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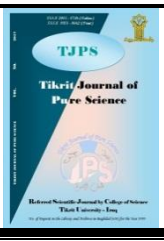

New Pyrazolines with Imine Moiety: Synthesis, Characterization

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ABSTRACT

Chalcone was prepared by claisen- schmidt condensation between reaction equivalent moles from 4-amino acetophenone with thiophen -2-carboxaldehyde in presence sodium hydroxide as base, the mechanism was involved the abstraction α Proton by base from the α-carbon of the ketone to form carbanion, which attacks carbonyl of aldehyde contains no α-hydrogens to produce α-β-unsaturated ketone, Chalcone derivative used to synthesize pyrazoline derivatives by condensation with 2,4-dinitro phenyl hydrazine. The newly synthesized compounds were determined using spectroscopic methods such as FTIR, Mass spectra, ^{1}H-NMR.

1. Introduction

Chalcone is an aryl aromatic carbonyl (ketone) compound that is the essential nucleus of some significant biological compounds, these compounds are known as chalcones. It is found in abundance in plants in the form of fla-vonoids and isoflavonoids. The structure of Chalcone involves of double aryl aromatic rings linked through alpha, beta-unsaturated carbonyl order [1]. Chalcones have evidenced to be useful applications in extensive of biological area such as antioxidant [2], antihyperglycemic [3], antimalarial [4], anti-inflammatory [5] , antibacterial [6] and antitumor [7].Claisen-Schmidt condensation use to prepare chalcone and derivatives [8]. Chalcone is a useful intermediate in the pharmaceutical industry for the production of heterocyclic chemicals such as indazole [9], isoxazole [10] and pyrazoline [11]. Pyrazolines are well-known aromatic heterocyclic chemicals [12]. Pyrazolines are five-membered heterocyclic compounds of nitrogen. Pyrazoline derivatives are of great interest in the field of medicinal chemistry due to their biological activity [13].

2. Experimental

2.1 Material

Sigma-Aldrich, Fluka, and BDH provided all of the chemicals and materials. The melting points were calculated using an electrothermal capillary instrument and are not adjusted. On a Shimadzu model FTIR-8400S, FTIR measurements were taken. A Shimadzu GCMS-QP2010 Ultra equipment was used to collect mass spectra. At 300 MHz, A Bruker spectrophotometer type ultra-shield was used to obtain ^{1}HNMR spectra.

2.2 Synthesis

2.2.1. Synthesis of 1-(4-amino phenyl)-3-(thiophen-2-yl)prop-2-en-1-one (1)

The chalcon was manufactured using the steps outlined previously.[14] , synthesized by dissolving (0.13gm, 1mml) from 4-amino acetophenone with ethanol (10 ml) Na OH (1ml, 40%) added to a mixture For 30 minutes, the reaction was agitated Following that, thiophen -2-carboxaldehyde (0.112gm , 1 mmol) was gradual addition , and Leave the mixture with stirring for 24 hours. The substance was dried and recrystallized from 100% ethanol after being added crushed ice.

Yellow powder, m.p 152 -154 C°; ,yield 88%; FT-IR ($\bar{\upsilon}$ cm^{-1}), Figure 1: 3329, 3217(amino group), 3095,3063 (***CH*** aromatic), 2943 (***C-H*** aliphatic), 1618 (carbonyl group), 1597 (***CH=CH***), 1573 (***C=C*** aromatic), ^{1}HNMR (400MHz, DMSO-d6) Figure 2: δ 6.16 (s, 2H, ***NH2),*** 6.61 (,***Ar-H*** d, 2H), 6.61 (d, 2H, 2***Ar-H***), 7.16 (***Ar-H thiophene,*** t, 1H), 7.50 (***Ar-H thiophene*** d, 1H), 7.60 (***CH=CH*** d, 1H,), 7.74 (,***CH=CH*** d, 1H-), 7.82 (***Ar-H thiophene*** d, 1H), 7.86 (2***Ar-H***, d, 2H) . R*f* = 0.65 (5:5, Ethyl acetate: Hexane).

2.2.2 Synthesis of 4-(1-(2,4-dinitrophenyl)-5-(thiophen-2-yl)-4,5-dihydro-1H-pyrazol-3-yl)aniline (2)

According to authorised sources [15], this chemical is made By blending Chalcone compounds (1) (0.23gm,1mmol) in ethanol (10ml) and add 2,4-di nitro phenyl hydrazine (0.2gm,1mml)] The reaction was checked by TLC using a hexane – ethyl acetate order (7:3) after it had been refluxed for 8 hours at 80 ^{O}C., The combined product is filtered, washed with water, and dried after the reaction mixture is added to the ice crusher.

Orange powder, yield 82%, m.p 153-155 C°; FT-IR (ῡ cm^{-1}), Figure 3 :3323,3281 (amino group), 3105(aromatic ***C-H),*** 1616 (isomethane), 1599 (***C=C***), 1510 ,1330 (***NO_2***), ^{1}H-NMR (500 MHz, DMSO-d6) δ (ppm) Figure 4: 2.74 (dd, 1H, ***Ha-pyrazoline***,), 3.0-3.2 (dd, 1H, ***Hb-pyrazoline***), 4.5-4.6 t, 1H, ***Hx-pyrazoline***,), 6.17 (s, 2H, ***NH_2***), 6.62 (d, 2H, ***Ar-H***), 7.78 (d, 2H, ***Ar-H***), 7.18-8.85 (m, 6H, ***Ar-H thiophene***,). Mass , Figure 5 : 396 M+ For C $_{18}$H $_{14}$N $_{5}$O $_{4}$S. R*f* = 0.71 (5:5, Hexane: Ethyl acetate).

2.2.3 Synthesis of Schiff bases

The synthesized chemicals were obtained utilizing a modified process described in a previous publication [16] . These compounds were made in accordance with the protocol of benzaldehyde derivative (1 mmol) in ethanol as solvent (10 ml) with few droplets of (glacial acetic acid), and then pyrazoline derivatives compound (2) (1 mmol) were added. The mixture was heating by refluxed for 10-12 hours and checked the reaction by using Thin layer chromatography technic with a hexane: ethylacetate system (1:2) The sediment was desiccated and recrystallizaltion by using ethanol after being filtered and rinsed with methanol.

N-(4-(1-(2,4-dinitrophenyl)-5-(thiophen-2-yl)-4,5-dihydro-1H-pyrazol-3-yl)phenyl)-1-(thiophen-2-yl)methanimine (3)

Orange powder , m.p 162-164C°; yield 88%;:),FT-IR(ῡ cm^{-1}), Figure 6: 3090,3061(C-Haromatic), 2935(H-C=N), 1612 (C=N), 1595 (pyrazoline C=N), 1579 (C=C aromatic), 1514,1332 (NO_2), Rf= 0.61 (2:1, Ethyl acetate: Hexane).

N-(4-(1-(2,4-dinitrophenyl)-5-(thiophen-2-yl)-4,5-dihydro-1H-pyrazol-3-yl)phenyl)-1-(furan-2-yl) methanimine (4)

Red powder, m.p 157-159 C°; yield 85%: FT-IR (ῡ cm^{-1}), Figure 7 : 3230,3124 (aromatic C-H), 3093 (H-C=N), 1618 (C=N), 1599 (pyrazoline C=N), 1579 (aromatic C=C), 1508,1327 (NO_2), Mass (NCI) m/z),: 490 M+ For C $_{24}$H $_{17}$N $_{5}$O $_{5}$S. Rf= 0.63 (1:2, Ethyl acetate: Hexane).

N-(4-(1-(2,4-dinitrophenyl)-5-(thiophen-2-yl)-4,5-dihydro-1H-pyrazol-3-yl)phenyl)-1-(4-nitrophenyl)methanimine(5)

Yellow powder, m.p 142-144 C°; yiled 82%, FT-IR(ῡ cm^{-1}) (Figure 8),: 3201,3091 (C-Haromatic), 2949,2856 (H-C=N), 1614 (C=N), 1595 (pyrazoline C=N), 1575 (aromatic C=C), 1508,1327 (NO_2), Rf= 0.67 (2:1, Ethyl acetate: Hexane).

N-(4-(1-(2,4-dinitrophenyl)-5-(thiophen-2-yl)-4,5-dihydro-1H-pyrazol-3-yl)phenyl)-1-(4-chlorophenyl)methanimine (6)

Orange powder, m.p 155-157 C; yield 88%; FT-IR (ῡ cm^{-1}) (Figure 9) : 3213,3178 (C-Haromatic), 3091 (H-C=N), 1614 (C=N), 1593 (pyrazoline C=N), 1577 (aromatic C=C), 1510,1325 (NO_2), Rf= 0.76 (2:1, Ethyl acetate: Hexane).

3-(((4-(1-(2,4-dinitrophenyl)-5-(thiophen-2-yl)-4,5-dihydro-1H-pyrazol-3-yl)phenyl)imino)methyl)phenol (7)

Brown powder, m.p 166-168 ^{O}C; yield 84%,; FT-IR (ῡ cm^{-1}) (Figure 10), : 3325 (OH), 3097 (C-Haromatic), 3043 (H-C=N), 1616 (C=N), 1597 (pyrazoline C=N), 1575 (aromatic C=C), 1510,1330 (NO_2) Rf= 0.58 (2:1, Ethyl acetate: Hexane).

N-(4-(1-(2,4-dinitrophenyl)-5-(thiophen-2-yl)-4,5-dihydro-1H-pyrazol-3-yl)phenyl)-1-(m-tolyl)methanimine (8)

Red powder, yield 88%, 144-146 C°; FT-IR (ῡ cm^{-1}): 3107,3063 (C-H aromatic),2943(C-Halphatic) and interfrance (H-C=N), 1614(C=N), 1585 (pyrazoline C=N), 1541 (aromatic C=C), 1508,1329 (NO_2). ^{1}H-NMR (500MHz, DMSO-d6) δ (ppm) (Figure 11): 3.20 (Ha- pyrazoline, m,1H), 3.54 (Hb-pyrazoline, m, 1H), 4.85 (Hx-pyrazoline, t, 1H), 5.93 (NH-pyrazoline, d, 1H), 8.86 (s, 1H, HC=N), 6.09-8.37 (m,14H, Ar-H), Rf= 0.61 (2:1, Ethyl acetate: Hexane).

2.2.4 Synthesis 3-(N-substituted-4-aminophenyl)-5-substitutedaryl-pyrazoline derivatives

These chemicals were made using a modified process given in the reference [17]. compound (2) (1mmol) and corresponding anhydrides [phthalic anhydride] (0.15gm, 1mmol) or maleic anhydride (0.10gm, 1mmol)] in glacial acetic acid (3mL), to a solution of pyrazoline derivatives and added (0.1gm,1.2 mmol) anhydrous sodium acetate , The mixture was left to reflux for 1 hour after the reaction was completed (as determined by TLC), and then the liquid was poured over crushed ice and stirred together. Filtered, rinsed with water, and dried the separated substance

2-(4-(1-(2,4-dinitrophenyl)-5-(thiophen-2-yl)-4,5dihydro-1Hpyrazol-3-yl)phenyl)isoindoline-1,3-dione (9)

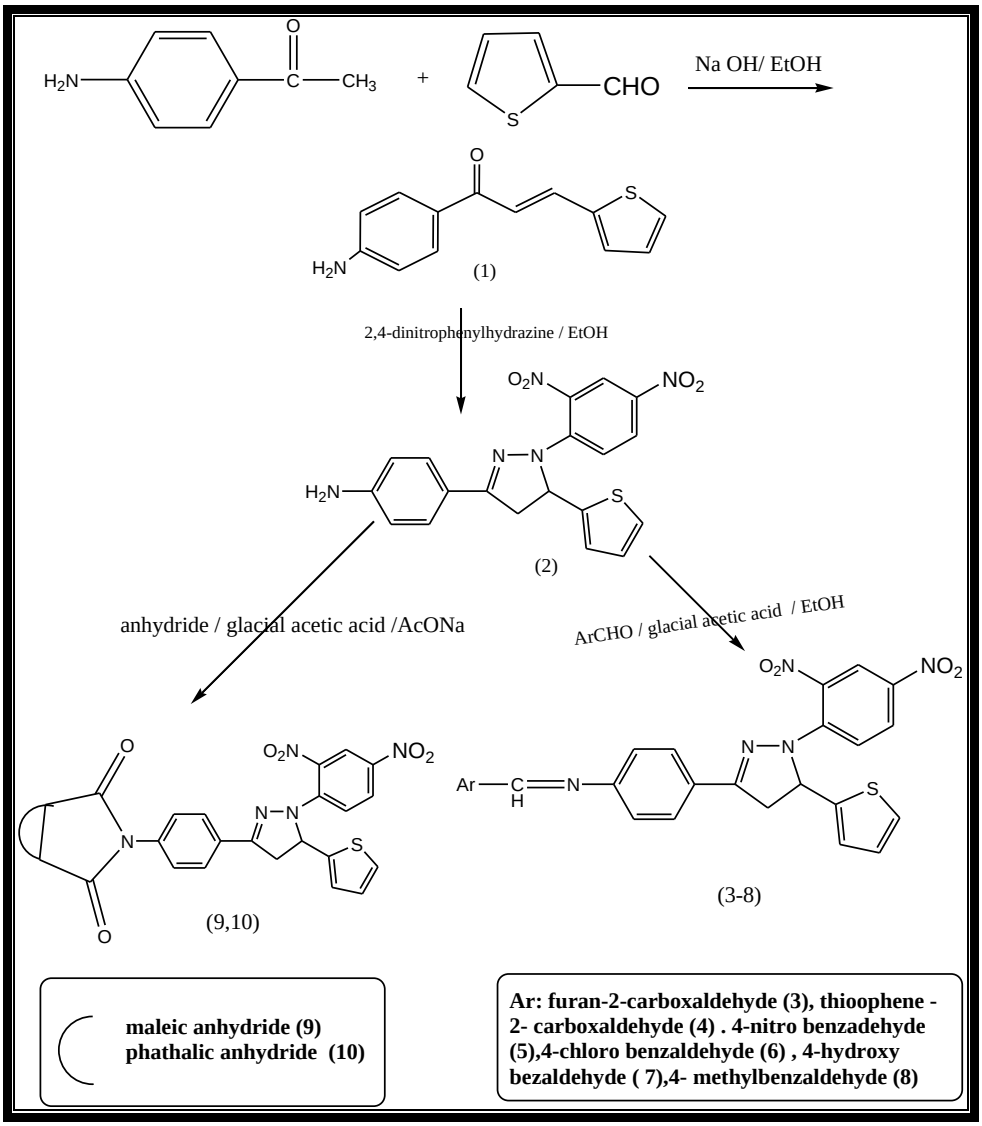
Brown powder, m.p 151-153 ◦C; yield 57 %; FT-IR (ῡ), (Figure 12): 3227,3103 (***C-Haromatic***), 1739,1712 (***C=O***), shoulder (***pyrazoline C=N***), 1595 (***aromatic C=C***), 1510,1330 (***NO_2***), Mass (NCI) m/z), : 552 M+ For C $_{27}$H $_{18}$N $_{5}$O $_{6}$S. R*f*= 0.48 (1:4, Hexane: Ethyl acetate).

1-(4-(1-(2,4-dinitrophenyl)-5-(thiophen-2-yl)-4,5dihydro-1Hpyrazol-3-yl)phenyl)-1H-pyrrole-2,5-dione (10)

Brown powder, m.p 141-143 ◦C yield 61 %, FT-IR (ῡ), (Figure 13): 3099(***C-Haromatic),*** 1737,1714 (***C=O***), shoulder (***pyrazoline C=N***), 1587 (***aromatic C=C***), 1510,1329 (***NO_2***), R*f* = 0.73 (4:1, Ethyl acetate: Hexane).

3. Results and Discussion

The reaction of 4- aminoacetophenone with thiophen -2-carboxaldehyde in ethanol in the presence of sodium hydroxide 40 % solution yielded the chalcone derivative compound (1). The pyrazoline compound (2) was formed when Chalcone compound (1) was combined with 2,4-dinitrophenyl hydrazine in ethanol . In an acidic methanolic solution, Schiff bases (3-8) were made by reacting chemical (2) with various aromatic aldehydes. N-acyl-3,4-disubstituted pyrazoline derivatives (9,10) were synthesis by reaction compound (2) with different anhydrides. (Scheme1).



Scheme 1: synthesis of derivatives (1-10)

The absorption bands were visible in the FT-IR spectrum of compound (1) at 1597cm^{-1} and 1618 cm^{-1} regions due to CH=CH and C=O respectively figure 1.

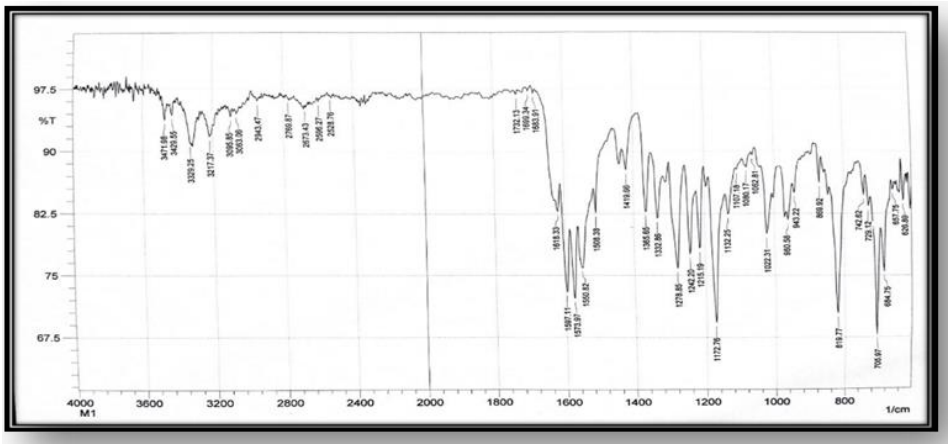


Fig.1: FTIR spectrum of compound (1)

Compound 1's ^{1}HNMR spectrum revealed a singlet band at 6.16 ppm due to NH2 protons, The signal appears at 7.60,7.74 ppm and is associated with two aromatic protons for CH=CH of chalcone .figure 2.

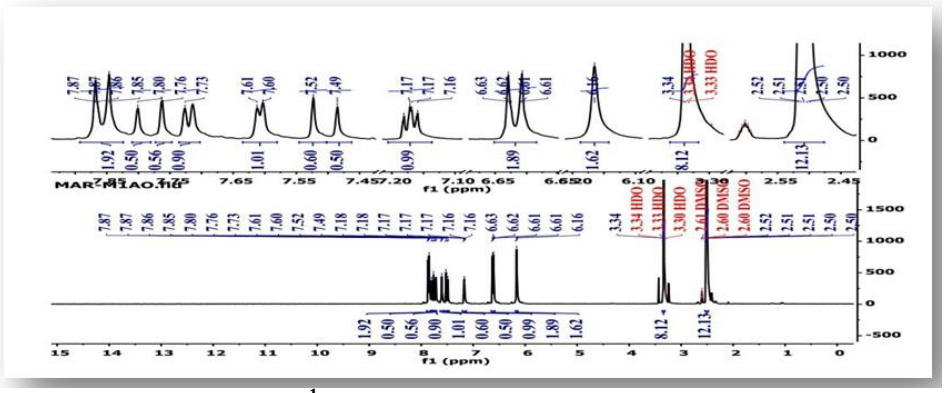


Fig. 2: ^{1}HNMR spectrum of compound (1)

FTIR spectrum of compound (2) figure 3 through the appearance of stretching vibration of NH_2 group, (asymmetrical and symmetrical) at 3323,3281 cm^{-1} and 1616 cm^{-1} regions due to C=N

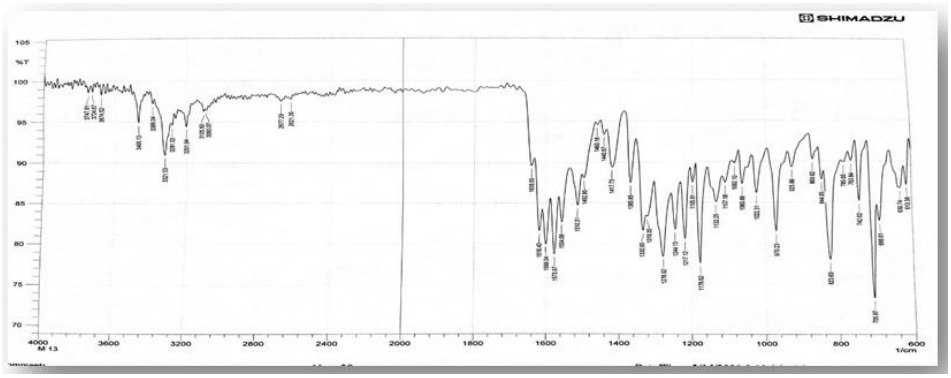


Fig. 3: FTIR spectrum of compound (2)

Compound 2's ^{1}HNMR data revealed a 2.74 ppm doublet of doublet signal, a 3.0-3.2 ppm doublet of doublet signal, and a 4.5-4.6 ppm triplet signal associated to 3H of pyrazolinering. At 6.17ppm, the protons of NH2 show as a singlet signal. The following signals were discovered in the ^{1}HNMR spectra of chemical 8: 3.20ppm, 3.54 ppm, and 4.85 ppm due to the pyrazoline ring's 3H, respectively. mass spectrum was used to proven structure of compound (2) figure 5.

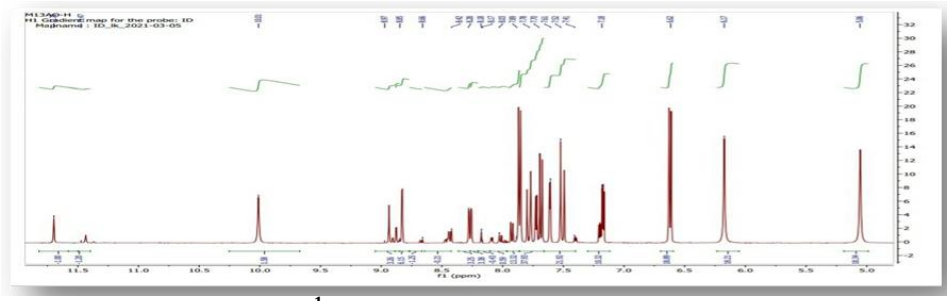


Fig. 4: ^{1}HNMR spectrum of compound (2)

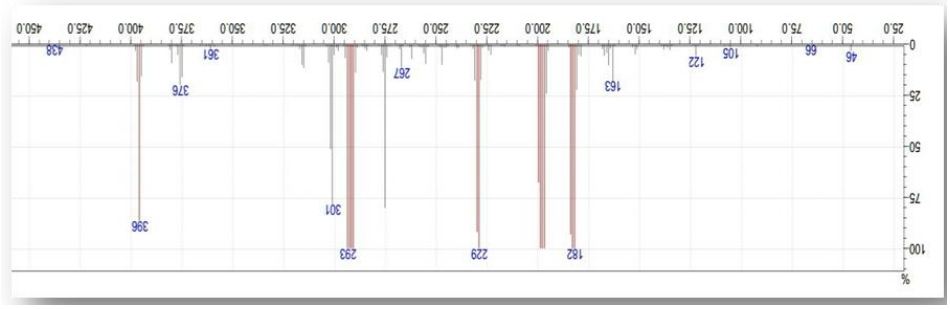


Fig. 5: Mass spectrum of compound (2)

FT-IR spectra of the title compounds (3-8) (figure 6-10) showed the appearance of absorption bands in 1612-1618 cm^{-1} ,1595-1597 regions due to C=N and CH=N respectively and disappearance for ν(NH2) of the amine at ν (3323,3281) cm-1.

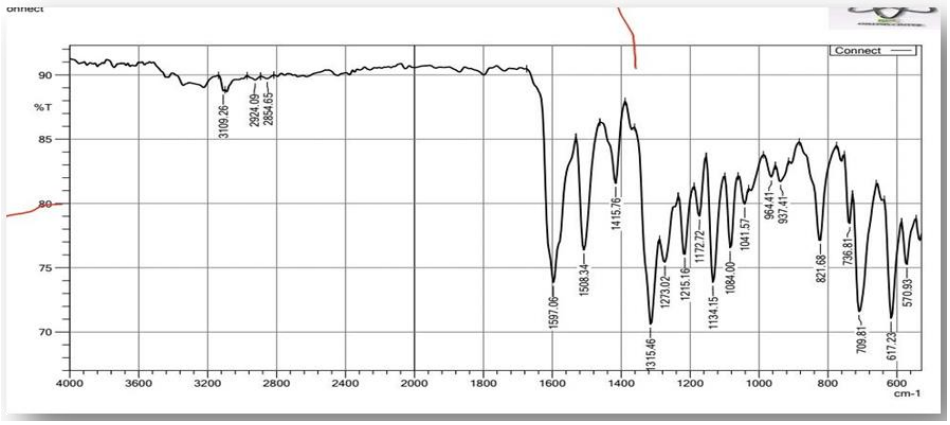


Fig. 6: FTIR spectrum of compound (3)

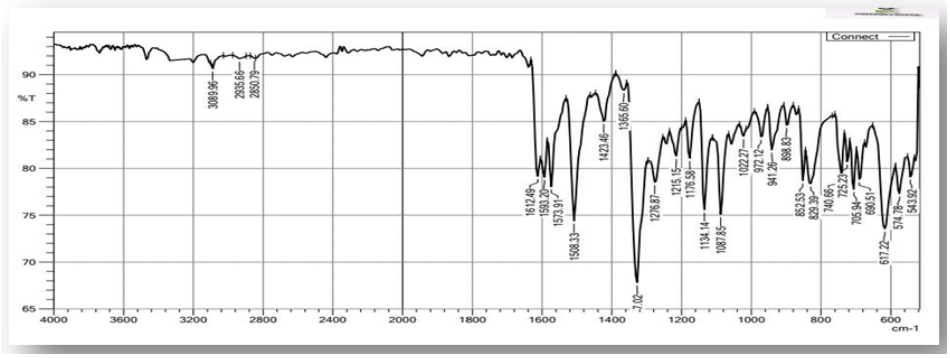


Fig. 7: FTIR spectrum of compound (4)

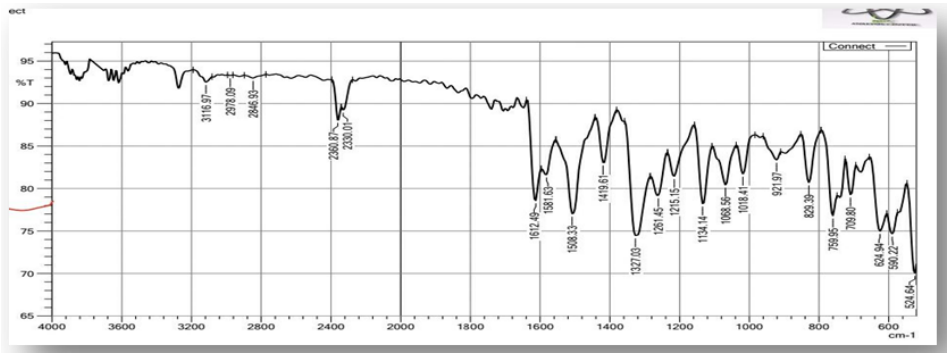


Fig. 8: FTIR spectrum of compound (5)

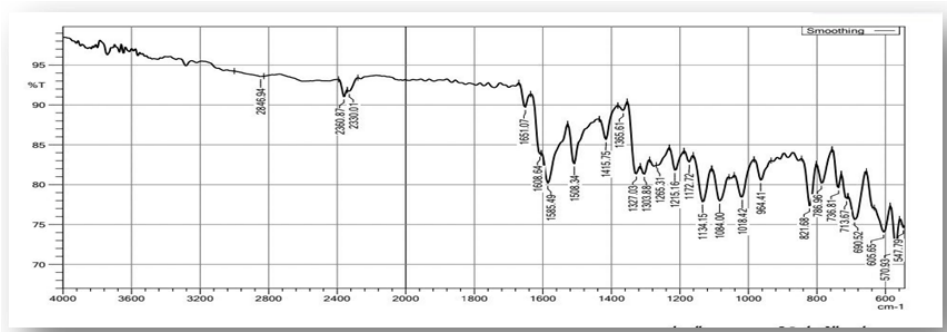


Fig. 9: FTIR spectrum of compound (6)

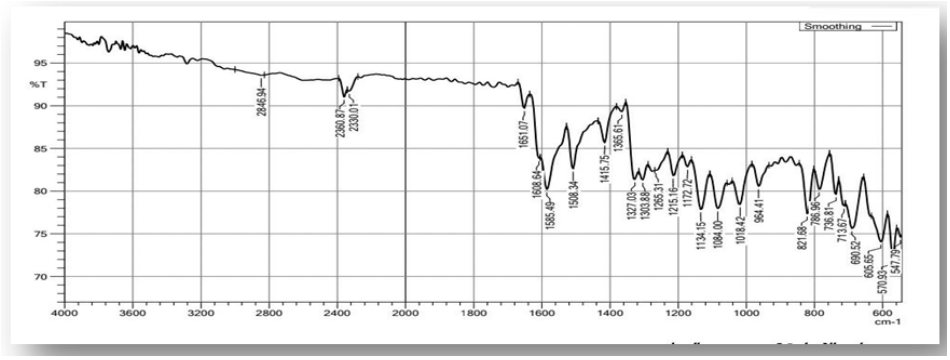


Fig. 10: FTIR spectrum of compound (7)

^{1}H-NMR spectrum of compound (8) exhibited signals (Figure 11) at 3.20 , 3.54 , 4.85 and 8.86 were assigned to protons pyrazoline and HC=N proton , The aromatic protons were appeared at (6.09-8.37) ppm.

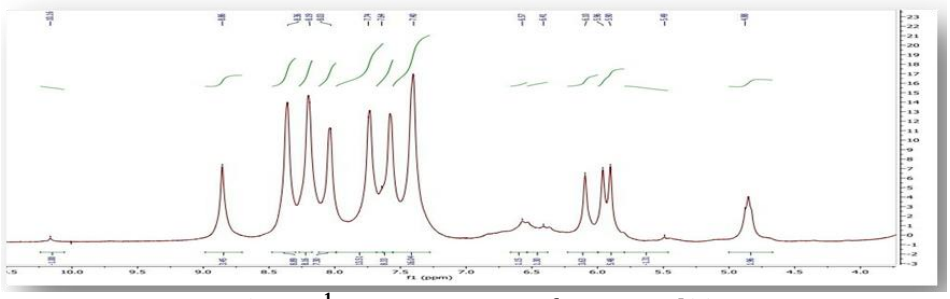


Fig. 11: ^{1}HNMR spectrum of compound(8)

The N-acyl-3,4-disubstituted pyrazoline derivatives (9,10) were characterized by recording their FT-IR. The FTIR spectra(figure 12,13) of compound (9,10) showed appearance a new band in the area (1739-1737 ,1712-1714) cm -1 which has been (C=O) of chalcone and disappearance of NH_2 stretching band of compound (2).

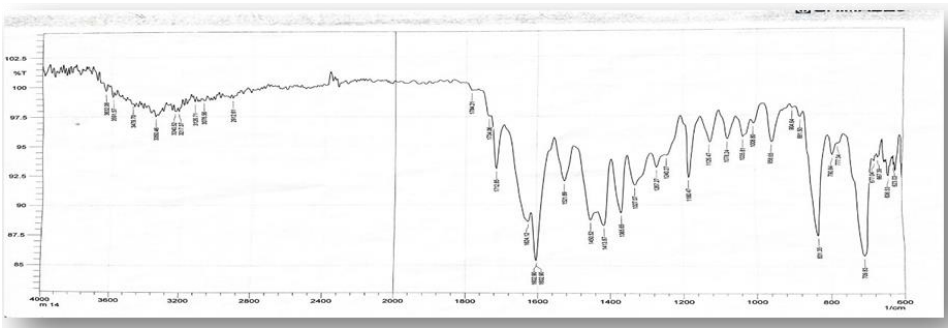


Fig. 12: FTIR spectrum of compound (9)

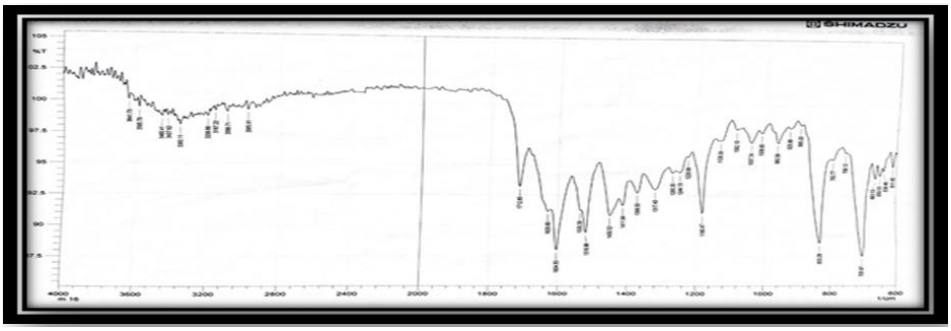


Fig. 13: FTIR spectrum of compound (10)

4. Conclusion

Novel pyrazoline derivatives are prepared and characterized on the basis of analytical and spectral data. The analysis of these compounds were proven formation of compounds

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بايروازولينات جديده مع متدليه الايمين : تحضير , تشخيص

مروه عبد الله عطيه ، الفه عبد نايف، عبد القادر محمد نوري

قسم الكيمياء , كليه العلوم , الجامعه المستنصرية, بغداد , العراق

الملخص

تم تحضيرالجالكون بواسطه تكثيف كليسن شمدت بين تفاعل مولات متكافئة من 4- امينو اسيتوفينون مع الثايوفين -2- كاربوكسالديهايد بوجود هيدروكسيد الصوديوم كقاعده، وقد تضمنت الميكانيكيه استخلاص بروتون الفا بواسطه القاعدة من الفا-كاربون للكيتون لتكوين كاربان ايون الذي يهاجم كاربونيل الألديهايد لا يحتوي الألدهيد على هيدروجين ألفا لينتج ألفا-بيتا غير المشبع كيتون، استخدم مشتق الجالكون لتحضيير مشتقات البيرازولين عن طريق التكثيف مع 2،4-دينيترو فينيل هيدرازين. تم تحديد المركبات المحضره الجديدة باستخدام طرق التحليل الطيفي مثل FTIR ، أطياف الكتلة ، ^{1}H-NMR