Rafidain Journal of Science

https://rsci.mosuljournals.com

Vol. 32, No.1, pp.138-148, 2023

Synthesis and Spectral Study of some New α, β-Unsaturated Carbonyl Compounds and Pyrazole Derivatives

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p-ISSN: 1608-9391
e -ISSN: 2664-2786

Article information

Received: 3/ 9/ 2022
Accepted: 22/ 10/ 2022

DOI: 10.33899/rjs.2023.177296

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ABSTRACT

This work includes the synthesis of some new pyrazole derivatives from the reaction of new α,β-unsaturated carbonyl derivatives with hydrazine hydrate. α,β- Unsaturated carbonyl derivatives which are prepared in several ways by reaction of hydrazide-hydrazone **A_2** with substituted aromatic aldehydes in the presence of triethylamine as a base, and also prepared by reaction of hydrazide-hydrazone **A_2** with phenylisothiocyanate and (ethyl chloro acetate or dimethyl sulfate) or **A_2** with carbon disulfide and (ethyl chloro acetate or dimethyl sulfate) in the presence of potassium hydroxide in dry dimethyl formamide. The structures of these new synthesized compounds were confirmed by physical and spectroscopic methods (FT-IR, ^{1}H-NMR,^{13}C-NMR).

Keywords: Pyrazole derivatives, α, β-unsaturated carbonyl compounds, hydrazide- hydrazone

INTRODUCTION

The hydrazide-hydrazone compounds are organic compounds used in the synthesis of heterocyclic compounds due to their interaction with the electrophile and nucleophile (Belskaya *et al*., 2010), and it is an important class responsible for many pharmaceutical applications because of its structure that contains the azomethine group (NH-N=CH) attached to carbonyl group responsible for these applications (Rollas and Güniz, 2007), An important characteristic of hydrazones its automeric form, that is, appear as keto-enol form (Ray *et al*., 2008) and it also has an important biological activity, as anti-cancer (Kumar *et al*., 2012), anti-HIV (Jin *et al*., 2010) ,anti-microbial (Özkay *et al*., 2010), anti-tuberculosis (Mahajan *et al*., 2011), antioxidant (Belkheiri *et al*., 2010), anti-parasitic (Caputto *et al*., 2011) and anti-inflammatory (Almasirad *et al*., 2005), as well as insecticides (Monfared *et al*., 2007).

As well as one of the most important materials used in organic synthesis is the α,β-unsaturated carbonyl compounds, which are the unite building of organic chemistry and therefore have the attention of many researchers during the last decades (Zhang *et al*., 2020). As well as being used in many industries, as starting materials for compounds such as, plastics, resins (Banner and Hong, 1993), dyes (Asiri, 2003) as well as perfumes (Bianco *et al*., 2004). In addition to having many biological activities, as an antibacterial (Liu *et al*., 2013), antiviral (Nowakowska, 2007), antifungal (Sortino *et al*., 2007), antitumor (Katsori and Hadjipavlou-Litina, 2009), antioxidant (Raghavendra *et al*., 2007), anti-inflammatory (Dabbagh *et al*., 2012) (Cheng *et al*., 2008) and antimalarial. Also, α, β- unsaturated compounds were well-known by their use as intermediates for the synthesis of heterocyclic compounds (Al-Sabawi, 2015).

Pyrazole is one of the important classes because it is included in many combinations of pharmaceutical compounds such as phenylbutazone, celecoxib, dipyrone, antipyrine and rimonabant (Yerragunta *et al*., 2014) (Faria *et al*., 2017), pyrazole compounds and its derivatives are one of the most important materials used in organic synthesis , It is widely spread because of its nucleus present in the different structures that are used in various fields such as agriculture, technology and medicine (Ansari *et al*., 2017) (Fustero *et al*., 2011).This type of compounds possesses a wide variety Biological activities as antibacterial (Payne *et al*., 2021), antifungal (Chu and Cutler, 1986), antimicrobial (Roof and Saied, 2019) (Hafez *et al*., 2016), antihistamine (Srivastava *et al*., 2012), anti-depressant (Bailey *et al*., 1985), antitumor (Mohareb *et al*., 2012) (Ardiansah, 2017),anti-viral (Zárate-Zárate *et al*., 2015), and antihypertensive (Siddiqui *et al*., 2015).

Encouraged by these observations it is worthwhile to synthesize hydrazide-hydrazone and some new α, β-unsaturated compounds in different methods and studying their reactivity toward nucleophiles to synthesize pyrazole compounds shown in the scheme (1).

EXPERIMENTAL

Melting points were measured by Electro-thermal SMP30- Stuart melting point apparatus, (uncorrected). (^{1}H-NMR and ^{13}C-NMR) spectra were recorded using Bruker Bio Spin GmbH Spectrophotometer (400 MHz by using TMS as internal standard and using DMSO-d6 as a solvent) [(s) singlet, (d) doublet, (m) multiple]. (FT-IR) spectra were measured using a Japanese-made device (Shimadzu FT-IR-ATR) in a region confined between (400-4000 cm^{-1}).

Synthesis of (Cyano-acetic acid benzo[1,3]dioxol-5-ylmethylene-hydrazide) A_2 (Khidre *et al.*, 2017)

A mixture of (3.0 g, 0.02 mol) of piperonal with (2.0 g, 0.02 mol) of cyanoaceto hydrazide in (20 ml) absolute ethanol was reflux continues for (2 hours) and then cooled, filtered off, washed with absolute ethanol and finally dried to give the precipitate with clear color (Light brown) m.p (188-186 °C), yield% (93%).

The hydrazide-hydrazone A_2 enter two paths to obtain α, β-Unsaturated Carbonyl Compounds and pyrazole derivatives

1-The first pathway

A- Synthesis of α, β-Unsaturated Carbonyl Compounds A_3-A_{10} (Khidre et al., 2011)

Equimolar of hydrazide-hydrazone **A_2** (0.346 g, 0.0015mol) with (0.0015 mol) of substituted aromatic aldehyde in (20 ml) absolute ethanol in a base medium from triethylamine (Et_3N) (6-8 drops) was refluxed for (2- 5) hours. The reaction mixture was cooled, filtered off, then washed several times with absolute ethanol and dried. The physical properties are shown in the (Table 1).

Table 1: Physical properties of α, β-unsaturated carbonyl compounds A_3-A_{10}.

Compd. No.	R	m.p ^oC	Yield %	Color
A_3	H	226-230	85	Deep yellow
A_4	*o*-NO_2	200-203	56.6	Deep yellow
A_5	*o*-Cl	230-232	67.6	Deep yellow
A_6	*p*-OCH_3	201-203	51.5	Yellow
A_7	2,3-DiOCH_3	204	58	Yellow
A_8	CH_2O_2	254-256	51	Deep yellow
A_9	*m*-NO_2	190-193	67	Deep yellow
A_{10}	*p*-Br	238-240	52.8	Yellow

B- Synthesis of various compounds for α, β-Unsaturated Carbonyl Compounds

Preparation of α, β-Unsaturated Carbonyl Compound A_{11} (Salman, 2013)

Adding the KOH (0.56 g, 0.01mol) suspended in dry DMF (10 ml) to hydrazine hydrazone **A_2** (2.31g, 0.01mol) with stirring continues for (30 min), then phenylisothiocyanate (1.35 g, 0.01mol) was added gradually to the reaction mixture with continuous stirring for (12 hours) at room temperature to form an intermediate compound followed by the addition of ethyl chloro acetate (1.22 g, 0.01mol) with continuous stirring for (6 hours). The reaction mixture is poured over crushed ice with stirring, and the precipitate formed is separated by filtration, then leave to dry and recrystallized with ethanol/DMF, the result is dark yellow, m.p (175-173 °C), yield (63%).

Preparation of α, β-Unsaturated Carbonyl Compound A_{12} (Salman, 2013)

By following the same mentioned method for preparing **A_{11}** and using (1.26 g, 0.01mol) dimethyl sulfate instead of ethyl chloroacetate, a yellow precipitate is obtained m.p (172°C), yield (51%).

Preparation of α, β-Unsaturated Carbonyl Compound A_{13} (Salman, 2013)

Adding of KOH (1.12 g, 0.02) suspended in (10 ml) of dry dimethyl formamide (DMF) with (2.31 g, 0.01mol) of hydrazide-hydrazone **A_2**. The mixture was cooled in an ice bath at 10^oC, then (0.76 g, 0.01mol) of CS_2 was added to it gradually, with stirring for (6 hours) to form the intermediate compound, then (1.225 g, 0.01mol) of ethylchloro acetate was added with continuous stirring for (3 hours), then it is gradually poured over crushed ice containing (10 drops) of conc. HCl with stirring, filtered off and dried to obtain an orange precipitate, m.p (150-148°C), yield (95%).

Preparation of α, β-Unsaturated Carbonyl Compound A_{14} (Salman, 2013)

By following the same working method for preparing **A_{13}** and using (1.26 g, 0.01mol) of dimethyl sulfate instead of ethyl chloroacetate, a yellow precipitate m.p (158°C), yield (74%).

Preparation of α, β-Unsaturated Carbonyl Compound A_{15} (Salman, 2013)

Adding of KOH (0.56 g, 0.01mol) suspended in (10 ml) of dry DMF with (2.31 g, 0.01 mol) of the starting material hydrazide-hydrazone **A_2** is dissolved in (0.76 g, 0.01 mol) of CS_2 in an ice-bath at 0 ^oC and the mixture was stirred for (12 hours) to form the intermediate compound, then followed by adding (2 M. 20 ml) of conc. HCl drop by drop to the reaction mixture with continuous stirring for one hour, the reaction mixture then poured over crushed ice with stirring to complete the precipitation process, then filtered off and recrystallized from ethanol to give a yellow precipitate m.p (174°C), yield (87%).

2- The Second pathway

Synthesis of Pyrazole Derivatives A_{16}-A_{23} (Shams *et al*., 2010)

A mixture of (0.001 mol) of the compounds **A_3- A_{10}** produced in the first pathway with hydrazine hydrate 88 % (0.002 mol) in (15 ml) of absolute ethanol, then refluxed for (4-5 hours), the mixture was concentrated to half the quantity, then leave until a precipitate is formed, then filtration and dried. The physical properties are shown in the (Table 2).

Table 2: Physical properties of pyrazole derivatives A_{16}-A_{23}.

Compd. No.	R	m.p, ^oC	Yield %	Color
A_{16}	H	181−183	42	Pale pink
A_{17}	*o*-NO_2	167	35	Deep purple
A_{18}	*o*-Cl	134	51	Deep purple
A_{19}	*p*-OCH_3	178	41	Deep purple
A_{20}	2,3-DiOCH_3	191	43	Deep purple
A_{21}	CH_2O_2	Decompose	45	Deep purple
A_{22}	*m*-NO_2	185	40	Dark brown
A_{23}	*p*-B_r	148−150	61	Deep purple

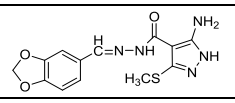
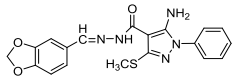
Synthesis of Pyrazole Derivative A_{24} (Debbabi *et al*., 2016)

A mixture of hydrazide-hydrazone **A_2** (0.346 g, 0.0016 mol) with hydrazine hydrate 88% (0.12 g, 0.0015 mol) in (15 ml) of absolute ethanol was refluxed for (5hours). After cooling and leaving overnight, the formed solid was filtered off and dried to obtain a dark purple precipitate. m.p (170-167°C), yield (56%).

Synthesis of Pyrazole Derivatives A_{25-26} (Zelenin *et al*., 2001)

A mixture of compound **A_{14}** (0.91 g, 0.003 mol) obtained from the first path with hydrazine hydrate 88% (0.25 g, 0.005 mol) or phenylhydrazine in (15 ml) absolute ethanol was refluxed (3 hours), the formed precipitate was cooled, filtration and recrystallized with ethanol, then dried, the physical properties are shown in the (Table 3).

Table 3: Physical properties of pyrazole derivatives A_{25}-A_{26}.

Compd. No.	X	m.p, ^oC	Yield %	Color
A_{25}		191−193	45	Lead crystals
A_{26}		100−103	52	Light brown

Synthesis of Pyrazole Derivative A_{27} (Salman, 2013)

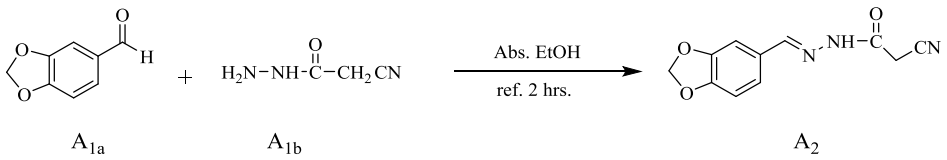
A mixture of compound **A_{12}** (0.12 g, 0.0004 mol) obtained from the first path with hydrazine hydrate (0.25 g, 0.005 mol) in (15 ml) absolute ethanol was refluxed (3 hours), the formed

precipitate was cooled and filtered off and recrystallized from ethanol, then dried to obtain a yellow precipitate m.p (190 – 189 °C), yield (40%)

RESULT AND DISCUSSION

In the content of this research, we discuss how to synthesize new pyrazole derivatives through two pathways starting with the use of hydrazide- hydrazone **A_2**, the first pathway involves obtain a new α, β -unsaturated carbonyl compounds. While the second pathway included obtain a new pyrazole derivative. Which is expected to be of biological importance as similar pyrazole derivatives that were prepared before.

The hydrazone-hydrazide **A_2** was synthesized by reaction of cyanoacetohydrazide with piperonal using ethanol as a solvent, as shown in equation (1), The structure of the **A_2** was confirmed by physical and spectroscopic properties (FT-IR, ^{1}H-NMR), in the FT-IR spectrum an absorption band appears at (3307 cm^{-1}) for the NH group and two absorption bands at (1687 cm^{-1}), (1597 cm^{-1}) for C=O and C=C groups respectively, as well as an absorption band at (2258 cm^{-1}) for the CN group , In addition to the symmetric and asymmetric (C-O-C) ring ether bands, respectively, which appeared at (1037 cm^{-1}) and (1257 cm^{-1}), also the characteristic band that gave clear evidence of the formation of the compound is the C=N band, which appeared at (1670 cm^{-1}), while the ^{1}H-NMR spectrum of compound **A_2** showed the following chemical shifts (δ, ppm): 2.27 [s, 2H, -CH_2-CN], 6.87 [s, 2H, O-CH_2-O], 7.62-8.13[m, 3H, Ar-H], 8.25 [s, 1H, CH=N], 9.32 [s, 1H, -NH].



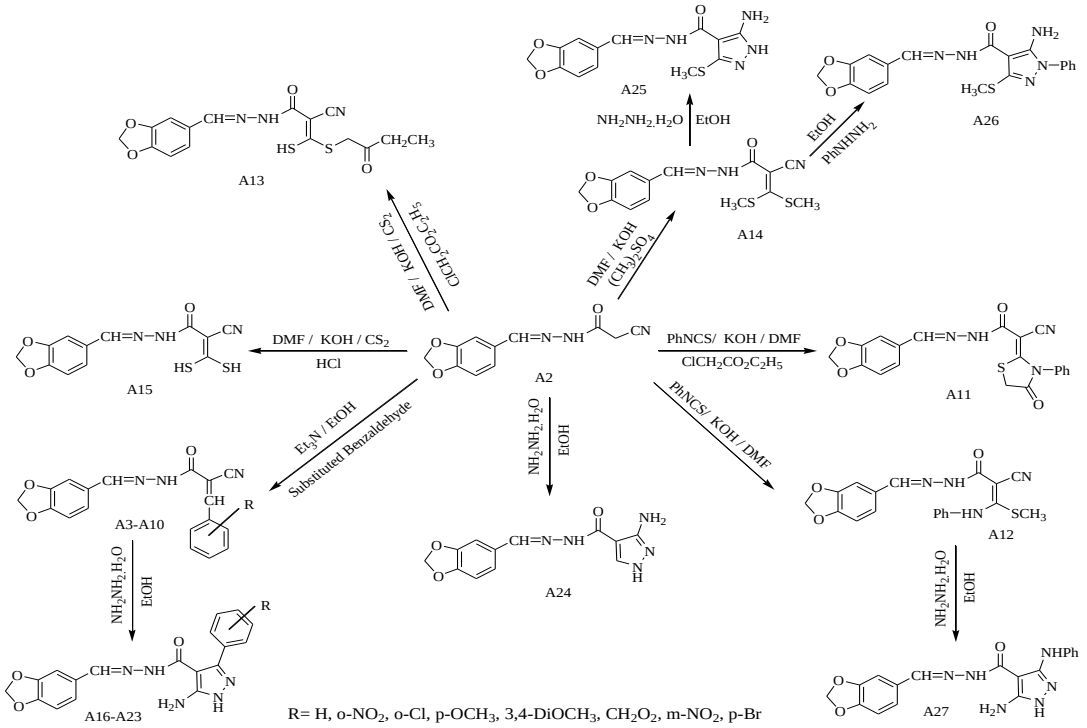
A_{1a} A_{1b} A_2

Equation 1: Preparation of hydrazide-hydrazone compound A_2

The new derivatives of α,β-unsaturated carbonyl compounds were prepared by two methods, one part of which was prepared by reaction of hydrazide-hydrazine **A_2** with substituted aromatic aldehyde in a basic medium of triethylamine (TEA) and using absolute ethanol as a solvent, while the second part was prepared by adding other components mentioned in the method of experimental on the hydrazone hydrazone **A_2** using KOH suspended in dry DMF solvent, as in scheme (1), the structure of the new product **A_{11}** was confirmed by physical and spectroscopic properties (FT-IR, ^{1}H-NMR, ^{13}C-NMR), in the FT- IR spectrum, a characteristic absorption band of the functional group (C=C) appeared at 1587 cm^{-1}, which gave clear evidence of the formation of the compound **A_{11}**. As well as, absorption bands at 1661 and 1741 $cm^{-1}$for the carbonyl groups (C=O) amide and lactum respectively, in addition to the absorption bands at 2200 cm^{-1} for the (CN) group, at 1635 cm^{-1} for the (C=N) group and at 3269 cm^{-1} for the (NH) group. The ^{1}H-NMR spectrum of compound **A_{11}** showed a new proton signal at 4.04 [s, 2H, CH_2-thiazolidin-4-one ring], In addition to the proton signals at 6.08 [s, 2H, O-CH_2-O], 6.98-7.36[m, 8H, Ar-H], 8.28 [s, 1H, CH=N], 11.23[s, 1H, -NHCO], As well as the ^{13}C-NMR spectrum, which showed additional carbon signals, which proved that the required new compound was obtained. The results were identical to the proposed compound **A_{11}**, as shown in the (Table 9).

The new pyrazole derivatives **A_{16}-A_{27}** were prepared by reacting the products of the first pathway **A_3-A_{10}**, **A_{12}**, **A_{14}** with hydrazine hydrate in absolute ethanol except for the pyrazole derivative **A_{24}** it was prepared directly from the reaction of hydrazone-hydrazide **A_2** with hydrazine hydrate using an ethanol as a solvent, as in scheme (1). The (FT-IR) spectrum of all compound produced shows a characteristic absorption band for the (NH_2) group with the disappearance of the band (CN) at the same time, which gave a good indication of the reaction that takes place and the formation of the required product. For example, the FT-IR spectrum of the compound **A_{23}** gave a characteristic absorption band for the (NH_2) group at 3300 cm^{-1} with the disappearance of the band

(CN). As well as the bands that appear at 1665 cm^{-1} for the carbonyl group (C=O), at 1602 cm^{-1} and 1627 cm^{-1} for groups (C=C) and (C=N) respectively, also, the absorption band for (NH) group which appeared at 3157 cm^{-1}. In addition to the substituent group band (C-Br) which appeared at 607 cm^{-1}, also this compound was confirmed using the ^{1}H-NMR, which showed following chemical shifts (δ, ppm): 3.95 [s, 2H, NH_2], 4.29 [s, 2H, O-CH_2-O], 7.38-8.11[m, 7H, Ar-H], 8.59 [s, 1H, CH=N], 10.83 [s, 1H, -NH-CO], 11.20 [s, 1H, NH pyrazole ring], also, the composite ^{13}C-NMR spectrum of compound **A_{23}** showed signals of additional carbons at (116.36), (137.15), (160.18) ppm which represents the carbon of the formed pyrazole ring. As for the spectroscopic measurements of other new compounds, are shown in the (Tables 4−9).



Scheme (1): Synthesis of some α, β-unsaturated carbonyl compounds and pyrazole derivatives

Table 4: FT-IR data of α, β-unsaturated carbonyl compounds A_3-A_{10}.

NO	R	C=O	CN	NH	C=N	C=C	C-O-C	Other
A_3	H	1687	2204	3304	1625	1595	1257 asym 1037 sym	—
A_4	*o*-NO_2	1697	2220	3275	1668	1595	1261 asym 1043 sym	NO_2 1521 asym 1342 sym
A_5	*o*-Cl	1693	2218	3296	1625	1595	1263 asym 1033 sym	C-Cl 754
A_6	*p*-OCH_3	1683	2206	3207	1655	1593	1259 asym 1035 sym	—
A_7	2,3-DiOCH_3	1699	2220	3313	1627	1595	1267 asym 1037 sym	—
A_8	CH_2O_2	1687	2204	3236	1623	1597	1257 asym 1035 sym	—
A_9	*m*-NO_2	1697	2223	3209	1627	1595	1255 asym 1035 sym	NO2 1529 asym 1350 sym
A_{10}	*p*-B_r	1683	2214	3292	1625	1595	1261 asym 1041 sym	C-Br 615

Table 5: FT-IR data of various compounds for α, β-unsaturated carbonyl compounds A_{11}-A_{15}.

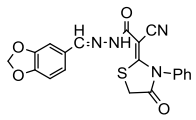
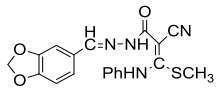
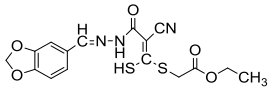
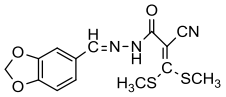
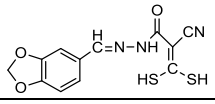
NO	Compounds	C=O	CN	NH	C=N	C=C	C-O-C	Other
A_{11}		1661	2200	3269	1635	1587	1263 asym 1035 sym	C=O lactum 1741
A_{12}		1683	2228	3165	1642	1595	1253 asym 1037 sym	—
A_{13}		1665	2185	3131	1631	1554	1261 asym 1037 sym	C=O ester 1726
A_{14}		1654	2185	3194	1625	1591	1253 asym 1035 sym	—
A_{15}		1666	2270	3236	1624	1593	1257 asym 1033 sym	—

Table 6: FT-IR data of pyrazole derivatives A_{16}-A_{23}.

NO	R	C=O	NH_2, NH	C=N	C=C	C-O-C	Other
A_{16}	H	1668	3260, 3080	1629	1602	1263 asym 1041 sym	—
A_{17}	*o*-NO_2	1687	3300, 3186	1629	1602	1261 asym 1039 sym	NO_2 1502 asym 1348 sym
A_{18}	*o*-Cl	1680	3300, 3155	1629	1602	1261 asym 1039 sym	C-Cl 8015
A_{19}	*p*-OCH_3	1665	3307, 3176	1629	1602	1259 asym 1037 sym	—
A_{20}	2,3-DiOCH_3	1670	3442, 3100	1629	1602	1261 asym 1039 sym	—
A_{21}	CH_2O_2	1660	3292, 3169	1629	1602	1263 asym 1039 sym	—
A_{22}	*m*-NO_2	1681	3395, 3199	1629	1602	1263 asym 1041 sym	NO_2 1502 asym 1361 sym
A_{23}	*p*-B_r	1665	3300, 3157	1627	1602	1263 asym 1039 sym	C-Br 607

Table 7: FT-IR data of pyrazole derivatives A_{24}-A_{27}.

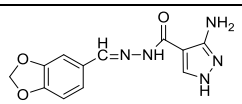
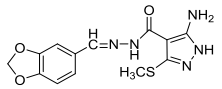
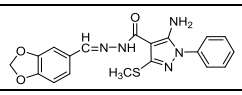
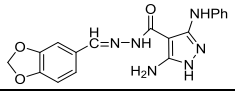
NO	Compounds	C=O	NH_2, NH	C=N	C=C	C-O-C
A_{24}		1672	3317, 3188	1629	1602	1263 asym 1039 sym
A_{25}		1663	3323, 3160	1629	1602	1259 asym 1039 sym
A_{26}		1680	3309, 3125	1627	1598	1249 asym 1033 sym
A_{27}		1681	3325, 3105	1629	1602	1263 asym 1031 sym

Table 8: The ^{1}H-NMR spectral data of compounds.

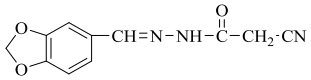
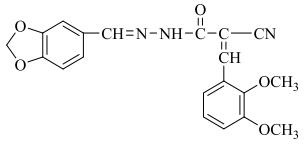
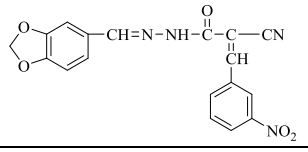
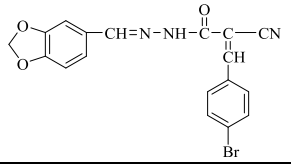
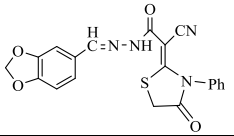
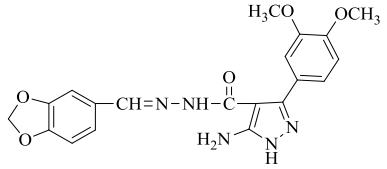
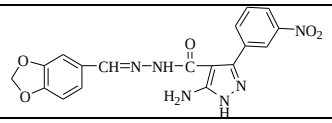
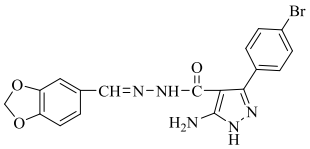
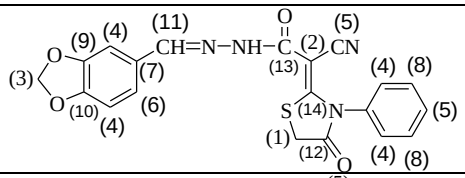
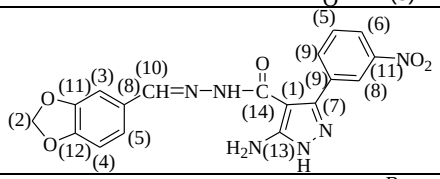
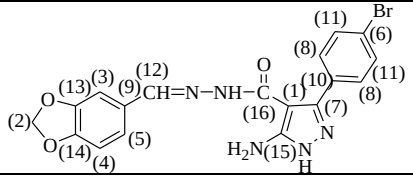
Compd. No.	Structure	^{1}H-NMR, (ppm), DMSO-d6
A2		2.27 [s, 2H, -CH_2-CN], 6.87 [s, 2H, O-CH_2-O], 7.62-8.13[m, 3H, Ar-H], 8.25 [s, 1H, CH=N], 9.32 [s, 1H, -NH]
A7		3.84, 3.88 [s, 6H, 2 OCH_3], 6.11 [s, 2H, O-CH_2-O], 6.98-7.35[m, 6H, Ar-H], 8.15 [s, 1H, CH=C], 8.39 [s, 1H, CH=N], 10.31[s, 1H, -NH]
A9		6.21 [s, 2H, O-CH_2-O], 6.94-8.70[m, 7H, Ar-H], 9.81 [s, 1H, CH=C], 10.15 [s, 1H, CH=N], 11.37 [s, 1H, -NH]
A10		6.10 [s, 2H, O-CH_2-O], 7.00-7.29[m, 3H, Ar-H], 7.81-7.98[m, 4H, Ar-H], 8.23 [s, 1H, CH=C], 8.35[s, 1H, CH=N], 11.85 [s, 1H, -NH]
A11		4.04 [s, 2H,CH_2-Thiazolidin-4-one ring], 6.08 [s, 2H, O-CH_2-O], 6.98-7.36[m, 8H, Ar-H], 8.28 [s, 1H, CH=N], 11.23[s, 1H, -NHCO]
A20		3.83, 3.86 [s, 6H, 2 OCH_3], 6.00 [s, 2H, NH_2], 6.12 [s, 2H, O-CH_2-O], 6.87-7.41[m, 6H, Ar-H], 8.59 [s, 1H, CH=N], 8.86 [s, 1H, -NH-CO], 10.20 [s, 1H, NH pyrazole ring]
A22		6.00 [s, 2H, NH_2], 6.11 [s, 2H, O-CH_2-O], 6.87-8.70[m, 7H, Ar-H], 8.59 [s, 1H, CH = N], 8.84 [s, 1H, -NH-CO], 10.21 [s, 1H, NH pyrazole ring]
A23		3.95 [s, 2H, NH_2], 4.29 [s, 2H, O-CH_2-O], 7.38-8.11[m, 7H, Ar-H], 8.59 [s, 1H, CH=N], 10.83 [s, 1H, -NH-CO], 11.20 [s, 1H, NH pyrazole ring]

Table 9: The ^{13}C-NMR spectral data of compounds.

Compd. No.	Structure	^{13}C-NMR, (ppm), DMSO-d6
A11		34.76, 61.89, 101.98, 105.50, 108.88, 123.83, 129.25, 129.26, 129.66, 148.42, 149.49, 165.23, 168.00, 169.27
A22		102.18, 106.46, 109.06, 119.26, 121.84, 125.58, 128.79, 130.49, 131.53, 135.24, 139.04, 148.44, 150.51, 161.16
A23		116.36, 116.67, 120.78, 120.90, 124.60, 124.77, 137.06, 137.15, 149.01, 149.12, 150.26, 153.69, 155.12, 155.21, 160.18, 166.48

CONCLUSION

In this study, using simple and easy working methods, reaction conditions, available and cheap chemicals, we were able to prepare important compounds such as α, β-unsaturated carbonyl and pyrazole derivatives, which are believed to be of biological importance depending on the published literature. For this study focused on preparation of these derivatives.

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تحضير ودراسة طيفية لبعض مركبات الفا، بيتا– الكاربونيل غير المشبعة الجديدة ومشتقات البيرازول

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الملخص

يتضمن البحث تحضير بعض مشتقات البيرازول الجديدة التي تم تصنيعها من تفاعل مركبات الفا، بيتا– الكاربونيل غير المشبعة الجديدة مع الهيدرازين المائي. تم تحضير مشتقات الفا، بيتا– الكاربونيل غير المشبعة بعدة طرائق منها عن طريق تفاعل هيدرازيد – هيدرازون $\mathbf{A_2}$ مع معوضات الألديهيدات الاروماتية بوجود ثلاثي إيثيل أمين كقاعدة او عن طريق تفاعل هيدرازيد – هيدرازون $\mathbf{A_2}$ مع فينيل ايزوثايوسيانات و(ايثيل كلورو اسيتيت او ثنائي مثيل سلفايد) او ثنائي كبريت الكاربون و(ايثيل كلورو اسيتيت او ثنائي مثيل سلفايد) بوجود هيدروكسيد البوتاسيوم في ثنائي مثيل فورماميد الجاف. تم تشخيص تراكيب المركبات المحضرة الجديدة من خلال القياسات الفيزيائية والطيفية (FT-IR, ^{1}H & ^{13}C-NMR).

الكلمات الدالة: مشتقات البيرازول، مركبات الفا، بيتا– الكاربونيل غير المشبعة، هيدرازيد – هيدرازون.