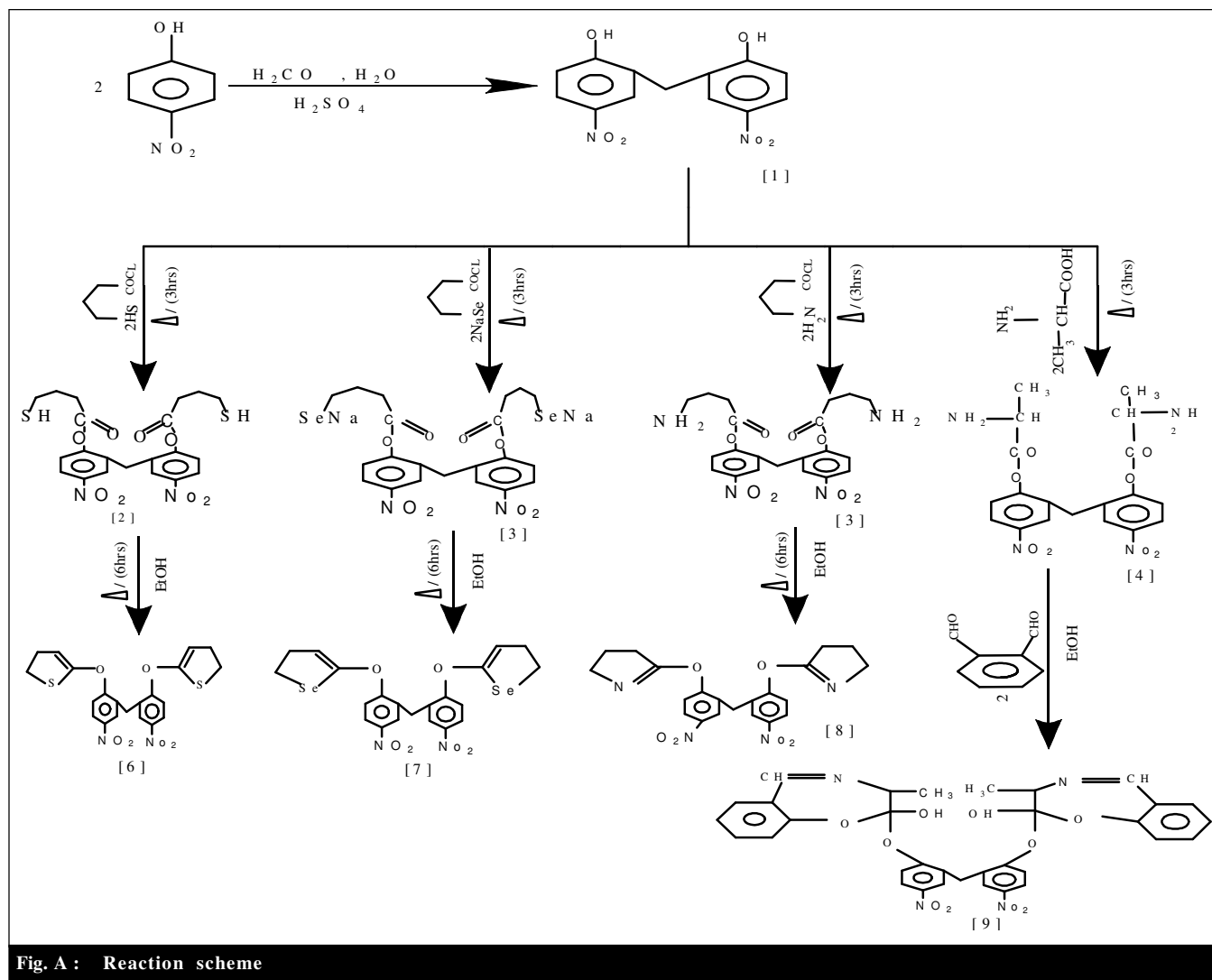


Fig. A : Reaction scheme

compound [1] or compound [2] or compound [3] or compound [4] or compound [5] respectively were heated under reflux for six hours in presence of ethanol, the precipitate as filtered off and recrystallized from abs. ethanol to give (82-87) per cent of compounds [6-9], respectively.

### EXPERIMENTAL FINDINGS AND ANALYSIS

Most of the reactions employed in this work are intramolecular condensation reactions which involve several steps to give finally products of compounds [6-9].

Indeed, seleno compounds is stronger nucleophile than sulphur compounds.

All synthesized compounds [1-9] have been characterized by their melting points and spectroscopic methods (FT-IR- spectra, (C.H.N)-analysis H.NMR-spectra).

### FT-IR-Spectra :

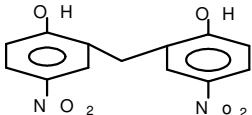
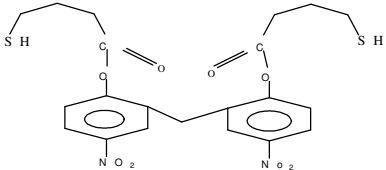
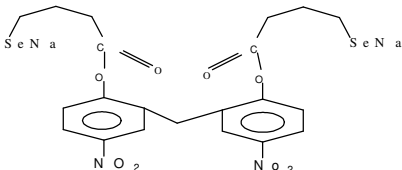
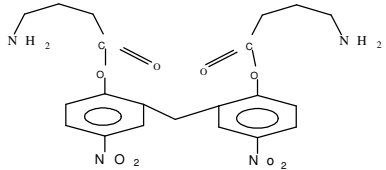
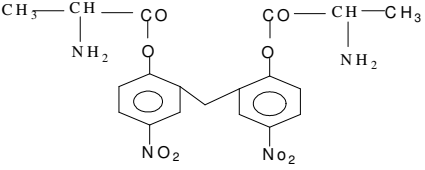
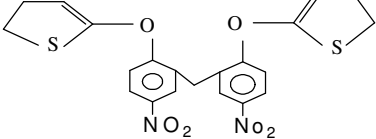
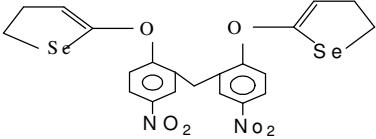
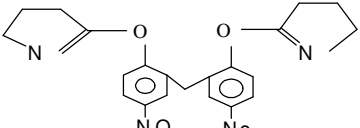
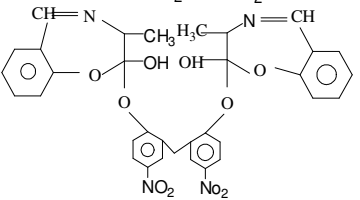
In FT-IR spectra, the reaction is followed by appearance of hydroxyl group (-OH) absorption band of phenol at  $(3500)\text{cm}^{-1}$  in compound [1], while this band disappears and other band appears at  $(1705-1690)\text{cm}^{-1}$  due to carbonyl group

of ester ( $-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-$ ) in compounds [2-5], which also disappear so that another band appear at  $(1230-1271)\text{cm}^{-1}$  due to (C-O-C) of ether in compound [6-9], other data of functional groups shown in the following Table 1.

### $^1\text{H-NMR-Spectrum} :$

Appearance of peaks and disappearance of other peaks is evidence of formatted compounds such as disappearance of (O-H) band in compound [1] and appearance other peak (O-CO-) band of ester due to formation of compounds [2-5].

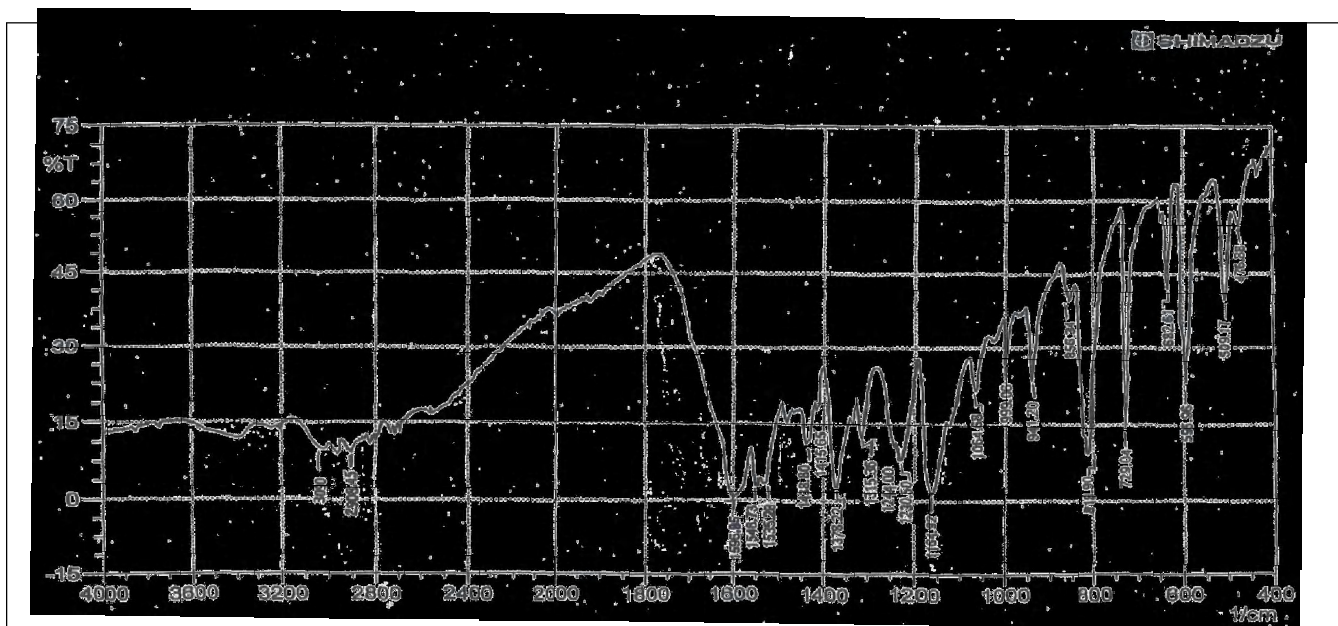
**Table 1: FT.IR data (cm<sup>-1</sup>) of compounds[1-9]**

Comp. No.	Structural formula	$\nu(\text{C}=\text{O})$ of ester	$\nu(\text{C-O})$ , $\nu(-\text{NO}_2)$	Other Bands
1.		----	---- 1340,1530s	$\nu(\text{O-H})$ : 3500S (C=C)aromatic:1587 (CH)aliphatic:2955
2.		1705s	---- 1445,1550	(S-H): 2460M (C=C)aromatic:1568 (CH)aliphatic:2930
3.		1700s	---- 1370,1555s	(C-Se): 740S (C=C)aromatic:1588 (CH)aliphatic:2935
4.		1695s	---- 1340,1560s	$\nu(-\text{NH}_2)$ : 3320 (C=C)aromatic:1593 (CH)aliphatic:2940
5.		1690vs	---- 1370,1554	$\nu(-\text{NH}_2)$ : 3250b (C=C)aromatic:1596 (CH)aliphatic:2955
6.		----	1230 1378,1535	(C-S)endocyclic: 682 (C=C)aromatic:1584 (C-O-C)ether:1160
7.		----	1271 1325,1512	(C-Se) endocyclic: 1635 (-NO <sub>2</sub> ):1442S (C-O-C)ether:1144
8.		----	1234 1373,1533	(C-N)endocyclic: 1460,1569 (C=C)aromatic:1590 (C-O-C)ether:1152
9.		----	1230 1359,1537	$\nu(\text{O-H})$ :3425m (CH=N)azomethine: 1620 (C=C)aromatic:1589 (C-O-C)ether:1153

S=strong, m=medium, w=weak, b=broad

**Table 2 : Melting points, M.F, Nams and (C.H.N)-Analysis of compounds[1-9]**

Comp. No.	M.F, Name	M.P (C°)	Calc. /Found. C%	H%	N%
1.	C <sub>13</sub> H <sub>10</sub> N <sub>2</sub> O <sub>6</sub> 2,2'-methylene -bis (4-nitro phenol)	139-140	53.793 53.517	3.448 3.266	9.655 9.424
2.	C <sub>21</sub> H <sub>22</sub> N <sub>2</sub> O <sub>8</sub> S <sub>2</sub> 2,2'-methylene-bis (4-nitro phenyl mercapto butanoate )	186-187	51.012 50.897	4.453 4.237	5.668 5.484
3.	C <sub>21</sub> H <sub>20</sub> N <sub>2</sub> O <sub>8</sub> Se <sub>2</sub> Na <sub>2</sub> 2,2'-methylene-bis (4-nitro phenyl sodium seleno butanoate )	173-174	39.878 39.687	3.164 3.093	4.430 4.318
4.	C <sub>21</sub> H <sub>24</sub> N <sub>4</sub> O <sub>8</sub> 2,2'-methylene -bis (4-nitro phenyl-amino butanoate)	171-172	54.782 54.635	5.217 5.089	12.173 12.047
5.	C <sub>19</sub> H <sub>20</sub> N <sub>4</sub> O <sub>8</sub> 2,2'-methylene-bis (4-nitro phenyl -2-amino prapanoate)	197-198	52.777 52.542	4.629 4.408	12.962 12.878
6.	C <sub>21</sub> H <sub>19</sub> N <sub>2</sub> O <sub>6</sub> S <sub>2</sub> 2,2'-methylene-bis(2-(4-nitro phenoxy)-4,5-dihydro thiophene	215-216	55.021 54.917	3.930 3.812	6.113 6.027
7.	C <sub>21</sub> H <sub>18</sub> N <sub>2</sub> O <sub>6</sub> Se <sub>2</sub> 2,2'-methylene bis(2-(4-nitro phenoxy)-4,5-dihydro selenole).	224-226	45.658 45.469	3.261 3.197	5.073 4.955
8.	C <sub>21</sub> H <sub>20</sub> N <sub>4</sub> O <sub>6</sub> 2,2'-methylene-bis(2-(4-nitro phenoxy)-3,4,5-trihydro pyrrole)	219-220	59.433 59.317	4.716 4.575	13.207 13.119
9.	C <sub>33</sub> H <sub>28</sub> N <sub>4</sub> O <sub>10</sub> 2,2'-methylene-bis(2-(4-nitro phenoxy)-2-hydroxy-3-methyl-benzoxazepine)	247-248	61.875 61.693	4.375 4.227	8.75 8.608

**Fig. 1 : FT-IR Spectra of compound (6)**

<sup>1</sup>H-NMR- Spectrum of compounds [1-9] showed : singlet signal at □ (s, 10.7)ppm for proton of hydroxyl<sup>(13)</sup> group (-OH), of phenol in compound [1], while this signal disappears and other signals appear :

- Signals at □ (m,3.9),(t,3.4 )ppm for protons<sup>(15)</sup> of (-CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>-S) and signal at □(s,4.25)ppm for proton of (SH) in compound[2].

-Signals at □ (m,4.2), (t,3.95)ppm for proton(-CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>-Se)in compound [3].

- Signals at □ (m,3.5),(t,3.2)ppm for protons of (-CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>-N) and signal at □ (3.85) for protons of (-CH-NH<sub>2</sub>) in compound [4].

- Signal at □ (d,3.80),(m,3.40)ppm for protons of (-CH-CH<sub>3</sub>) and signal at □ (3.98) for protons of (-CH-NH<sub>2</sub>) in

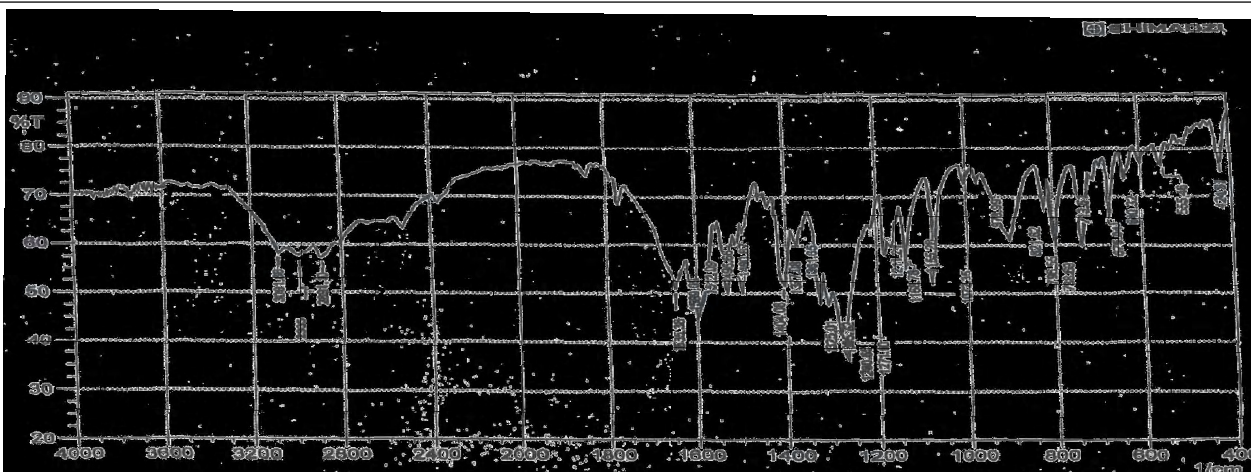


Fig. 2 : FT-IR Spectra of compound (7)

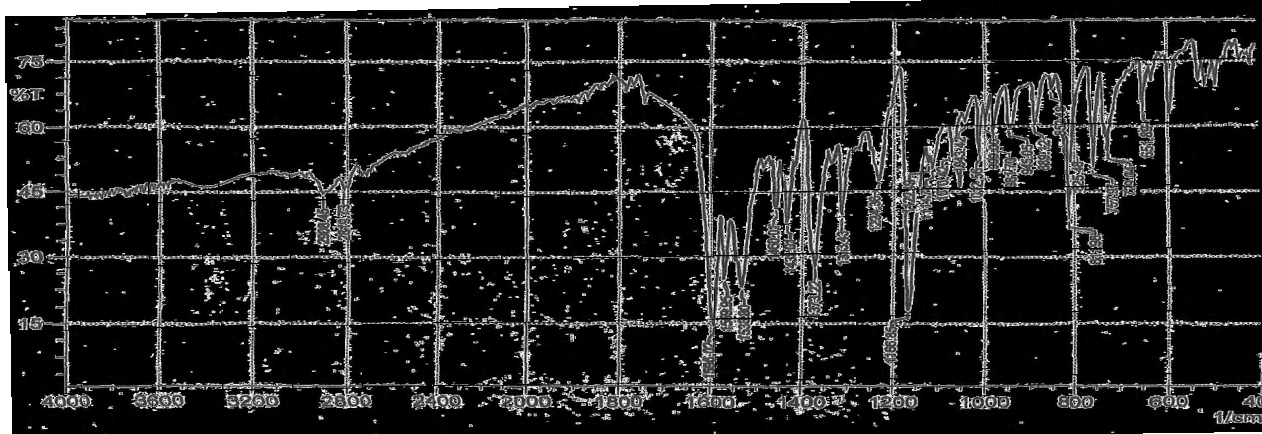


Fig. 3 : FT-IR Spectra of compound (8)

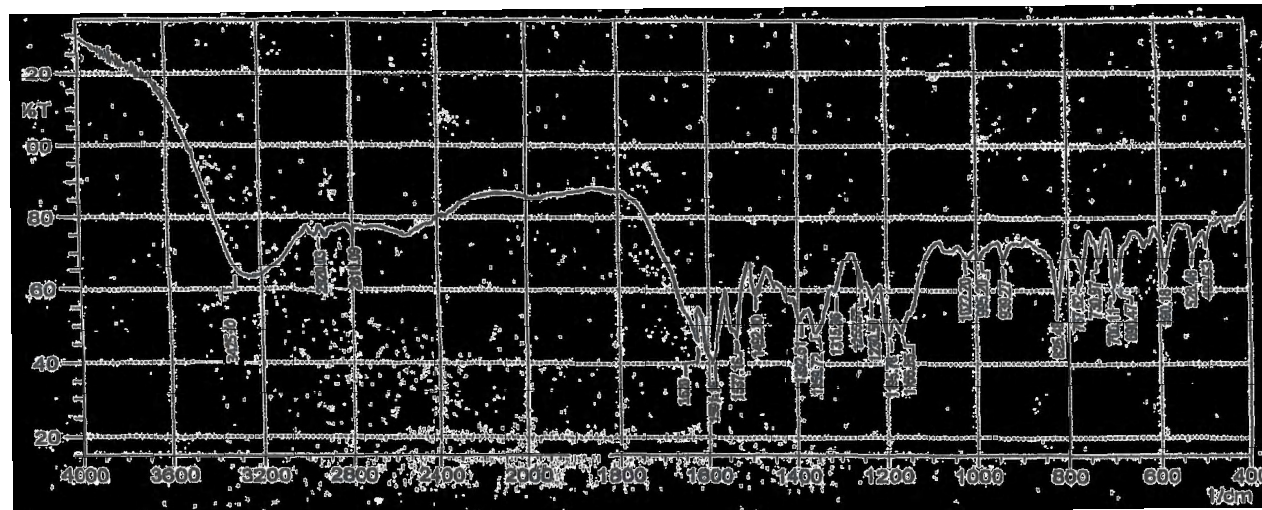


Fig. 4 : FT-IR Spectra of compound (9)

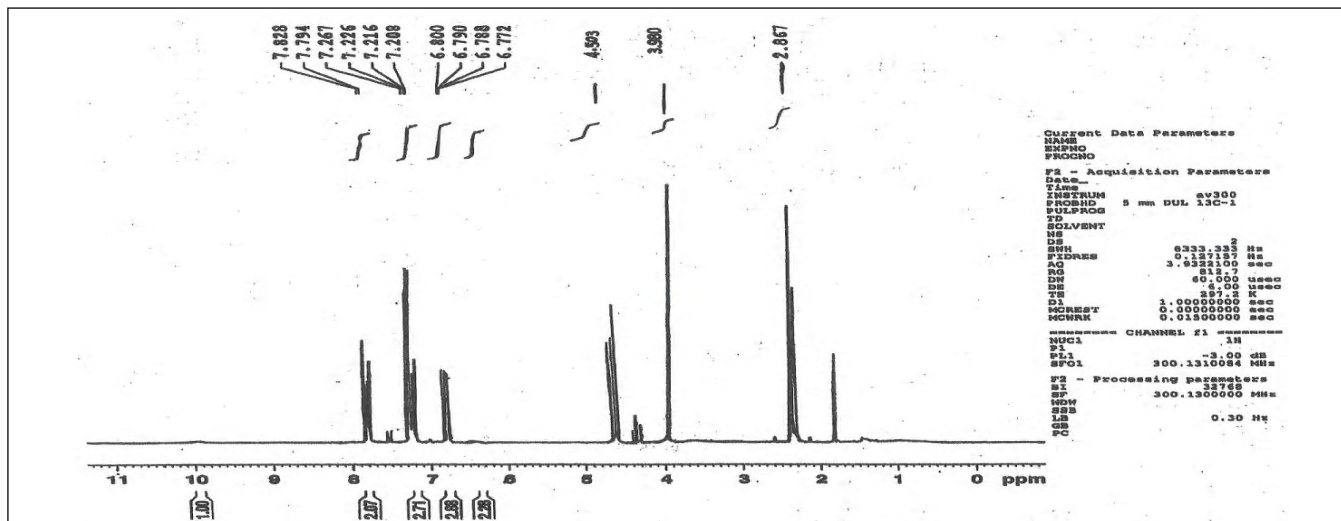


Fig. 5 : <sup>1</sup>H-NMR-Spectra of compound (6)

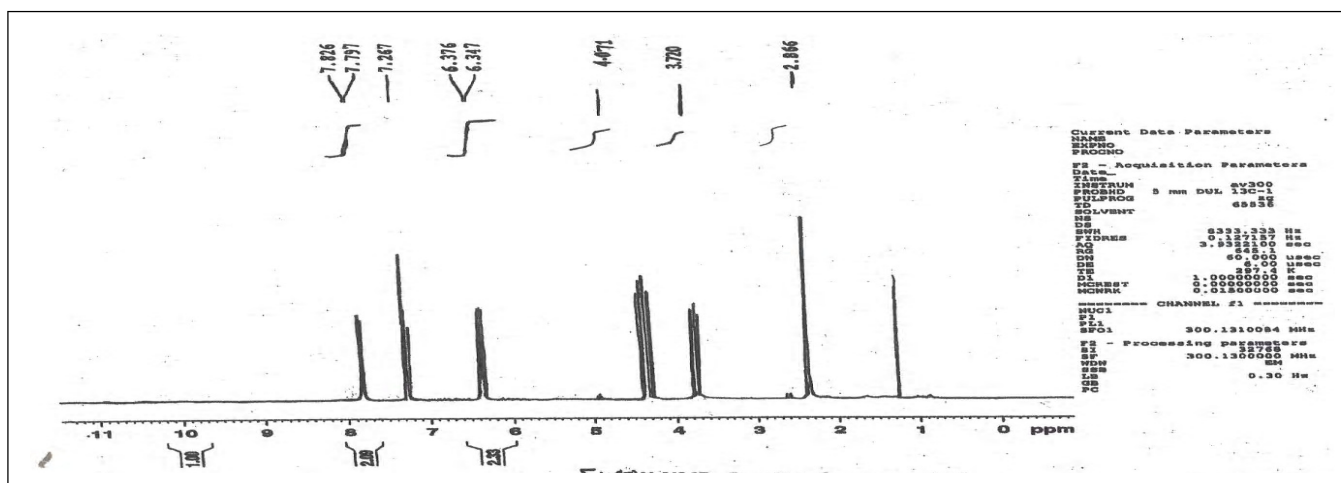


Fig. 6 : <sup>1</sup>H-NMR-Spectra of compound (7)

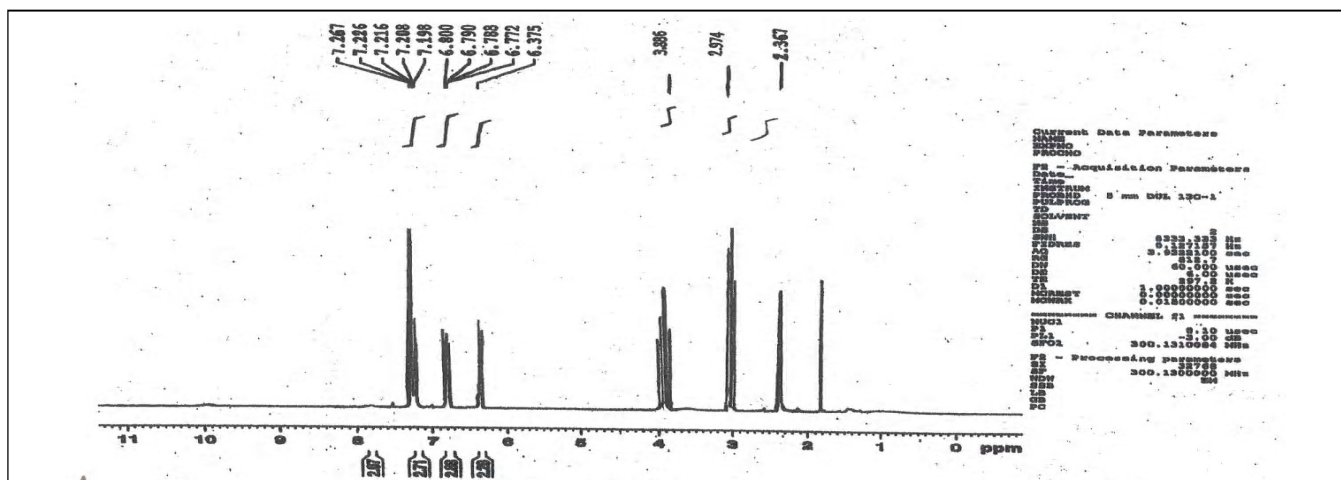
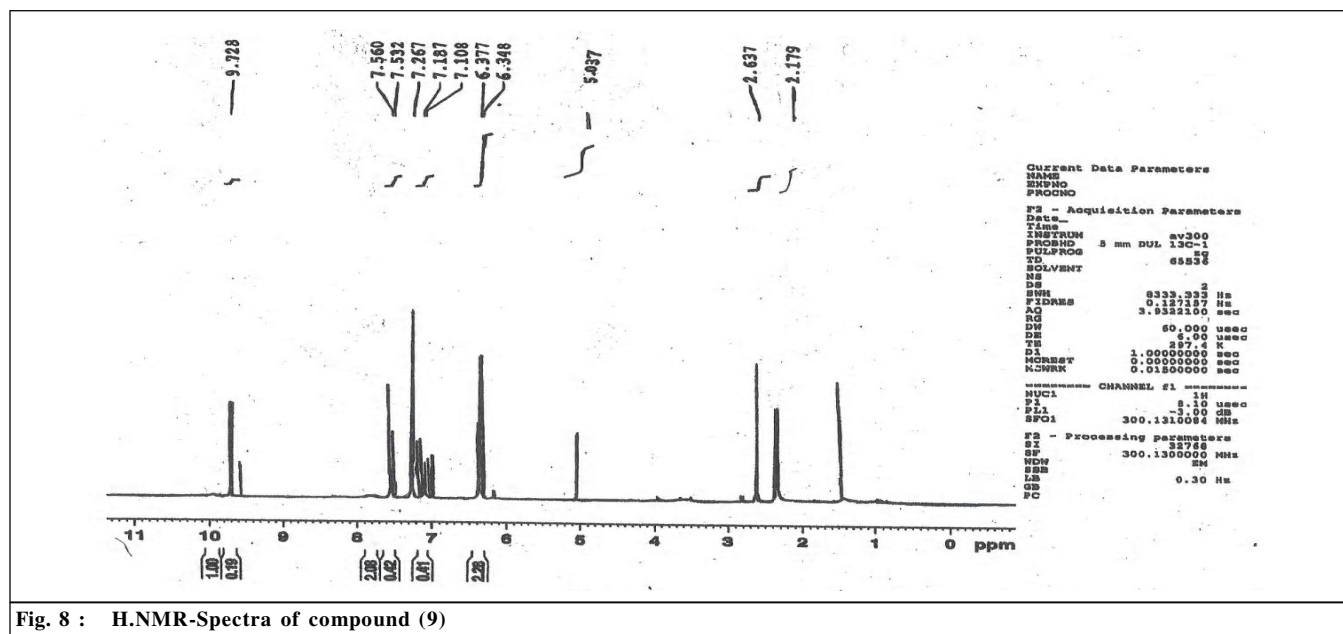


Fig. 7 : <sup>1</sup>H-NMR-Spectra of compound (8)



compound [5].

- Signal at  $\square$  (t, 4.5), (t, 3.98) ppm for protons of

$$\begin{array}{c} \text{CH}_2-\text{CH} \\ | \\ (\text{CH}_2-\text{S}) \end{array}$$
 endocyclic in compound [6].

- Signal at  $\square$  (t, 4.07), (t, 3.72) for protons of

$$\begin{array}{c} \text{CH}_2-\text{CH} \\ | \\ (\text{CH}_2-\text{Se}) \end{array}$$
 endocyclic in compound [7].

- Signal at  $\square$  (t, 3.88), (t, 2.97) for protons of

$$\begin{array}{c} \text{CH}_2-\text{CH} \\ | \\ (\text{CH}_2-\text{Se}) \end{array}$$
 endocyclic in compound [8].

- Signal at  $\square$  (s, 8.72) for protons of (CH=N)azomethine in benzoxazepine cycle, signal at  $\square$  (s, 2.63) for protons of methyl group (-CH<sub>3</sub>) in compound [9] and signal at  $\square$  (s, 5.03) for proton of (C-OH) hydroxyl group in compound [9] and other peaks<sup>(12-15)</sup>.

#### (C.H.N) – Analysis :

(C.H.N) – analysis, it was found from compared the calculated data with found data of these compounds, the results were compactable, the data of analysis, M.F, names and melting points are listed in Table 2.

All these results are strong evidence for synthesized compounds[1-9].

#### Acknowledgement:

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to Mr. Audai in Jordan for providing (C.H.N)-element analytical, <sup>1</sup>H-NMR-spectra and Melting points.

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