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Fluorescence Studies of 4-Furanone and 4-Oxazolone Substituted Synthesized Coumarins.

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Abstract : 3-(coumarin-4-yl)-5-(substituted benzoyl)-2-(3H)- furanones have been prepared from 3-(substituted benzoyl propionic acid and coumarin-4-aldehyde and characterized on the basis of IR, ¹H NMR and mass spectrometric data. Some of the compounds have been tested for antibacterial activity.

I. INTRODUCTION

The chemistry of butenolides has attracted more attention in the last few decades due to their novel biological actions used as an important anthelmintic and ascaricidal agents.^{1,2} The butenolide ring present in cardenolides shows a strong oral cardiotonic activity.³ The 3,3-diethylbutyrlactone has been reported to have anticonvulsant activity.⁴ While the butenolides have exhibited antibiotic activity,⁵ anti-inflammatory, analgesic, antitumor, antiviral and anticancer properties also,^{6,7} and potential pharmaceutical interest.^{8,9}

In the present investigations, we report the synthesis and reaction of 3-(coumarin-4-yl)-5-(substituted benzoyl)-2-(3H)-furanones following the literature procedure,¹⁰ with appropriate modification, and a study of biological activity of the resulting products. These compounds were synthesized according to Scheme I. Similarly, 3-(coumarin-4-yl)-5-(substituted benzoyl)-2-(3H)-Oxazolones,^{11,12} In our earlier work, we have assigned E-configuration based on NOE experiments.¹³ These compounds were synthesized according to Scheme II.

II. RESULTS AND DISCUSSION:

In our earlier work, we have assigned E-configuration based on NOE experiments.¹³ Similarly, 3-(coumarin-4-yl)-5-(substituted benzoyl)-2-(3H)-Oxazolones, were synthesized from (un)substituted benzoyl glycine by reacting with coumarin-4-aldehyde in the presence of Sodium acetate in acetic anhydride (Scheme II). The structures assigned to the compounds were supported by the results of I.R, ¹H NMR and Mass. Physiological studies: The synthesized molecules of Furanones (20-32) showed λ_{max} between 330nm to 420nm, while the synthesized molecules of Oxazolones (41-59) showed λ_{max} between 330nm to 420nm.

III. EXPERIMENTAL (General Procedure)

4-[(7-propanoyloxy-2H-1-benzopyran-2-one-4-yl)methylene-2-phenyl-(4H)furanone²⁰: 7-propanoyloxycoumarin-4-carboxaldehyde,**9** (1.23g, 0.005 moles), fused sodium acetate (2.0gm) and benzoyl propionic acid, **17** (0.98g, 0.0055moles) were intimately mixed by grinding in mortar. The mixture was mixed with acetic anhydride (3ml), heated on a boiling water bath for 20min., with shaking and stirring, diluted from ethanol solvent afforded 20; yield 0.95g(49%); mp 260-262°C. IR(KBr):3152, 839,1767, , 1620, 1506, 1251, 1221, 1135, 1006, 757 cm⁻¹; ¹H-NMR(CDCl₃): δ = 1.30(3H, t, J = 7.61Hz), 2.64-2.71(m, 2H), 6.62(s, 1H), 6.73(s,1H), 7.09(1H, d, J = 2.3Hz), 7.13(1H, d, J = 2.3Hz), 7.19(1H, d, J = 2.3Hz), 7.28(2H, d, J = 8.2 Hz,), 7.42(s, 1H), 7.67(2H, d, J = 8.2Hz), 7.73(1H, d, J = 8.6Hz); MS: mz (M⁺,389).

4-[(7-propanoyloxy-2H-1-benzopyran-2-one-4-yl)methylene-2-(4-methoxyphenyl)-5(4H)furanone **21**; yield 1.19g (57%); mp 256-258°C. IR(KBr): 3163, 3035, 2868,1783, 1561, 1349, 1281, 755 cm⁻¹; ¹H-NMR(CDCl₃): δ = 1.29(3H, t, J = 7.52Hz), 2.61-2.69 (m, 2H), 3.89(s, 3H), 6.68(s, 1H), 7.00 (1H, d, J = 9.2Hz), 7.12(1H, d, J = 2.2Hz), 7.14(1H, d, J = 2.2Hz), 7.23(2H, d, J = 2.2Hz), 7.39(s, 1H), 7.73-7.77(s, 3H); MS: mz (M⁺, 419). 4-[(7-butanoyloxy-2H-1-benzopyran-2-one-4-yl)methylene-2-phenyl-5(4H)furanone **22**; yield 0.95g (61%); mp 260-262°C. IR(KBr): m.p.=270-272°C char). IR(KBr):3155, 927, 2878,1750, 619, 1574, 1506, 1214, 1133, 990,856,753 cm⁻¹; ¹H-NMR (CDCl₃): δ = 0.98(3H, t, J = 7.4Hz), 1.49-1.75 (m, 2H), 2.52 (2H, t, J = 6.9Hz), 6.54(s, 1H), 6.66(s, 1H), 7.01-7.23(m, 5H), 7.34(s, 1H), 7.59 (2H, d, J = 8.6Hz), 7.63(s, 1H).

4-[(7-butanoyloxy-2H-1-benzopyran-2-one-4-yl)methylene-2-(4-methyl)phenyl-5(4H)furanone²³; The compound was obtained as orange yellow needle from ethanol,1.19g (yield=57%, m.p.=265-268°C char). IR(KBr): 3163, 3035, 1783, 1699, 1561, 134

1281, 988, 750cm⁻¹; ¹H-NMR(CDCl₃): δ=1.07(3H, t, J = 7.4Hz), 1.76-1.87(m, 2H), 2.43(s, 3H), 2.60(2H, t, J = 7.4Hz), 6.61(s, 1H), 6.68(s, 1H), 6.73(s, 1H), 7.08(1H, d, J = 2.3Hz), 7.12 (1H, d, J= 2.0 Hz), 7.27 (1H, t, J = 6.2Hz), 7.42(s, 1H), 7.65-7.75(m, 3H). 4-[(7-butanoyloxyH-1-benzopyran-2-one-4-yl)methylene-2-(4-methoxyphenyl)-5(4H)furanone24 ; yield 1.27g (59%); mp 260-262°C. IR(KBr): 3159, 2997, 2841, 1778, 1705, 1607, 1504, 1233, 989, 828cm⁻¹; ¹H-NMR(CDCl₃) : δ=1.07(3H, t, J = 7.5Hz), 1.78-1.84(m, 2H), 2.60(2H, t, J = 7.8Hz), 3.90(s, 3H), 6.67(2H, d, J=2.3Hz), 7.12(2H, d, J = 2.3Hz), 7.13(2H, t, J=2.3 Hz), 7.20(1H, d, J = 2.3Hz), 7.39(s, 1H), 7.74-7.77(m,2H).

4-[(7-benzyloxy-2H-1-benzopyran-2-one-4-yl)methylene-2(4-methyl)phenyl-5(4H)furanone25, yield 1.52g (61%); mp284-286°C. IR(KBr):3161, 3030, 2917, 1785, 1474, 1413, 1347, 1260, 1134, 1025, 990 &752cm⁻¹; ¹H-NMR(CDCl₃): δ=2.57(s, 3H), 6.65 (s,1H), 6.77(s, 1H), 7.20-7.47(m, 4H), 7.49(s, 1H), 7.55(2H, t, J = 7.5Hz), 7.69(2H, t, J = 7.3Hz), 7.81 (2H, d, J = 8.8Hz), 8.22(2H, d, J = 7.0Hz).4-[(7-benzyloxy-2H-1-benzopyran-2-one-4-yl)methylene-2(4-methoxy)phenyl-5(4H)furanone26; yield 1.23g (53%); mp284-286°C. IR(KBr): 3161, 3030, 2917, 1785, 1474, 1413, 1347, 1260, 1134, 1025, 990 & 752cm⁻¹; ¹H-NMR(CDCl₃) δ: 3.90(s, 3H), 6.70 (s, 1H), 6.91-7.20 (m, 3H), 7.29(s, 1H), 7.32 (1H, t, J = 6.6Hz), 7.35(1H, t, J = 7.3Hz), 7.53-7.81 (m, 6H), 8.22 (2H, d, J = 7.3Hz); MS: mz(M⁺, 467).

4-[(7-(2-chlorobenzoyloxy -2H-1 - benzopyran -2-one -4-yl)methylene-2(4-methyl) phenyl-5(4H)furanone27, yield 1.52g (59%); mp258-260°C. IR(KBr): 3161, 3030, 2917, 1785, 1474, 1413, 1347, 1260, 1134, 1025, 990,752cm⁻¹; ¹H-NMR(D₂SO₄) δ 2.59(s, 3H), 6.93(s, 1H), 7.24(s, 2H), 7.44-7.71(m, 6H), 7.87(1H, d, J = 8.8Hz), 8.07(2H, d, J = 7.0Hz), 8.24(s, 1H), 8.42(1H, d, J = 7.0Hz). 4-[(7-Benzyl-2H-1-benzopyran-2-one-4-yl)methylene-2(4-methyl)phenyl-5(4H)furanone28; yield 1.42g (53%); mp245-247°C. IR(KBr):3160, 2997, 2841, 1778, 1705, 1607, 1504, 1351, 1251, 1142, 829cm⁻¹; ¹H-NMR(CDCl₃): δ2.44(s, 3H), 5.17(s, 2H), 6.62(s, 1H), 6.96(2H, d, J = 2.45Hz), 7.00(1H, d, J = 2.5Hz), 7.30(1H, d, J = 8.3Hz), 7.37(s, 1H), 7.38-7.64(m, 6H), 7.67(3H, d, J = 6.4Hz).

4 -[(7- Benzyl -2H-1 - benzopyran -2-one -4-yl) methylene -2(4-methoxy)phenyl-5-(4H)furanone29; yield 1.40g (62%); mp284-286°C. IR(KBr):3160, 2841, 1778, 1705, 1607, 1504, 1351, 1251, 989, 829 cm⁻¹; ¹H-NMR(CDCl₃): δ 3.89(s, 3H), 5.16(s, 2H), 6.50(s, 1H), 6.68(s, 1H), 6.95-7.12(m, 4H), 7.26-7.44(m, 6H), 7.64(s, 1H), 7.67(s, 1H), 7.75(s, 1H). 4-[(7-(2' -Chlorobenzyl-2H-1-benzopyran-2-one-4-yl)methylene-2-phenyl)-5-(4H)furanone30; yield 1.20g (53%); mp215-218°C. IR(KBr): 3146, 1784, 1716, 1610, 1538, 1507, 1352, 1281, 1185, 1160, 1035, 993 and 743cm⁻¹; ¹H-NMR(CDCl₃): δ= 5.27(s, 2H), 6.51(s, 1H), 6.79(s, 1H), 6.91-7.03(m, 3H), 7.29-7.34(m, 3H), 7.43-7.54(m, 5H), 7.64-7.77(m, 1H), 7.78 (1H, d, J = 3.6Hz), 7.82(1H, d, J = 9.9Hz).

4-[(7-(4-NitroBenzyl)-2H-1-benzopyran-2-one -4 -yl)methylene -2(4-methyl)phenyl-5-(4H)furanone31; yield 1.49g (62%); mp290-293°C. IR(KBr):3032, 2856, 1778, 1701, 1611, 1518, 1346, 1281, 1185, 1148, 987 & 827; ¹H-NMR (CDCl₃) :δ=2.66(s, 3H), 5.36(s, 2H), 6.47(s, 1H), 6.78(s, 1H), 6.91-6.96(3H, t, J = 3.6Hz), 7.60(1H, d, J = 2.6Hz), 7.62(3H, d, J = 3.6Hz,), 7.75(3H, t, J= 3.6 Hz), 8.25(2H, t, J = 3.6Hz).

4-[(7-(4-Cyano Benzyl -2H-1-benzopyran-2-one -4-yl)methylene -2(4-methyl)phenyl- 5 - (4H)furanone32; yield 1.25g (58%); mp284-286°C. (yield=58%, m.p.=250-255°Cchar). IR(KBr): 3436, 3072, 2854, 1728, 1612, 1509, 1352, 1214, 1183, 1019 and 966cm⁻¹; ¹H-NMR (CDCl₃): δ= 2.43(s, 3H), 5.22 (s, 2H), 6.52(s,1H), 6.74(s, 1H), 6.92(3H, d, J = 2.6Hz), 7.00(1H, d, J = 2.6Hz), 7.28(s, 1H), 7.43(s,1H), 7.57(2H, d, J = 8.4Hz), 7.66-7.57(m, 5H).

By successfully study of furanone,we prepared analogues Oxazolones which tremendous application in antitumour and anticancer activity. 4-(7-propanoyloxy-2H-bezopyran-2-one-4-yl)methylene -2(4-methyl)phenyl- 5 - (4H)furanone41: 7-propanoyloxy benzopyran-2-one-4-carboxaldehyde (1.23g,0.005moles), fused sodium acetate (2.0gm) and benzoyl propionic acid, 17 (0.98g, 0.0055moles) benzoyl Glycine 38 (0.98g ,0.0055moles) mixed with Ac₂O (3ml), heated on a boiling water bath for 20 min. Cooled and filtered,dried, yield1.03 g (53%); mp 235-237°C. IR(KBr): 3135, 3064, 2941, 1766, 1619, 1558, 1452, 1355, 1297, 1137, 978 ,769cm⁻¹; ¹H-NMR(CDCl₃): δ=1.30 (3H, t, J = 7.50Hz), 2.10-2.69(, 2H), 2.43(s, 3H), 2.60(2H, t, J = 7.4Hz), 7.17(1H, d, J = 2.2Hz), 7.21(1H, d, J = 2.2 Hz), 7.58 (2H, t, J = 7.2 Hz), 7.69-7.84(m, 3H), 8.23(1H, d, J =7.0 Hz), 8.84(2H, d, J = 6.7Hz). MS: mz (M⁺, 389).

4-((7-propanoyloxy-2-one-4-yl)methylene)-2-(2-chlorophenyl)5(4H) oxazolone42: The compound was obtained as yellow needle from ethylacetate,1.08g(yield=51%, m.p.=210-220°C). IR(KBr):3135, 2943, 1801, 1760, 1617, 1559, 1474, 1350, 1262, 1132, 977, 866 &733 cm⁻¹; ¹H-NMR(CDCl₃):δ=1.30(3H, t, J = 7.6Hz), 2.60-2.71(m, 2H), 7.58

(2H, d, $J = 7.6\text{Hz}$), 7.21(1H, d, $J = 2.2\text{Hz}$), 7.58(2H, t, $J = 2.73\text{Hz}$), 7.75(s, 1H), 7.82 (1H, d, $J = 8.6\text{ Hz}$), 8.16 (1H, d, $J = 7.0\text{Hz}$). MS: mz (M^+ , 423).

4-(7-Butonyloxy-2H-bezopyran-2-one-4-yl)methylene)-2-phenyl-5(4H)oxazolone **43**; yield 1.02g (53%); IR(KBr): 3097, 2944, 1780, 1760, 1617, 1558, 1328, 1262, 1137, 902 & 697 cm^{-1} ; $^1\text{H-NMR}$ (CDCl_3): $\delta = 1.07$ (3H, t, $J = 7.4\text{Hz}$), 1.56-1.88 (m, 2H), 2.61 (2H, t, $J = 7.22\text{Hz}$), 7.11-7.20(m, 2H), 7.41(s, 1H), 7.57 (2H, t, $J = 7.0\text{Hz}$), 7.68 (1H, d, $J = 7.0\text{Hz}$), 7.80(2H, d, $J = 8.6\text{ Hz}$), 8.22(2H, d, $J = 7.02\text{Hz}$).

4-(7- Butonyloxy -2H -bezopyran -2- one-4 -yl) methylene)-2-(2-chlorophenyl-5(4H) oxazolones**44**;yield 1.18g (53%); 190-200°C. IR(KBr): 3083 , 2935, 1803, 1761, 1608, 1559, 1473,1264, 1179,974 ,740 cm^{-1} ; $^1\text{H-NMR}$ (CDCl_3): $\delta = 1.30$ (3H, t, $J = 4.5\text{Hz}$), 1.56-1.88 (m, 2H), 2.60(2H, d, $J = 7.6\text{Hz}$), 7.15(2H, d, $J = 7.8\text{Hz}$), 7.48(s, 2H), 7.84(2H, d, $J = 5.5\text{Hz}$), 7.79(2H, t, $J = 7.6\text{Hz}$), 8.16(1H, d, $J = 6.63\text{Hz}$).

4-((7-benzoyl-2H-bezopyran-2-one-4-yl) methylene)-2-phenyl-5(4H) oxazolone.**45**:

(52%); 1.13g(yield = 52%, m.p.= 24-243 °C char). IR(KBr): 3078,1870, 1449, 1326, 1248, 1133, 1052, 975, 864 & 769 cm^{-1} . $^1\text{H-NMR}$ (CDCl_3): $\delta=7.36$ (s,1H), 7.95-8.16(m,7H), 8.21-8.48(m,3H), 8.43-8.48(m, 2H), 8.74(, d, $J = 7.68\text{Hz}$).

4-((2-chorobenzoyl)-2H-bezopyran-2-one-4-yl)methylene)-2-(2-chlorophenyl-5(4H) oxazolone**46**; yield 1.01g (39%); 190-200°C. IR(KBr): 3078, 1800, 1736,1558, 1449, 326, 1248, 1132,1051, 978, 864 & 699 cm^{-1} ; $^1\text{H}(\text{CDCl}_3)$: $\delta=7.00$ (s, 1H), 7.39(s, 2H), 7.427.59(m, 4H),7.70(1H, t, $J = 7.7\text{Hz}$), 7.80(2H, t, $J = 7.7\text{Hz}$), 7.99-8.13(m, 3H). 4-[7-(2-Chlorobenzyl)-2H-bezopyran-2-one-4-yl)methylene]-2-phenyl-5(4H) oxazolone**47**; yield 1.12g (49%); mp190-200°C. IR(KBr):3077, 1800, 1710, 1609, 1554, 1450,1374, 1350, 1280, 1175, 1064, 1064, 1008, 884,697 cm^{-1} ; $^1\text{H-NMR}$ (CDCl_3) : $\delta= 5.27$ (s, 2H), 6.95-7.03(m, 2H), 7.23-7.30 (m, 6H), 7.32 (2H, d, $J = 3.9\text{Hz}$), 7.50 (s, 1H), 7.57(s, 1H), 7.61(1H, d, $J = 3.5\text{Hz}$), 7.74(1H, d, $J = 8.6\text{Hz}$).

4-[7-(2-Chlorobenzyl)-2H- bezopyran -2-one-4-yl)methylene]2-(2-chlorophenyl-5-(4H) oxazolone**48**; yield 1.23g (50%); mp256-258°C. IR(KBr):3080, 1802, 1719, 1617, 1536, 1471, 1430, 1396, 1346, 1209, 1144, 1117, 1033, 1004, 961 &736 cm^{-1} ; $^1\text{H-NMR}$ (CDCl_3): $\delta= 5.27$ (s, 2H) , 6.95-7.03(m, 2H),7.23-7.30(m, 6H), 7.32(2H, d, $J = 3.9\text{Hz}$), 7.50 (s, 1H), 7.57(s, 1H), 7.61 (1H, d, $J = 3.5\text{ Hz}$), 7.74(1H, d, $J = 8.6\text{Hz}$). 4-[7-(4-nitrobenzyl)-2H-bezopyran-2-one-4-yl)methylene]-2-(2-chlorophenyl)-5(4H) oxazolone**49**; yield 0.98g (38%); 245-248°C. IR(KBr):2923, 2226, 1801, 1714, 1600, 1554, 1452,1327, 1282, 1145, 1067, 981, 821, 699 & 549 cm^{-1} ; $^1\text{HNMR}$ (CDCl_3): $\delta= 5.22$ (s, 2H), 6.92(1H, d, $J = 2.34\text{Hz}$), 6.98 (1H, d, $J = 2.7\text{Hz}$), 7.02(1H, d, $J = 2.7\text{Hz}$),7.44-7.63(m, 6H), 7.69-7.77(m, 3H), 8.16(1H, d, $J = 7.0\text{Hz}$). 4-[7-(4-cyanobenzyl-2H-bezopyran-2-one-4-yl)methylene]-2-phenyl-5(4H)oxazolone **50**; yield 1.14g (51%); 250-255°C. IR(KBr):2923, 2226, 1801, 1714, 1512, 1452, 1353, 1327,1282, 1145, 1067, 821549 cm^{-1} ; $^1\text{H-NMR}$ (CDCl_3):5.22(s, 2H), 6.92(s, 1H),6.99(1H, d, $J = 9.0\text{Hz}$), 7.24(s, 2H), 7.40 (s, 1H), 7.55-7.77(m, 8H), 8.22(2H, d, $J = 7.8\text{Hz}$).

4-[6-methyl-2H-1-bezopyran-2-one-4-yl) methylene]-2-phenyl-5(4H) oxazolone**51**; yield 0.75g (51%); 253-255°C.IR(KBr):3066, 1801, 1716, 1654 , 620, 1546, 1452, 1346, 1298, 1178, 1066, 759 cm^{-1} ; $^1\text{H-NMR}$ (CDCl_3): $\delta= 2.48$ (s, 3H),7.30 (1H, d, $J = 8.6\text{Hz}$), 7.40(1H,d, $J = 8.6\text{Hz}$), 7.48(s, 1H), 7.54-7.62(m, 3H), 7.70(1H, t, $J = 7.5\text{ Hz}$), 7.76(s, 1H), 8.23(2H, d,J=7.4 Hz).

4-[6-methyl-2H-1-bezopyran-2-one-4-yl)methylene]-2-(2-Chloro)phenyl-5(4H) oxazolone**52**; yield 0.73g (51%); 268-270°C.IR(KBr):3066, 1801, 1716, 1654, 1620, 1546, 1452, 1346, 1298, 1178, 1066, 883 &759 cm^{-1} . $^1\text{H-NMR}$ (CDCl_3): $\delta=2.48$ (s,3H),7.30 (1H, d, $J = 8.2\text{Hz}$), 7.40(1H, d, $J = 8.2\text{Hz}$), 7.47(1H, d, $J = 8.0\text{Hz}$), 7.54-7.62(m, 4H), 7.76(s, 1H), 8.18(1H, d, $J = 8.2\text{Hz}$).

4-[6-methyl-2H-1-bezopyran-2-one-4-yl)methylene]2-(2-methyl)phenyl-5(4H) oxazolone**53**:

yield 0.80g (49%); 231-232°C. 0.80g(yield=49%, m.p.=231-232°C).

IR(KBr):3066,2922,1803,1712, 1652,1537, 1353,1261, 1182, 1089,871 cm^{-1} ; $^1\text{H-NMR}$ (CDCl_3): $\delta=2.45$ (s, 3H),2.82(s, 3H), 7.29(1H, d, $J = 8.3\text{Hz}$), 7.35-7.42 (m,3H), 7.48(s, 1H), 7.54(1H, t, $J = 7.3\text{ Hz}$), 7.61(s, 1H), 7.70(s,1H), 8.15(1H, d, $J = 8.3\text{Hz}$).

4-[7-methyl-2H-1-bezopyran-2-one-4-yl) methylene]-2-phenyl-5(4H) oxazolone**54**; yield 0.73g (51%); 268-270°C.

The compound was obtained as orange yellow needles from ethanol,0.56g (yield=34%, m.p.=281-283°C). IR(KBr):3064, 1805, 1714, 1649, 1560, 1537, 1450, 1348, 1174, 952 and 887 cm^{-1} . $^1\text{H-NMR}$ (CDCl_3): $\delta= 2.48$ (s, 3H), 7.19(1H, d, $J = 7.1\text{Hz}$), 7.21(s, 1H) 7.45(s, 1H), 7.57(2H, t, $J = 7.0\text{ Hz}$), 7.68-7.77(m, 3H), 8.23(2H, d, $J = 7.4\text{ Hz}$).

4-[7-methyl-2H-1-bezopyran-2-one-4-yl)methylene]-2-(2-Chloro)phenyl-5(4H) oxazolone**55**; yield 0.64g (35%); 275-277°C. IR(KBr): 3085, 1805, 1712, , 1618, 1546, 1471, 1344, 1274, 1182, 1043,777 cm^{-1} ; $^1\text{H- NMR}$ (CDCl_3): $\delta2.48$ (s, 3H),7.18(d, J = 7.8Hz, 1H), 7.21(s, 1H), 7.45(1H, t, $J = 7.1\text{Hz}$), 7.51-7.63(m, 3H), 7.70(m, 2H), 8.20 (1H, d, $J = 8.3\text{Hz}$).

4-[7-acetoxy-2H-1-bezopyran-2-one-4-yl)methylene]-2-(2-Chloro)phenyl-5(4H) oxazolone⁵⁶: yield 0.86g (42%); 226-240°C. IR(KBr):3097, 1797, 1701, 1620, 1554, 1537, 1350, 1269, 1186, 894 & 727 cm⁻¹; ¹H-NMR (CDCl₃): δ=2.32(s, 3H), 7.22(1H, d, J = 8.6 Hz), 7.34(s, 1H), 7.56(s, 1H), 7.61(1H, t, J = 8.2 Hz), 7.67(s, 1H), 7.70-7.787(m, 2H), 8.13(1H, d, J = 8.6 Hz), 8.22(1H, d, J = 8.6 Hz).

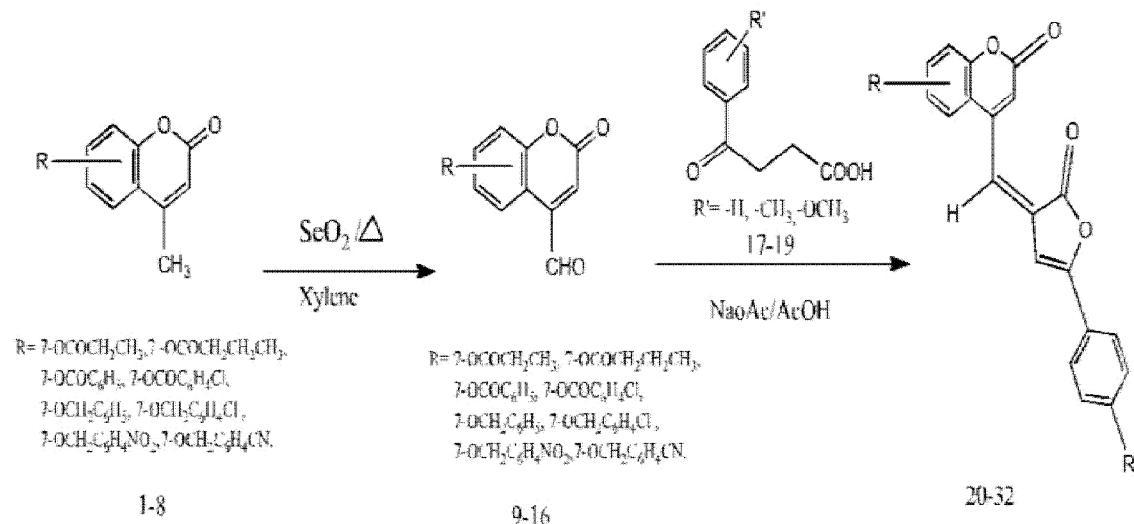
4-[7-acetoxy-2H-1-bezopyran-2-one-4-yl)methylene]-2-(2-methyl)phenyl-5(4H) oxazolone⁵⁷: yield 0.73g (51%); 268-270°C. 1.07g (yield=55%, m.p.=245-247°C). IR(KBr): 3097, 1805, 1760, 1718, 1604, 1556, 1535, 1348, 1265, 1178, 1027, 1178, 1020, 896 & 736cm⁻¹; ¹H-NMR(DMSO): δ=2.30(s, 3H), 2.66(s, 3H), 7.22(d, J=8.2Hz, 1H), 7.34(s, 1H), 7.47-7.51(m, 3H), 7.59(s, 1H), 7.63(1H, t, J = 7.7Hz), 8.03(1H, d, J = 8.2Hz), 8.21(1H, d, J = 8.2 Hz).

4-[2H-1-naphth[1,2-b]pyran-2-one-4-yl)methylene]-2-(2-methyl)phenyl-5(4H) oxazolone

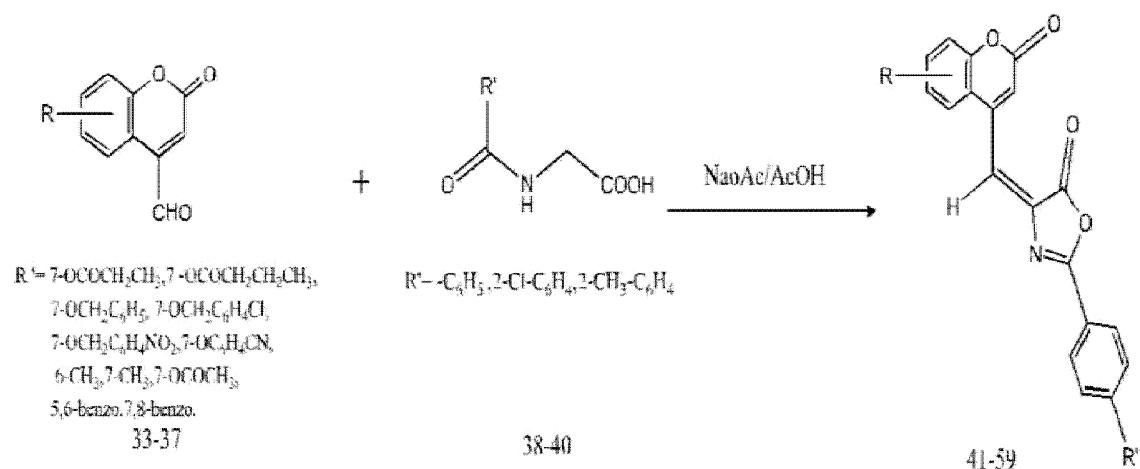
58 yield 0.28g (51%); mp263-265°C. IR(KBr):3062, 17971, 1712, 1600, 1552, 1533, 1357, 1271, 1184, 1087, 883 and 727cm⁻¹; ¹H-NMR(CDCl₃): δ=2.8(s, 3H), 7.44(2H, d, J = 8.8Hz), 7.58(1H t, J = 7.9Hz), 7.63(s, 1H), 6.68-7.72(m, 2H), 7.84 (1H, d, J = 8.8Hz), 7.76(s, 1H), 7.92-7.98(m, 2H), 8.14 (1H, d, J = 8.8Hz), 8.56(1H, t, J = 8.2Hz).

4-[2H-1-naphth[2,3-b]pyran-2-one-4-yl)methylene]-2-(2-methyl)phenyl-5(4H) oxazolone⁵⁹; yield 0.70g (38%); 268-270°C. IR(KBr):3066, 1797, 1731, 1552, 1514, 1131, 1271, 1176, 1271, 1033, 877, 723cm⁻¹; ¹H-NMR(CDCl₃):δ=2.78(s, 3H), 7.34-7.42(m, 2H), 7.50-7.54(m, 2H), 7.58(2H, t, J = 7.8Hz), 7.70(s, 1H), 7.92(1H, d, J = 8.3Hz), 7.97(1H, d, J = 8.3Hz), 8.04(1H, d, J = 8.3Hz), 8.14(1H, t, J = 8.3Hz), 8.31(1H, t, J = 8.3Hz).

Scheme I:-Synthesis of 4-Furanone substituted Coumarins:



Scheme II:-Synthesis of 4-Oxazolone substituted Coumarins:

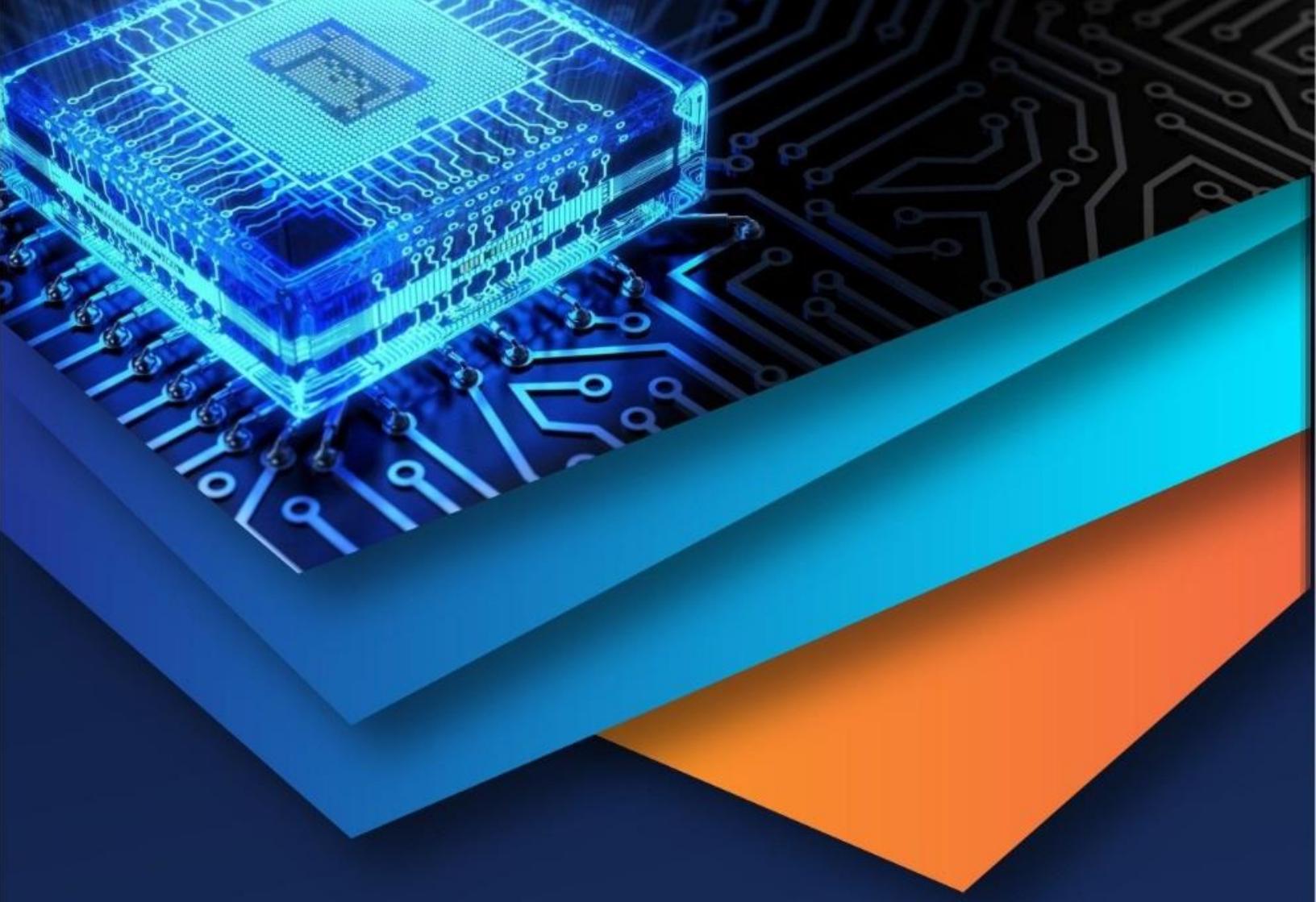


Physiological Studies: Absorption Spectra of Furanones and Oxazolone :

No.	R and R'	λ_{max}	No.	R and R'	λ_{max}
1	R= COCH ₂ CH ₃ , R'= H	390	17	R= COCH ₂ CH ₂ CH ₃ , R'= Cl	390
2	R= COCH ₂ CH ₃ , R'= OCH ₃	380	18	R= COC ₆ H ₅ , R'= H	360
3	R= COCH ₂ CH ₂ CH ₃ , R'= H	420	19	R= COC ₆ H ₄ Cl, R'= Cl	370
4	R= COCH ₂ CH ₂ CH ₃ , R'= CH ₃	395	20	R= CH ₂ C ₆ H ₄ Cl, R'= H	370
5	R= COCH ₂ CH ₂ CH ₃ , R'= OCH ₃	380	21	R= CH ₂ C ₆ H ₄ Cl, R'= Cl	380
6	R= COC ₆ H ₅ , R'= CH ₃	360	22	R= CH ₂ C ₆ H ₄ NO ₂ , R'= Cl	370
7	R= COC ₆ H ₅ , R'= OCH ₃	330	23	R= CH ₂ C ₆ H ₄ CN, R'= H	380
8	R= COC ₆ H ₄ Cl, R'= CH ₃	360	24	R= 6-CH ₃ , R'= H	380
9	R= CH ₂ C ₆ H ₅ , R'= CH ₃	410	25	R= 6-CH ₃ , R'= Cl	380
10	R= CH ₂ C ₆ H ₅ , R'= OCH ₃	400	26	R= 6-CH ₃ , R'= CH ₃	380
11	R= CH ₂ C ₆ H ₄ Cl, R'= CH ₃	350	27	R= 7-CH ₃ , R'= H	380
12	R= CH ₂ C ₆ H ₄ NO ₂ , R'= CH ₃	360	28	R= 7-CH ₃ , R'= Cl	360
13	R= CH ₂ C ₆ H ₄ CN, R'= CH ₃	380	29	R= 7-OCOCH ₃ , R'= Cl	360
14	R= COCH ₂ CH ₃ , R'= H	370	30	R= 7-OCOCH ₃ , R'= CH ₃	370
15	R= COCH ₂ CH ₃ , R'= Cl	390	31	R= 5,6-C ₄ H ₄ , R'= CH ₃	370
16	R= COCH ₂ CH ₂ CH ₃ , R'= H	380	32	R= 7,8-C ₄ H ₄ , R'= CH ₃	370

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