Synthesis, Characteristics and Utility of some Chromone derivatives

Mohamed S. Muftah1 and Mostafa M O Abdoarrahem2
Chemistry department, faculty of sciences- BaniWalid, Alzzytuna university- Libya
Zoology department, faculty of sciences- BaniWalid, Alzzytuna university- Libya

Abstract— The 6,7,8 tribromo-2 –methyl– 4H- chromen -4- one was synthesized by reaction of bromobenzoyl chloride with 1,3 dicarbonyl. The new compounds (3), (4) was characterized by elemental analysis, 1H –NMR, infrared and mass spectroscopy. The biological significance was compared with amikacin as standard.

Keywords: 6,7,8 tribromo -2 – methyl – 4H- chromen -4- one (3) ;
2- (3, 4, 5 trimethoxystyryl) - 6,7,8 tribormo - 4H- chromen -4- one (4)

Introduction

Chromones and their derivatives are well known naturally occurring oxygen containing heterocyclic compounds, which perform important biological functions in nature. It is known that certain natural and synthetic chromone derivatives possess important biological activities, such as antitumor [1], antihepatotoxic, antioxidant [2], anti-inflammatory [3], antispasmolytic, estrogenic [4], and antibacterial activities [5].

Chromones constitute one of the major classes of naturally occurring compounds, and interest in their chemistry continue unabated because of their usefulness as biological active agents [6]. Some of the biological activities attributed to chromon derivatives include cytotoxic (anticancer) [7,8, 9], neuroprotective [10], HIV inhibitory [11], antimicrobial [12,13], antifungal [14], and antioxidant activity[15].

Experimental:

Instrumentation

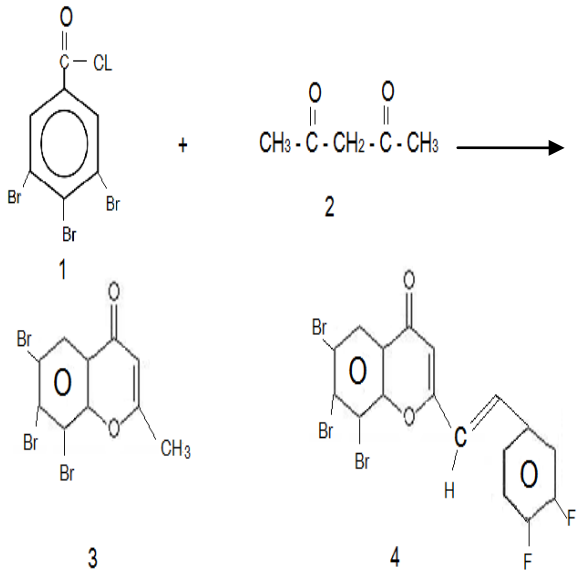
Melting points were measured on Gallenkamp electronic melting points apparatus, the elemental analysis was performed on a Perkin-Elmer 2400. Infrared spectra were recorded using potassium bromide disks on a pye Unicam SP-3-300 infrared spectrophotometer. ^{1}H-NMR experiments were run at 300 MHz on an a Varian Mercury VX-300 NMR spectrometer using TMS as internal standard in deuterated dimethyl Sulphoxide the mass spectra were recorded on shimadzu GCMS- Q- P – 1000 EX mass spectrometer at 70 ev.

Synthesis of 6,7,8 tribromo–2-methyl–4H–chromen-4–one (3)

A mixture of 3,4,5 tribormobenzoyl chloride (0.1 Mole) and acetyl acetone (0.1 Mole) in a round bottom glass (Pyrix) flask (250ml) in absolute ethanol (100ml). The reaction mixture was stirred at room temperature for 4 hrs in the presence of sodium ethoxide (prepared by 0,42 gm sodium metal in 20 ml dry ethanol). The reaction mixture is refluxed for 6 hrs, the solid product that formed was filtered, dried and recrystallized from petroleum ether (80/100 C°).

Synthesis of 2 (3,4 diflourostyryl) -6,7,8 tribromo–4H–chromen-4–one (4)

A mixture of 6,7,8 tribromo–2-methyl–4H–chromen-4–one (0.1 mole) with 3,4- diflourobenzaldehyde (0.1 mole) in a round bottom glass (Pyrix) flask (250 ml) in absolute ethanol (100ml). The reaction mixture was stirred at room temperature for 6 hours in presence of sodium ethoxide (prepared by reaction, 0.38 gm sodium metal with 15 ml dry ethanol). The solid producte that formed was filtered, dried and recrystallized from benzene.



Biological activity:

The compounds (3) and (4) were screened for their antibacterial activity against two gram positive bacteria, two gram negative bacteria and fungi *candida albicans* [16,17], the results of antimicrobial studies are given in table 3.

All the tested compounds showed antimicrobial activity and these activities were compared to standard amikacin.

Table 1; Physical characterization of chromones (3) and (4).

Compound number	MP.C° colour	Solvent (yield %)	MF (M.w$_t$)	Elemental analysis Calcd/Found	
				C %	H%
3	136 – 138 Brown	Petroleum ether (80/100) 73	$C_{10}H_5O_2Br_3$ 396.8603	30.26 30.04	1.25 1.11
4	208 – 210 Brown	Benzene 86	$C_{17}H_7O_2Br_3F_2$ 520.9499	39.19 38.97	1.34 1.20

Results and discussion

Spectroscopic studied of 6,7,8 tribromo– 2- methyl– 4H– chromen-4 –one (3).

The infrared spectrum of the (3) table 2; exhibited the absorption bands at 1661 cm^{-1} and 1647 cm^{-1} are corresponding to υ (C = O) (chromone), υ (C = C), respectively. The ^{1}H-NMR spectrum of the (3) table 2, deuterated DMSO – d_6 showed a singlet signal at 6.42 ppm (S, 1H, pyran ring) and matiplets at 7.98 – 7. 63 ppm (m, Ar – H).

The mass spectrum of compound (3) showed the molecular ion peak at m/e 397 (79%), the following peaks of m/e values followed by % of relative abundances: 398 [M+1] (41,7), 381 (66.13), 316 (52. 28), 301 (92.07), 236 (44.18), 221 (70.11), 141 (83.21), 79 (36%), 65 (100%)

The infrared spectrum of the (4) table 2 also exhibited the absorption bands due to $\upsilon_{C=O}$ at 1697 cm^{-1}, $\upsilon_{C=C}$ at 1656 cm^{-1}. The ^{1}H-NMR spectrum of the (4) table 2; deuterated DMSO – d_6 displayed signals at (δ /ppm); 8.11 – 7.51(m, 5H, Ar-H), 6.30 (S, 1H, pyran ring) and 6.68 (d, 1H, CH = CH).

The mass spectrum of (4) showed the following peaks of m/e values followed by % of relative abundances: [M] 521 (90.11), [M-1] 520 (63.20). 502 (37.51), 483 (82.35), 44 (44.29), 361 (29,61), 281(65.08), 262 (37.19), 77 (100).

Table 2; Spectroscopic for chromones (3) and (4).

Compound number	IR (KBr) δcm^{-1}	^{1}H-NMR δ (ppm)
3	$\upsilon_{C=O}$ 1661 $\upsilon_{C=C}$ 1647	642 (S, Pyran ring) 7.63 (m, Ar)
4	$\upsilon_{C=O}$ 1679 $\upsilon_{C=C}$ 1656	6.30 (S, Pyran ring) 6.68 (d, CH =CH) 7.51 (m, Ar)

Table 3; the inhibition zones (mm) of chromones (3) and (4). The activity of 2.5 mg/ml of the sample Amikacin was used as standard.

Compound/ standard	*Bacillus subtilis* (+ gram)	*Pseudomonas aeruginosa* (- gram)	*Candida albicans*
3	16	18	12
4	21	25	20
Amikacin	24	29	18

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