Synthesis Some of New Heterocyclic derivatives containing Azo Group

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Abstract

This paper is involved synthesis of Chalcone compound as starting material which used in synthesis of new heterocyclic derivatives from prepared compound previosly (D) [5-((acetyl phenyl)diazenyl)-2-hydroxy benzaldehyde] to give cyclic compounds such as Thiazine , Oxazine and 1,3- Oxazepine derivatives. These compounds have been characterized by T.LC , (FT-IR , H-NMR) Spectra , Elemental Analysis(C.H.N)and melting points.

***Keywords*:** Synthesis chalcone, thiazine,oxazine,1,3-oxazepine

Introduction:

Azo compounds are widely used as dyes and pigments.Anather applications are analytical chemistry. On the other hand azo compounds shown biological activities [1,2]. Chalcons are prepared by condensating of aryl ketons with aromatic aldehydes in presence of suitable condenising agents. Chalcons have been used as intermediate for the preparations of compounds having pharmacological activities[3-7] such as antimicrobial agents,antiviral and anti-inflammatory.

Heterocyclic compounds containing thiazine and oxazine moiety are well known for their diverse biological activities and play akey role as anti psychotic[8],antiviral[9],and antimicrobial agents[10]. Cyclization of some compounds to produce hetero cycles including hetero atome of nitrogen or sulfur atoms are known of highly biological activity and many applications in several fields [11]. In this study prepared some new chalcone derivatives,thiazine,oxazine and 1.3-oxazepine derivatives.

Experimental

Materials

All chemicals were of highest purity and used as supplied by the manufactures.

Measurements

Melting points(m.p.) of the synthesized compounds were determined in open capillary tube and are uncorrected by Bio Cote,BIB By Scientific,limited Stone,Staffordshire ,ST15

OSA,UK(230V,50HZ,75W) Elemental C.H.N analysis were carried out by EUROEA Elemental analyzer,Kufa university/Bio chemical labratory. IR spectra were recorded on(Shimadzu 8400 series),in the 4000-400cm^{-1} range using KBr disk. H-NMR spectra were recorded on(Bruker, Ultra Shield 300 MHZ , Switzerland),Al-biayt university-Jordon ,by using DMSO as solvent. Thin layer chromatography(T.L.C)was preformed on silica gel G for (T.L.C) and spots were visualized by Iodine vapors.

Preparation of D[5-((Acetyl phenyl)diazenyl)-2-hydroxy benzaldehyde]

This compound was prepared previosly according to the reference(12).

Preparation of [5-(4-(3-(4-chloro phenyl)acryloyl)phenyl)diazenyl)-2-hydroxybenzaldehyde] D_1

P-chloro benzaldehyde (2m.mole,0.28gm)was dissolved in absolute EtOH(20ml)to compound D(2m.mole,0.6gm)was added with 5ml from(10% NaOH) . The mixture was Sterried for 6hr at room tempreture.The reaction was monitored by TLC using (benzene : methanol)(3:2)ml Rf(0.78). The solvent was evaporated and the precipitation was recrystallized from absolute EtOH to give(0.5gm,51.3%) , m.p.decompose 200 °C.

Preparation of [3-(4-chlorophenyl)-1-(4-(4-hydroxy-3-(2-hydroxy phenyl imino) methyl) phenyl) diazenyl)phenyl) prop-2-en-1-one] D_2

Amixture of compound D_1(0.5m.mole,0.2gm)withO-amino phenol (0. 5m.mole,0.055gm)were reflexed for 12hr at 60°C in presence of EtOH(20 ml) with addition drops of glacial acitic acid. The reaction was monitored by TLC using (benzene : methanol) (4:1)ml Rf (0.31). The solvent was evaporated and the precipitation was re crystallized from absolute EtOH to give compound D_2(0.15gm,62.5%) , m.p. decompose 250 C°.

Preparation of [3-(4-chlorophenyl)-1-(4-(4-hydroxy-3-((pyrimidin-2- ylimino) methyl)phenyl)prop-2-en-1-one]D_3

Ethanolic mixture of compound D_1(0.5m.mole,0.2gm)with2-amino Peremidine(0. 5m.mole,0.048gm)were reflexed for 12hr at 60°C in presence of EtOH(20 ml) with addition drops from glacial acitic acid. The reaction was monitored by TLC using (benzene :methanol) (4:1)ml Rf(0.94). The solvent was evaporated and the precipitation was re crystallized from absolute EtOH to give compound D_3 (0.15gm,65%) , m.p. decompose at 170° C.

Preparation of [2-(5-(4-(3-(4-chloro phenyl)acryloyl)phenyl)diazenyl)-2-hydroxy phenyl)-3-(pyrimidin-2-yl)-2,3-dihydro-1,3-oxazepine-4,7-dione] D_4

Amixture of compound D_3(0.2m.mole,0.1gm)with maliec anhydride(0.2m.mole,0.02gm)were reflexed for 24hr at 50°Cin presence of benzene(20 ml). The reaction was monitored by TLC using (benzene : methanol) (4:1)ml Rf(0.9). The solvent was evaporated and the precipitation was re crystallized from absolute EtOH to give compound D_4(0.09gm,79%) , m.p. decompose 250C°.

Preparation of [3-(5-(4-(3-(4-chlorophenyl)acryloyl)phenyl)diazenyl)-2-hydroxyphenyl)-4-(2-hydroxyphenyl)-4-(2-hydroxyphenyl)-3,4-dihydro-1,3-oxazepine-1,5-dione] D_5.

Amixture of compound D_2(0.2m.mole,0.1gm) with phethalic anhydride(0.2m.mole,0.03gm) were reflexed for 24hr at 50°Cin presence of benzene(20 ml) . The reaction was monitored by TLC using (benzene : methanol) (3:2)ml Rf(0.83). The solvent was evaporated and the precipitation was re crystallized from absolute EtOH to give compound D_5 (0.085gm,68%) , m.p. decompose 180C°.

Preparation of [4-(4-(2-amino-6-(4-chlorophenyl)-6H-1,3-thiazin-4-yl)phenyl)diazenyl)-2-((2-hydroxy phenylimino)methyl)phenol] D_6, [4-(4-(2-amino-6-(4-chlorophenyl)-6H-1,3-oxazin-4-yl)phenyl)diazenyl)-2-((2-hydroxy phenylimino)methyl)phenol] D_7

Amixture of compound D_2(0.1gm, 0.2m.mole) with one{(thiourea 0.15gm,0.2m.mole),or(urea 0.012gm,0.2m.mole) }were reacted in presence ethanolic sodium hydroxide(25ml)with mechanical stirre for (6h).this was poured into 20ml of cold water with continuous stirring for an hour and then kept in refrigerator for 24 hours. The solvent was evaporated and the precipitation was re crystallized from absolute EtOH .The completion of the reaction was monitored by T.L.C. using (benzene : methanol) (3:2)ml, Rf for D_6 (0.91),and for D_7(0.72). To give[D_6 (0.07gm,64.8%),m.p. decompose 200° C]. [D_7(0.065gm,62.1%) m.p. decompose 230° C] respectivly.

Results and Discussion:

The started compound(D)(5-((acetyl phenyl)diazenyl)-2-hydroxy benzaldehyde) prepared from reaction P-aminoacetophenone with salicyldehyde which converted to Chalcone compound(D_1)by reaction of product with P-Chloro benzaldehyde in presence of 10% NaOH(scheme1).The FT-IR spectrum of (D) compound v(cm^{-1}) figure(1) :1710(C=O,ketone),1695(C=O, aldehyde) sharp,1600(C=C aromatic),1573,1481(N=N azo),3431(OH) weak,3200(C=H aromatic), (C-H aliphatic)shifted to2864 due to effect of electron withdrawing groups, while the FT-IR of compound(D_1) figure(2) noted appearance 3261(O-H)the broad frequency due to the hydrogen bond between CHO and neighboring OH,2974(C=H alkene),1669(C=O ketone),1654(C=O aldehyde) sholder due to the congugated system,1640(C=C aromatic),1600(C=C alkene),1520(N=N azo),667(C-Cl).The elemental analysis calculated(%) for (D_1) $C_{22}H_{15}N_2O_3Cl$(M.W 390.5):C,67.61;N,7.17 ; H,3.84 Found : C,67.655; N,7.79 ; H,4.83.

Compound(D_2)was prepared from reaction compound $D_1$with O-amino phenol in acidic midiume(drops of glacial acetic acid)(scheme 2). The FT-IR of this compound v(cm^{-1}) figure(3) noted appearance (O-H)broad band in 3445, 1637(C=O Keton)sharp, , 1560(C=C alkene)interference with(C=N imine),1491(C=C aromatic) 1413(N=N azo), 650(C-Cl). compound(D_3)was prepared from reaction $D_1$with 2-amino pirimidine in acidic middle(drops of glacial acetic acid) (scheme 2). The FT-IR of this compound v(cm^{-1}) figure(4) noted appearance3491(O-H) broad band, 1653(C=O keton) interference with(C=N Imine), 1585(C=C alkene),1575(C=C aromatic) 1411(N=N azo), 630(C-Cl). The elemental analysis calculated(%) for (D_3) $C_{26}H_{18}N_5O_2Cl$ (M.W 467.5):C,66.74;N,14.97 ; H,3.85 Found : C,66.99; N,14.76 ; H,4.41.

Compound (D_4) was prepared from reaction $D_3$with maleic anhydride(scheme 3). The FT-IR of this compound v(cm^{-1}) Figure (5) noted appearance3451(O-H)weak,1720(C=O Lacton , cyclic ester),1690(C=O Lactam amide), 1650(C=O ketone),1593(C=C alkene),1491(C=C aromatic),1408(N=N azo),2924(C-H aliphatic).

Compound (D_5) was prepared from reaction $D_2$with phethalic anhydride (scheme 3). The FT-IR of this compound v(cm^{-1}) Figure (6) noted appearance3421(O-H)broad,1700(C=O Lacton , cyclic ester),1675(C=O Lactam amide), 1600(C=O ketone),1570(C=C alkene),1475(C=Caromatic),1417(N=N azo),2980(C-H aliphatic). The elemental analysis calculated(%) for (D_5) $C_{36}H_{24}N_3O_6CL$ (M.W 629.5):C,68.63 ;N,6.67 ; H,3.81 Found : C,69.62 ; N,6.41 ; H ,3.75 .

The compounds(D_6),(D_7)was prepared from reaction of compound D $_{11}$with thio urea and urea respectively(scheme 4) The FT-IR of these compounds v(cm^{-1}) noted appearance3392(O-H),two bands in 3277,3178(NH_2) clearly in D_6 but in D_7 noted appearance (NH_2) bands interference with (O-H)band in the range about (3450,3200).

while the other bands in these compounds 1616(C=Nimine),1575(C=N endo cyclic) interference with(C=C aromatic),3012 (C-H) aliphatic, ,868(C-S)in D_6 ,but in D_7.,1575(C=N)endo cyclic,1558(C=N Imine)weak ,1450(C=C aromatic),2958(C-H aliphatic),while the azo group noted appearance in (1411) in the two compounds Figur (7) and (8).

The elemental analysis calculated(%) for (D_7) $C_{29}H_{22}N_5O_3Cl$ (M.W523.5):C,66.50 ;N,13.40 ; H,4.20 Found : C,67.14 ; N,13.81 ; H,4.31 .

H-NMR Spectra:

The spectra of compound D_6 in DMSO as solvent Figure(9) showed:

Singlet signal in ∂ 11.97 due to proton of (O-H) phenolic. Singlet signal in ∂ 9.92 due to protons of(NH2). Singlet signal in ∂ 8.74 due to proton of (CH=N). Multiplet signal in ∂(7.39-6.53) due to protons of benzene rings. Singlet signal in ∂ 5.49 due to proton of hetro sixth ring.

The spectra of compound D_4 in DMSO as solvent Figure(10) showed:

Doublet signal in ∂ 12.12,12.09 due to protons of malice ring (CH=CH). Singlet signal in ∂ 11.99 due to proton of(O-H). Multiplet signal in ∂(7.07-6.41) due to protons of benzene and Pirimidine rings. Singlet signal in ∂ 3.65 due to proton of (O-CH-N)oxazepine ring. Doublet signal in ∂ 2.72, 2.50 due to protons alkene(CH=CH).

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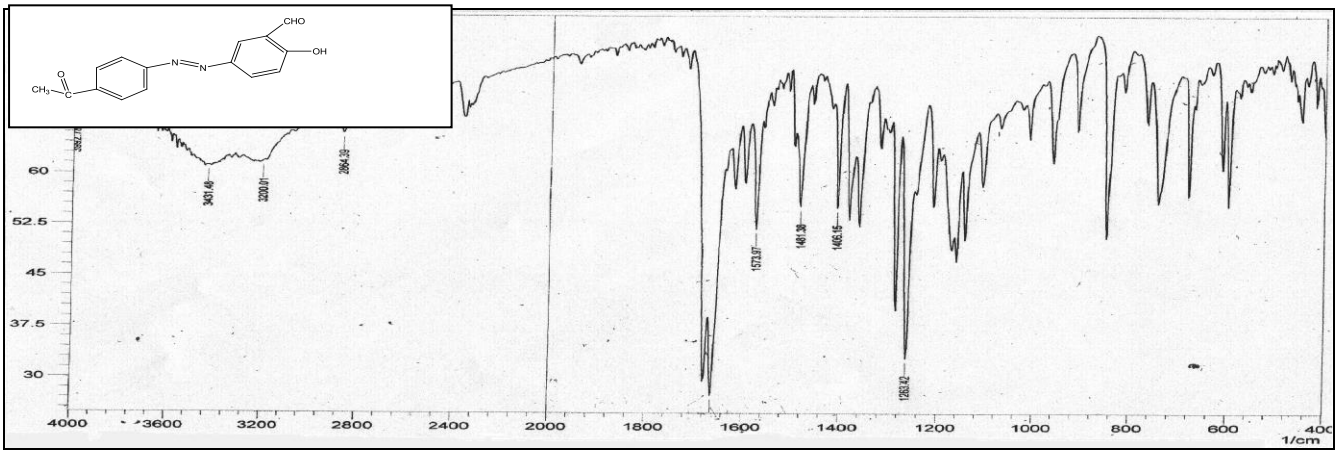


Figure (1) FT-IR Spectrum for Comp. (D)

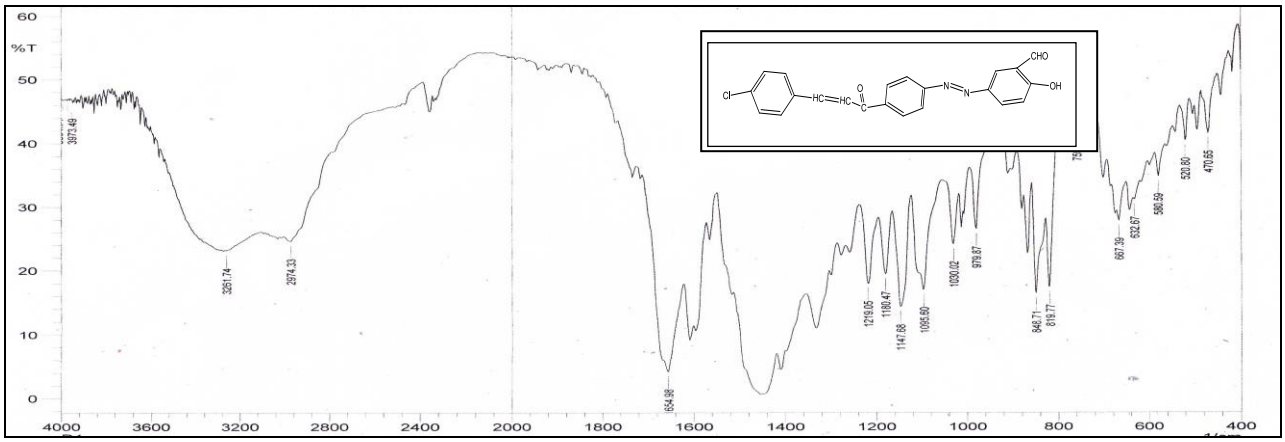


Figure (2) FT-IR Spectrum for Comp. (D_1)

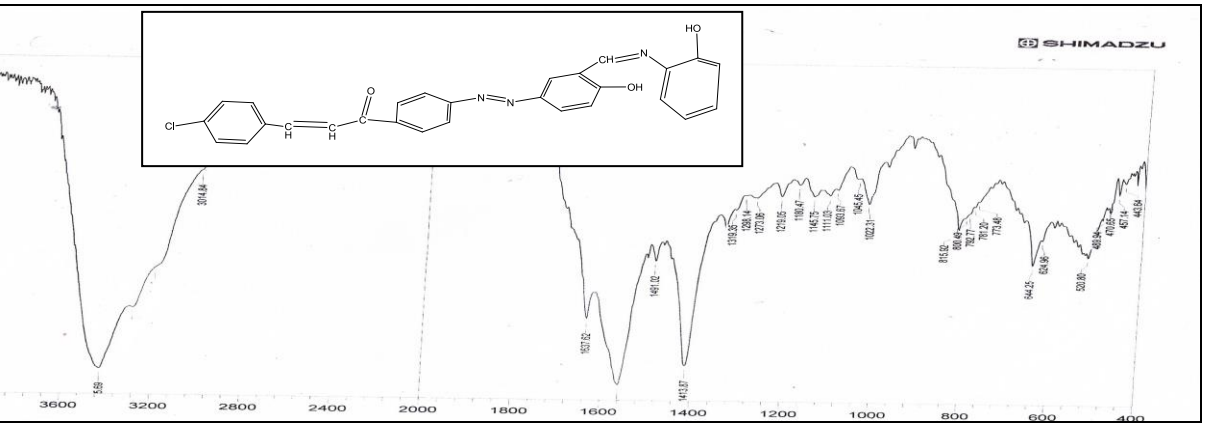


Figure (3) FT-IR Spectrum for Comp. (D_2)

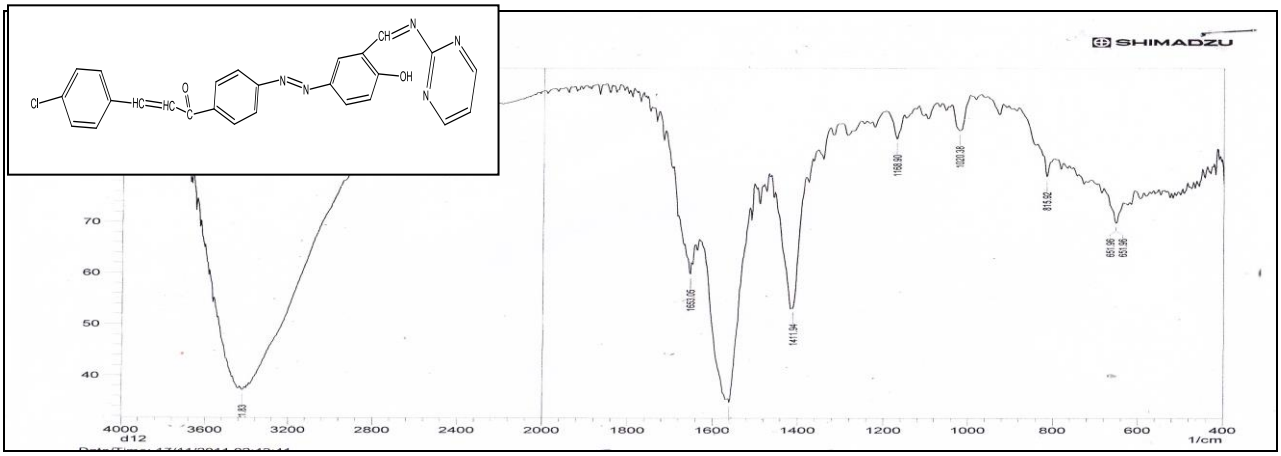
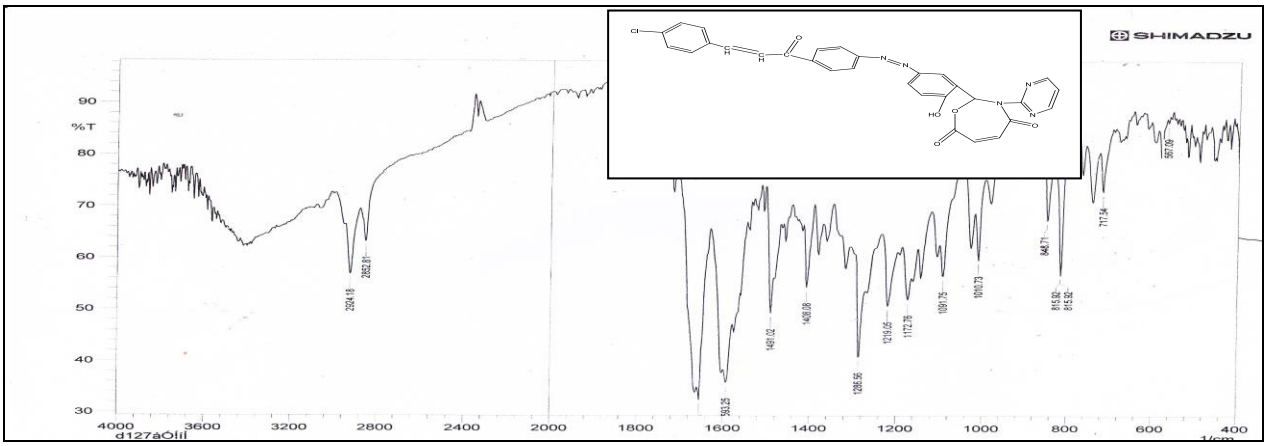


Figure (4) FT-IR Spectrum for Comp. (D_3)



Figure(5) FT-IR Spectrum for Comp. (D_4)

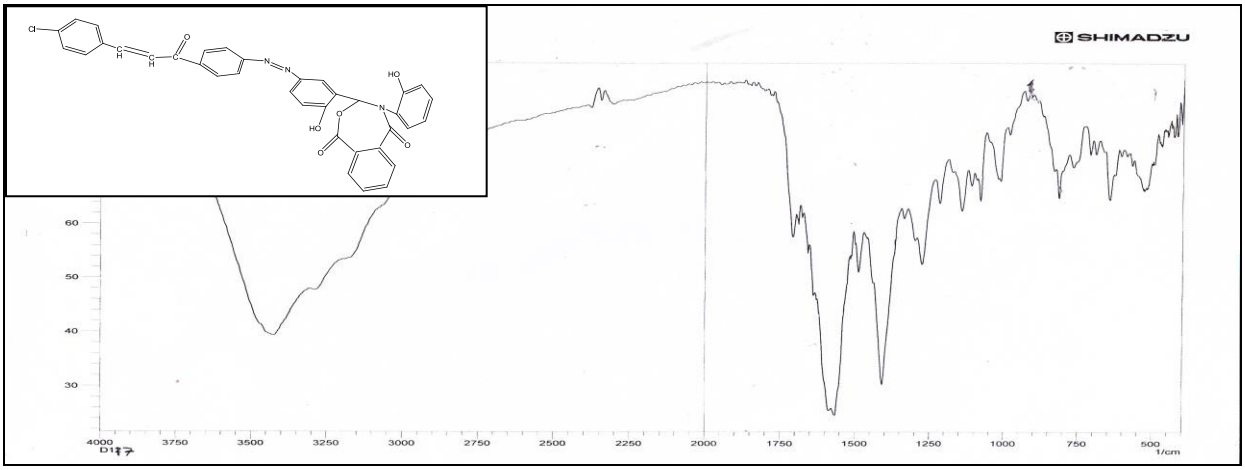


Figure (6) FT-IR Spectrum for Comp. (D_5)

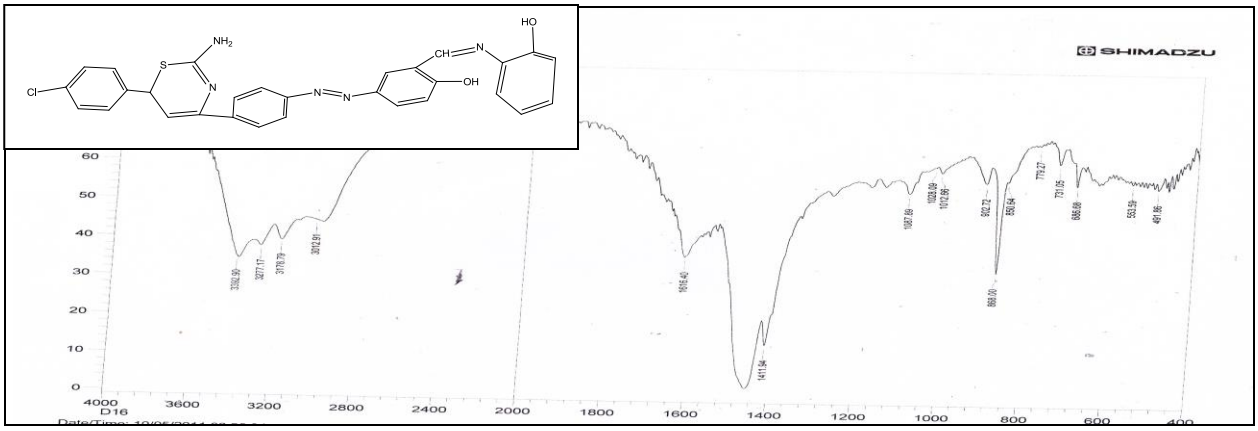


Figure (7) FT-IR Spectrum for Comp. (D_6)

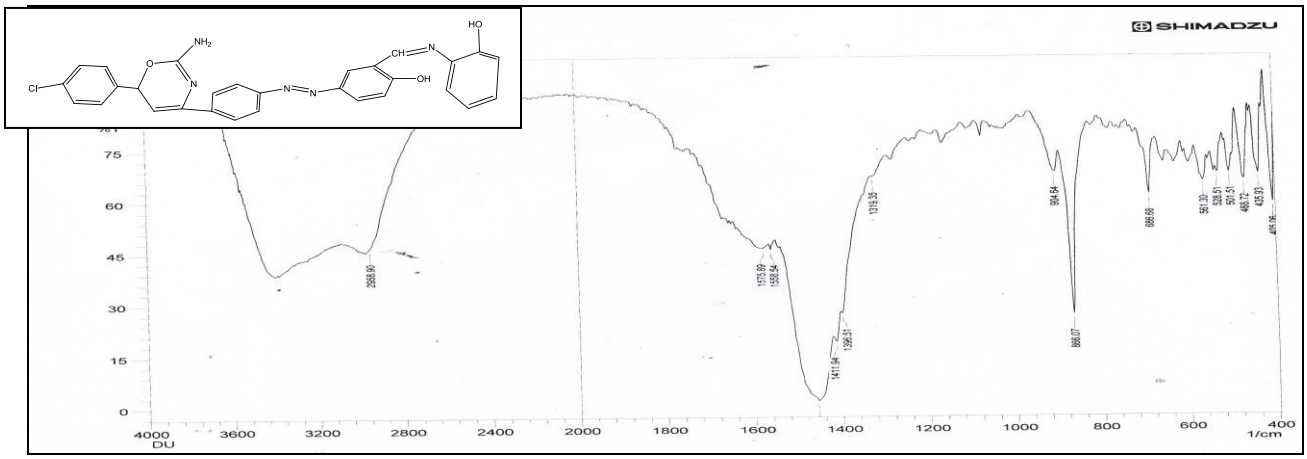
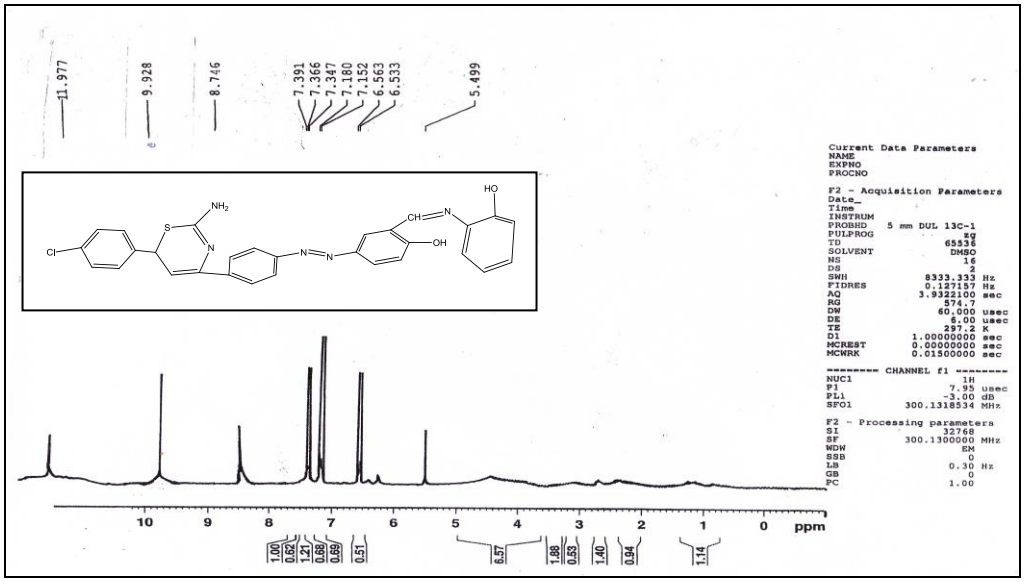
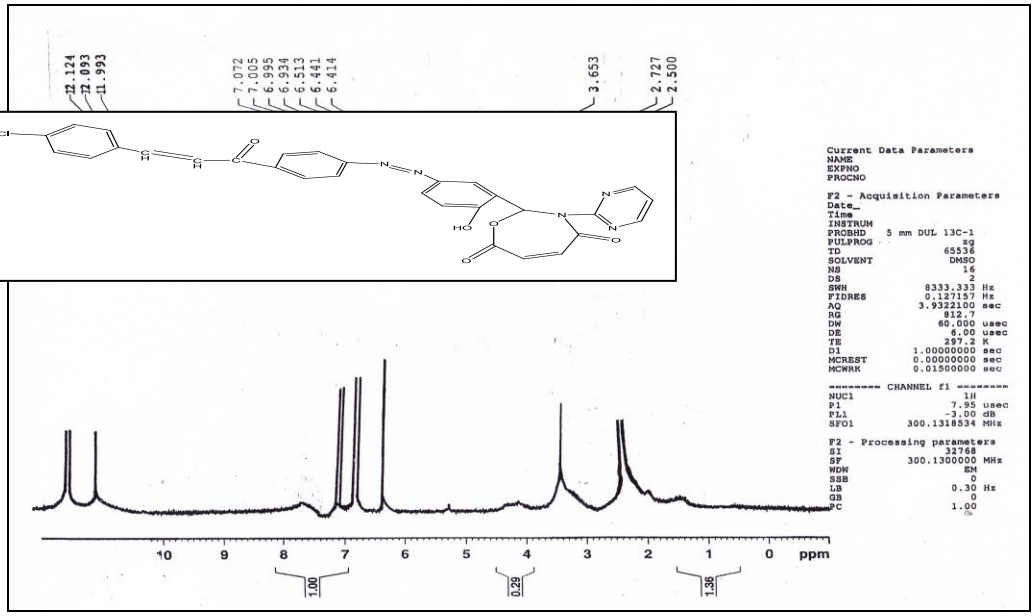


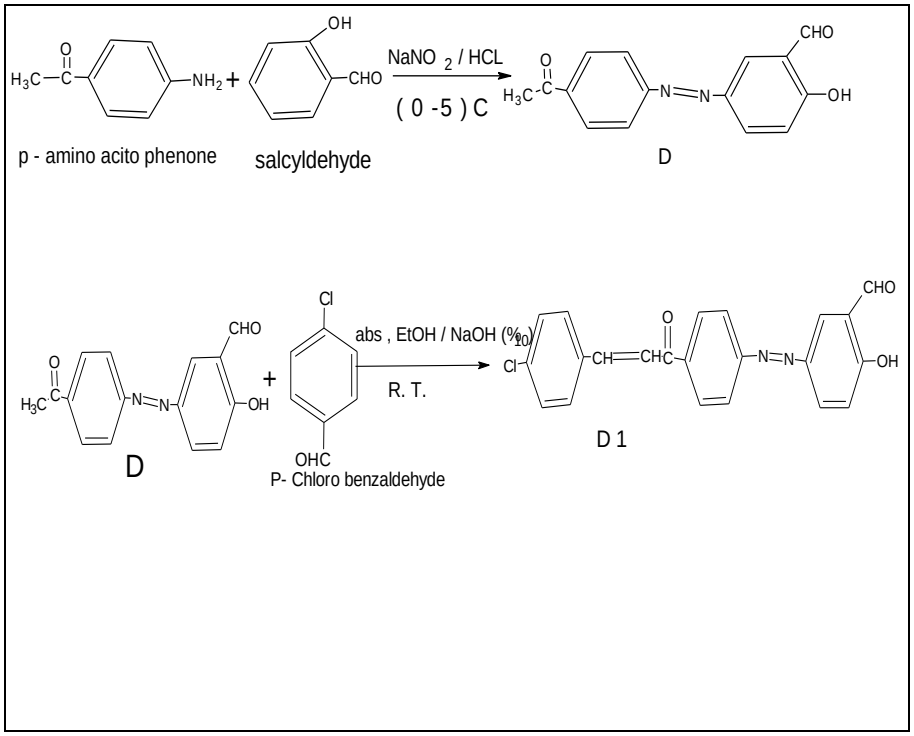
Figure (8) FT-IR Spectrum for Comp. (D_7)



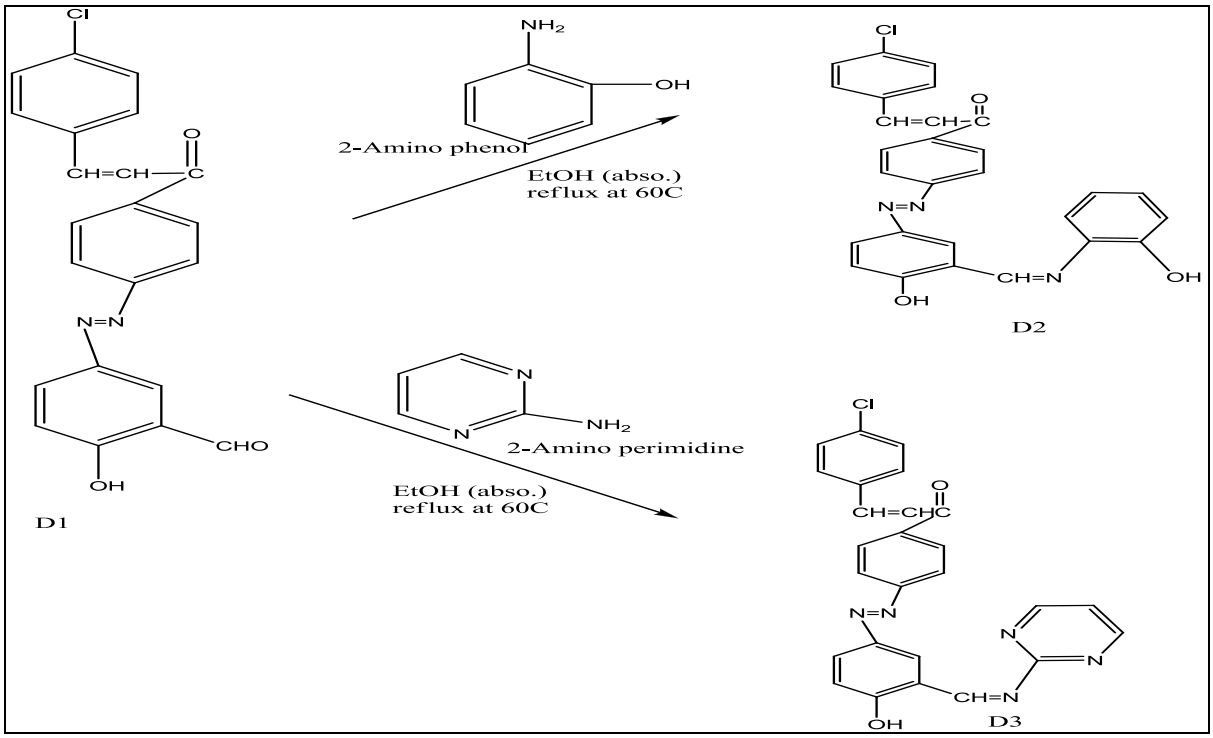
Figure(9) H-NMR Spectrum for Comp. (D_6)



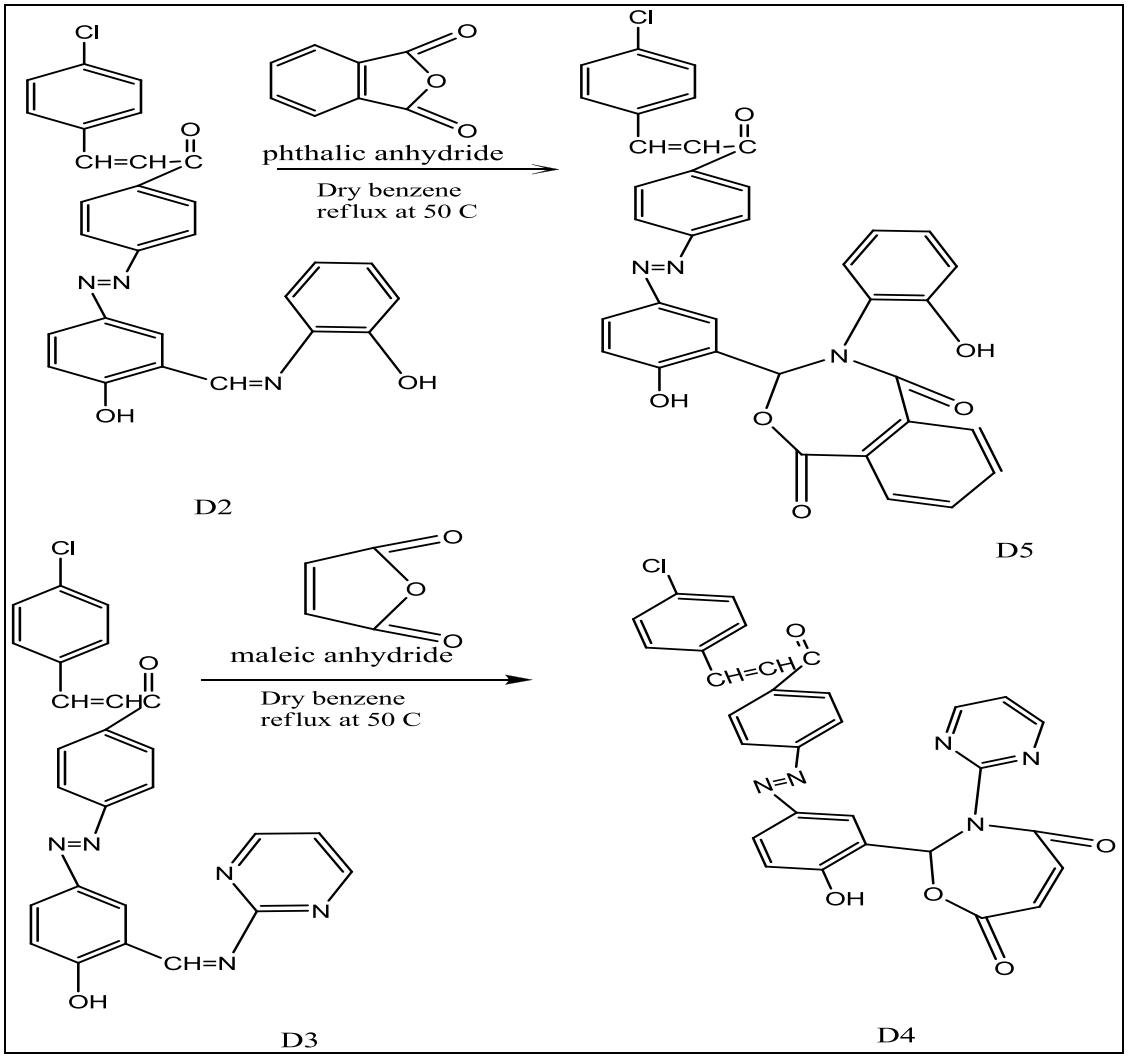
Figure(10) H-NMR Spectrum for Comp. (D_4)



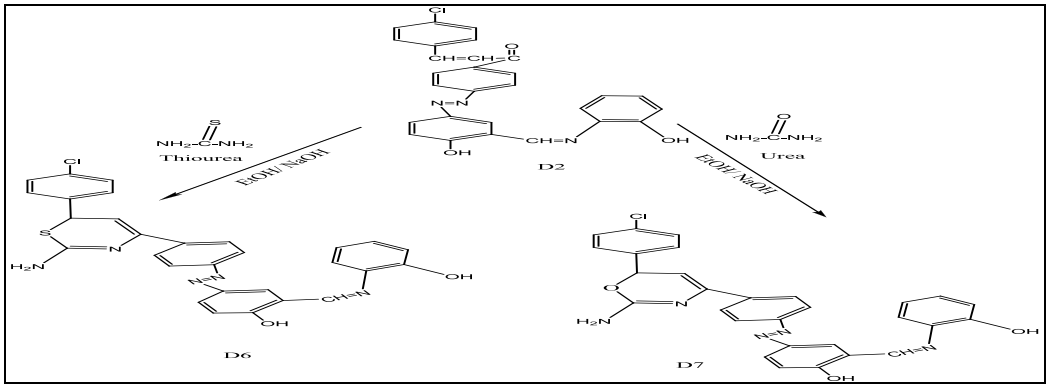
Scheme(1)preparation Comp.(D,D1)



Scheme(2) preparation Comp.(D2,D3)

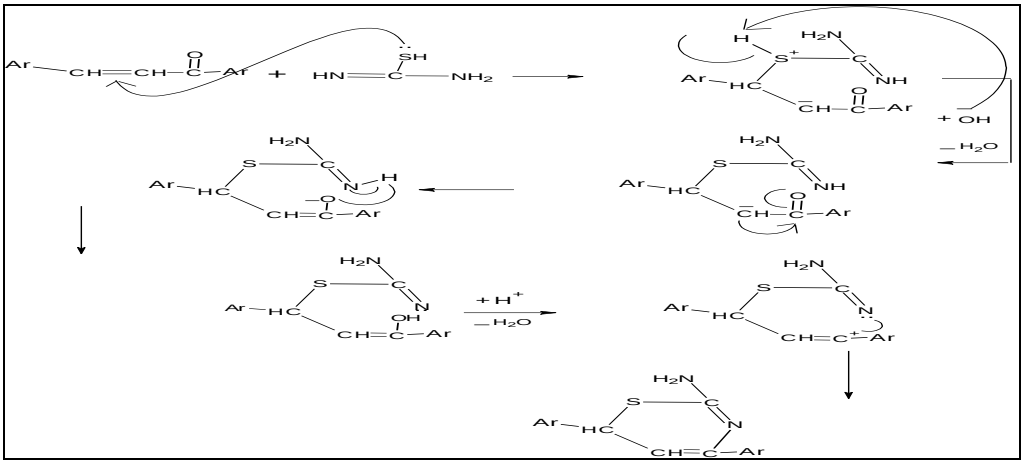


Scheme(3) preparation Comp.(D_5,D_4)



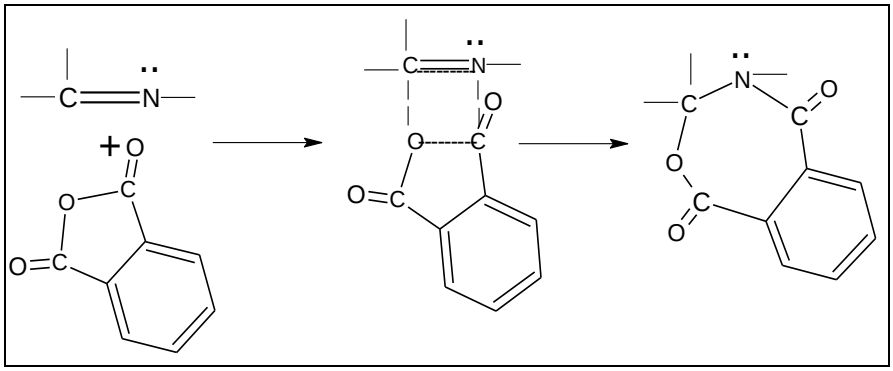
Scheme(4) preparation Comp.(D_6,D_7)

The suggestion mechanism[12] of formation for six membered ring:



Scheme(5)

The mechanism of seven membered ring[13] through cyclo addition(5+2):



Scheme(6)

Table(1)physical properties from prepared compounds.

Comp.	M.f	M.Wt	R_f	Ben;met (T.L.C)	m.p C°	Colour
D	$C_{15}H_{12}N_2O_3$	268	-------	----------	(172-174)	Light brown
D_1	$C_{22}H_{15}N_2O_3Cl$	390.5	0.78	3:2	Decomp.200	dark brown
D_2	$C_{28}H_{20}N_3O_3Cl$	481.5	0.31	4:1	Decomp.250	dark brown
D_3	$C_{26}H_{18}N_5O_2Cl$	467.5	0.94	4:1	Decomp.170	Light brown
D_4	$C_{30}H_{20}N_5O_5Cl$	565.5	0.90	4:1	Decomp.250	dark brown
D_5	$C_{36}H_{24}N_3O_6Cl$	629.5	0.83	3:2	Decomp.180	dark brown
D_6	$C_{29}H_{22}N_5SO_2Cl$	539.5	0.91	3:2	Decomp.200	Light brown
D_7	$C_{29}H_{22}N_5O_3Cl$	523.5	0.72	3:2	Decomp.230	dark brown

Table(2):(FT-IR)-data(Cm^{-1})of compounds(D-D_7).

Comp.No	I.R(KBr) (Only Important Groups)
D	1710(C=O,ketone),1695(C=O, aldehyde), 1600(C=C aromatic),1573,1481(N=N azo),3431(OH).
D_1	3261(O-H), 2974(C=H alkene),1669(C=O ketone),1654(C=O aldehyde), 1640(C=C aromatic),1600(C=C alkene),1520(N=N azo).
D_2	3445 (O-H), 1637(C=O Keton), , 1560(C=C alkene)interference with(C=N imine),1491(C=C aromatic) 1413(N=N azo).
D_3	3491 (O-H), 1653(C=O keton) interference with(C=N imine), 1585(C=C alkene),1575(C=C aromatic), 1411(N=N azo).
D_4	3451(O-H)weak,1720(C=O Lacton , cyclic ester),1690(C=O Lactam amide), 1650(C=O ketone),1593(C=C alkene),1491(C=C aromatic),1408(N=N azo).
D_5	3421(O-H) , 1700(C=O Lacton , cyclic ester),1675(C=O Lactam amide), 1600(C=O ketone),1570(C=C alkene),1475(C=Caromatic),1417(N=N azo).

D_6	3392(O-H),two bands in 3277,3178(NH_2), 1616(C=Nimine),1575(C=N endo cyclic) interference with(C=C aromatic), 868(C-S).
D_7	(NH_2) bands interference with (O-H)band in the range about (3450,3200) , 1575(C=N)endo cyclic,1558(C=N imine)weak ,1450(C=C aromatic).

Table (3) : H.NMR –data (δ $_{PPm}$) of some compounds.

Comp. No.	H.NMR
D_6	11.97 due to proton of (O-H) phenolic, 9.92 due to protons of(NH2) , 8.74 due to proton of (CH=N) , (7.39-6.53) due to protons of benzene rings , 5.49 due to proton of hetro sixth ring.
D_4	12.12,12.09 due to protons of malice ring (CH=CH), 11.99 due to proton of(O-H), (7.07-6.41) due to protons of benzene and Pirimidine rings, 3.65 due to proton of (O-CH-N)oxazepine ring, (2.72, 2.50) due to protons alkene(CH=CH).

تحضير مشتقات حلقية غير متجانسة جديدة تحتوي مجموعة أزو

رضيه عبد الباقي خضر الدجيلي

قسم الكيمياء / كلية التربية للبنات / جامعة الكوفة

الخلاصة

تضمن البحث تحضيرمركبات حلقية غير متجانسة جديدة من المركب ازو المحضر سابقاً

(D) [5-((acetyl phenyl)diazenyl)-2-hydroxy benzaldehyde]

تضمنت الخطوة الأولى تحضير مركب الكالكون من خلال تفاعل المركب السابق مع بارا-كلورو بنز- الديهايد ومنه حضرت قواعد شف جديدة،أما الخطوة الثانية فهي تحضيرمشتقات الثيازين والاوكسازين ،الخطوة الأخيرة هي تحضير حلقات سباعية مشتقات (1,3- اوكسازبين) .تم متابعة سير التفاعلات الكيميائية بوساطة تقنية T.L.C (كروماتوغرافيا الطبقة الرقيقة) وقد سجلت قيم R_f .شخصت المركبات المحضرة من خلال قياس درجات الانصهار، مع بعض الطرق الطيفية المتمثلة بـ (طيف الأشعة تحت الحمراء لجميعها وطيف الرنين النووي المغناطيسي) وكذلك التحليل الدقيق للعناصرC.H.N لبعض منها .