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SUPPLEMENTARY MATERIAL TO

Microwave-assisted synthesis of some new coumarin–pyrazoline hybrids and their antimicrobial activity

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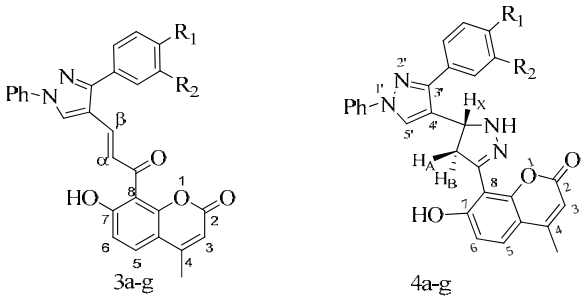

General structures of the synthesized compounds with atomic numbering.

ANALYTICAL AND SPECTRAL DATA FOR COMPOUNDS **3a**–**g** AND **4a**–**g**

*(E)-8-[3-(1,3-Diphenyl-1*H*-pyrazol-4-yl)-1-oxo-2-propen-1-yl]-7-hydroxy-4--methyl-2*H*-1-benzopyran-2-one (**3a**)*. Anal. Calcd. for $C_{28}H_{20}N_2O_4$: C, 74.94; H, 4.46; N, 6.21 %. Found: C, 74.99; H, 4.50; N, 6.25 %; IR (KBr, cm^{-1}): 3440 (OH), 1636 (C=N); ^{1}H-NMR (400 MHz, $CDCl_3$, δ / ppm): 2.45 (3H, *d*, *J* = 1.004 Hz, CH_3), 6.20 (1H, *d*, *J* = 1.0 Hz, H_3), 6.96 (1H, *d*, *J* = 9.0 Hz, H_6), 7.33–7.37 (1H, *m*, Ar-H), 7.46–7.54 (5H, *m*, Ar-H), 7.68 (1H, *d*, *J* = 9.0 Hz, H_5), 7.73–7.75 (2H, *m*, Ar-H), 7.85–7.87 (2H, *m*, Ar-H), 8.04 (1H, *d*, *J* = 15.5 Hz, H_α), 8.18 (1H, *d*, *J* = 15.5 Hz, H_β), 8.62 (1H, *s*, pyrazole H), 13.94 (1H, *s*, OH); ^{13}C-NMR (100 MHz, $CDCl_3$, δ / ppm): 19.3, 109.7, 110.9, 115.3, 118.6, 119.4, 122.8, 125.6, 126.3, 127.3, 128.7, 128.8, 129.5, 130.8, 134.2, 137.2, 137.5, 153.4, 154.8, 156.3, 153.5, 159.6, 163.6, 193.0; MS (*m*/*z*): 449 ($[M+H]^+$, 100 %).

*(E)-7-Hydroxy-8-{3-[3-(4-methoxyphenyl)-1-phenyl-1H-pyrazol-4-yl]-1-oxo--2-propen-1-yl}-4-methyl-2*H*-1-benzopyran-2-one (**3b**)*. Anal. Calcd. for $C_{29}H_{22}N_2O_5$: C, 72.79; H, 4.63; N, 5.85 %. Found: C, 72.81; H, 4.65; N, 5.87 %;

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IR (KBr, cm^{-1}): 3444 (OH), 1635 (C=N); ^{1}H-NMR (400 MHz, $CDCl_3$, δ / ppm): 2.45 (3H, *d*, CH_3, *J* = 1.0 Hz), 3.89 (3H, *s*, OCH_3), 6.20 (1H, *d*, *J* = 1.0 Hz, H_3), 6.96 (1H, *d*, *J* = 8.7 Hz, H_6), 7.05 (2H, *d*, *J* = 9.0 Hz, Ar-H), 7.33–7.37 (1H, *m*, Ar-H), 7.48–7.52 (2H, *m*, Ar-H), 7.67 (1H, *d*, *J* = 8.7 Hz, H_5), 7.69 (2H, *d*, *J* = = 9.0 Hz, Ar-H), 7.84–7.86 (2H, *m*, Ar-H), 8.03 (1H, *d*, *J* = 15.3 Hz, H_α), 8.16 (1H, *d*, *J* = 15.3 Hz, H_β), 8.60 (1H, *s*, pyrazole H), 13.97 (1H, *s*, OH); ^{13}C-NMR (100 MHz, $CDCl_3$, δ / ppm): 19.3, 55.4, 110.9, 112.0, 114.3, 115.3, 118.4, 119.4, 120.3, 123.8, 124.1, 124.6, 125.3, 127.2, 129.5, 130.0, 130.8, 136.9, 139.4, 156.3, 156.6, 159.7, 160.1, 167.4, 196.1; MS (*m*/*z*): 479 ($[M+H]^+$, 100 %).

*(*E*)-8-{3-[3-(3,4-Dimethoxyphenyl)-1-phenyl-1H-pyrazol-4-yl]-1-oxo-2-propen-1-yl}-7-hydroxy-4-methyl-2*H*-1-benzopyran-2-one (**3c**)*. Anal. Calcd. for $C_{30}H_{24}N_2O_6$: C, 70.86; H, 4.76; N, 5.51 %. Found: C, 70.90; H, 4.78; N, 5.49 %; IR (KBr, cm^{-1}): 3447 (OH), 1633 (C=N); ^{1}H-NMR (400 MHz, $CDCl_3$, δ / ppm): 2.45 (3H, *d*, *J* = 1.0 Hz, CH_3), 3.87 (3H, *s*, OCH_3), 3.89 (3H, *s*, OCH_3), 6.20 (1H, *d*, *J* = 1.0 Hz, H_3), 6.97 (1H, *d*, *J* = 9.0 Hz, H_6), 7.33–7.37 (1H, *m*, Ar-H), 7.46–7.54 (3H, *m*, Ar-H), 7.68 (1H, *d*, *J* = 9.0 Hz, H_5), 7.76–7.78 (2H, *m*, Ar-H), 7.86–7.88 (2H, *m*, Ar-H), 8.05 (1H, *d*, *J* = 15.5 Hz, H_α), 8.18 (1H, *d*, *J* = 15.5 Hz, H_β), 8.64 (1H, *s*, pyrazole H), 13.97 (1H, *s*, OH); ^{13}C-NMR (100 MHz, $CDCl_3$, δ / ppm): 19.3, 55.2, 55.4, 110.8, 114.8, 118.6, 119.6, 121.8, 124.3, 125.4, 126.8, 127.1, 127.7, 128.1, 128.5, 129.5, 131.8, 132.5, 134.8, 137.2, 137.5, 153.4, 154.8, 156.3, 153.5, 159.6, 163.7, 193.0; MS (*m*/*z*): 509 ($[M+H]^+$, 100 %).

*(*E*)-7-Hydroxy-4-methyl-8-[3-(1-phenyl-3-p-tolyl-1H-pyrazol-4-yl)-1-oxo-2-propen-1-yl]-2*H*-1-benzopyran-2-one (**3d**)*. Anal. Calcd. for $C_{29}H_{22}N_2O_4$: C, 75.31; H, 4.79; N, 6.06 %. Found: C, 75.34; H, 4.82; N, 6.04 %; IR (KBr, cm^{-1}): 3436 (OH), 1637 (C=N); ^{1}H-NMR (400 MHz, $CDCl_3$, δ / ppm): 2.43 (3H, *s*, CH_3), 2.45 (3H, *d*, *J* = 1.0 Hz, CH_3), 6.20 (1H, *d*, *J* = 1.0 Hz, H_3), 6.95 (1H, *d*, *J* = 9.0 Hz, H_6), 7.31–7.36 (3H, *m*, Ar-H), 7.48–7.52 (2H, *m*, Ar-H), 7.63 (2H, *d*, *J* = 8.0 Hz, Ar-H), 7.68 (1H, *d*, *J* = 9.0 Hz, H_5), 7.85 (2H, *d*, *J* = 8.0 Hz, Ar-H), 8.04 (1H, *d*, *J* = 15.5 Hz, H_α), 8.16 (1H, *d*, *J* = 15.5 Hz, H_β), 8.60 (1H, *s*, pyrazole H), 13.95 (1H, *s*, OH); ^{13}C-NMR (100 MHz, $CDCl_3$, δ / ppm): 19.3, 21.37,109.6, 110.9, 112.0, 115.3, 118.5, 119.4, 125.4, 126.6, 127.2, 129.2, 129.5, 129.5, 129.6, 130.8, 138.6, 139.4, 153.4, 154.3, 154.8, 159.6, 167.4, 192.9; MS (*m*/*z*): 463 ($[M+H]^+$, 100 %).

*(*E*)-8-{3-[3-(4-Fluorophenyl)-1-phenyl-1H-pyrazol-4-yl]-1-oxo-2-propen-1-yl}-7-hydroxy-4-methyl-2*H*-1-benzopyran-2-one (**3e**)*. Anal. Calcd. for $C_{28}H_{19}FN_2O_4$: C, 72.10; H, 4.11; N, 6.01 %. Found: C, 72.12; H, 4.14; N, 6.06 %; IR (KBr, cm^{-1}): 3448 (OH), 1636 (C=N); ^{1}H-NMR (400 MHz, $CDCl_3$, δ / / ppm): 2.45 (3H, *d*, *J* = 1.0 Hz, CH_3), 6.20 (1H, *d*, *J* = 1.0 Hz, H_3), 6.95 (1H, *d*, *J* = 9.0 Hz, H_6), 7.05 (2H, *d*, *J* = 8.5 Hz, Ar-H), 7.35–7.36 (1H, *m*, Ar-H), 7.40–7.53 (2H, *m*, Ar-H), 7.69 (2H, *d*, *J* = 8.5 Hz, Ar-H), 7.71 (1H, *d*, *J* = 9.0 Hz, H_5), 7.84–7.86 (2H, *m*, Ar-H), 8.04 (1H, *d*, *J* = 15.3 Hz, H_α), 8.15 (1H, *d*, *J* =

= 15.3 Hz, H_β), 8.60 (1H, *s*, pyrazole H), 13.95 (1H, *s*, OH); ^{13}C-NMR (100 MHz, $CDCl_3$, δ / ppm): 19.3, 110.7, 111.5, 114.4, 115.3, 118.4, 119.4, 120.3, 123.8, 124.1, 124.6, 125.2, 127.2, 129.5, 130.0, 130.8, 131.2, 135.6, 136.9, 139.4, 158.3, 159.6, 160.7, 164.1, 167.4, 196.1; MS (*m*/*z*): 467 ($[M+H]^+$, 100%).

*(*E*)-8-{3-[3-(4-Chlorophenyl)-1-phenyl-1H-pyrazol-4-yl]-1-oxo-2-propen-1--yl}-7-hydroxy-4-methyl-2*H*-1-benzopyran-2-one (**3f**)*. Anal. Calcd. for $C_{28}H_{19}ClN_2O_4$: C, 69.64; H, 3.97; N, 5.80 %. Found: C, 69.68; H, 4.01; N, 5.84 %; IR (KBr, cm^{-1}): 3445 (OH), 1636 (C=N); ^{1}H-NMR (400 MHz, $CDCl_3$, δ / / ppm): 2.46 (3H, *d*, *J* = 1.0 Hz, CH_3), 6.20 (1H, *d*, *J* = 1.0 Hz, H_3), 6.97 (1H, *d*, *J* = 8.7 Hz, H_6), 7.34–7.37 (3H, *m*, Ar-H), 7.49–7.51 (2H, *m*, Ar-H), 7.63 (2H, *d*, *J* = 8.5 Hz, Ar-H), 7.68 (1H, *d*, *J* = 8.7 Hz, H_5), 7.85 (2H, *d*, *J* = 8.0 Hz, Ar-H), 8.04 (1H, *d*, *J* = 15.5 Hz, H_α), 8.16 (1H, *d*, *J* = 15.5 Hz, H_β), 8.60 (1H, *s*, pyrazole H), 13.95 (1H, *s*, OH); ^{13}C-NMR (100 MHz, $CDCl_3$, δ / ppm): 19.3, 110.9, 112.1, 115.4, 118.7, 119.2, 125.1, 125.7, 126.4, 127.4, 129.2, 129.5, 129.5, 129.6, 130.8, 138.6, 139.4, 142.8, 153.4, 154.3, 154.8, 159.6, 167.4, 192.9; MS (*m*/*z*): 483 ($[M+H]^+$, 100 %).

*(*E*)-8-{3-[3-(4-Bromophenyl)-1-phenyl-1H-pyrazol-4-yl]-1-oxo-2-propen-1--yl}-7-hydroxy-4-methyl-2*H*-1-benzopyran-2-one (**3g**)*. Anal. Calcd. for $C_{28}H_{19}BrN_2O_4$: C, 63.77; H, 3.63; N, 5.31 %. Found: C, 63.80; H, 3.67; N, 5.35 %; IR (KBr, cm^{-1}): 3441 (OH), 1654 (C=N); ^{1}H-NMR (400 MHz, $CDCl_3$, δ / / ppm): 2.45 (3H, *d*, *J* = 1.0 Hz, CH_3), 6.20 (1H, *d*, *J* = 1.0 Hz, H_3), 6.96 (1H, *d*, *J* = 9.0 Hz, H_6), 7.36–7.44 (5H, *m*, Ar-H), 7.68 (1H, *d*, *J* = 9.0 Hz, H_5), 7.73––7.75 (2H, *m*, Ar-H), 7.85–7.87 (2H, *m*, Ar-H), 8.04 (1H, *d*, *J* = 15.5 Hz, H_α), 8.18 (1H, *d*, *J* = 15.5 Hz, H_β), 8.62 (1H, *s*, pyrazole H), 13.94 (1H, *s*, OH); ^{13}C--NMR (100 MHz, $CDCl_3$, δ / ppm): 19.2, 109.62, 114.3, 115.2, 120.8, 123.2, 124.6, 126.8, 127.3, 127.7, 128.9, 129.5, 130.4, 134.3, 137.4, 137.3, 153.2, 154.6, 156.1, 153.5, 157.6, 162.8, 192.4; MS (*m*/*z*): 527 ($[M+H]^+$, 100 %).

*8-(4′,5′-Dihydro-1,3-diphenyl[4,5′-bi-1H-pyrazol]-3′-yl)-7-hydroxy-4-methyl--2*H*-1-benzopyran-2-one (**4a**)*. Anal. Calcd. for $C_{28}H_{22}N_4O_4$: C, 72.71; H, 4.79; N, 12.11 %. Found: C, 72.75; H, 4.82; N, 12.14 %; IR (KBr, cm^{-1}): 3333 (OH), 1597 (C=N); ^{1}H-NMR (400 MHz, $CDCl_3$, δ / ppm): 2.41 (3H, *d*, *J* = 1.0 Hz, CH_3), 3.78 (1H, *dd*, *J* = 17.8 Hz, *J* = 9.0 Hz, H_A), 4.09 (1H, *dd*, *J* = 17.8 Hz, *J* = = 10.5 Hz, H_B), 5.14 (1H, *dd*, *J* = 9.0 Hz, *J* = 10.5 Hz, H_X), 5.97 (1H, *brs*, N–H, D_2O exchangeable), 6.12 (1H, *d*, *J* = 1.0 Hz, H_3), 6.97 (1H, *d*, *J* = 9.0 Hz, H_6), 7.29–7.31 (1H, *m*, Ar-H), 7.39–7.50 (6H, *m*, Ar-H), 7.69–7.74 (4H, *m*, Ar-H, H_5), 8.05 (1H, *s*, pyrazole H), 12.54 (1H, *s*, OH); ^{13}C-NMR (100 MHz, $CDCl_3$, δ / ppm): 19.1, 44.2, 54.3, 105.4, 110.9, 112.3, 113.9, 119.2, 122.0, 125.9, 126.6, 128.2, 128.3, 128.8, 129.4, 132.8, 139.8, 151.5, 153.2, 155.5, 160.3, 161.8; MS (*m*/*z*): 463 ($[M+H]^+$, 100 %).

*8-[4′,5′-Dihydro-3-(4-methoxyphenyl)-1-phenyl[4,5′-bi-1H-pyrazol]-3′-yl]-7--hydroxy-4-methyl-2*H*-1-benzopyran-2-one (**4b**)*. Anal. Calcd. for $C_{29}H_{24}N_4O_4$:

C, 70.72; H, 4.91; N, 11.38 %. Found: C, 70.75; H, 4.94; N, 11.42 %; IR (KBr, cm^{-1}): 3335 (OH), 1599 (C=N); ^{1}H-NMR (400 MHz, $CDCl_3$, δ / ppm): 2.42 (3H, *d*, *J* = 1.0 Hz, CH_3), 3.78 (1H, *dd*, *J* = 17.8 Hz, *J* = 9.0 Hz, H_A), 3.84 (3H, *s*, OCH_3), 4.10 (1H, *dd*, *J* = 17.8 Hz, *J* = 10.5 Hz, H_B), 5.13 (1H, *dd*, *J* = 9.0 Hz, *J* = 10.5 Hz, H_X), 5.83 (1H, *brs*, N–H, D_2O exchangeable), 6.13 (1H, *d*, *J* = 1.0 Hz, H_3), 6.97 (1H, *d*, *J* = 9.0 Hz, H_6), 6.99 (2H, *d*, *J* = 8.7 Hz, Ar-H), 7.42–7.54 (4H, *m*, Ar-H, H_5), 7.62 (2H, *d*, *J* = 8.7 Hz, Ar-H), 7.69–7.73 (2H, *m*, Ar-H), 8.04 (1H, *s*, pyrazole H), 13.92 (1H, *s*, OH); ^{13}C-NMR (100 MHz, $CDCl_3$, δ / ppm): 19.3, 43.2, 53.7, 55.6, 109.7, 110.9, 115.3, 118.6, 119.4, 122.8, 125.6, 126.3, 127.3, 128.7, 128.8, 129.5, 130.8, 134.2, 137.2, 137.5, 153.4, 154.8, 156.3, 153.5, 159.6, 162.8; MS (*m*/*z*): 493 ($[M+H]^+$, 100 %).

*8-[3-(3,4-Dimethoxyphenyl)-4′,5′-dihydro-1-phenyl[4,5′-bi-1*H*-pyrazol]-3′-yl]--7-hydroxy-4-methyl-2*H*-1-benzopyran-2-one (**4c**)*. Anal. Calcd. for $C_{30}H_{26}N_4O_5$: C, 68.95; H, 5.02; N, 10.72 %. Found: C, 70.01; H, 5.06; N, 10.76 %; IR (KBr, cm^{-1}): 3340 (OH), 1596 (C=N); ^{1}H-NMR (400 MHz, $CDCl_3$, δ / ppm): 2.41 (3H, *d*, *J* = 1.0 Hz, CH_3), 3.77 (1H, *dd*, *J* = 17.8 Hz, *J* = 9.0 Hz, H_A), 3.84 (3H, *s*, OCH_3), 3.87 (3H, *s*, OCH_3), 4.08 (1H, *dd*, *J* = 17.8 Hz, *J* = 10.5 Hz, H_B), 5.14 (1H, *dd*, *J* = 9.0 Hz, *J* = 10.5 Hz, H_X), 5.95 (1H, *brs*, N–H, D_2O exchangeable), 6.12 (1H, *d*, *J* = 1.0 Hz, H_3), 6.96 (1H, *d*, *J* = 9.0 Hz, H_6), 7.27–7.30 (1H, *m*, Ar-H), 7.39–7.50 (4H, *m*, Ar-H), 7.69–7.74 (4H, *m*, Ar-H, H_5), 8.06 (1H, *s*, pyrazole H), 12.55 (1H, *s*, OH); ^{13}C-NMR (100 MHz, $CDCl_3$, δ / ppm): 19.0, 44.1, 52.3, 55.1, 55.4, 109.7, 110.9, 114.2, 114.4, 115.2, 116.3, 124.3, 112.3, 127.8, 130.5, 130.6, 131.4, 131.8, 132.7, 153.3, 158.5, 159.3, 160.4. MS (*m*/*z*): 523 ($[M+H]^+$, 100 %).

*8-[4′,5′-Dihydro-1-phenyl-3-p-tolyl-[4,5′-bi-1H-pyrazol]-3′-yl]-7-hydroxy-4--methyl-2*H*-1-benzopyran-2-one (**4d**)*. Anal. Calcd. for $C_{29}H_{24}N_4O_4$: C, 73.09; H, 5.08; N, 11.76 %. Found: C, 73.11; H, 5.11; N, 11.79 %; IR (KBr, cm^{-1}): 3336 (OH), 1599 (C=N); ^{1}H-NMR (400 MHz, $CDCl_3$, δ / ppm): 2.41 (3H, *d*, *J* = = 1.0 Hz, CH_3), 2.43 (3H, *s*, CH_3), 3.77 (1H, *dd*, *J* = 17.8 Hz, *J* = 9.0 Hz, H_A), 4.09 (1H, *dd*, *J* = 17.8 Hz, *J* = 10.5 Hz, H_B), 5.14 (1H, *dd*, *J* = 9.0 Hz, *J* = 10.5 Hz, H_X), 5.30 (1H, *brs*, N–H, D_2O exchangeable), 6.12 (1H, *d*, *J* = 1.0 Hz, H_3), 6.95 (2H, *d*, *J* = 8.5 Hz, Ar-H), 6.99 (1H, *d*, *J* = 8.7 Hz, H_6), 7.42–7.54 (4H, *m*, Ar-H, H_5), 7.62 (2H, *d*, *J* = 8.5 Hz, Ar-H), 7.69–7.73 (2H, *m*, Ar-H), 8.04 (1H, *s*, pyrazole H), 13.92 (1H, *s*, OH); ^{13}C-NMR (100 MHz, $CDCl_3$, δ / ppm): 19.2, 21.3, 44.8, 54.6, 108.4, 112.4, 113.2, 115.5, 121.2, 122.4, 125.3, 125.8, 126.2, 127.3, 129.71, 130.4, 131.3, 133.2, 151.0, 153.2, 159, 162.5; MS (*m*/*z*): 477 ($[M+H]^+$, 100 %).

*8-[3-(4-Fluorophenyl)-4′,5′-dihydro-1-phenyl[4,5′-bi-1*H*-pyrazol]-3′-yl]-7--hydroxy-4-methyl-2*H*-1-benzopyran-2-one (**4e**)*. Anal. Calcd. for $C_{28}H_{21}FN_4O_3$ C, 69.99; H, 4.41; F, 3.95; N, 11.66. Found: C, 70.02, H, 4.45, N, 11.69; IR (KBr, cm^{-1}): 3334 (OH), 1597 (C=N); ^{1}H-NMR (400 MHz, $CDCl_3$, δ / ppm):

2.41 (3H, *d*, *J* = 1.0 Hz, CH_3), 3.77 (1H, *dd*, *J* = 17.8 Hz, *J* = 9.0 Hz, H_A), 4.08 (1H, *dd*, *J* = 17.8 Hz, *J* = 10.5 Hz, H_B), 5.13 (1H, *dd*, *J* = 9.0 Hz, *J* = 10.5 Hz, H_X), 4.97 (1H, *brs*, N–H, D_2O exchangeable), 6.11 (1H, *d*, *J* = 1.0 Hz, H_3), 6.95 (1H, *d*, *J* = 9.0 Hz, H_6), 6.97 (2H, *d*, *J* = 8.3 Hz, Ar-H), 7.40–7.48 (4H, *m*, Ar-H, H_5), 7.64 (2H, *d*, *J*=8.3 Hz, Ar-H), 7.69–7.74 (2H, *m*, Ar-H), 8.03 (1H, *s*, pyrazole H), 12.53 (1H, *s*, OH); ^{13}C-NMR (100 MHz, $CDCl_3$, δ / ppm): 19.4, 44.2, 54.8, 109.7, 111.9, 115.3, 118.6, 119.4, 122.8, 125.6, 126.3, 127.3, 128.7, 128.8, 129.5, 130.8, 134.2, 137.2, 137.5, 153.4, 154.8, 156.3, 153.5, 159.6, 163.6; MS (*m*/*z*): 481 ($[M+H]^+$, 100 %).

*8-[3-(4-Chlorophenyl)-4′,5′-dihydro-1-phenyl[4,5′-bi-1*H*-pyrazol]-3′-yl]-7--hydroxy-4-methyl-2*H*-1-benzopyran-2-one (**4f**)*. Anal. Calcd. for $C_{28}H_{21}ClN_4O_3$: C, 67.67; H, 4.26; N, 11.27 %. Found: C, 67.70; H, 4.30; N, 11.30 %; IR (KBr, cm^{-1}): 3332 (OH), 1595 (C=N); ^{1}H-NMR (400 MHz, $CDCl_3$, δ / ppm): 2.42 (3H, *d*, *J* = 1.0 Hz, CH_3), 3.75 (1H, *dd*, *J* = 17.8 Hz, *J* = 9.0 Hz, H_A), 4.06 (1H, *dd*, *J* = = 17.8 Hz, *J* = 10.5 Hz, H_B), 5.14 (1H, *dd*, *J* = 9.0 Hz, *J* = 10.5 Hz, H_X), 5.63 (1H, *brs*, N–H, D_2O exchangeable), 6.12 (1H, *d*, *J* = 1.0 Hz, H_3), 6.98 (1H, *d*, *J* = = 9.0 Hz, H_6), 7.18 (2H, *d*, *J* = 8.4 Hz, Ar-H), 7.37–7.42 (4H, *m*, Ar-H, H_5), 7.48 (2H, *d*, *J* = 8.4 Hz, Ar-H), 7.71–7.74 (2H, *m*, Ar-H), 8.02 (1H, *s*, pyrazole H), 12.58 (1H, *s*, OH); ^{13}C-NMR (100 MHz, $CDCl_3$, δ / ppm): 19.2, 43.2, 54.8, 111.6, 116.3, 118.1, 119.8, 121.8, 125.8, 126.3, 127.3, 128.7, 128.9, 129.5, 130.8, 134.2, 137.2, 137.5, 153.4, 154.7, 156.3, 153.5, 157.6, 162.6; MS (*m*/*z*): 497 ($[M+H]^+$, 100 %).

*8-[3-(4-Bromophenyl)-4′,5′-dihydro-1-phenyl[4,5′-bi-1*H*-pyrazol]-3′-yl]-7--hydroxy-4-methyl-2*H*-1-benzopyran-2-one (**4g**)*. Anal. Calcd. for $C_{28}H_{21}BrN_4O_3$: C, 62.12; H, 3.91; N, 10.35 %. Found: C, 62.15; H, 3.94; N, 10.38 %; IR (KBr, cm^{-1}): 3330 (OH), 1596 (C=N); ^{1}H-NMR (400 MHz, $CDCl_3$, δ / ppm): 2.43 (3H, *d*, *J* = 1.0 Hz, CH_3), 3.80 (1H, *dd*, *J* = 17.8 Hz, *J* = 9.0 Hz, H_A), 4.08 (1H, *dd*, *J* = = 17.8 Hz, *J* = 10.5 Hz, H_B), 5.16 (1H, *dd*, *J* = 9.0 Hz, *J* = 10.5 Hz, H_X), 5.42 (1H, *brs*, N–H, D_2O exchangeable), 6.14 (1H, *d*, *J* = 1.0 Hz, H_3), 6.92 (1H, *d*, *J* = = 9.0 Hz, H_6), 7.18 (2H, *d*, *J*=8.3 Hz, Ar-H), 7.37–7.42 (4H, *m*, Ar-H, H_5), 7.51 (2H, *d*, *J* = 8.3 Hz, Ar-H), 7.68–7.72 (2H, *m*, Ar-H), 8.02 (1H, *s*, pyrazole H), 12.58 (1H, *s*, OH); ^{13}C-NMR (100 MHz, $CDCl_3$, δ / ppm): 19.3, 43.5, 54.3, 11.7, 110.0, 114.3, 119.0, 119.4, 122.4, 123.6, 125.3, 127.1, 128.4, 128.8, 129.1, 130.4, 134.1, 137.2, 137.5, 153.4, 154.6, 154.9, 155.5, 157.6, 164.6; MS (*m*/*z*): 541 ($[M+H]^+$, 100 %).