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SYNTHESIS AND SPECTREAL CHARACTERIZATION OF PYRAZOLINE DERIVATIVES FROM CHALCONE DERIVATIVES

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ABSTRACT

The present research work describes the synthesis of new pyrazoline compounds and Chalcone derivatives. Synthesis of chalcones (1-9) were achived by condensation of diacetyl with substituted benzaldehyde in ethanolic sodium hydroxide (50%). The later compounds reacted with hydrazine hydrate (80%) in glacial acetic acid to yield 1,1'-(aryl -4,5-dihydro-1H-pyrazole-1,3-diyl)bis(ethan-1-one) (10-17). The characterization of the resulting products were confirmed by melting points, UV-Visible, FTIR, ^{1}HMNR, ^{13}C-NMR and Mass. (for some of them) spectral data.

KEYWORDS: New Chalcones, Pyrazolines.

INTRODUCTION

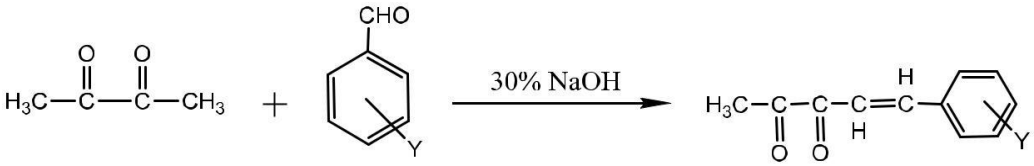
Chalcones, one of the major classes of natural products with widespread occurrence in fruits, vegetables, spices and soy based foodstuff, have been reported to possess several biological activities such as anti-inflammatory,[1] antibacterial.[2] anti-fungal,[3] and anti-tumor,[4] antioxidant[5] and antimalarial activities.[6] In addition of being used in pharmaceutical industries, chalcones also find wide applications in dyes.[7] Apart from being biologically important compounds.an important feature of chalcones is their ability to act as an intermediate for the synthesis of biologically active heterocyclic compounds such as pyrazoline derivatives.[8] Heterocyclic ring containing nitrogen such as Pyrazoline is a promissing structural moiety for drug design to have anti-bacterial,[9] anti-tumor,[10] antihistaminic[11] and anti-convulsant activity,[12] while isoxazole exhibit anti-microbial, anticancer[13] and analgesic activity.[14]

EXPERIMENTAL

^{1}H NMR and ^{13}CNMR were recorded on Bruker DPX-300FT (^{1}H: 300 MHz, ^{13}C: 75.5 MHz). All NMR spectra present in this work were measured in CDCl3 solution. All chemical shifts are given in ppm. The chemical shifts (δ) and coupling constants (*J*) are expressed in ppm and Hz, respectively. High-resolution mass spectra were recorded on a Micromass ZABSpec TOF, on a Q-Tof Applied Biosystems and on Waters Q-Tof 2 apparatus. Infrared Spectrophotometer were recorded on a Bio-Rad Merlin, FT-IR spectra Mod FTS 3000. Melting point data were collected by using Gallen Kamp electrothermal. Ultra-violet spectra were obtained using Unicam HEλIOSβ UV-2000 Spectrophotometer.

Synthesis of 5-Aryl pent-4-ene-2,3-dione (1-9)[15]

In a 100ml round-bottomed flask provided with a mechanical stirrer and immersed in an ice-bath, a mixture of (1.1g, 0.028 mole) of sodium hydroxide pellets, (20 ml) of water and (12.5 ml, 0.2 mole) of ethanol was stirred. A (2.3 ml, 0.022 mole) of freshly distilled portion of the diacetyl was poured on the stirred mixture followed by (2.3 ml, 0.022 mole) of a freshly distilled substituted benzaldehyde. The temperature of the mixture was kept at 20-25ºC with a vigorous stirring for (0.5) hours, until the mixture became thick, then kept in an ice chest or a refrigerator overnight. The product was filtered under vacuum and washed with water until the filtrates were neutral to litmus, then crude chalcone, after drying in air, was recrystillised from ethanol, as shown in the equation below (1).



Y= H, CH_3, NO_2, Br, OCH_3, O.Cl, p.Cl, m.NO_2, F

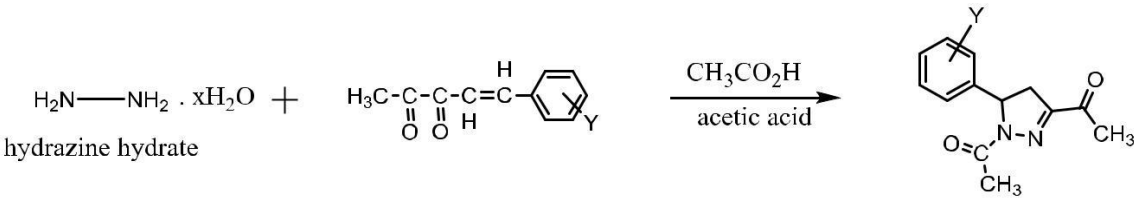
Scheme-1- synthesis of 5-Aryl pent-4-ene-2,3-dione.

Table 1: Some physical properties of prepared Chalcones (1-9).

Comp. No.	Y	M.Wt. (g/mol)	Molecular formula	m.p (◦ c)	Yield (%)	Colour
1	H-	174.20	C11H10O2	138-140	65	(Light) Beige
2	p.F	192.06	C11H9FO2	70-73	78	Yellow
3	p.CH_3	188.23	C12H12O2	110-113	84	Beige
4	p.Br	253.10	$C_{11}H_9BrO_2$	80-83	88	Light yellow
5	p.NO_2	219.20	$C_{11}H_9NO_4$	90-93	83	Bright yellow
6	p.OCH_3	204.23	C12H12O3	70-73	50	Pale yellow
7	m.NO_2	219.20	$C_{11}H_9NO_4$	150-153	63	Pale yellow
8	o.Cl	208.64	$C_{11}H_9ClO_2$	90-93	78	Light yellow
9	p.Cl	208.64	$C_{11}H_9ClO_2$	92-94	60	Pale yellow

Synthesis of 1,3-Diacetyl-5-aryl-2-pyrazoline.(10-17)

In a 100ml round-bottomed flask, a mixture of (0.001) mole of 5-aryl bent-4-ene-3-dion and (20 ml) of acetic acid will be mixed after adding (0.005 mol) Of hydrazine hydrate 80% gradually to mix with continuous stirring using magnetic stirrer and water bath (0-20 C). stirring was Continued for two hours and poured on crushed ice to get the precipitation than filtration of the crude is done with washing several time by under.dry the precipitation and recrystillazed from ethanol. The equation below illustrates the way.



Y= H, CH_3, p.NO_2, Br, o.Cl, p.Cl, m.NO_2, p.F

Scheme-2- synthesis of 1,3-Diacetyl-5-aryl-2-pyrazoline.

Table 2: Some physical properties of prepared 1,3-Diacetyl-5-aryl-2-pyrazoline (10-17).

Comp. No	X	M.Wt. (g/mol)	Molecular formula	m.p (◦ C)	Yield (%)	Colour
10	H-	230.27	C13H14N2O2	152-153	63	Light yellow
11	P.F	248.26	C13H13FN2O2	97-98	90	Pale yellow
12	P.CH_3	244.29	C14H16N2O2	135-137	72	Yellow
13	P.Br	309.16	C13H13BrN2O2	132-134	80	Light yellow
14	P.NO_2	275.09	C13H13N3O4	245-247	55	Brown
15	M.NO_2	275.09	C13H13N3O4	150-152	80	Yellow
16	O.Cl	264.07	C13H13ClN2O2	123-125	75	Pale yellow
17	P.Cl	264.07	$C_{13}H_{13}ClN_2O_2$	130-132	76	Yellow

RESULT AND DISCUSSION

Chalcones possess high reactivity due to the presence of the carbonyl group conjugated with the double bond. This instance suggests that the nucleophiles can react with chalcones at both the carbonyl group and the double bond. The reactions with binucleophiles leading to the broad range of cyclized compounds are of particular interest as pyrazoline.The starting chalcones, namely 5-Aryl pent-4-ene-2,3-dione, were synthesized via the Claisen- Schmidt reaction of diacetyl with substituted benzaldehyd in ethanol and in the presence of aqueous soudium hydroxide at room temperature. The structural assignments of the chalcones (1-9) based on melting points and spectral data UV-Visible, FTIR, ^{1}H-NMR, ^{13}C-NMR,Mass as shown in the table below.

Table 3: Some IR and UV-Visible. Spectral data of Compounds (1-9).

Comp. No.	Y	I.R(KBr)v cm^{-1}						U.V λ_{max}(.n.m) DMSO
		C=C	C=O free	C=O conjugate	C…C	C-H aliphatic	Others	
1	H	1602	1716	Overlapped with c=o free	1496	2937	-----	322 282
2	p.F	1604	1718	Overlapped with c=o free	1512	2989	C-F 1228	328 268
3	p.CH_3	1602	1703	1685	1514	2987	-----	335 270
4	p.Br	1622	1724	Overlapped with c=o free	1489	2983	C-Br 509	326 256
5	p.NO_2	1600	1716	Overlapped with c=o free	1478	2987	NO_2 (asy/sym) 1521, 1348	370 272
6	p.OCH_3	1597	1714	1683	1514	2978	c-o-c(asy/sym) 1180,1093	368 276
7	m.NO_2	1616	1720	Overlapped with c=o free	1482	2989	NO_2 (asy/sym) 1529, 1350	362 245
8	o.Cl	1593	1716	Overlapped with c=o free	1475	2993	c-cl 754	322 263
9	p.Cl	1597	1701	1685	1585	2993	c-cl 761	328 267

Table 4: ^{1}H NMR and mass spectral data of compounds (5,9).

Comp. No.	^{1}H NMR (ppm) – $CDCl_3$	(HRMS (ESI):, [M+H]+:
5	2.29(3H, s, C-12-H)7.19(1H, d, C-8-H), 7.83-7.88(3H, m, C-3,5,7- H), 8.29(2H,d, d C-2,6-H)	Found 11202022 calcd. 21202022
9	2.29(3H, s, C-13-H), 7.11(1H, d, C-8-H), 7.68(1H, d, C-7-H), 7.49(2H,d, C-3,5-H), 7.43(2H, d, C-2,6-H)	Found 22602.02 calcd. 22602.06

Table 5: ^{13}C- NMR data of compound (5,9).

Comp. No.	13C- NMR (ppm) – CDCl3
5	23.8(C12), 195.6(C10), 187.6(C9), 127.2(C8), 153.1(C7), 147.8(C1), 142.4(C4), 129.1(C3,C5), 124.5(C2,C6)
9	23.8(C13), 195.6(C10), 187.6(C9), 127.2(C8), 153.1(C7), 135.4 (C1,C4) 129.1(C3,C5), 129.3(C2,C6)

Reaction of chalcones (1-9) with hydrazine hydrate, under reflux in the presence of glacial acetic acid to yield the corresponding pyrazoline derivatives (10-17),The structure of the pyrazoline derivatives (10-17) were identified by by their melting point and spectral data UV-Visible, FTIR, ^{1}H-NMR, ^{13}C-NMR and Mass as shown in the table below.

Table 6: Some IR and UV-Visible.Spectral data of Compounds (10-17).

Comp. No.	x	I.R(KBr)v cm^{-1}						U.V λ_{max}(.n.m) DMSO
		C=O	C=N	**C=O near to N**	C…C	C-H Aliphatic	**Others**	
10	H	1706	1595	Over lap with c=o	1452	2990	-------	320 275
11	F	1695	1603	Over lap with c=o	1520	2975	C-F 1230	324 269
12	CH_3	1704	1622	1655	1513	2926	------	330 265
13	Br	1702	1597	Over lap with c=o	1492	2987	C-Br 530	320 254
14	NO_2	1703	1599	Over lap with c=o	1478	2932	C-NO2 1347,1522	341 285
15	NO_2	1698	1593	1642	1498	2956	C-NO2 1342,1520	339 279
16	Cl	1700	1605	Over lap with c=o	1522	2958	c-cl 780	319 268
17	Cl	1704	1588	Over lap with c=o	1487	2925	c-cl 730	322 260

Table 7: ^{1}H NMR, ^{13}C- NMR and mass spectral data of compounds (12).

^{1}H NMR (ppm) – $CDCl_3$	7.15(4H, d, C-8,12,9,11-H), 6.13(1H, t, C-6-H), 3.06,2.86(2H,d C-4-H),2.36(3H,s,C-1-H), 2.14(3H,s, C-16-H), 2.32(3H,s,C-18-H)
^{13}C- NMR (ppm) – $CDCl_3$	199.1(C2), 165.9(C14), 157.6(C3),138.4(C10),136.6(C7), 129.8(C9,C11), 127.6(C8,C12), 67.3(C6), 41.7(C4), 25.4(C1), 23.2(C16), 21.1 (C18)
(HRMS (ESI):, [M+H]+:	Found :245.1260, Calcd:245.1290

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