Electronic Supplementary Material (ESI) for Organic & Biomolecular Chemistry

Electronic Supplementary Information

Suzuki-Miyaura cross-coupling reactions on Halo Derivatives of 4*H*-Pyrido[1,2-*a*]pyrimidin-4-ones

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1. Protocol for Suzuki-Miyaura cross-couplings and analytical and ^{1}H and ^{13}C NMR data for compounds 29-44.

Suzuki-Miyaura cross-couplings

General procedure: To a solution of the monohalogenated derivative of 4*H*-pyrido[1,2-*a*]pyrimidin-4-one[1] (0.25 mmol), boronic acid (0.26 mmol) in DME (1.5 mL) and 1 M sodium $NaHCO_3$ solution (0.6 mL, 0.53 mmol) were introduced. The mixture was heated to 80 °C, after which $Pd(PPh_3)_4$ (14 mg, 0.01 mmol) was added. After stirring at 80 °C for 1 h – 96 h, the mixture was allowed to cool to RT, and was then poured into water (3 mL), and extracted with DCM (3 × 3 mL). The combined organic layers were dried over Na_2SO_4 and evaporated to dryness. The crude product was purified by column chromatography on silica gel [Kieselgel 60 for column chromatography (Reanal); *n*-hexane : ethyl acetate = 1 : 1 for compounds ; EtOAc : MeOH = 95 : 5 for compounds].

2-(4'-Methoxyphenyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (29)

Yellow crystals (61 mg, 97%; mp. 156-158 °C, *Lit*., mp 157-158 °C,[2,3] 153-154°C[4]). ^{1}H NMR (200 MHz, DMSO-d_6, 27°C): δ 8.94 (dd, $^{3}J_{6,7}$ = 7.0 Hz, $^{4}J_{6,8}$ = 1.4 Hz, 1H, 6-H), 8.18 (d, $^{3}J_{2',3'}$ = 8.9 Hz, 2H, 2'-H and 6'-H), 7.95 (ddd, $^{3}J_{8,9}$ = 8.9 Hz, $^{3}J_{7,8}$ = 7.0 Hz, $^{4}J_{6,8}$ = 1.4 Hz, 1H, 8-H), 7.72 (dd, $^{3}J_{8,9}$ = 8.9 Hz, $^{4}J_{7,9}$ = 1.2 Hz, 1H, 9-H), 7.31 (dt, $^{3}J_{6,7}$ = $^{3}J_{7,8}$ = 7.0 Hz, $^{4}J_{7,9}$ = 1.2 Hz, 1H, 7-H), 7.06 (d, $^{3}J_{2',3'}$ = 8.9 Hz, 2H, 3'-H and 5'-H), 6.92 (s, 1H, 3-H), 3.84 (s, 3H, OCH_3). ^{13}C NMR (50 MHz, DMSO-d_6, 27°C): δ 161.9 (C-4'), 160.5 (C-2), 158.0 (C-4), 151.1 (C-9*a*), 137.9 (C-8), 129.3 (C-1', C-2' and C-6'), 127.4 (C-6), 126.5 (C-9), 116.3 (C-7), 114.5 (C-3' and C-5'), 97.7 (C-3), 55.8 (OCH_3). MS(EI+): *m/z* = 252 [M^+], 224, 209, 181, 78, 51. HRMS(ES+) Calculated for $C_{15}H_{13}N_2O_2$ 253.0977 (MH^+), found 253.0981.

2-(4'-Trifluorophenyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (30)

Yellow crystals (66 mg, 91%; mp 186-188 °C). ^{1}H NMR (400 MHz, DMSO-d_6, 27°C): δ 8.98 (dd, $^{3}J_{6,7}$ = 6.8 Hz, $^{4}J_{6,8}$ = 1.4 Hz, 1H, 6-H), 8.41 (d, $^{3}J_{2',3'}$ = 8.3 Hz, 2H, 2'-H and 6'-H), 8.02 (ddd, $^{3}J_{8,9}$ = 8.8 Hz, $^{3}J_{7,8}$ = 6.8 Hz, $^{4}J_{6,8}$ = 1.4 Hz, 1H, 8-H), 7.88 (d, $^{3}J_{2',3'}$ = 8.3 Hz, 2H, 3'-H, 5'-H), 7.80 (dd, $^{3}J_{8,9}$ = 8.8 Hz, $^{4}J_{7,9}$ = 1.3 Hz, 1H, 9-H), 7.39 (dt, $^{3}J_{6,7}$ = $^{3}J_{7,8}$ = 6.8 Hz, $^{4}J_{7,9}$ = 1.3 Hz, 1H, 7-H), 7.11 (s, 1H, 3-H). ^{13}C NMR (100 MHz, DMSO-d_6, 27°C): δ 158.9 (C-2), 157.9 (C-4), 151.0 (C-9*a*), 140.8 (C-1'), 138.2 (C-8), 130.6 (q, $^{2}J_{C,F}$ = 32 Hz, C-4'), 128.2 (C-2' and C-6'), 127.2 (C-6), 126.5 (C-9), 125.8 (q, $^{3}J_{C,F}$ = 3.8 Hz, C-3' and C-5'), 124.3 (q, $^{1}J_{C,F}$ = 272 Hz, CF_3), 116.7 (C-7), 99.8 (C-3). MS(EI+): m/z = 290 [M^+], 262, 78, 51. HRMS(ES+) Calculated for $C_{15}H_{11}F_3N_2O$ 291.0745 (MH^+), found 291.0746.

2-(2'-Acetylphenyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (31)

Yellow crystals (56 mg, 85%; mp 142-143 °C). ^{1}H NMR (200 MHz, DMSO-d_6, 27 °C): δ 9.01 (d, $^{3}J_{6,7}$ = 7.0 Hz, 1H, 6-H), 8.01 (dd, $^{3}J_{7,8}$ = 7.0 Hz, $^{3}J_{8,9}$ = 8.7 Hz, 1H, 8-H), 7.87-7.79 (m, 1 H, 3'-H), 7.64-7.58 (overlapping m, 4H, 9-H, 4'-H, 5'-H and 6'-H) 7.40 (t, $^{3}J_{6,7}$ = $^{3}J_{7,8}$ = 7.0 Hz, 1H, 7-H), 6.78 (s, 1H, 3-H), 2.41 (s, 3H, CH_3). ^{13}C NMR (50 MHz, DMSO-d_6, 27 °C): δ 203.2 (CO), 162.3 (C-2), 157.7 (C-4), 150.4 (C-9*a*), 142.3 (C-2'), 138.4 (C-8), 136.6 (C-1'), 130.49 and 130.20 (C-4' and C-5'), 129.5 (C-3'), 127.4 (C-6 and C-6'), 126.1 (C-9), 116.9 (C-7), 101.1 (C-3), 30.8 (CH_3). MS(EI+): *m/z* = 264

[M^+], 249, 221, 78, 51. HRMS(ES+) Calculated for $C_{16}H_{13}N_2O_2$ 265.0978 (MH^+), found 265.0978.

2-(Naphth-1-yl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (32)
Yellow crystals (63 mg, 93%; mp 169-170 °C, *Lit*.,[5] mp 169-170 °C). ^{1}H NMR (400 MHz, DMSO-d_6, 27 °C): δ 9.07 (d, $^3J_{6,7}$ = 7.0 Hz, 1H, 6-H), 8.22 (d, $^3J_{7',8'}$ = 8.2 Hz, 1H, 8'-H), 8.05-8.02 (overlapping m., 3H, 8-H, 4'-H and 5'-H), 7.76 (d, $^3J_{8,9}$ = 8.8 Hz, 1H, 9-H), 7.71 (d, $^3J_{2',3'}$ = 7.0 Hz, 1H, 2'-H), 7.62-7.53 (overlapping m., 3H, 3'-H, 6'-H and 7'-H), 7.43 (dt, $^3J_{6,7}$ = $^3J_{6,7}$ = 7.0 Hz, $^4J_{7,9}$ = 1.0 Hz, 1H, 7-H), 6.63 (s, 1H, 3-H). ^{13}C NMR (100 MHz, DMSO-d_6, 27 °C): δ 164.0 (C-2), 157.4 (C-4), 150.7 (C-9*a*), 137.9 (C-8), 136.8 (C-1'), 133.5 (C-4'*a*), 130.3 (C-8'*a*), 129.7 (C-4'), 128.5 (C-5'), 127.34 (C-2'), 127.18 (C-6), 126.8 (C-6' or C-7'), 126.39 (C-9), 126.30 (C-6' or C-7'), 125.8 (C-8'), 125.5 (C-3'), 116.7 (C-7), 104.0 (C-3). MS(EI+): *m/z* = 272 [M^+], 243, 122, 78, 51. HRMS(ES+) Calculated for $C_{18}H_{13}N_2O$ 273.1028 (MH^+), found 273.1034.

2-(Thien-3-yl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (33)
Orange crystals (46 mg, 81%; mp 125 °C). ^{1}H NMR (200 MHz, DMSO-d_6, 27 °C): δ 8.95 (d, $^3J_{6,7}$ = 7.2 Hz, 1H, 6-H), 8.41 (d, $^4J_{2,5}$ = 1.8 Hz, 1H, 2'-H), 7.96 (dd, $^3J_{7,8}$ = 6.8 Hz, $^3J_{8,9}$ = 8.4 Hz, 1H, 8-H), 7.83 (d, $^3J_{4',5'}$ = 5.0 Hz, 1H, 4'-H), 7.72-7.66 (overlapping m, 2H, 9-H and 5'-H), 7.23 (dd, $^3J_{6,7}$ = 7.2 Hz, $^3J_{7,8}$ = 6.8 Hz, 1H, 7-H), 6.93 (s, 1H, 3-H). ^{13}C NMR (50 MHz, DMSO-d_6, 27 °C): δ 158.0 (C-4), 157.0 (C-2), 151.2 (C-9*a*), 140.5 (C-3'), 137.9 (C-8), 128.0 (C-2'), 127.7 (C-5'), 127.3 (C-6), 126.9 (C-4'), 126.3 (C-9), 116.2 (C-7), 98.7 (C-3). MS(EI+): *m/z* = 228 [M^+], 200, 78, 51. HRMS(ES+) Calculated for $C_{12}H_9N_2OS$ 229.0436 (MH^+), found 229.0430.

2-(Pyridin-3-yl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (34)
Yellow crystals (49 mg, 87%; mp 182 °C). ^{1}H NMR (200 MHz, DMSO-d_6, 27 °C): δ 9.36 (d, $^4J_{2',6'}$ = 1.4 Hz, 1 H, 2'-H), 8.98 (d, $^3J_{6,7}$ = 7.2 Hz, 1H, 6-H), 8.70 (dd, $^3J_{5',6'}$ = 4.8 Hz, $^4J_{2',6'}$ = 1.4 Hz, 1H, 6'-H), 8.54 (d, $^3J_{4',5'}$ = 7.9 Hz, 1H, 4'-H), 8.01 (dd, $^3J_{8,9}$ = 8.8 Hz, $^3J_{7,8}$ = 7.2 Hz, 1H, 8-H), 7.79 (d, $^3J_{8,9}$ = 8.8 Hz, 1H, 9-H), 7.55 (dd, $^3J_{H,H}$ = 4.8 Hz, $^3J_{4',5'}$ = 7.9 Hz, 1H, 5'-H), 7.38 (dt, $^3J_{6,7}$ = $^3J_{7,8}$ = 7.2 Hz, 1H, 7-H), 7.11 (s, 1H, 3-H). ^{13}C NMR (50 MHz, DMSO-d_6, 27 °C): δ 158.7 (C-2), 157.9 (C-4), 151.6 (C-6'), 151.2 (C-9*a*), 148.7 (C-2), 138.3 (C-8), 135.0 (C-4'), 132.6 (C-3'), 127.4 (C-6), 126.6 (C-9), 124.1 (C-5'), 116.8 (C-7), 99.5 (C-3). MS(EI+): *m/z* = 223 [M^+], 195, 169, 78, 51. HRMS(ES+) Calculated for $C_{13}H_{10}N_3O$ 224.0819 (MH^+), found 224.0819.

2-(Pyridin-4-yl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (35)
Yellow crystals (43 mg, 77%; mp 202-203 °C). ^{1}H NMR (200 MHz, DMSO-d_6, 27 °C): δ 8.99 (dd, $^3J_{6,7}$ = 6.9 Hz, $^4J_{6,8}$ = 1.6 Hz, 1H, 6-H), 8.75 (m, 2H, 2'-H and 6'-H), 8.13 (m, 2H, 3'-H and 5'-H), 8.01 (ddd, $^3J_{8,9}$ = 8.7 Hz, $^3J_{7,8}$ = 6.9 Hz, $^4J_{6,8}$ = 1.6 Hz, 1H, 8-H), 7.81 (dd, $^3J_{8,9}$ = 8.7 Hz, $^4J_{7,9}$ = 1.2 Hz, 1H, 9-H), 7.41 (dt, $^3J_{6,7}$ = $^3J_{7,8}$ = 6.9 Hz, $^4J_{7,9}$ = 1.2 Hz, 1H, 7-H), 7.16 (s, 1H, 3-H). ^{13}C NMR (50 MHz, DMSO-d_6, 27 °C): δ 158.27 (C-2), 158.05 (C-4), 151.3 (C-9*a*), 150.7 (C-2' and C-6'), 144.3 (C-4'), 138.4 (C-8), 127.4 (C-6), 126.7 (C-9), 121.5 (C-3' and C-5'), 117.1 (C-7), 100.3 (C-3). MS(EI+): *m/z* = 223 [M^+], 195, 78, 51. HRMS(ES+) Calculated for $C_{13}H_{10}N_3O$ 224.0819 (MH^+), found 224.0820.

2-((*E*)-1-Pentenyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (36)
Yellow crystals (54 mg, 99%; mp 53-54 °C). ^{1}H NMR (200 MHz, DMSO-d_6, 27 °C): δ 8.87 (dd, $^{3}J_{6,7}$ = 7.2 Hz, $^{4}J_{6,8}$ = 1.6 Hz, 1H, 6-H), 7.89 (ddd, $^{3}J_{7,8}$ = 7.2 Hz, $^{3}J_{8,9}$ = 8.2 Hz, $^{4}J_{6,8}$ = 1.6 Hz, 1H, 8-H), 7.60 (dd, $^{3}J_{8,9}$ = 8.2 Hz, $^{4}J_{7,9}$ = 1.4 Hz, 1H, 9-H), 7.25 (dt, $^{3}J_{6,7}$ = $^{3}J_{7,8}$ = 7.2 Hz, $^{4}J_{7,8}$ = 1.4 Hz, 1H, 7-H), 7.08-6.93 (m, 1H, 2'-H), 6.38 (d, $^{3}J_{1',2'}$ = 15.5 Hz, 1H, 1'-H), 6.33 (s, 1H, 3-H), 2.27-2.16 (m, 2H, =CHC$\underline{H}_2$), 1.58-1.49 (m, 2H, C$\underline{H}_2$CH$_3$), 0.91 (t, ^{3}J = 7.3 Hz, 3H, CH$_3$). ^{13}C NMR (50 MHz, DMSO-d_6, 27 °C): δ 159.8 (C-2), 157.9 (C-4), 150.8 (C-9*a*), 140.6 (C-2'), 137.6 (C-8), 129.1 (C-1'), 127.2 (C-6), 126.1 (C-9), 115.8 (C-7), 100.5 (C-3), 34.5 (C-3'), 21.8 (C-4'), 14.0 (C-5'). MS(EI+): *m/z* = 214 [M$^+$], 185, 171, 157, 78, 51. HRMS(ES+) Calculated for $C_{13}H_{15}N_2O$ 215.1184 (MH$^+$), found 215.1182.

2-Benzyl-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (37)
Yellow crystals (25 mg, 38%; mp 95-96 °C). ^{1}H NMR (200 MHz, DMSO-d_6, 27 °C): δ = 8.90 (dd, $^{3}J_{6,7}$ = 6.9 Hz, $^{4}J_{6,8}$ = 1.6 Hz, 1H, 6-H), 7.91 (ddd, $^{3}J_{7,8}$ = 6.9 Hz, $^{3}J_{8,9}$ = 8.9 Hz, $^{4}J_{6,8}$ = 1.6 Hz, 1H, 8-H), 7.63 (d, $^{3}J_{8,9}$ = 8.9 Hz, 1H, 9-H), 7.25 (dt, $^{3}J_{6,7}$ = $^{3}J_{7,8}$ = 6.9 Hz, $^{4}J_{7,9}$ = 1.4 Hz, 1H, 7-H), 7.08-6.93 (m, 1H, 2'-H), 6.38 (m, 6H, 7-H and phenyl), 6.26 (s, 1H, 3-H), 3.96 (s, 2H, C$\underline{H}_2$Ph). ^{13}C NMR (50 MHz, DMSO-d_6, 27 °C): δ 167.3 (C-2), 157.5 (C-4), 150.9 (C-9*a*), 138.7 (C-1'), 137.8 (C-8), 129.5 (C-2' and C-6'), 128.8 (C-3' and C-5'), 127.2 (C-6), 126.8 (C-4'), 126.0 (C-9), 116.3 (C-7), 102.3 (C-3), 43.9 (CH$_2$). MS(EI+): *m/z* = 236 [M$^+$], 207, 145, 130, 78, 51. 215. HRMS(ES+) Calculated for $C_{15}H_{13}N_2O$ 237.1028 (MH$^+$), found 237.1021.

3-(4'-Methoxyphenyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (38)
Yellow crystals (58 mg, 92%; mp. 142-143 °C). ^{1}H NMR (100 MHz, DMSO-d_6, 27 °C): δ 9.09 (dd, $^{3}J_{6,7}$ = 6.9 Hz, $^{4}J_{6,8}$ = 1.6 Hz, 1H, 6-H), 8.58 (s, 1H, 2-H), 7.94 (ddd, $^{3}J_{8,9}$ = 8.8 Hz, $^{3}J_{7,8}$ = 6.9 Hz, $^{4}J_{6,8}$ = 1.6 Hz, 1H, 8-H), 7.79 (d, $^{3}J_{2',3'}$ = 8.7 Hz, 2H, 2'-H and 6'-H), 7.72 (d, $^{3}J_{8,9}$ = 8.8 Hz, $^{4}J_{7,9}$ = 1.2 Hz, 1H, 9-H), 7.39 (dt, $^{3}J_{6,7}$ = $^{3}J_{7,8}$ = 6.9 Hz, $^{4}J_{7,9}$ = 1.2 Hz, 1H, 7-H), 7.01 (d, $^{3}J_{2',3'}$ = 8.7 Hz, 2H, 3'-H and 5'-H), 3.80 (s, 3H, OCH$_3$). ^{13}C NMR (50 MHz, DMSO-d_6, 27 °C): δ 159.0 (C-4'), 156.4 (C-4), 152.2 (C-2), 150.3 (C-9*a*), 136.9 (C-8), 129.8 (C-2' and C-6'), 127.6 (C-6), 126.9 (C-1'), 126.4 (C-9), 117.0 (C-7), 115.3 (C-3), 114.1 (C-3' and C-5'). MS(EI+): *m/z* = 252 [M$^+$], 237, 224, 209, 146, 78, 51. HRMS(ES+) Calculated for $C_{15}H_{13}N_2O_2$ 253.0977 (MH$^+$), found 253.0981.

3-(4'-Trifluoromethylphenyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (39)
Yellow crystals (55 mg, 76%; mp 224-225 °C). ^{1}H NMR (400 MHz, DMSO-d_6, 27 °C): δ 9.15 (dd, $^{3}J_{6,7}$ = 6.9 Hz, $^{4}J_{6,8}$ = 1.7 Hz, 1H, 6-H), 8.73 (s, 1H, 2-H), 8.10 (d, $^{3}J_{2',3'}$ = 8.2 Hz, 2H, 2'-H and 6'-H), 8.04 (ddd, $^{3}J_{8,9}$ = 8.7 Hz, $^{3}J_{7,8}$ = 6.9 Hz, $^{4}J_{6,8}$ = 1.7 Hz, 1H, 8-H), 7.81-7.78 (overlapping m, 3H, 3'-H, 5'-H and 9-H), 7.47 (dt, $^{3}J_{6,7}$ = $^{3}J_{7,8}$ = 6.9 Hz, $^{4}J_{H,H}$ = 1.3 Hz, 1H, 7-H). ^{13}C NMR (100 MHz, DMSO-d_6, 27 °C): δ 156.1 (C-4), 153.6 (C-2), 151.0 (C-9*a*), 139.0 (C-1'), 138.0 (C-8), 128.9 (C-2' and C-6'), 127.8 (C-6), 127.6 (C-4', $^{2}J_{C,F}$ = 32 Hz), 126.3 (C-9), 125.2 (C-3' and C-5', $^{3}J_{C,F}$ = 4 Hz), 124.5 (CF$_3$, $^{1}J_{C,F}$ = 272 Hz), 117.4 (C-7), 113.4 (C-3). MS(EI+): *m/z* = 290 [M$^+$], 262, 78, 51. HRMS(ES+) Calculated for $C_{15}H_{11}F_3N_2O$ 291.0745 (MH$^+$), found 291.0743.

7-(Naphthalene-1-yl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (40)

Orange crystals (61 mg, 90%; mp 133-134 °C). ^{1}H NMR (100 MHz, DMSO-d_6, 27 °C): δ 8.98 (d, $^{4}J_{6,8}$ = 1.6 Hz, 1H, 6-H), 8.38 (d, $^{3}J_{H,H}$ = 6.4 Hz, 1H, 2-H), 8.12-8.05 (overlapping m, 3H, 8-H, 4'-H and 5'-H), 7.86-7.83 (ovlapping m, 2H, 9-H and 8'-H), 7.70-7.52 (m, 4H, 2'-H, 3'-H, 6'-H and 7'-H), 6.46 (d, $^{3}J_{2,3}$ = 6.4 Hz, 1H, 3-H). ^{13}C NMR (50 MHz, DMSO-d_6, 27 °C): δ 157.2 (C-4), 155.1 (C-2), 151.1 (C-9*a*), 139.7 (C-8), 134.2 (C-1'), 133.8 (C-4'*a*), 131.1 (C-8'*a*), 129.5 (C-4' or C-5'), 128.95 (C-5' or C-4'), 128.77 (C-7), 128.1* (C-2'), 127.4* (C-3'), 126.8 (C-6'), 126.29 (C-6 or C-9), 126.21 (C-6 or C-9), 126.0* (C-7'), 125.0 (C-8'), 104.4 (C-3) *interchangeable. MS(EI+): *m/z* = 272 [M^+], 243, 204, 176, 122, 102, 88. HRMS(ES+) Calculated for $C_{18}H_{13}N_2O$ 273.1028 (MH^+), found 273.1036.

7-(Thien-3-yl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (41)
Yellow crystals (29 mg, 51%; mp 144-146 °C). ^{1}H NMR (200 MHz, DMSO-d_6, 27 °C): δ 9.19 (d, $^{4}J_{6,8}$ = 1.6 Hz, 1H, 6-H), 8.39 (dd, $^{3}J_{8,9}$ = 9.2 Hz, $^{4}J_{6,8}$ = 1.6 Hz, 1H, 8-H), 8.30 (d, $^{3}J_{2,3}$ = 6.2 Hz, 1H, 2-H), 8.20 (s, 1H, 2'-H), 7.77-7.68 (m, 3H, 9-H, 5'-H and 4'-H), 6.42 (d, $^{3}J_{2,3}$ = 6.2 Hz, 1H, 3-H). ^{13}C NMR (50 MHz, DMSO-d_6, 27 °C): δ 157. 2 (C-4), 154.7 (C-2), 150.68 (C-9*a*), 136.51 (C-8), 136.34 (C-3'), 128.6 (C-5'), 126.7 (C-9), 126.0 (C-4'), 124.5 (C-7), 124.0 (C-2'), 122.8 (C-6), 104.2 (C-3). MS(EI+): *m/z* = 228 [M^+], 200, 160, 116, 89, 45. HRMS(ES+) Calculated for $C_{12}H_9N_2OS$ 229.0436 (MH^+), found 229.0431.

7-(Pyrid-4-yl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (42)
Yellow crystals (50 mg, 89%; mp 217 °C). ^{1}H NMR (200 MHz, DMSO-d_6, 27 °C): δ 9.29 (d, $^{4}J_{6,8}$ = 1.9 Hz, 1H, 6-H), 8.72 (m, 2H, 2'-H and 6'-H), 8.40 (dd, $^{3}J_{8,9}$ = 9.3 Hz, $^{4}J_{6,8}$ = 1.9 Hz, 1H, 8-H), 8.34 (d, $^{3}J_{2,3}$ = 6.4 Hz, 1H, 2-H), 7.86-7.82 (overlapping m, 3H, 9-H, 3'-H and 5'-H), 6.47 (d, $^{3}J_{2,3}$ = 6.4 Hz, 1H, 3-H). ^{13}C NMR (50 MHz, DMSO-d_6, 27 °C): δ 157.2 (C-4), 155.2 (C-2), 151.24 (C-9*a*), 150.91 (C-2' and C-6'), 142.6 (C-4'), 136.0 (C-8), 127.1 (C-9), 126.2 (C-7), 125.3 (C-6), 121.5 (C-3' and C-5'), 104.7 (C-3). MS(EI+): *m/z* = 223 [M^+], 195, 155, 101, 77, 51. HRMS(ES+) Calculated for $C_{13}H_{10}N_3O$ 224.0819 (MH^+), found 224.0821.

8-(4'-Methoxyphenyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (43)
Yellow crystals (51 mg, 81%; mp 166-167 °C). ^{1}H NMR (200 MHz, DMSO-d_6, 27°C): δ 8.96 (d, $^{3}J_{6,7}$ = 7.6 Hz, 1H, 6-H), 8.29 (d, $^{3}J_{2,3}$ = 6.2 Hz, 1H, 2-H), 7.96-7.94 (overlapping m, $^{3}J_{2',3'}$ = 8.8 Hz, 3H, 9-H, 2'-H and 6'-H), 7.76 (dd, $^{3}J_{6,7}$ = 7.6 Hz, $^{4}J_{7,9}$ = 2.2 Hz, 1H, 7-H), 7.11 (d, $^{3}J_{2',3'}$ = 8.8 Hz, 2H, 3'-H and 5'-H), 6.32 (d, $^{3}J_{2,3}$ = 6.2 Hz, 1H, 3-H), 3.84 (s, 3H, OMe). ^{13}C NMR (50 MHz, DMSO-d_6, 27°C): δ 161.6 (C-4'), 157.2 (C-4), 155.6 (C-2), 152.3 (C-9*a*), 147.4 (C-8), 129.3 (C-2' and C-6'), 127.6 (C-6 and C-1'), 120.4 (C-9), 115.25 (C-3' and C-5'), 115.06 (C-7), 103.4 (C-3), 55.9 (OMe). MS(EI+): *m/z* = 252 [M^+], 224, 209, 181, 112. HRMS(ES+) Calculated for $C_{15}H_{13}N_2O_2$ 253.0977 (MH^+), found 253.0983.

[(*E*)-8-Pentenyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (44)
Yellow crystals (47 mg, 87%; mp 44-45 °C). ^{1}H NMR (200 MHz, DMSO-d_6, 27 °C): δ 8.85 (d, $^{3}J_{6,7}$ = 7.6 Hz, 1H, 6-H), 8.25 (d, $^{3}J_{2,3}$ = 6.4 Hz, 1H, 2-H), 7.57-7.53 (overlapping m, 2H, 7-H and 9-H), 6.91-6.77 (m, 1H, 2'-H), 6.61 (d, $^{3}J_{1',2'}$ = 16.0 Hz, 1H, 1'-H), 6.30 (d, $^{3}J_{2,3}$ = 6.4 Hz, 1H, 3-H), 2.31-2.21 (m, 2H, =CHC$\underline{H}_2$), 1.60-1.42 (m, 2H, C$\underline{H}_2$CH$_3$),

0.94 (t, ^{3}J = 7.3 Hz, 3H, CH_3). ^{13}C NMR (50 MHz, DMSO-d_6, 27 °C): δ157.2 (C-4), 155.4 (C-2), 152.3 (C-9*a*), 145.8 (C-8), 140.3 (C-2'), 127.0 (C-1' and C-6), 122.0 (C-9), 113.5 (C-7), 103.5 (C-3), 35.0 (C-3'), 21.8 (C-4'), 13.9 (C-5'). MS(EI+): *m/z* = 214 [M^+], 186, 157, 144, 116, 89, 77, 65, 51. HRMS(ES+) Calculated for $C_{13}H_{15}N_2O$ 215.1184 (MH^+), found 215.1187.

References

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4) K. Chen, S. C. Kuo, M. C. Hsieh, A. Mauger and C. M. Lin, *J. Med. Chem.,* 1997, **40**, 2266–2275.
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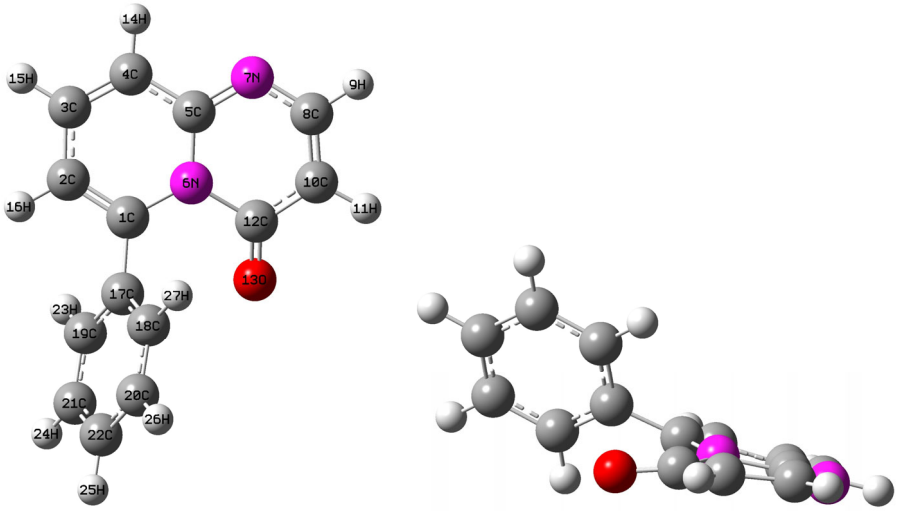
2. Theoretical calculation on ground-state geometry of 6-phenyl-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (48).

Cartesian coordinates of the optimized ground state energy of compound **48** by DFT method at 3LYP6-311++G(2d,2p) level.



Center Number	Atomic Number	Atomic Type	Coordinates (Angstroms) X	Y	Z
1	6	0	-0.048962	0.835865	-0.080031
2	6	0	0.159342	2.184232	-0.021533
3	6	0	1.461652	2.720634	0.096911
4	6	0	2.521352	1.880302	0.223657
5	6	0	2.346848	0.470510	0.158430
6	7	0	1.054388	-0.022387	-0.084082
7	7	0	3.403828	-0.310665	0.299110
8	6	0	3.223604	-1.636359	0.163553
9	1	0	4.103021	-2.246440	0.333991
10	6	0	2.046388	-2.220375	-0.211796
11	1	0	1.966005	-3.280271	-0.395453
12	6	0	0.892592	-1.430292	-0.486668
13	8	0	-0.143064	-1.799387	-1.002079
14	1	0	3.532116	2.226152	0.371935
15	1	0	1.600490	3.792019	0.133982
16	1	0	-0.702950	2.831648	0.006841
17	6	0	-1.437253	0.315544	0.006922
18	6	0	-1.816621	-0.521899	1.060004
19	6	0	-2.412488	0.772654	-0.880767
20	6	0	-3.142455	-0.899047	1.213985
21	6	0	-3.738734	0.384471	-0.731038
22	6	0	-4.108318	-0.450654	0.317013
23	1	0	-2.126499	1.410663	-1.705470
24	1	0	-4.480916	0.731758	-1.436615
25	1	0	-5.140074	-0.751803	0.434579
26	1	0	-3.422607	-1.544889	2.034746
27	1	0	-1.073261	-0.875884	1.761036

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3. X-ray crystallographic data on 6-phenyl-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (48).

Crystal data for **48**: single crystals were recrystallized from ethanol

Diffraction measurement device type: Rigaku Raxis-Rapid
$C_{14}H_{10}N_2O$
Mr = 222.24
Monoclinic, *C*2/*c*
a = 19.4658 (4) Å
b = 7.8017 (1) Å
c = 15.1530 (3) Å
β = 110.941 (1) °
V = 2149.23 (7) Å^3
Z = 8
F(000) = 928
D_x = 1.374 Mg m^{-3}
Cu Kα radiation, λ = 1.5418 Å
Cell parameter from 8822 reflections (θ range 6.51-71.64 °)
μ = 0.713 mm^{-1}
T = 293 (2) K
Colorless block
Size 0.44 x 0.41 x 0.39 mm

For more details please see the CIF files attached with supporting information. The crystal data of the product have been deposited at Cambridge Crystallographic Data Center, UK, and the reference numbers are CCDC 816421 for structure **48**.

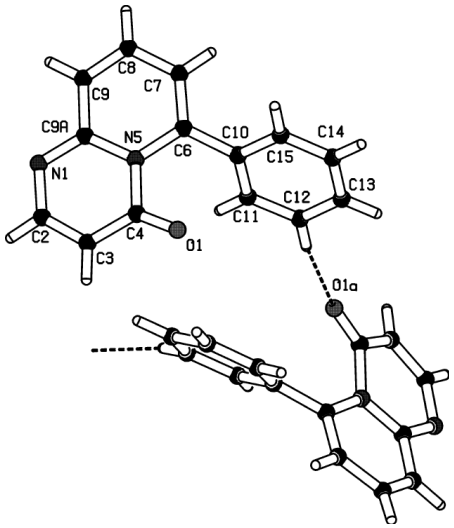

Figure S1. A non-classical CH••••O hydrogen bonding in compound **48** (see also main text).

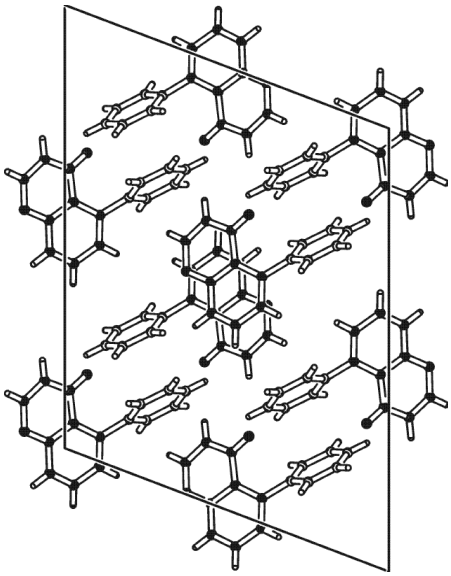

Figure S2. A π – π stacking of bicyclic moieties of compound **48** as viewed down the *b* axis (see also main text).

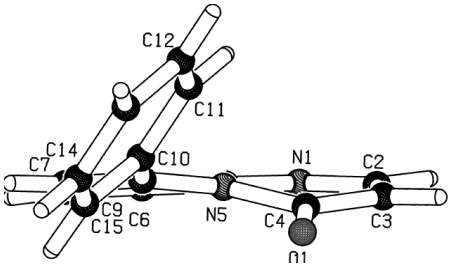

Figure S3. A view of compound **48,** as viewed down the N5-C9*a* bond.

4. ^{1}H and ^{13}C NMR spectra (in DMSO-d_6)

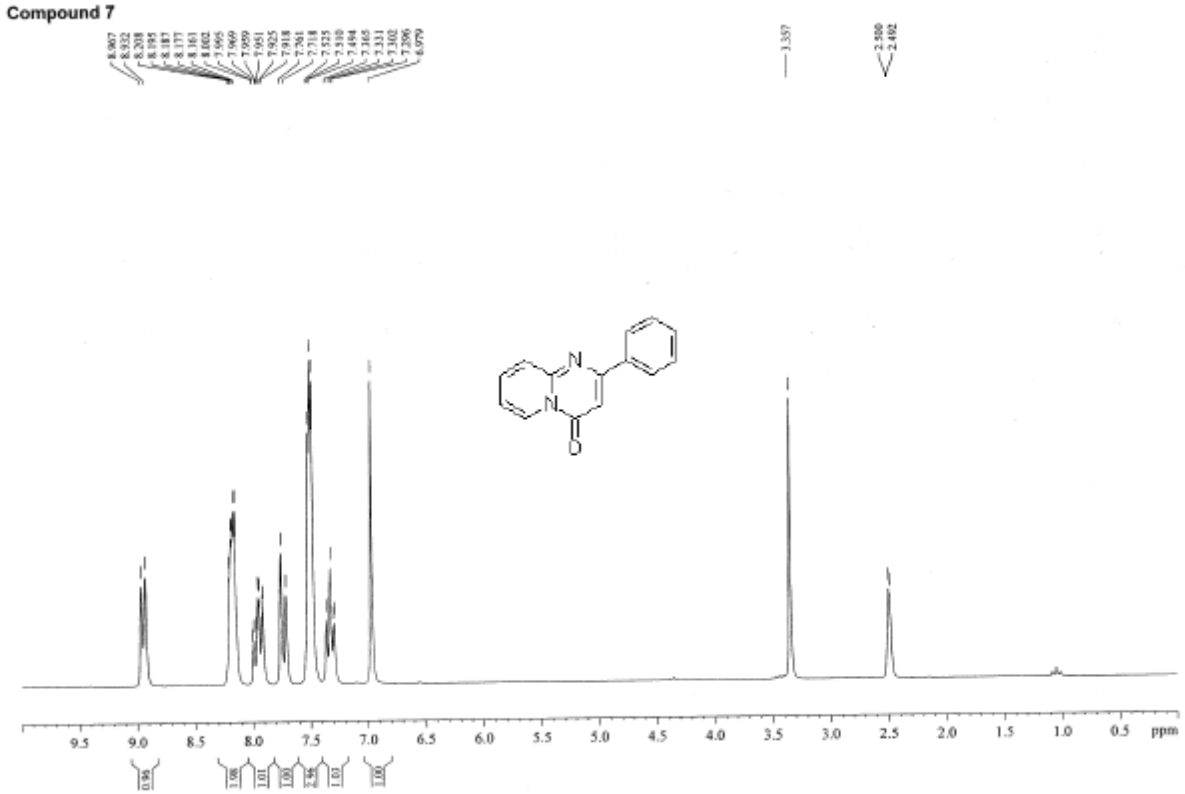

Figure S4. ^{1}H-NMR spectrum of 2-phenyl-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**7**) (200 MHz)

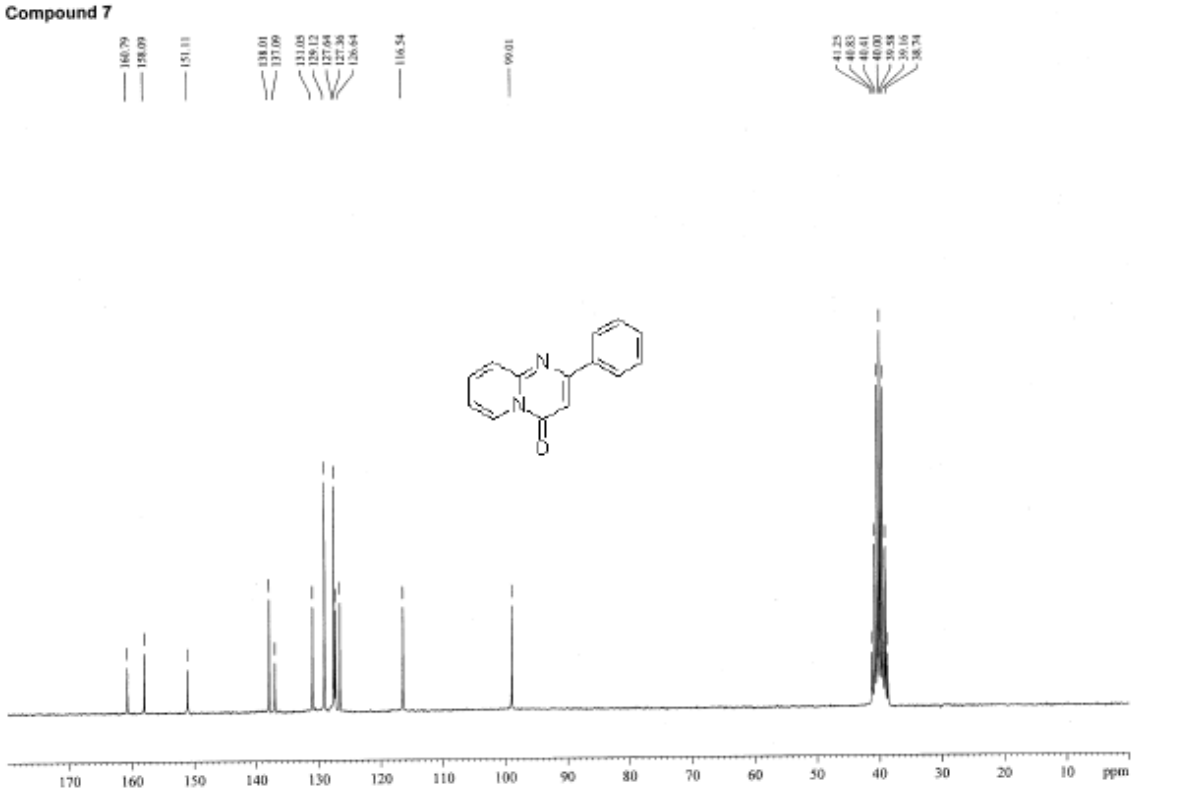

Figure S5. ^{13}C-NMR spectrum of 2-phenyl-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**7**) (200 MHz)

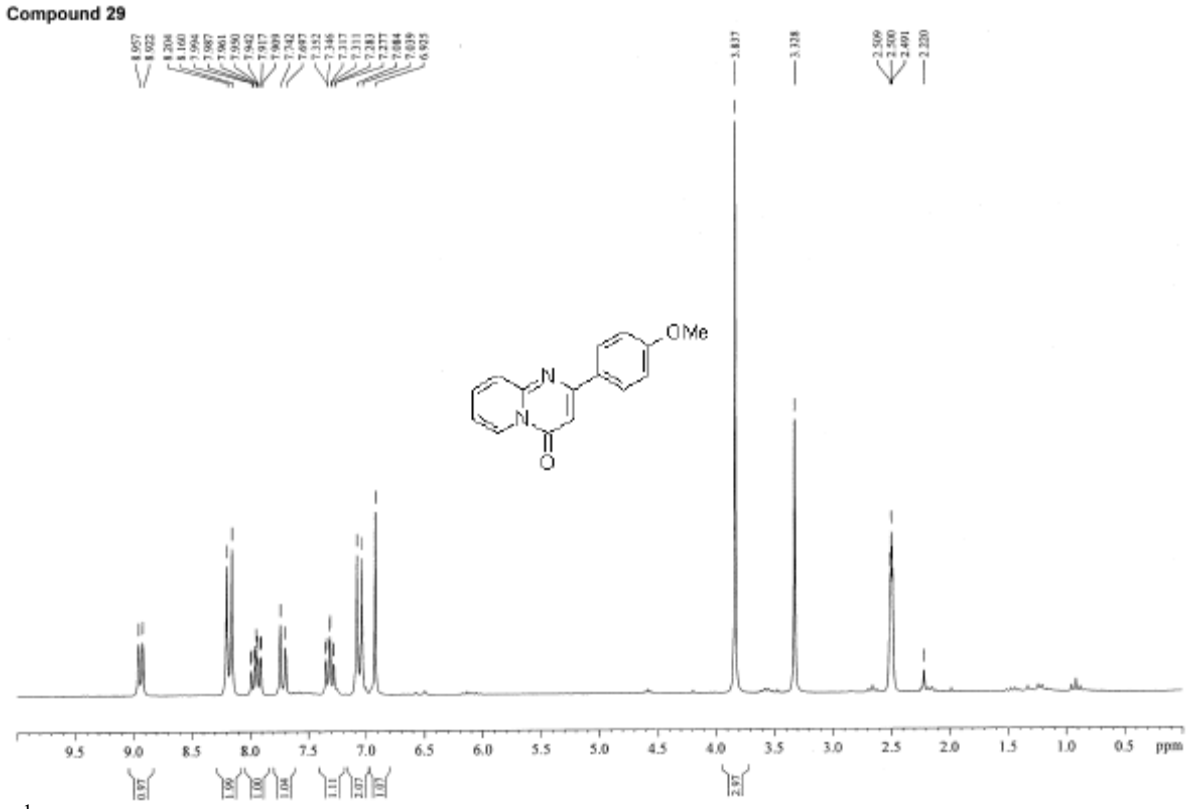

Figure S6. [1]H-NMR spectrum of 2-(4-methoxyphenyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**29**) (200 MHz)

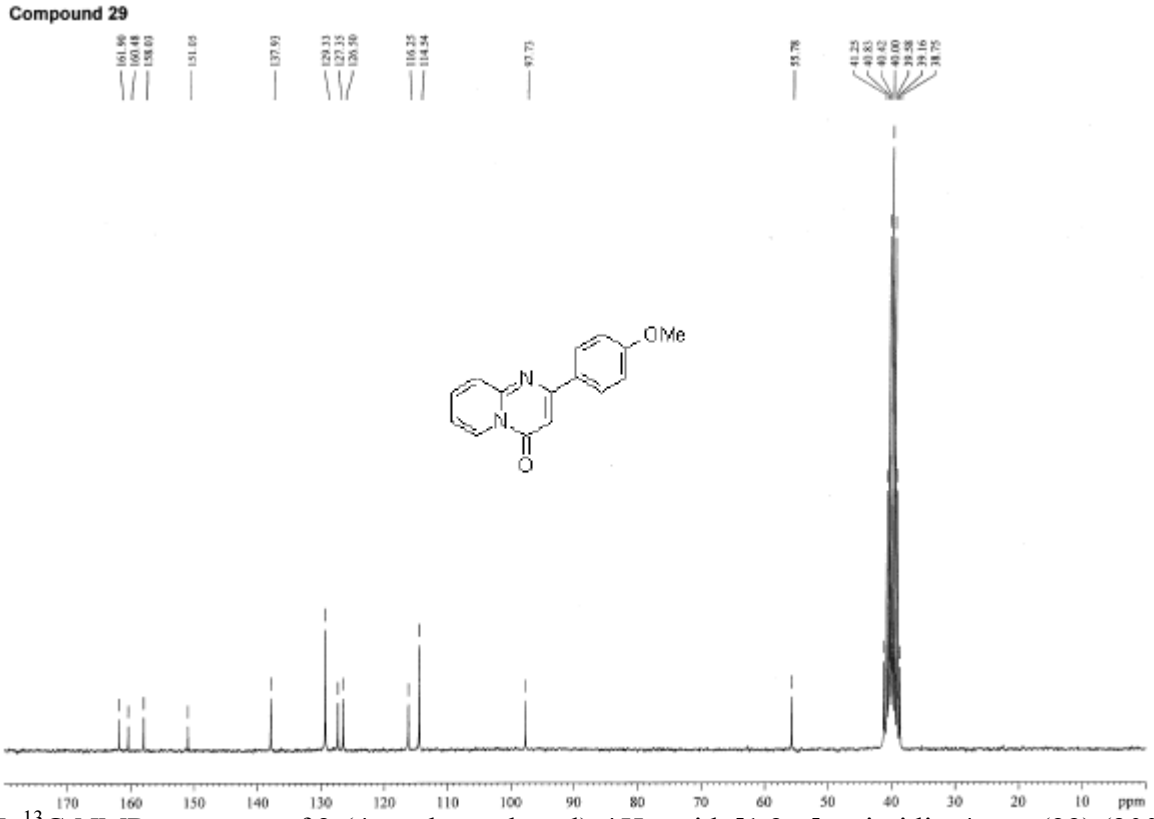

Figure S7. [13]C-NMR spectrum of 2-(4-methoxyphenyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**29**) (200 MHz)

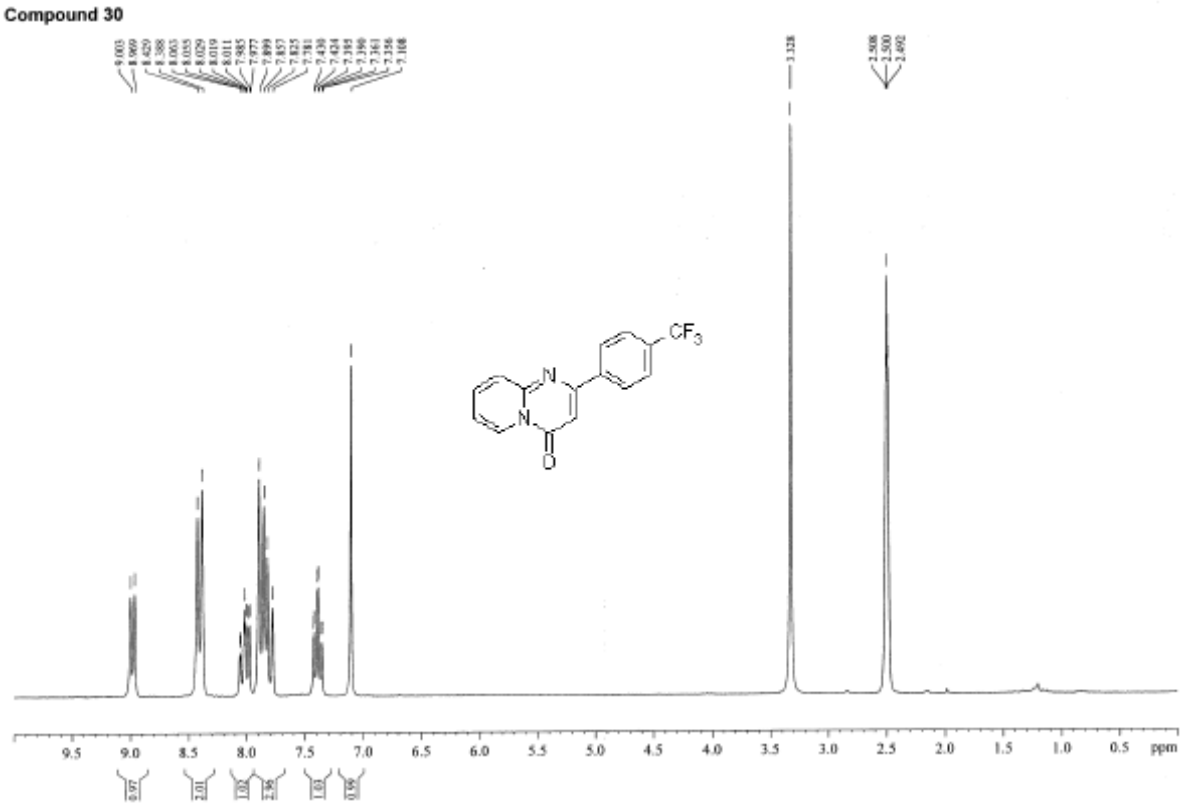

Figure S8. [1]H-NMR spectrum of 2-(4-trifluoromethylphenyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**30**) (200 MHz)

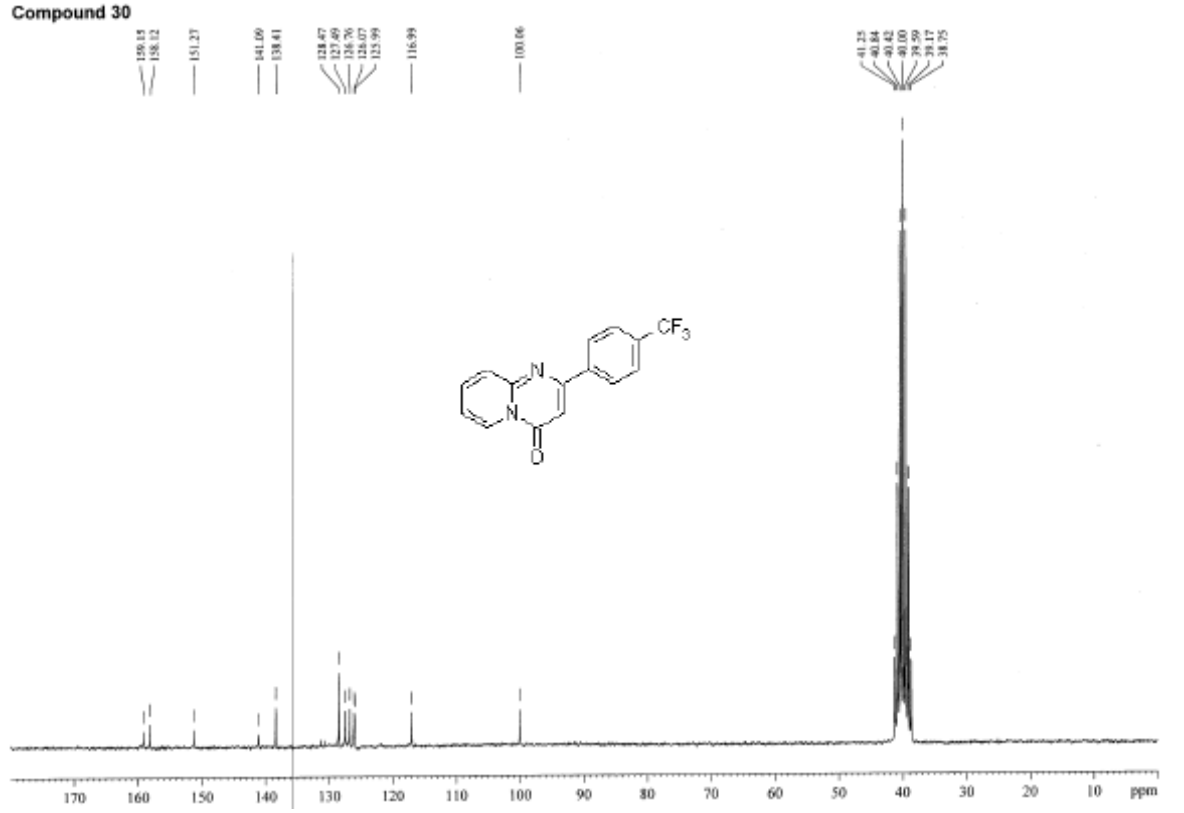

Figure S9. [13]C-NMR spectrum of 2-(4-trifluoromethylphenyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**30**) (200 MHz)

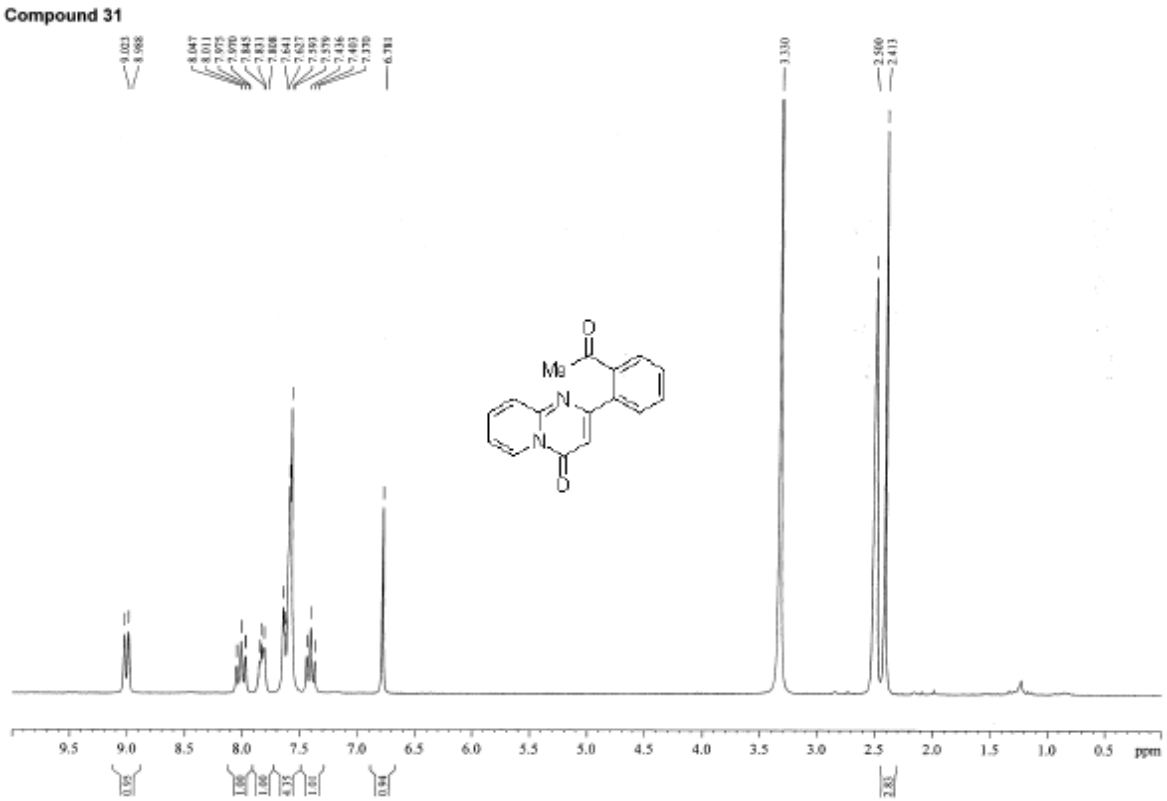

Figure S10. ^{1}H-NMR spectrum of 2-(2-acetylphenyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**31**) (200 MHz)

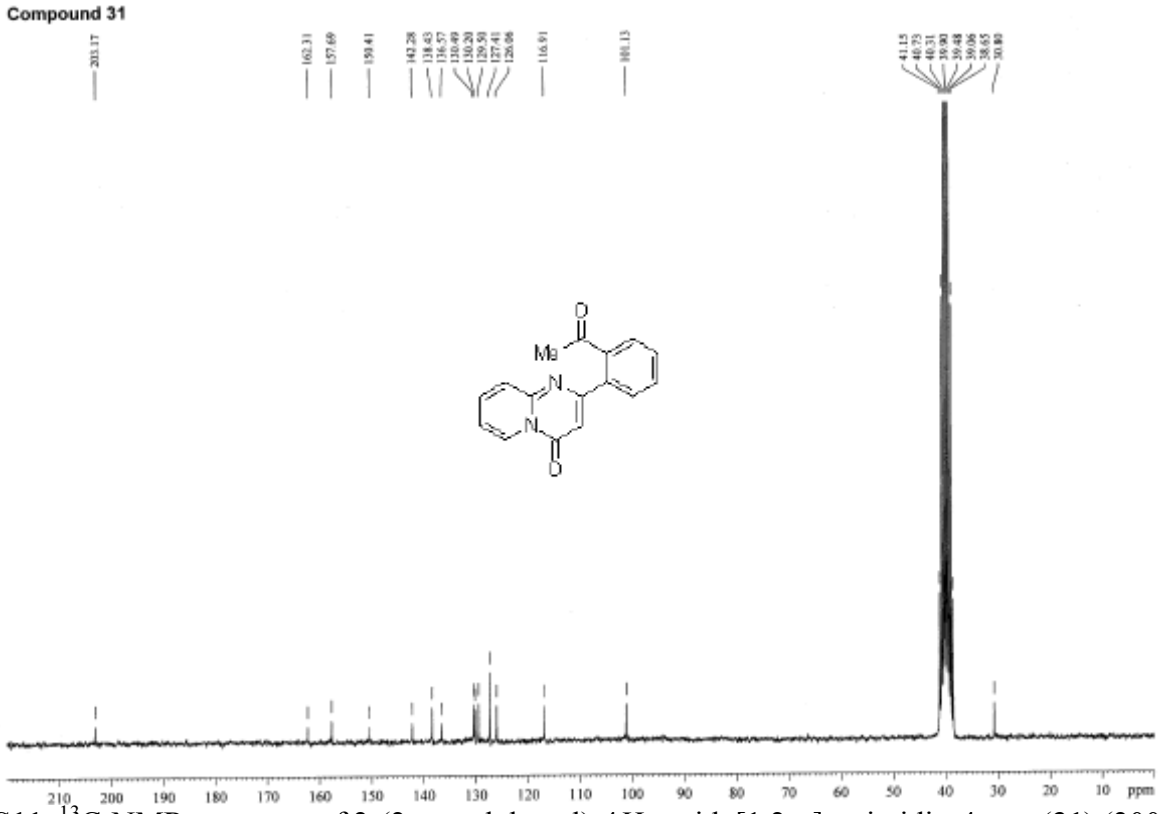

Figure S11. ^{13}C-NMR spectrum of 2-(2-acetylphenyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**31**) (200 MHz)

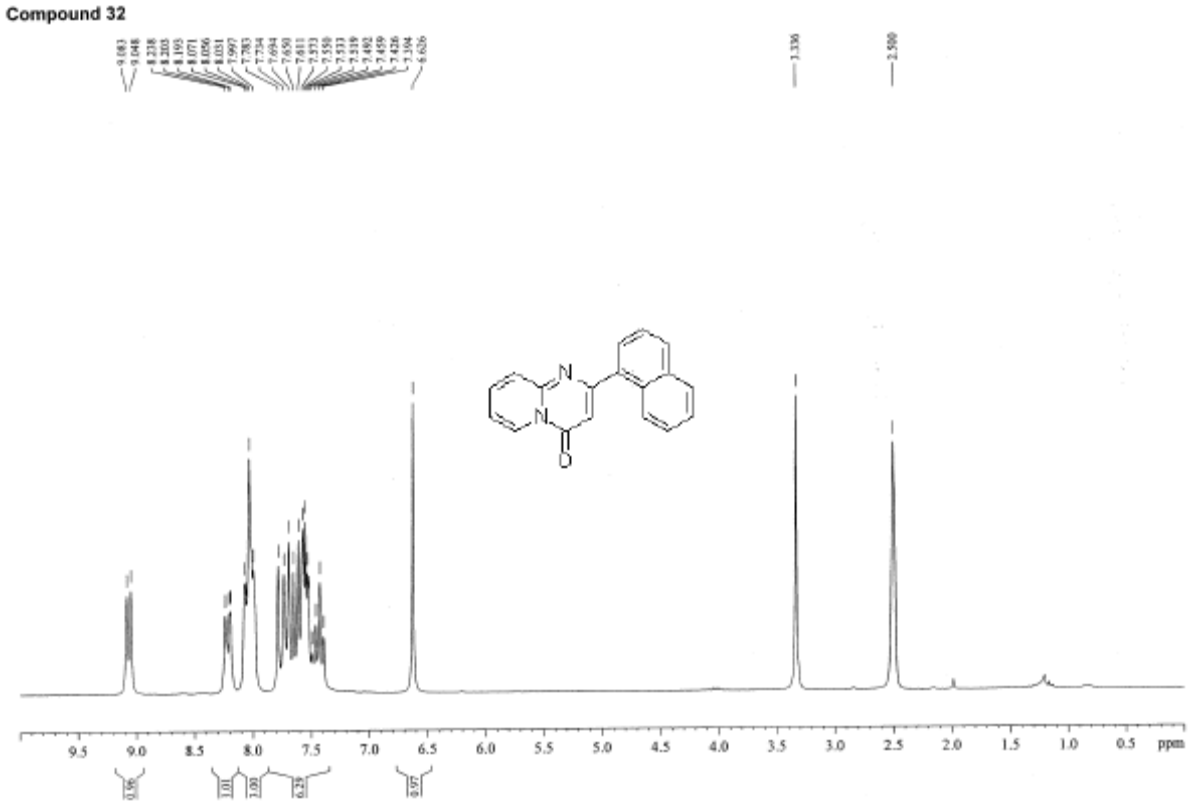

Figure S12. [1]H-NMR spectrum of 2-(1-naphthyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**32**) (200 MHz)

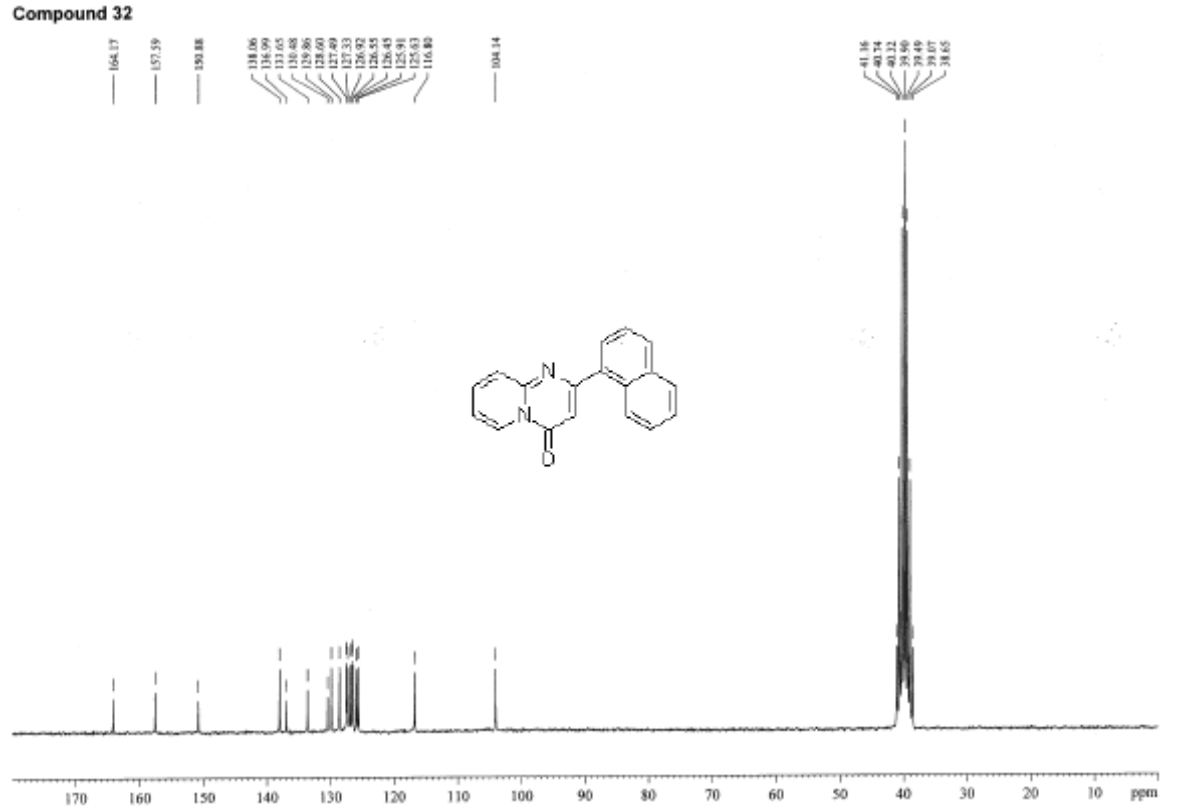

Figure S13. [13]C-NMR spectrum of 2-(1-naphthyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**32**) (200 MHz)

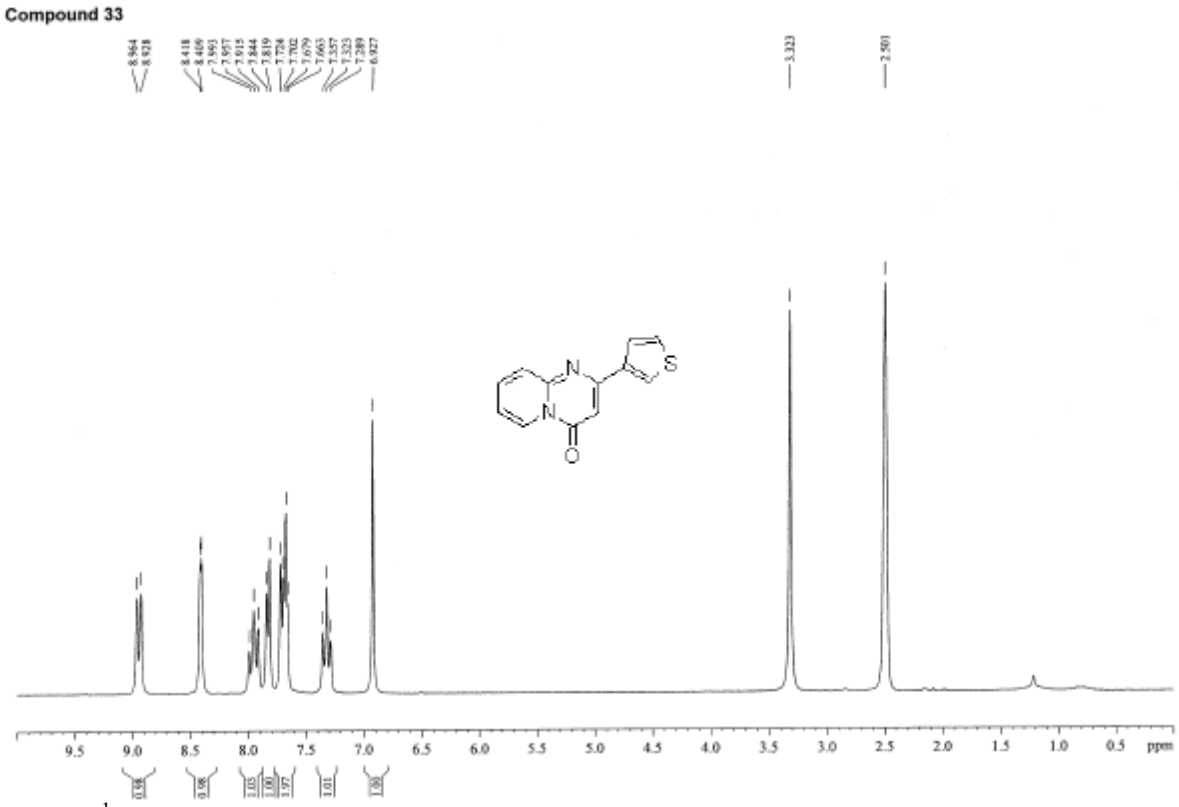

Figure S14. [1]H-NMR spectrum of 2-(3-thienyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**33**) (200 MHz)

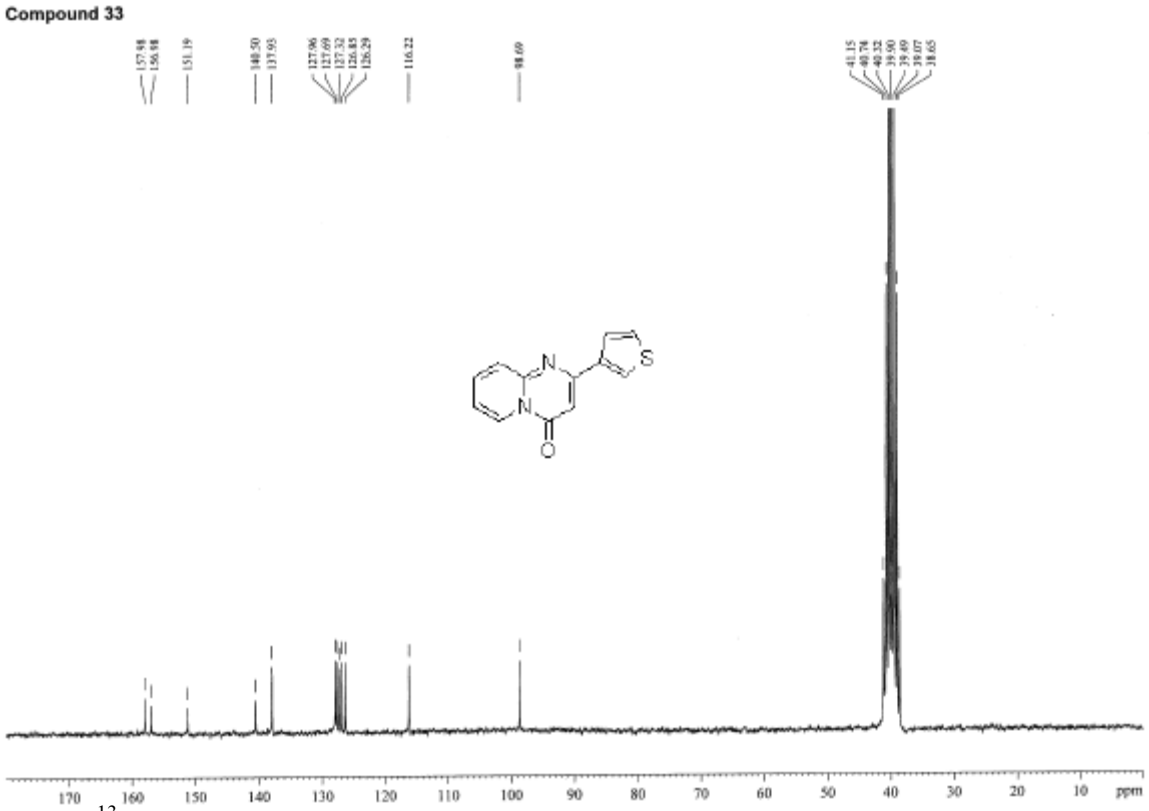

Figure S15. [13]C-NMR spectrum of 2-(3-thienyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**33**) (200 MHz)

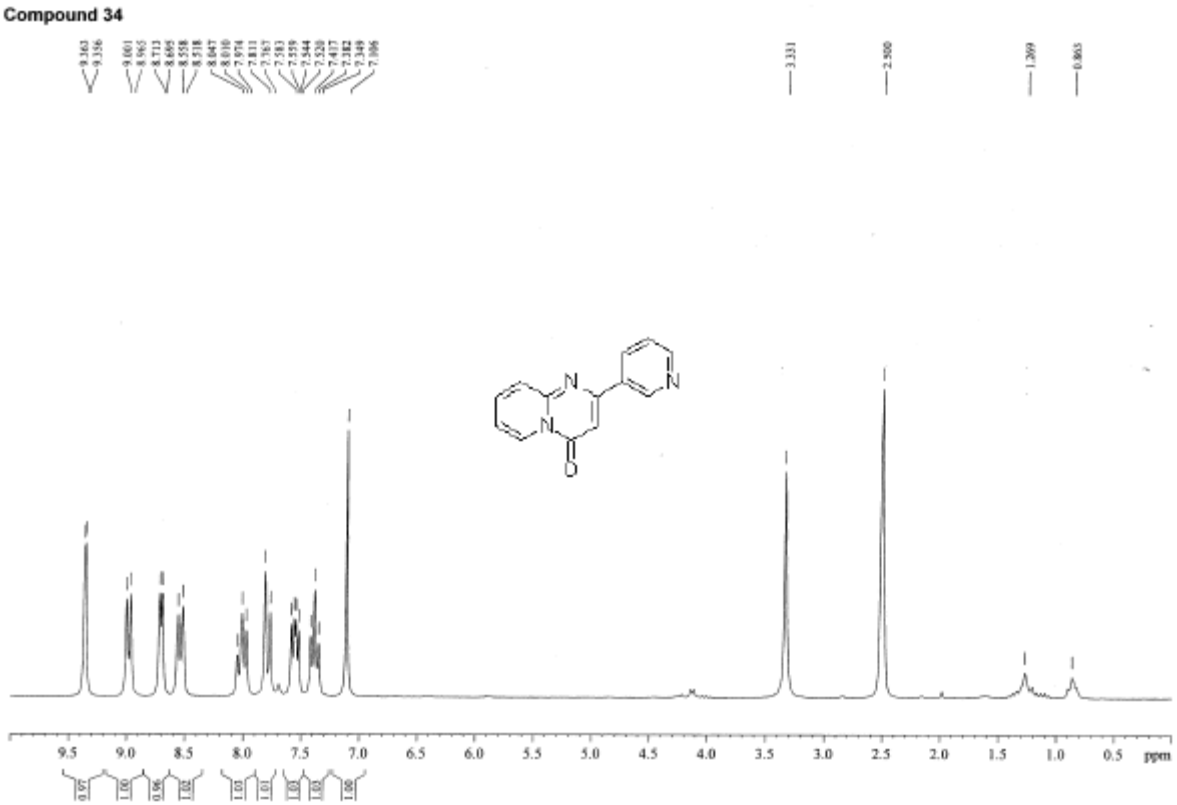

Figure S16 [1]H-NMR spectrum of 2-(3-pyridinyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**34**) (200 MHz)

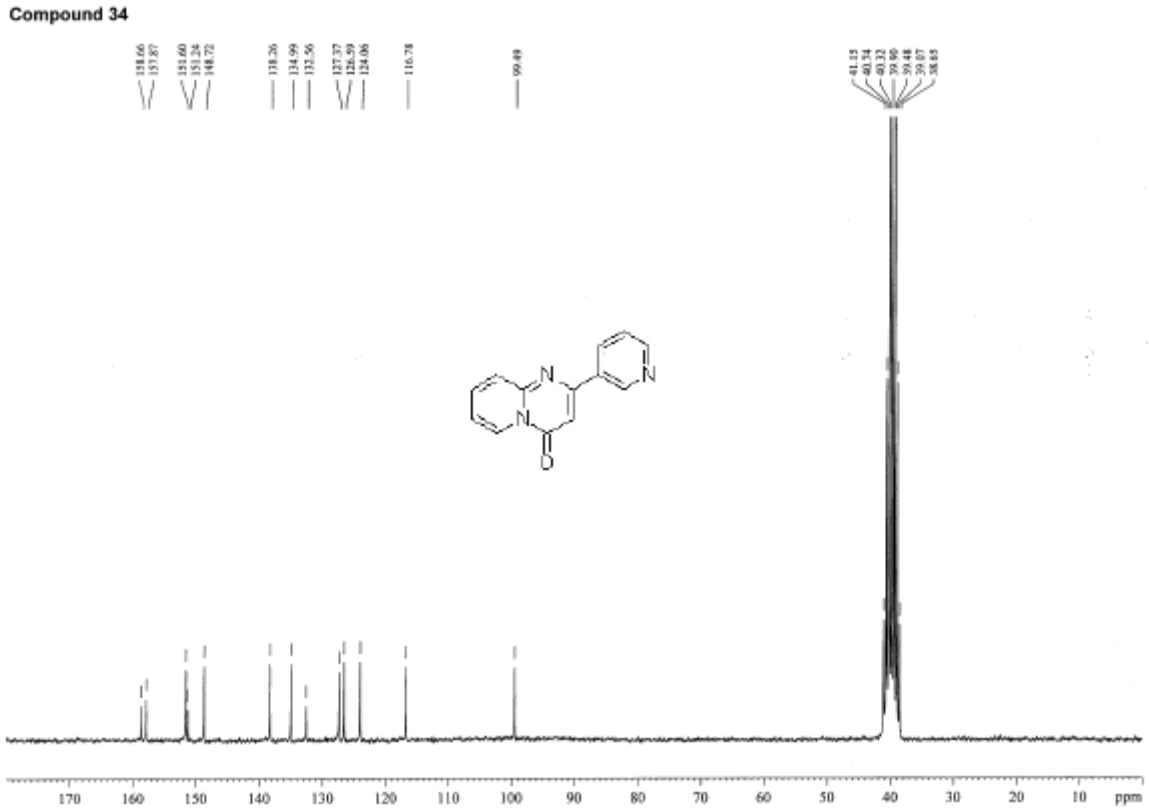

Figure S17. [13]C-NMR spectrum of 2-(3-pyridinyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**34**) (200 MHz)

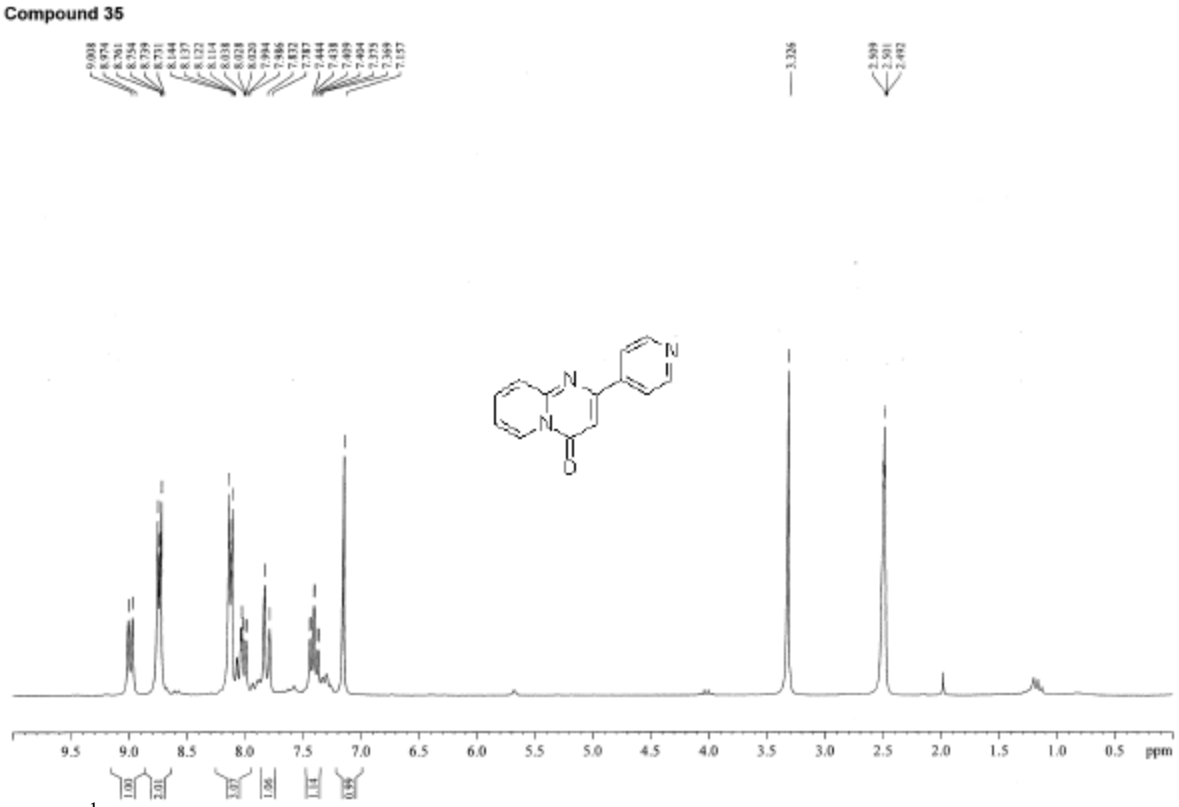

Figure S18. [1]H-NMR spectrum of 2-(4-pyridinyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**35**) (200 MHz)

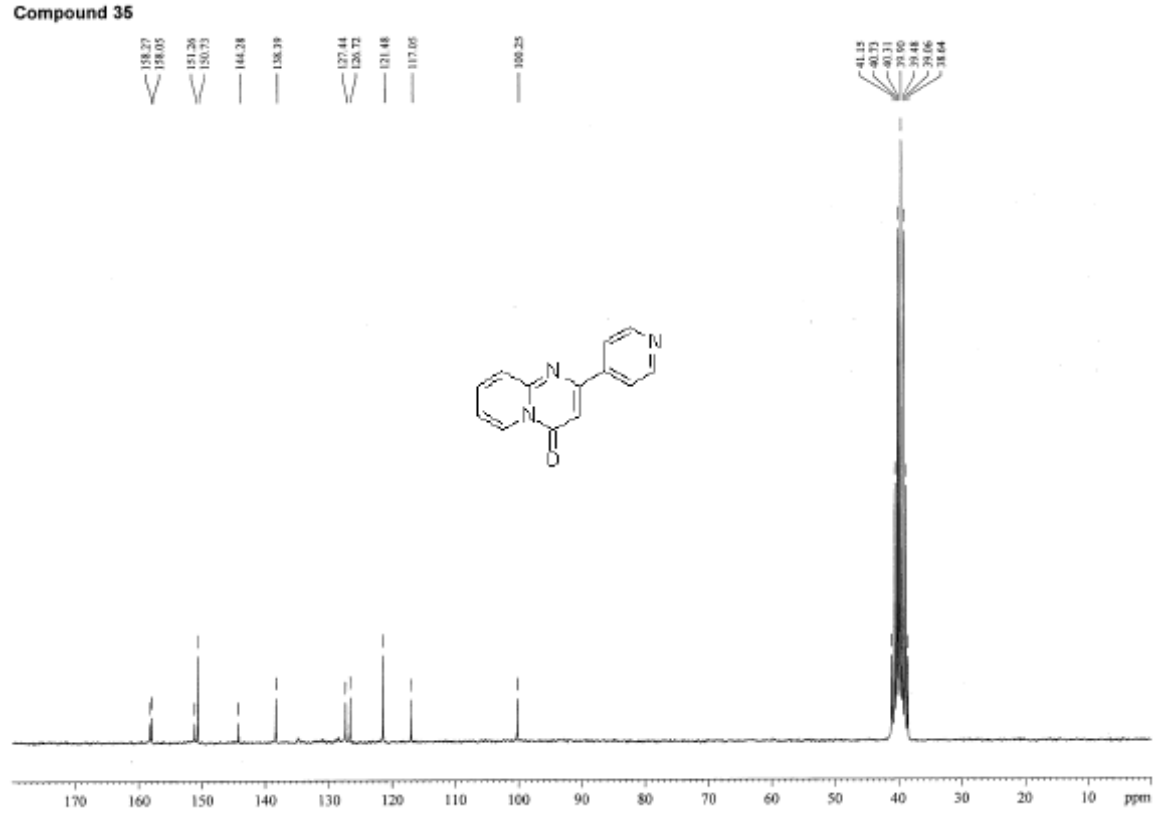

Figure S19. [13]C-NMR spectrum of 2-(4-pyridinyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**35**) (200 MHz)

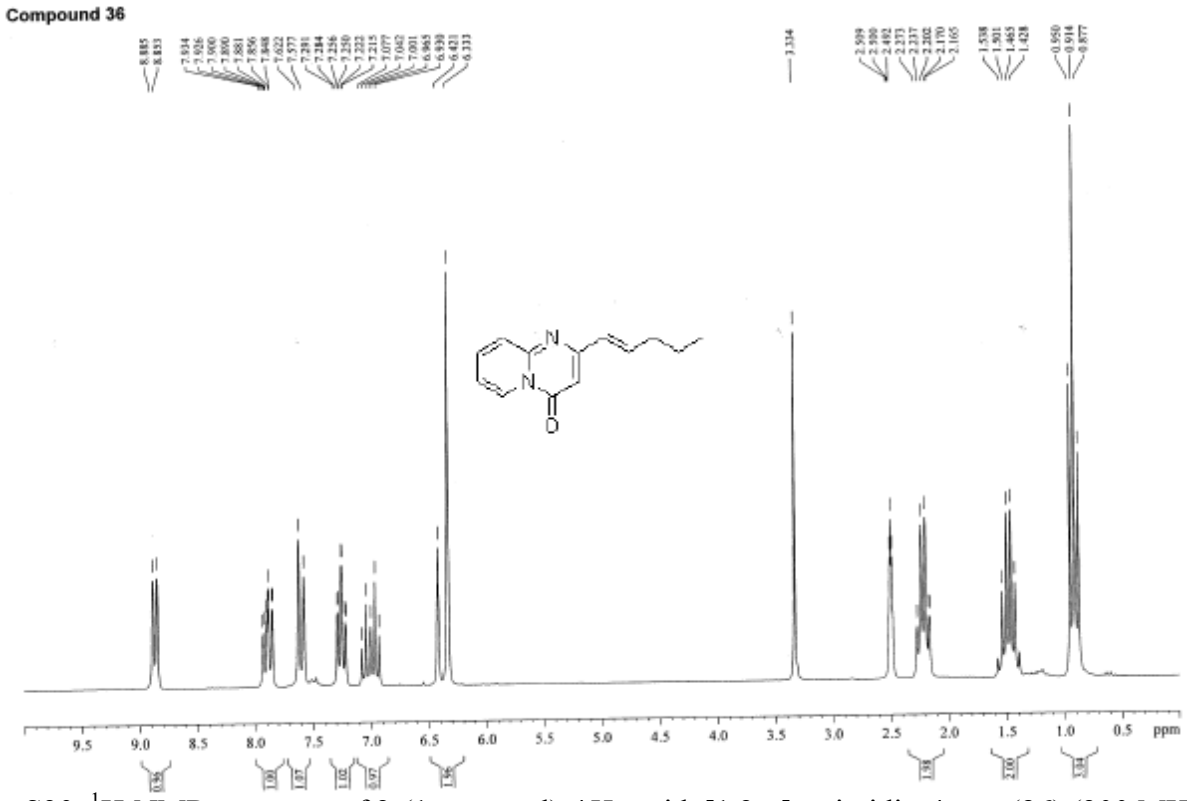

Figure S20. [1]H-NMR spectrum of 2-(1-pentenyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**36**) (200 MHz)

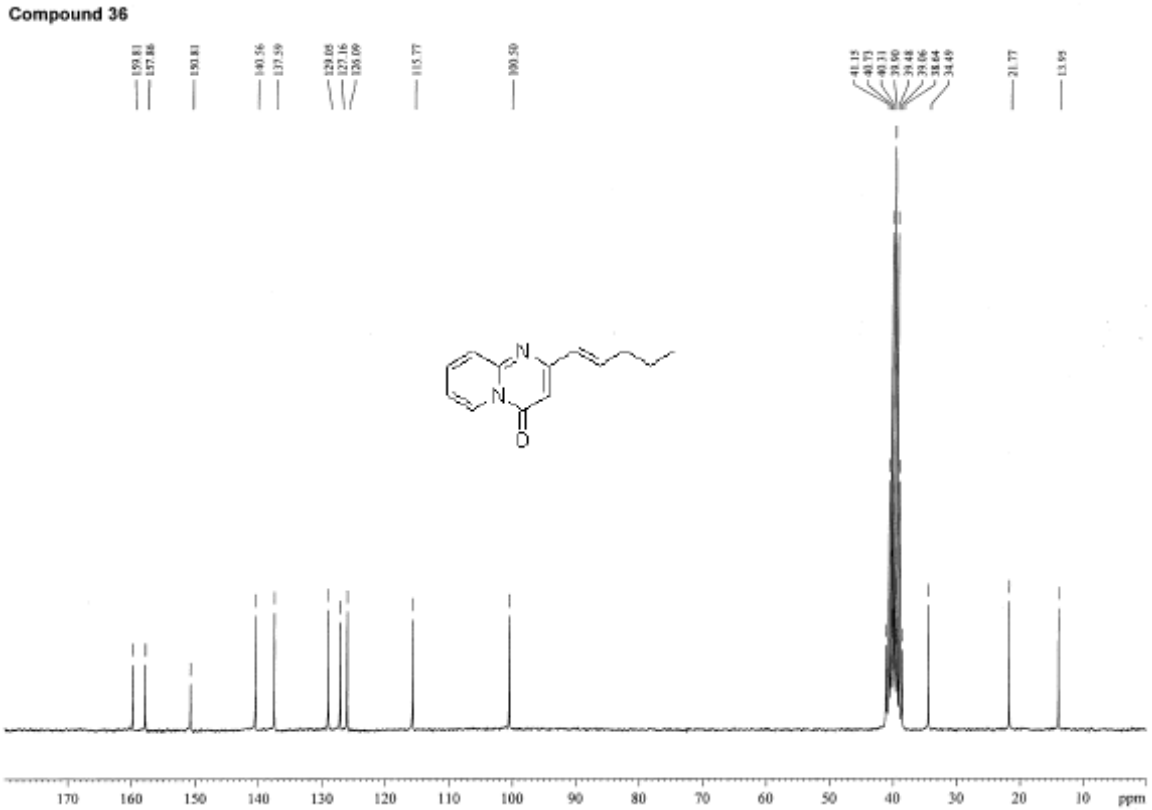

Figure S21. [13]C-NMR spectrum of 2-(1-pentenyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**36**) (200 MHz)

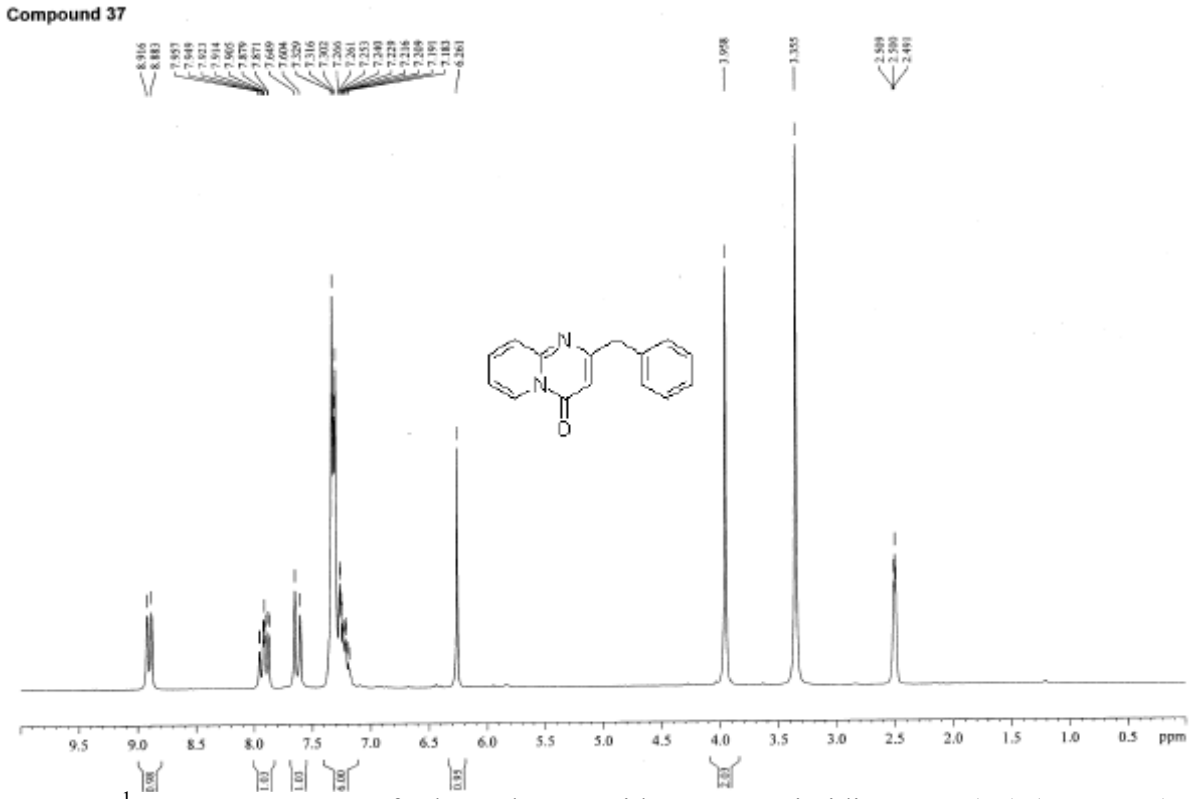

Figure S22. ^{1}H-NMR spectrum of 2-benzyl-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**37**) (200 MHz)

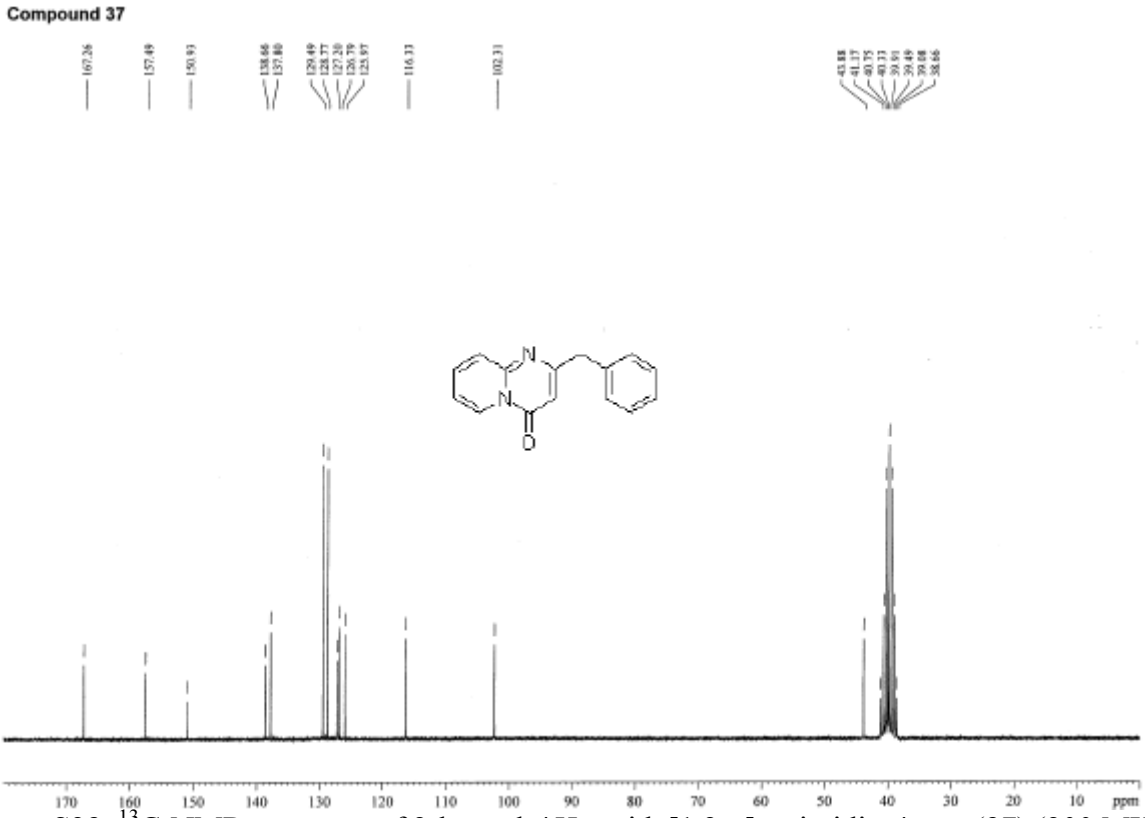

Figure S23. ^{13}C-NMR spectrum of 2-benzyl-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**37**) (200 MHz)

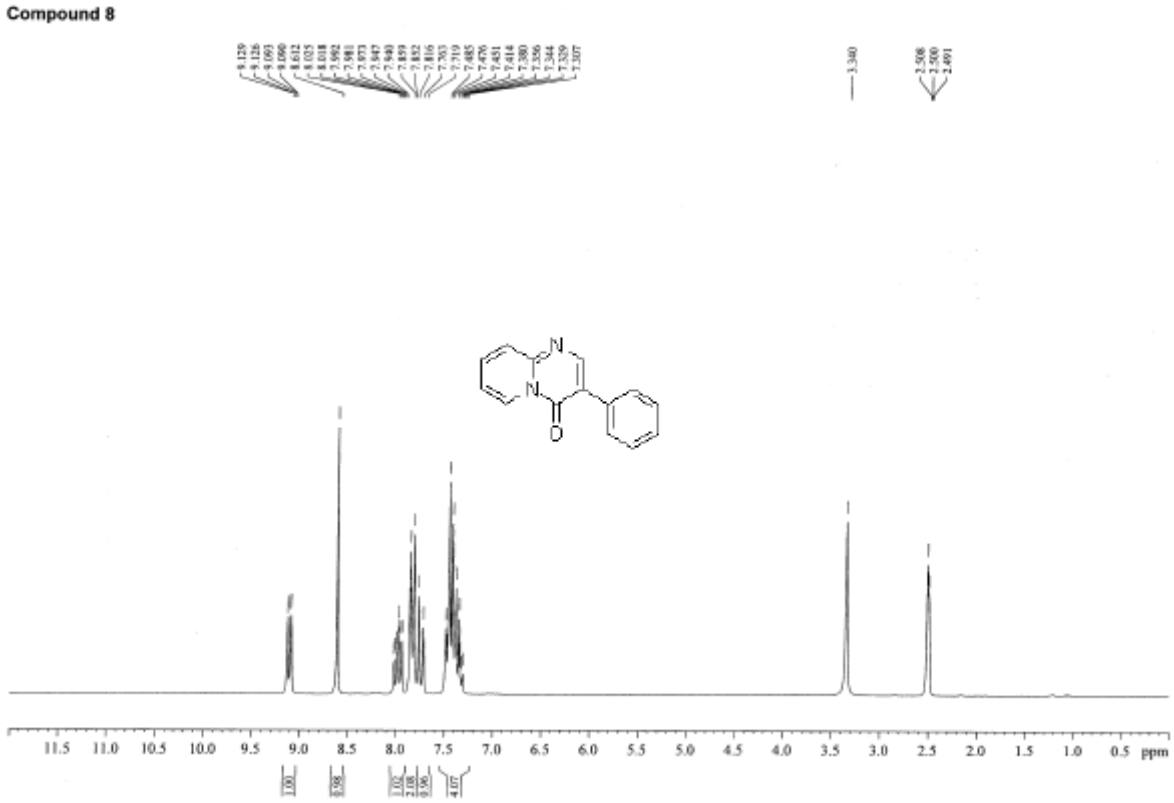

Figure S24. [1]H-NMR spectrum of 3-phenyl-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**8**) (200 MHz)

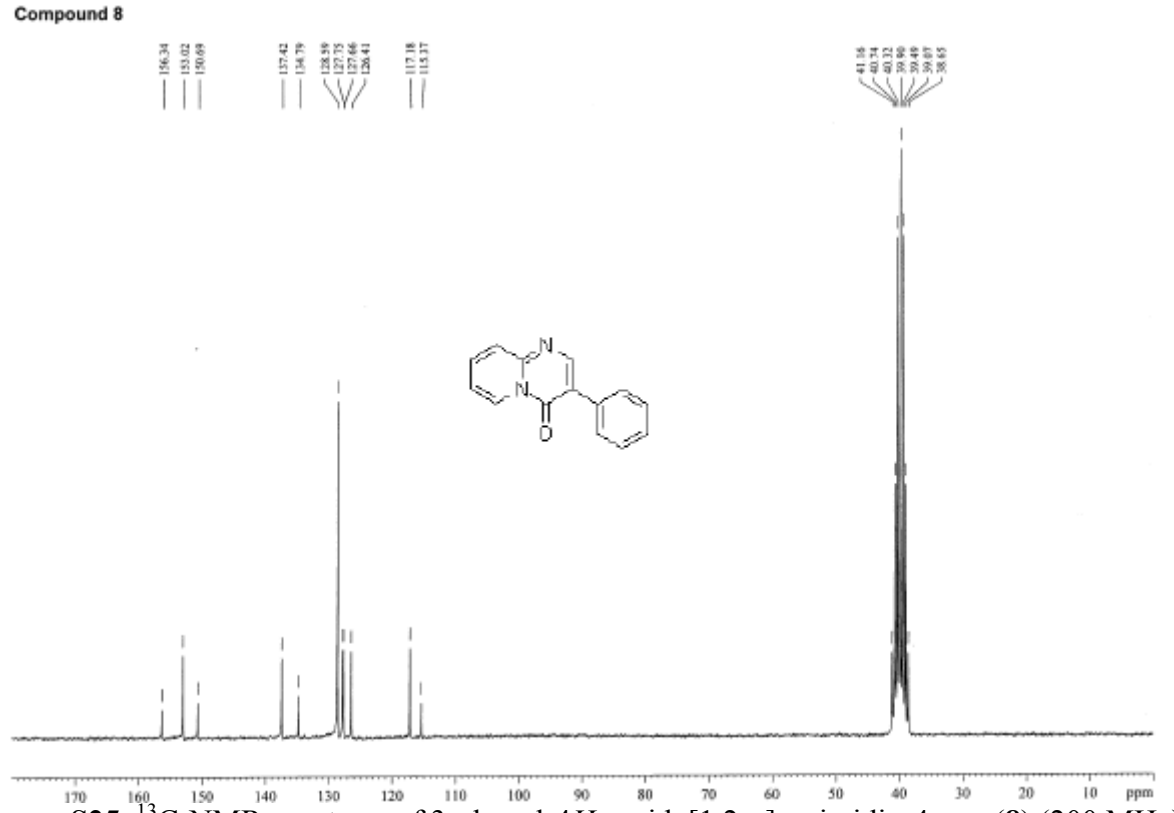

Figure S25. [13]C-NMR spectrum of 3-phenyl-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**8**) (200 MHz)

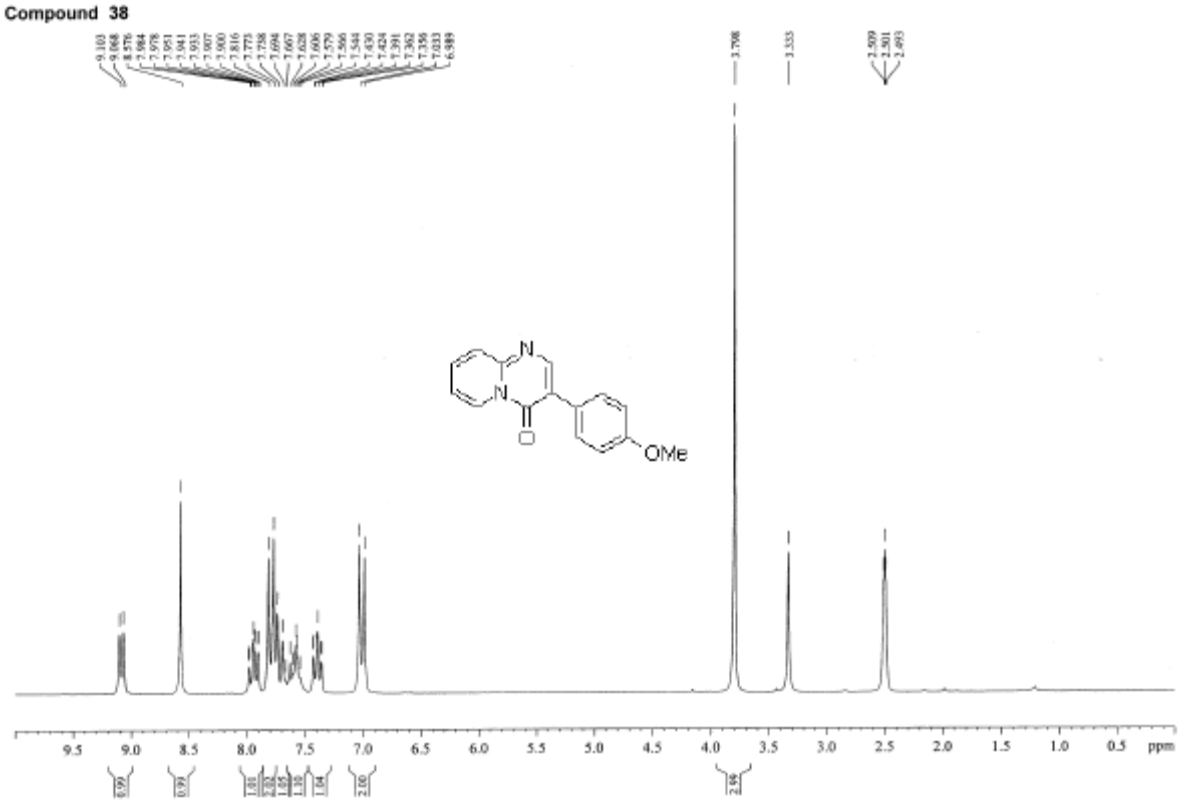

Figure S26. ^{1}H-NMR spectrum of 3-(4-methoxyphenyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**38**) (200 MHz)

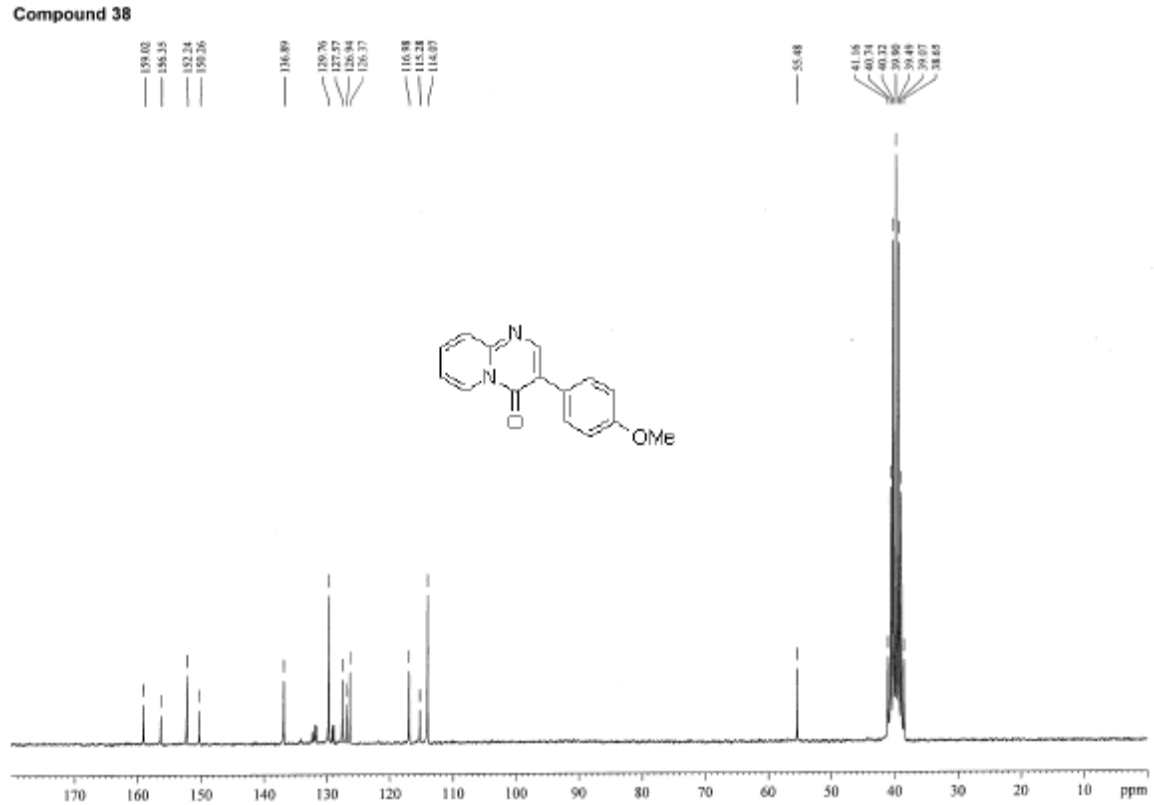

Figure S27. ^{13}C-NMR spectrum of 3-(4-methoxyphenyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**38**) (200 MHz)

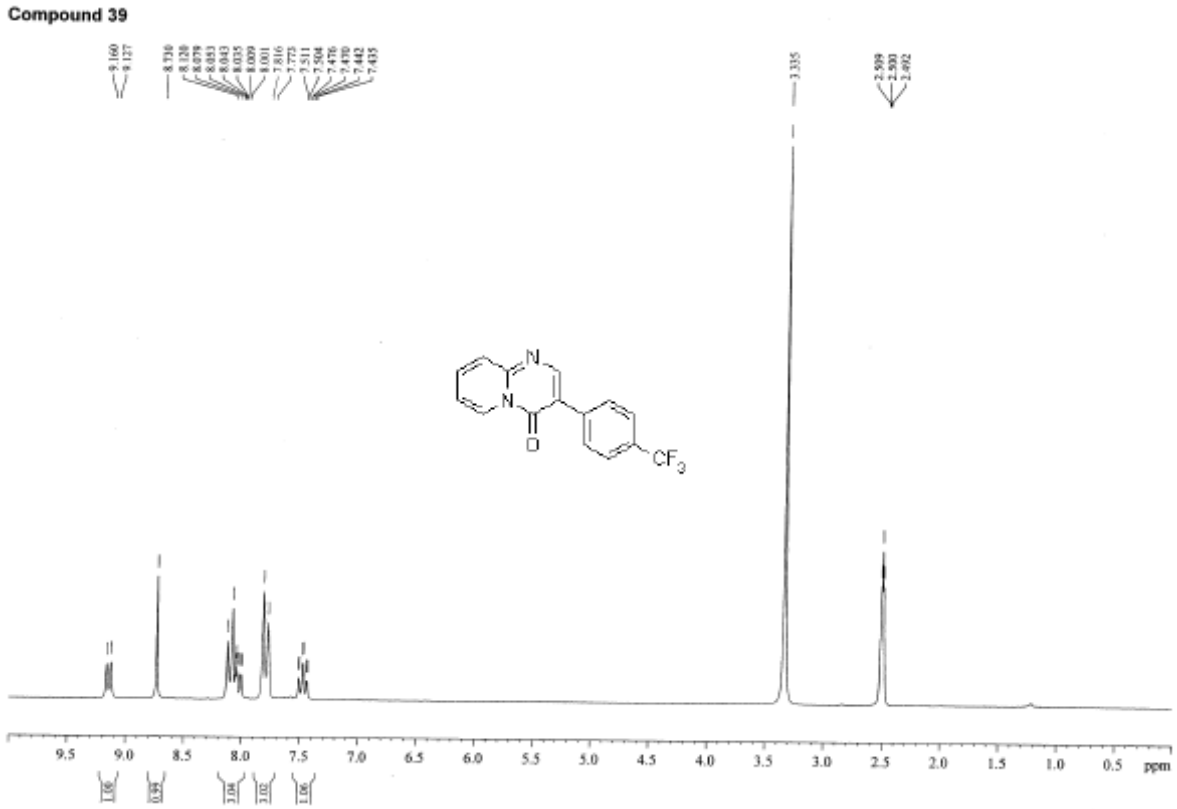

Figure S28. [1]H-NMR spectrum of 3-(4-trifluoromethylphenyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**39**) (200 MHz)

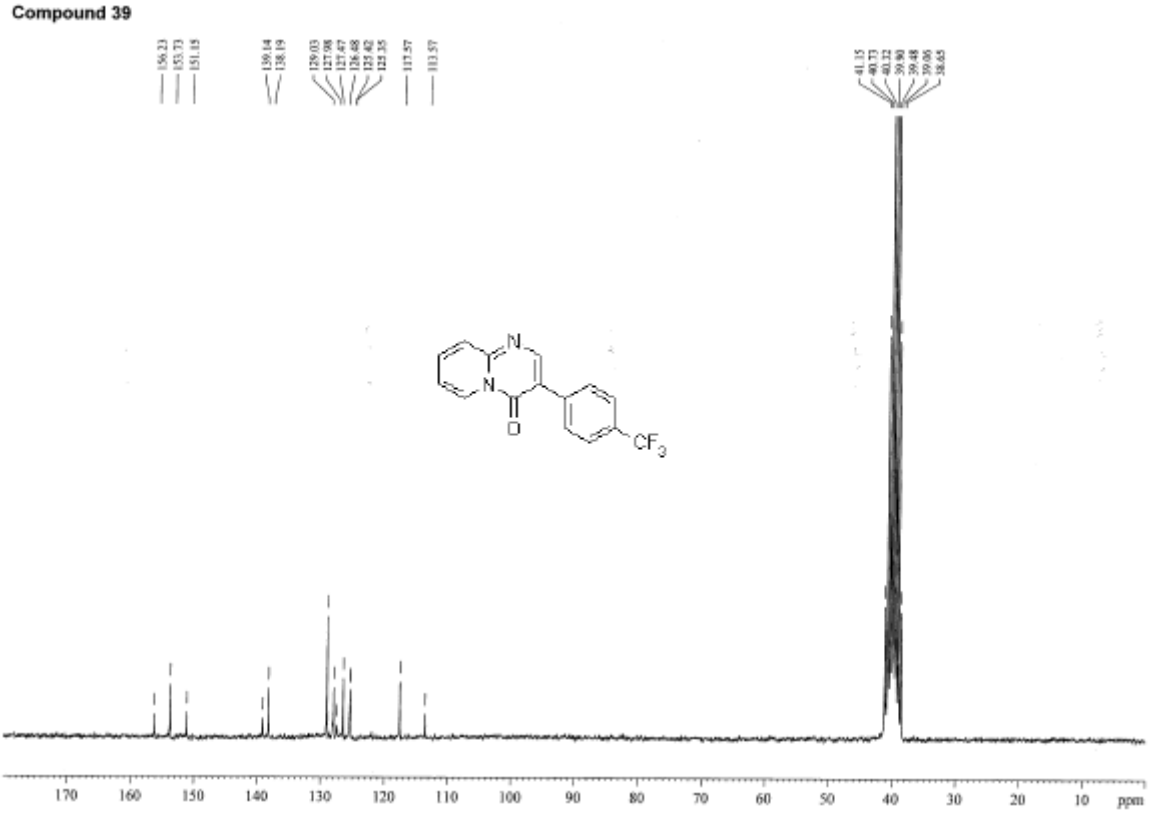

Figure S29. [13]C-NMR spectrum of 3-(4-trifluoromethylphenyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**39**) (200 MHz)

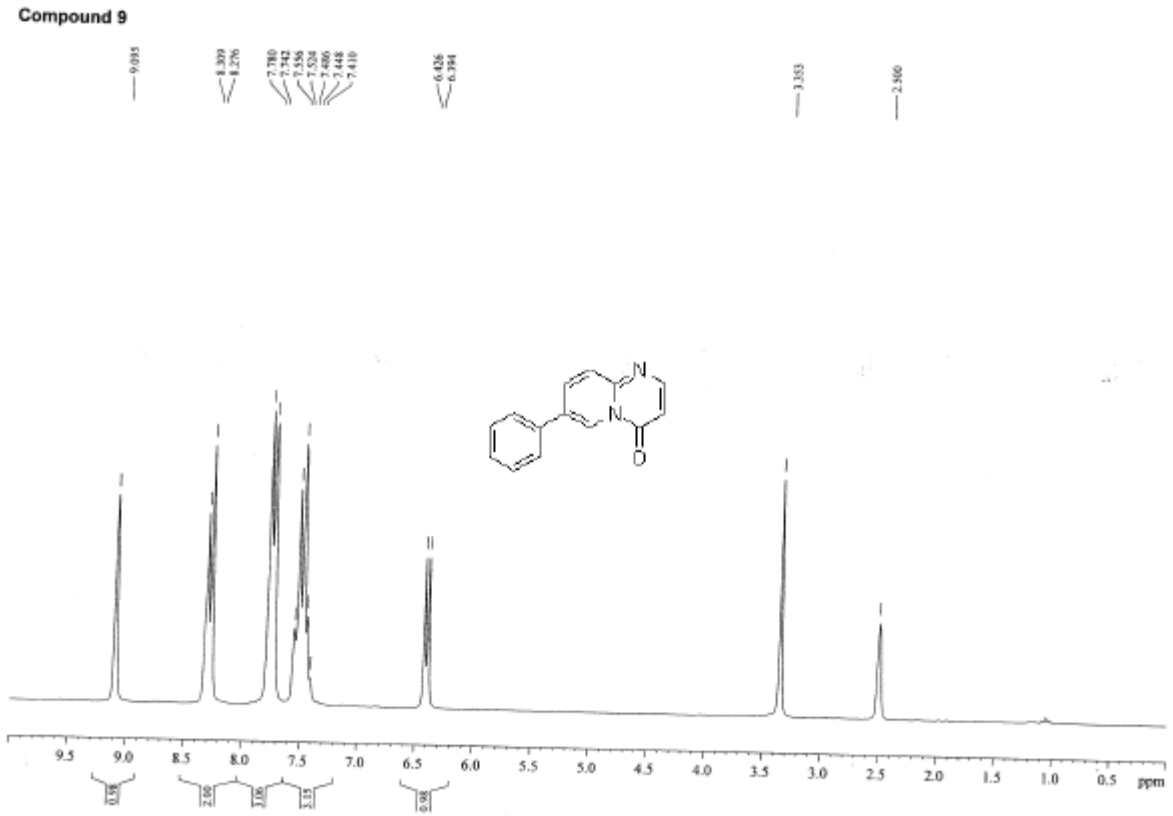

Figure S30. ^{1}H-NMR spectrum of 7-phenyl-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**9**) (200 MHz)

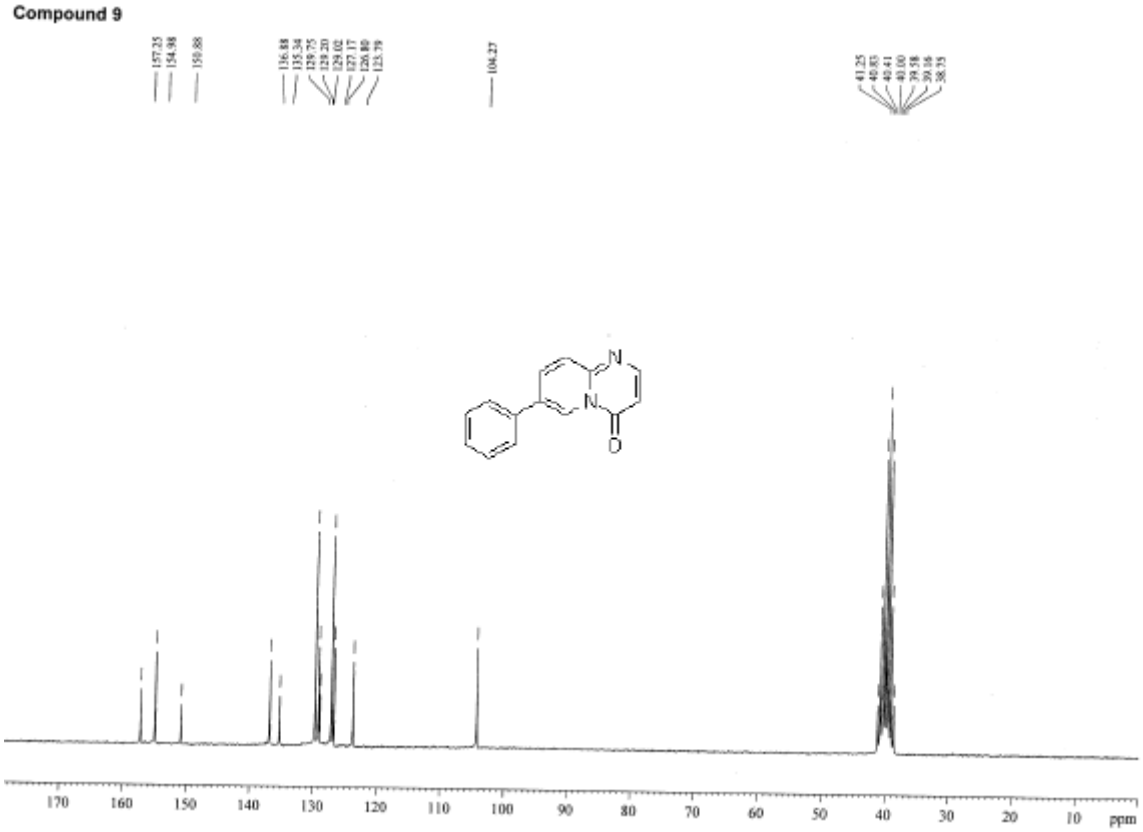

Figure S31. ^{13}C-NMR spectrum of 7-phenyl-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**9**) (200 MHz)

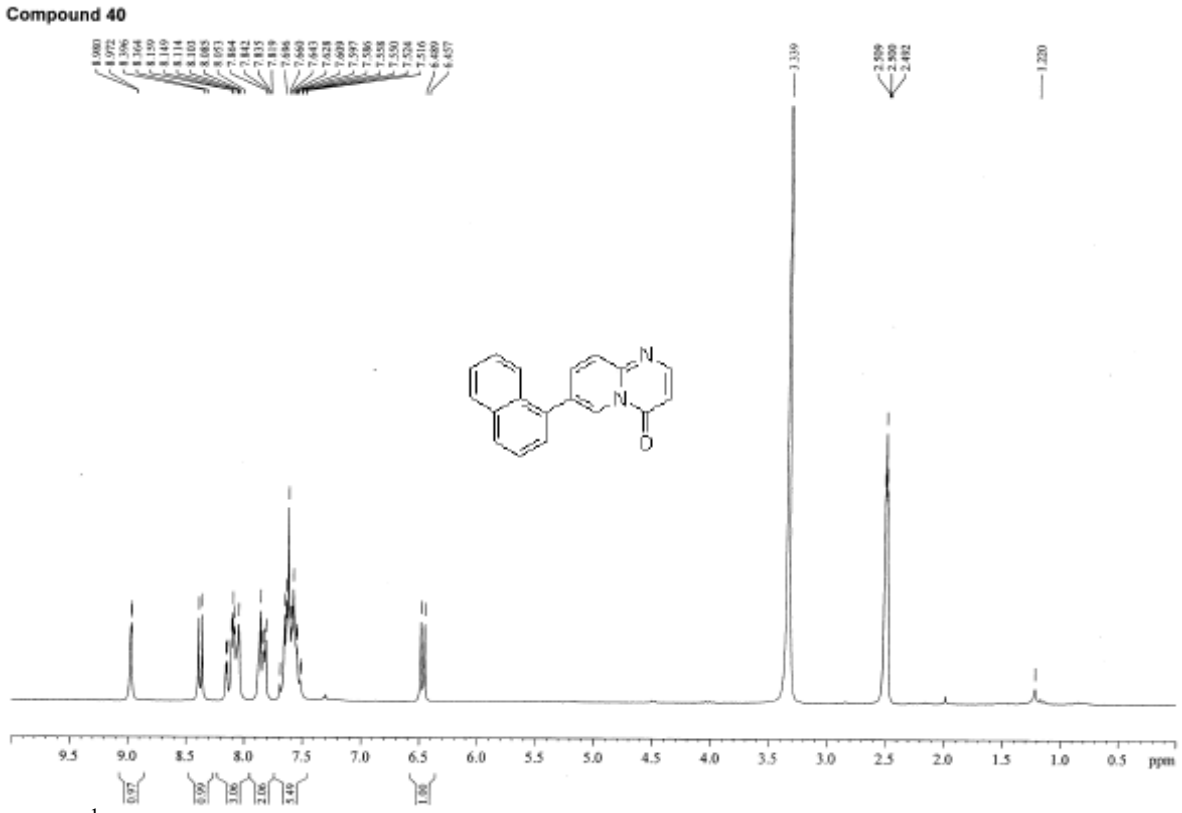

Figure S32. [1]H-NMR spectrum of 7-(1-naphthyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**40**) (200 MHz)

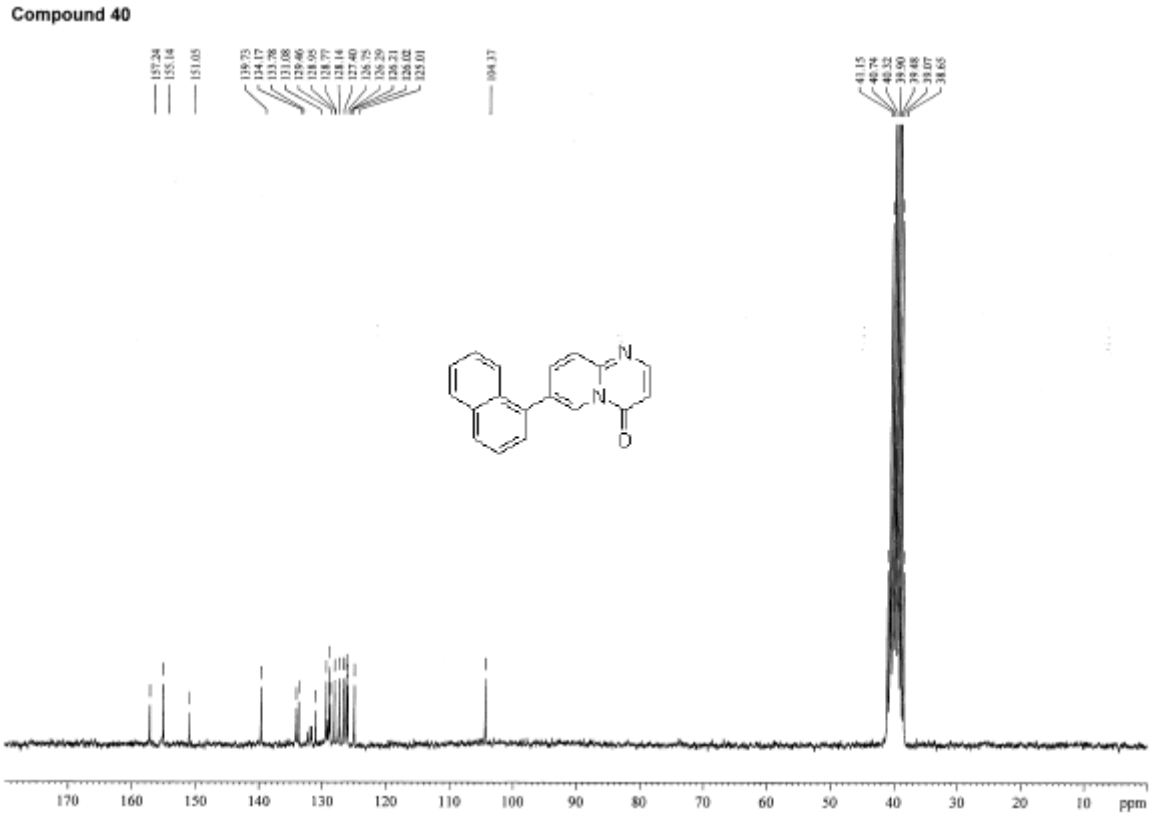

Figure S33. [13]C-NMR spectrum of 7-(1-naphthyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**40**) (200 MHz)

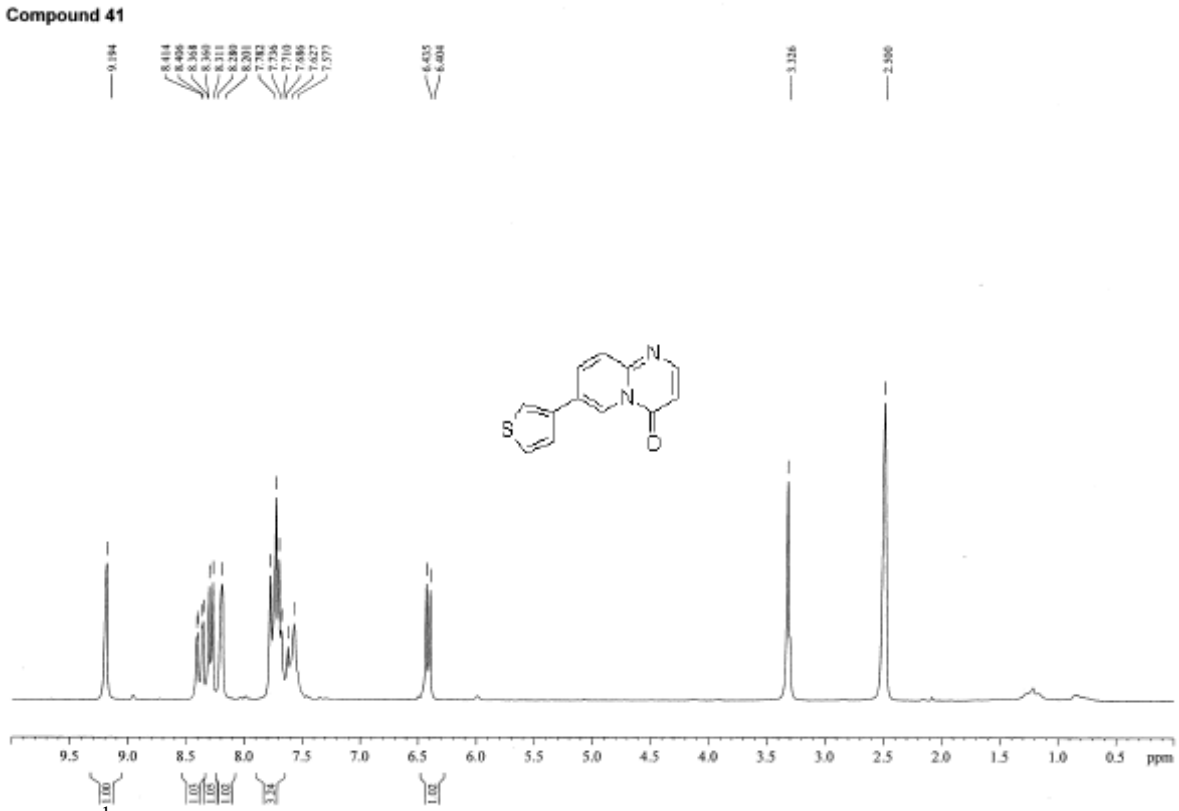

Figure S34. ^{1}H-NMR spectrum of 7-(3-thienyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**41**) (200 MHz)

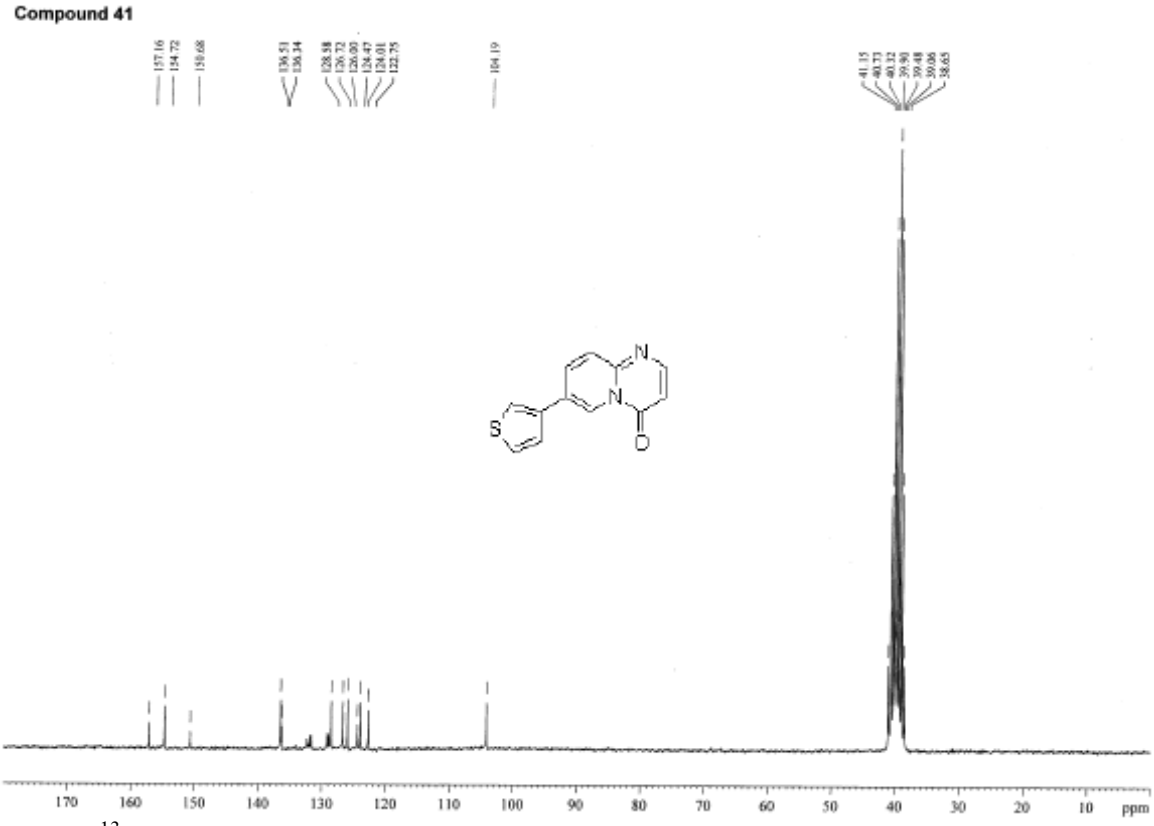

Figure S35. ^{13}C-NMR spectrum of 7-(3-thienyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**41**) (200 MHz)

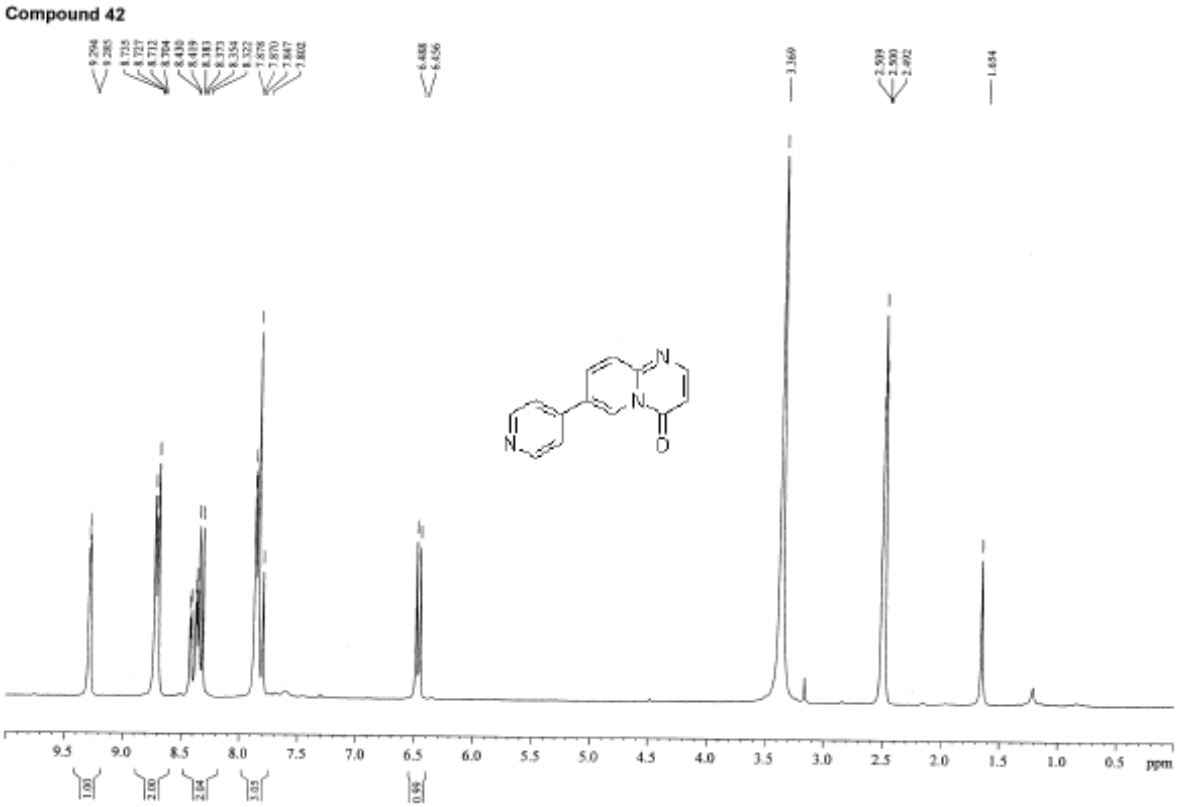

Figure S36. ^{1}H-NMR spectrum of 7-(4-pyridinyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**42**) (200 MHz)

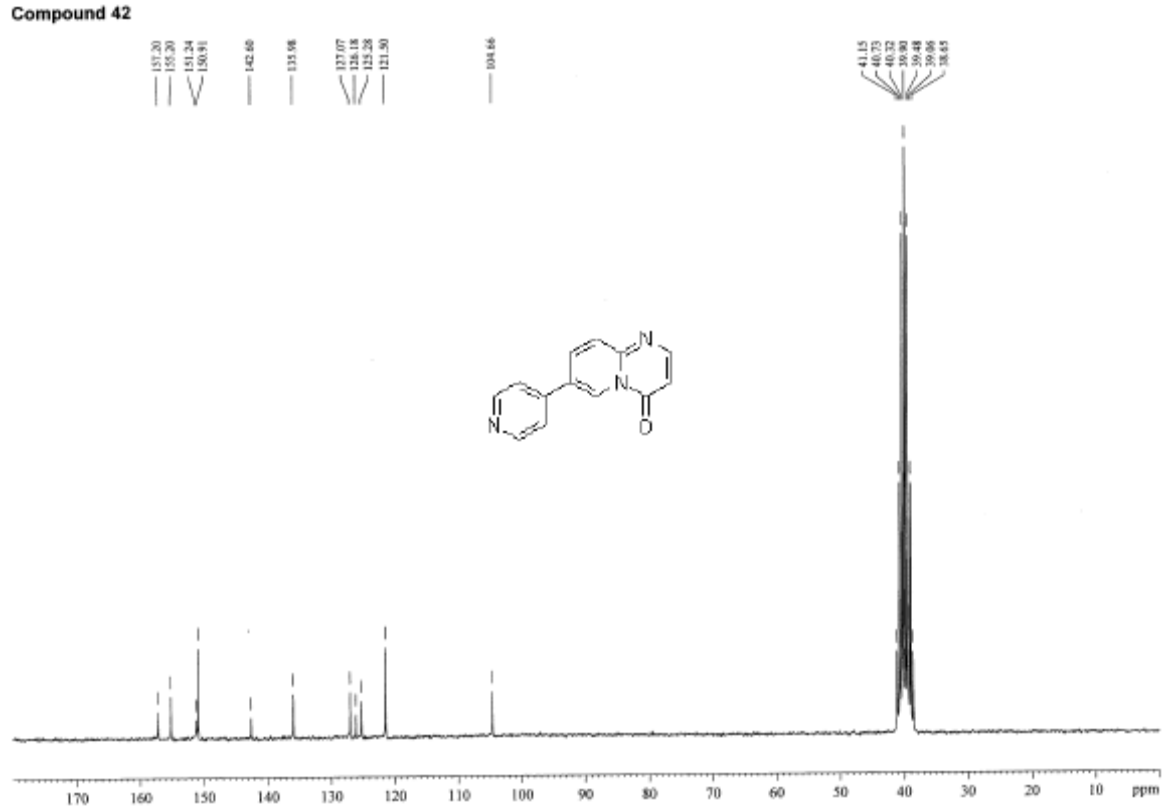

Figure S37. ^{13}C-NMR spectrum of 7-(4-pyridinyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**42**) (200 MHz)

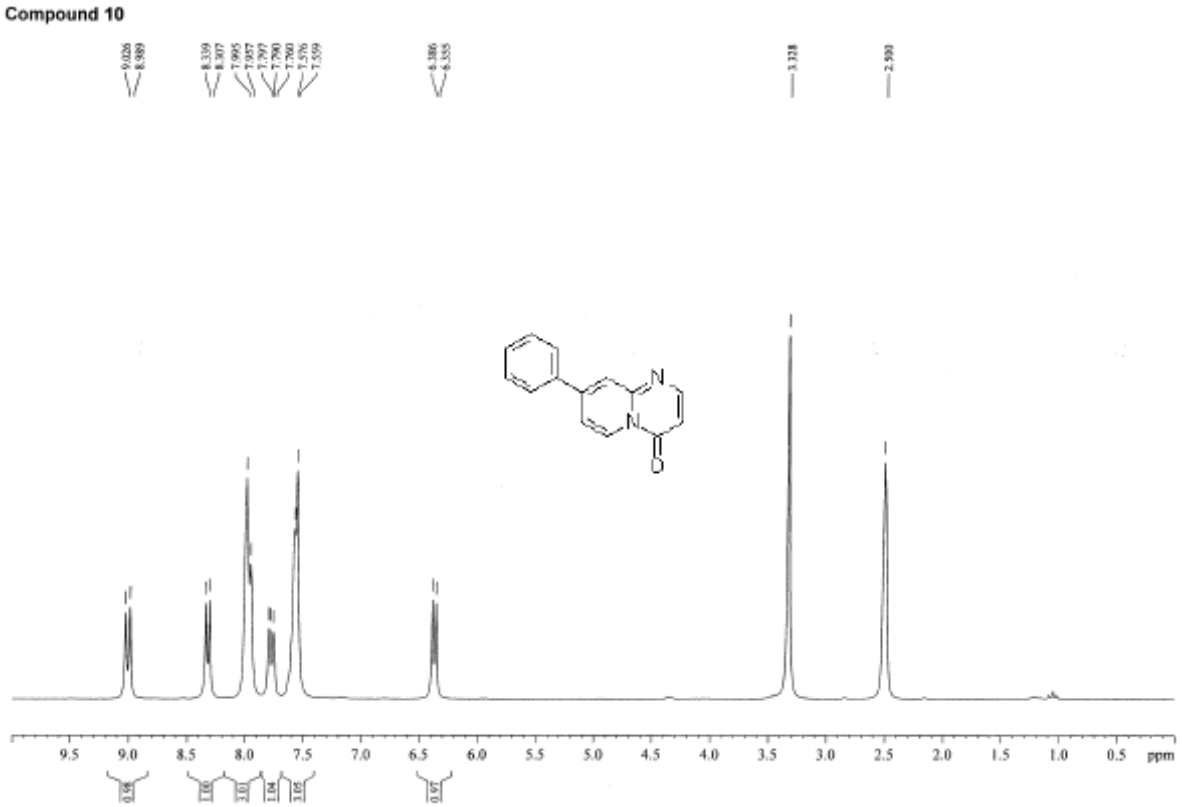

Figure S38. [1]H-NMR spectrum of 8-phenyl-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**10**) (200 MHz)

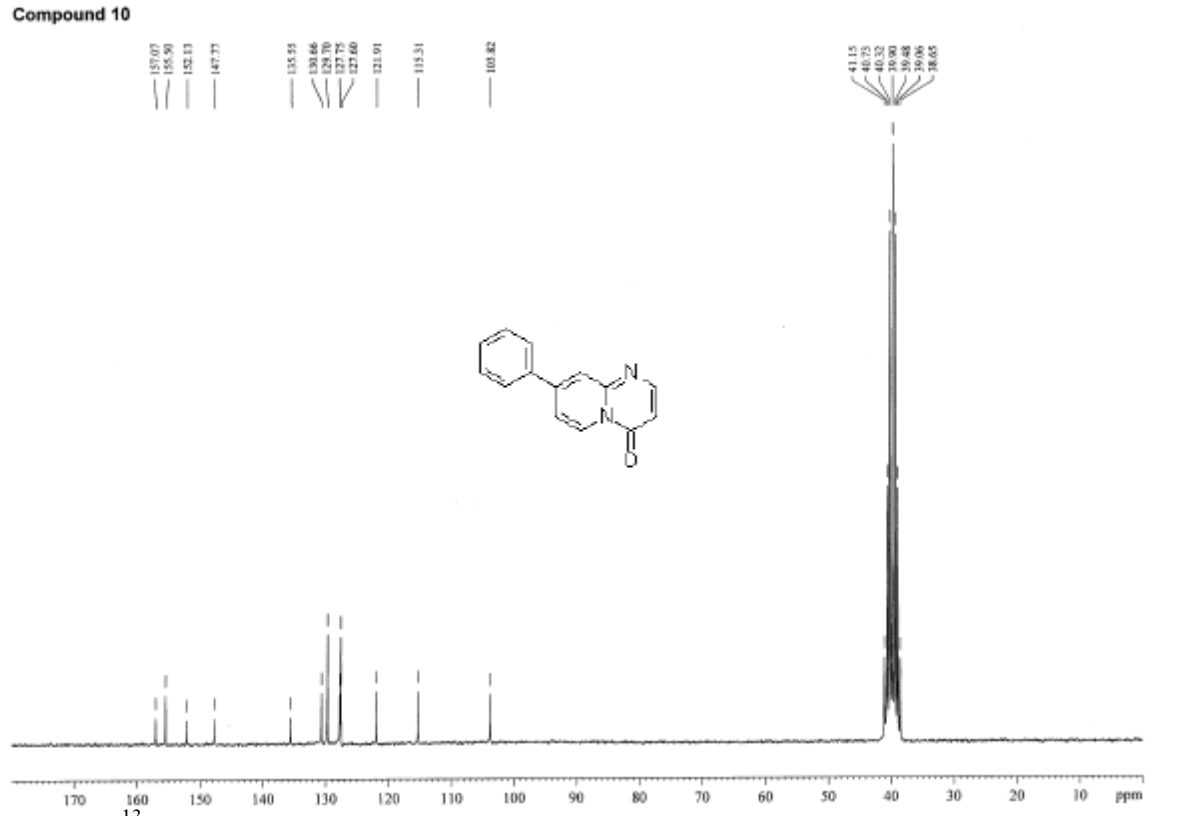

Figure S39. [13]C-NMR spectrum of 8-phenyl-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**10**) (200 MHz)

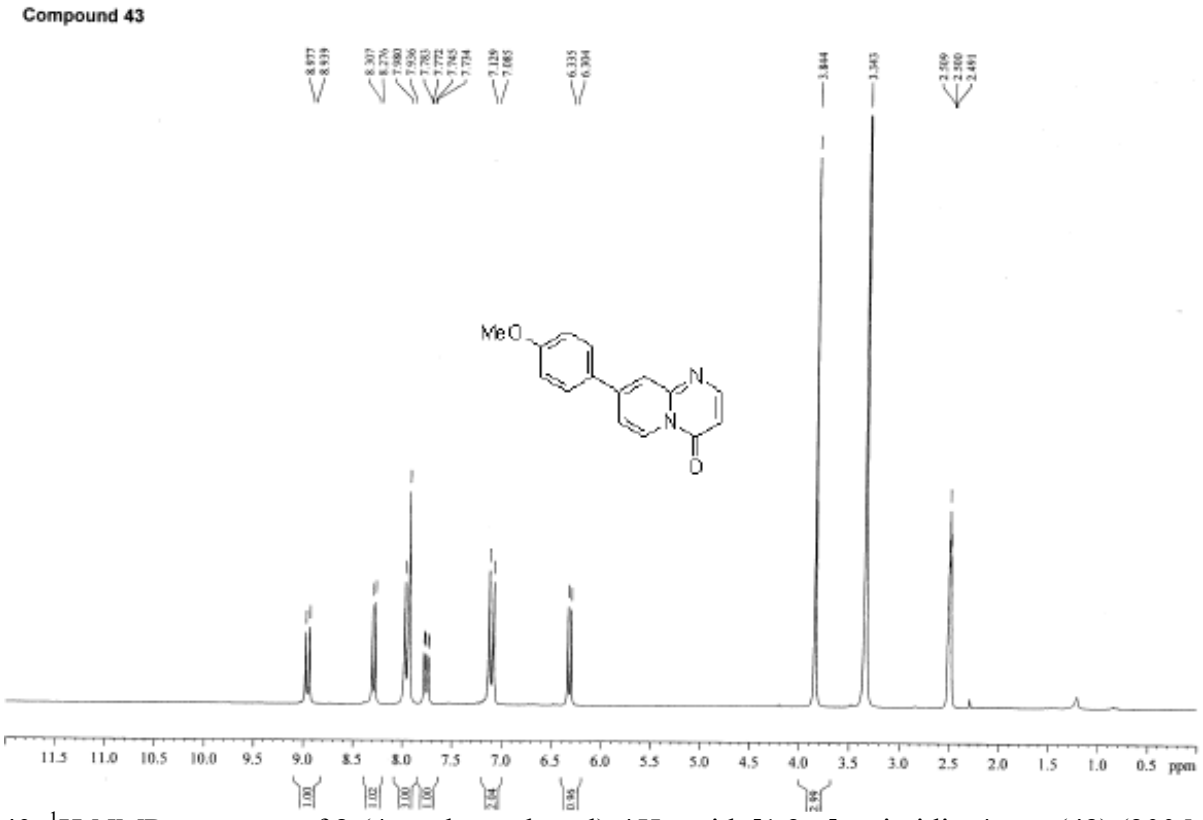

Figure S40. [1]H-NMR spectrum of 8-(4-methoxyphenyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**43**) (200 MHz)

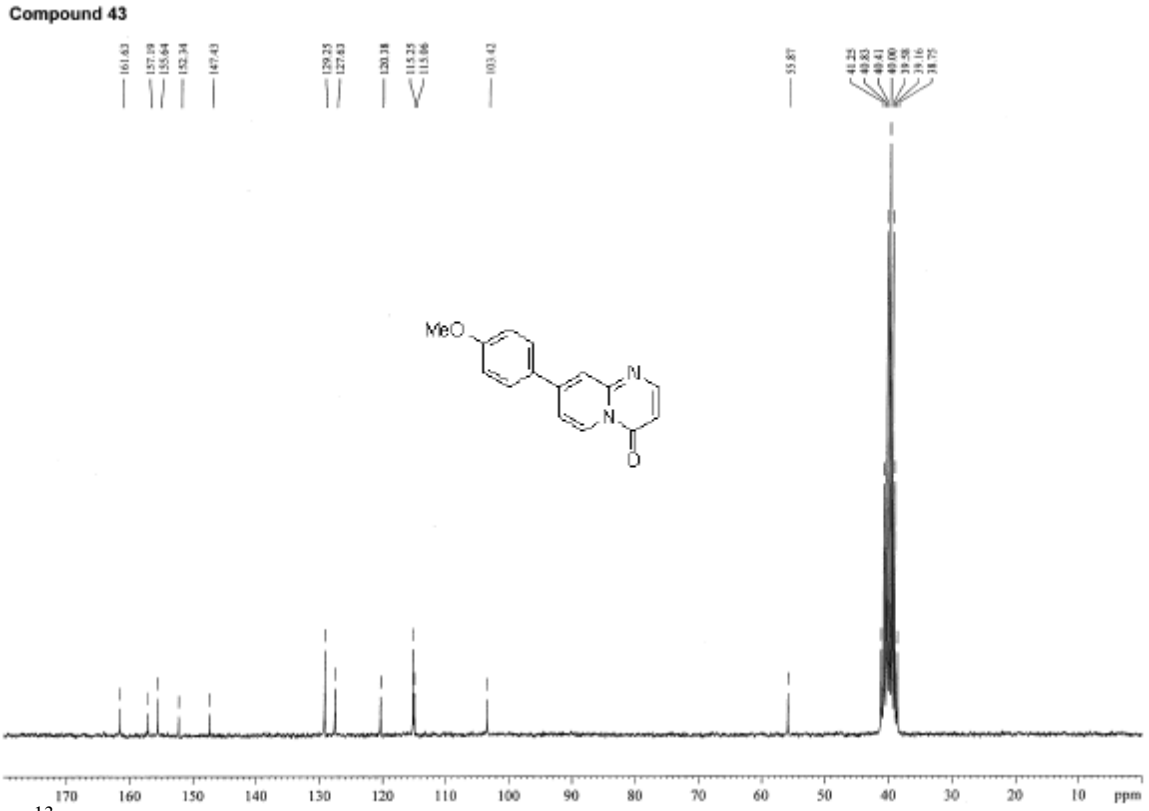

Figure S41. [13]C-NMR spectrum of 8-(4-methoxyphenyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**43**) (200 MHz)

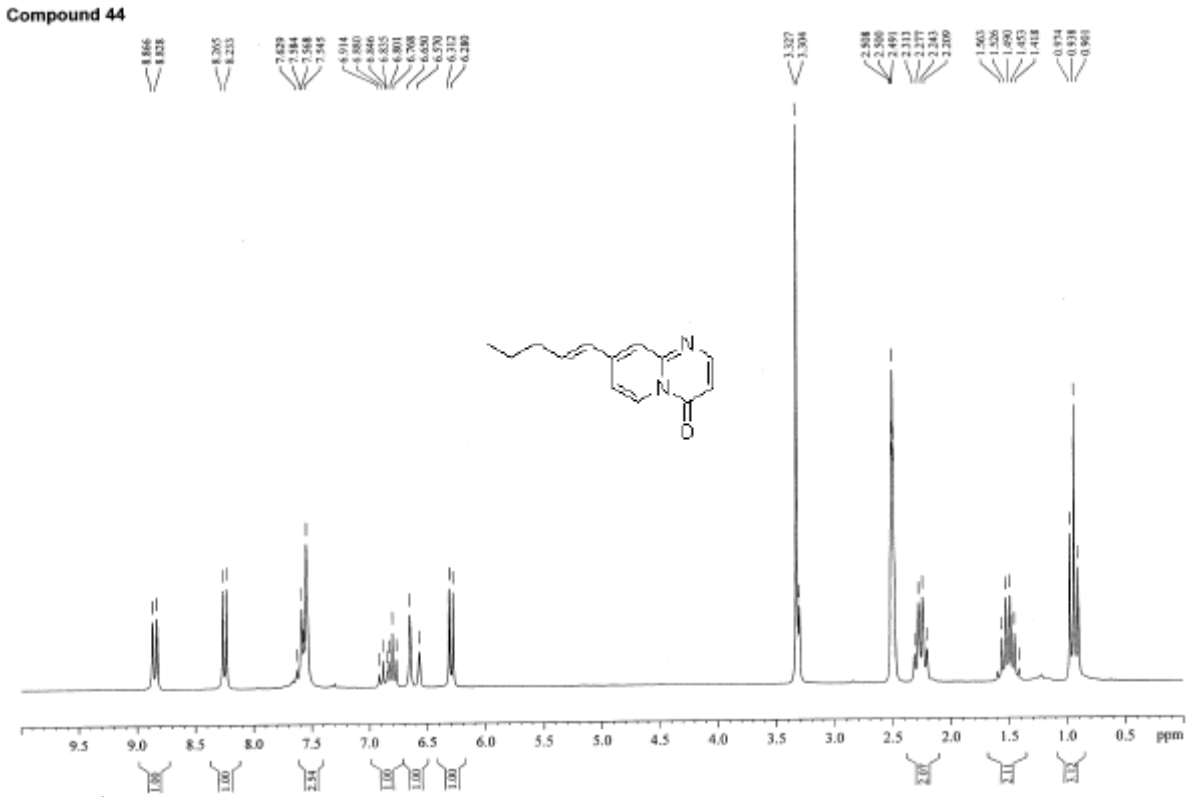

Figure S42. [1]H-NMR spectrum of 8-(1-pentenyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**44**) (200 MHz)

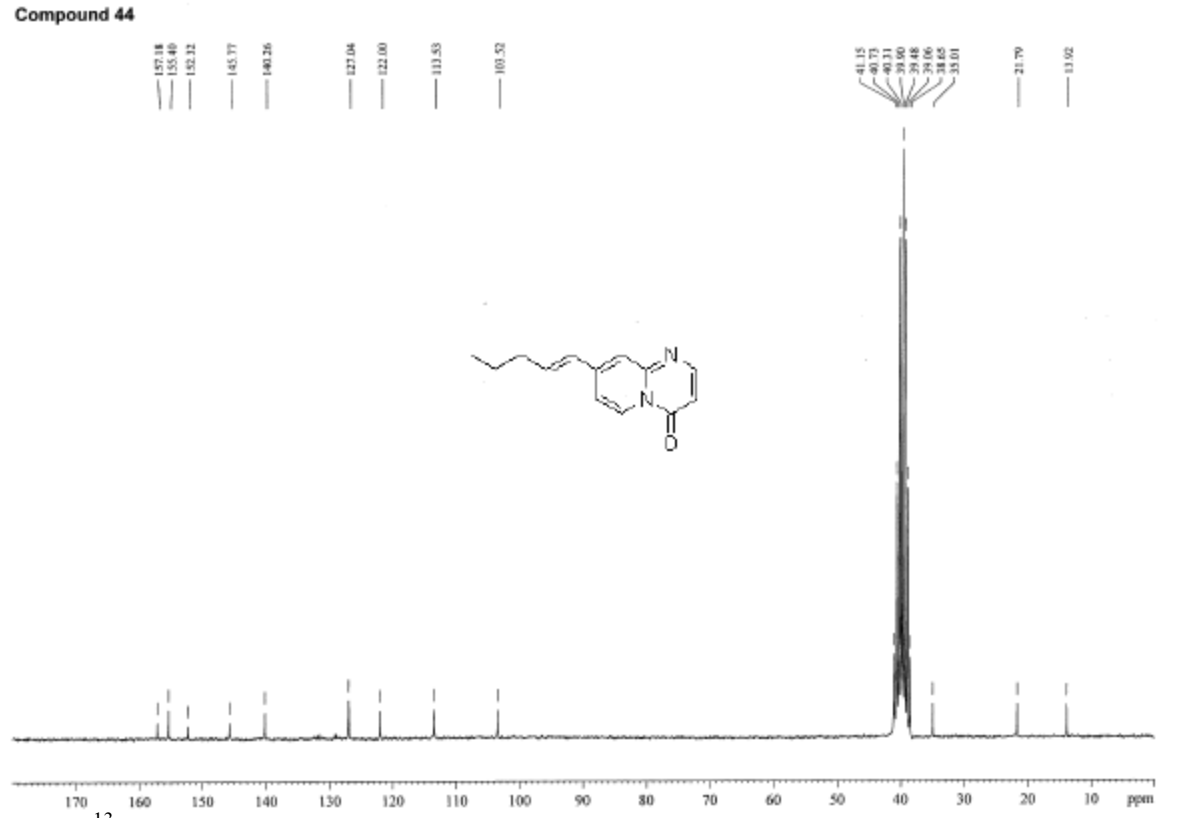

Figure S43. [13]C-NMR spectrum of 8-(1-pentenyl)-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**44**) (200 MHz)

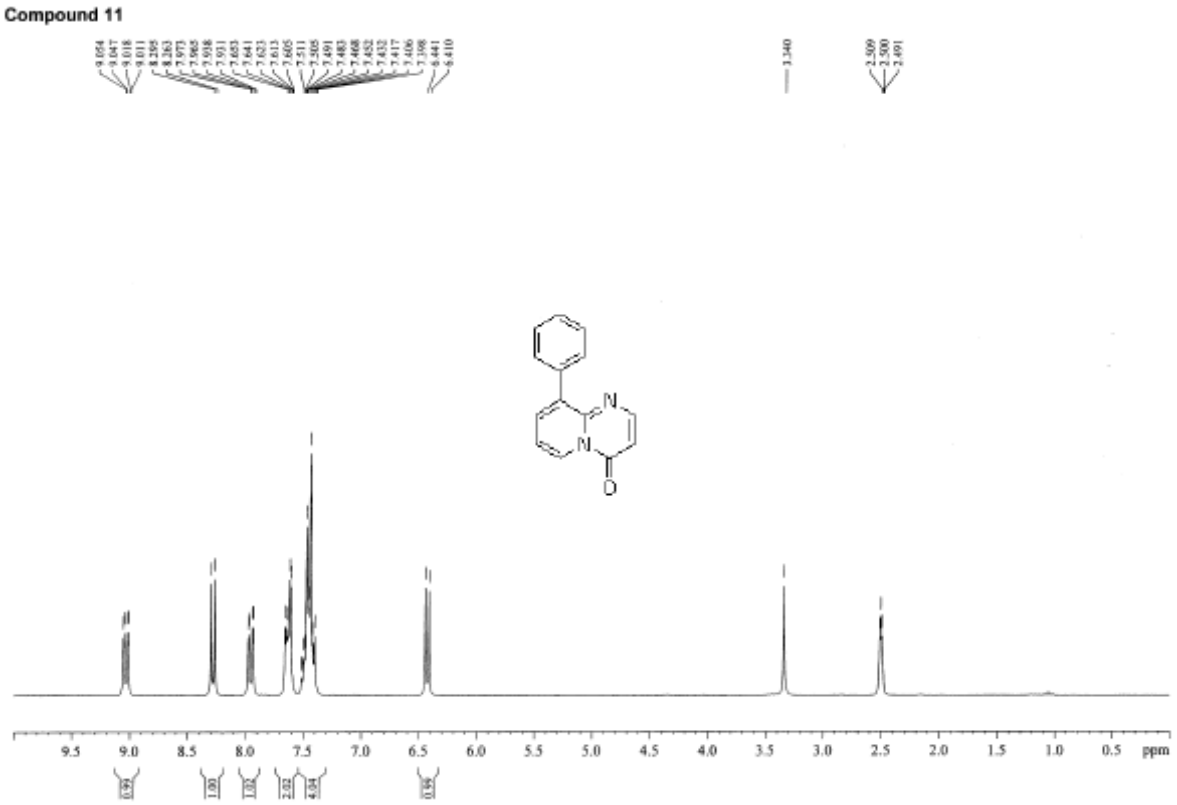

Figure S44. ^{1}H-NMR spectrum of 9-phenyl-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**11**) (200 MHz)

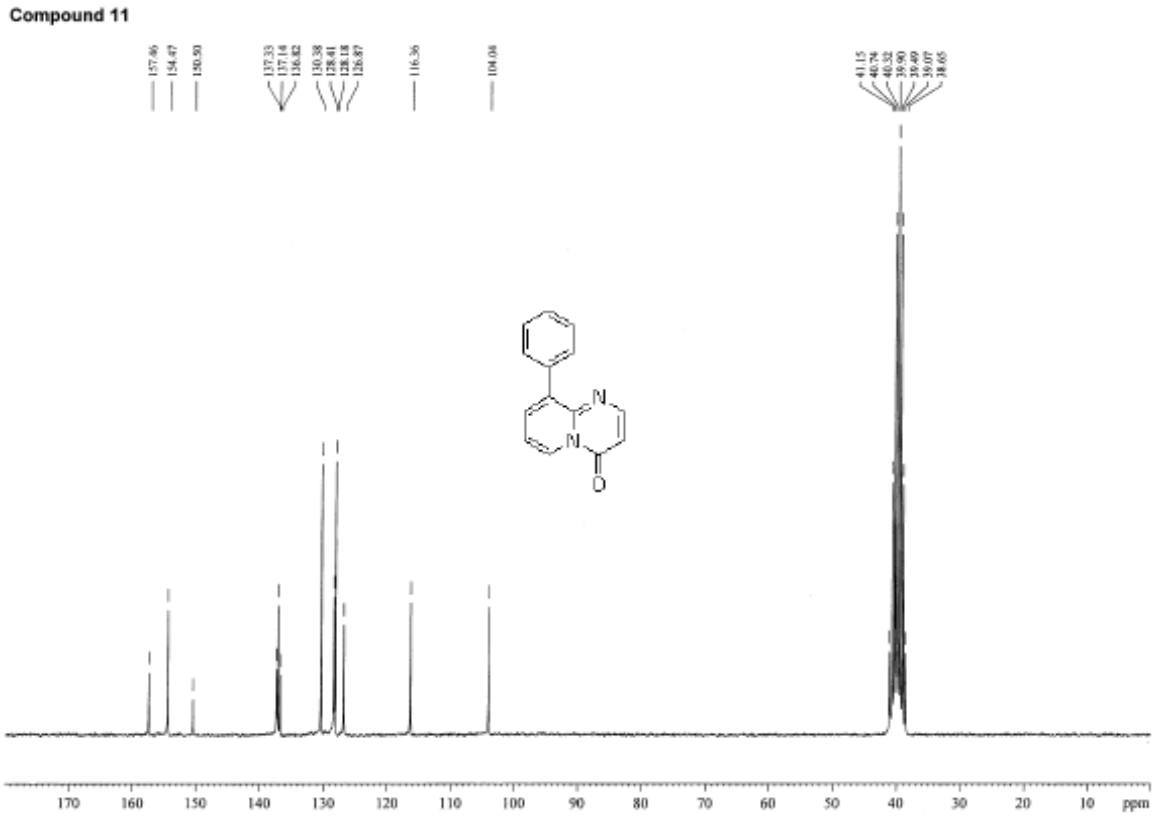

Figure S45. ^{13}C-NMR spectrum of 9-phenyl-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**11**) (200 MHz)

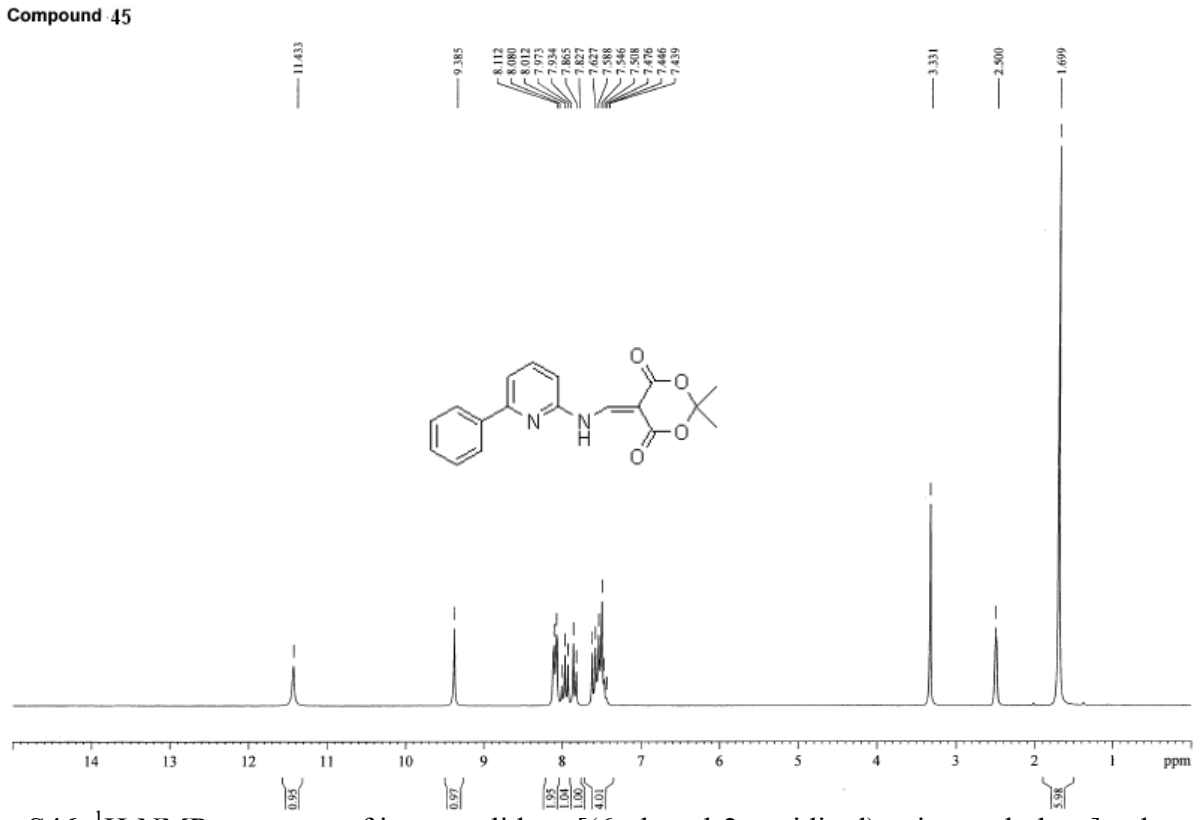

Figure S46. [1]H-NMR spectrum of isopropylidene [(6-phenyl-2-pyridinyl)aminomethylene]malonate (**46**) (200 MHz)

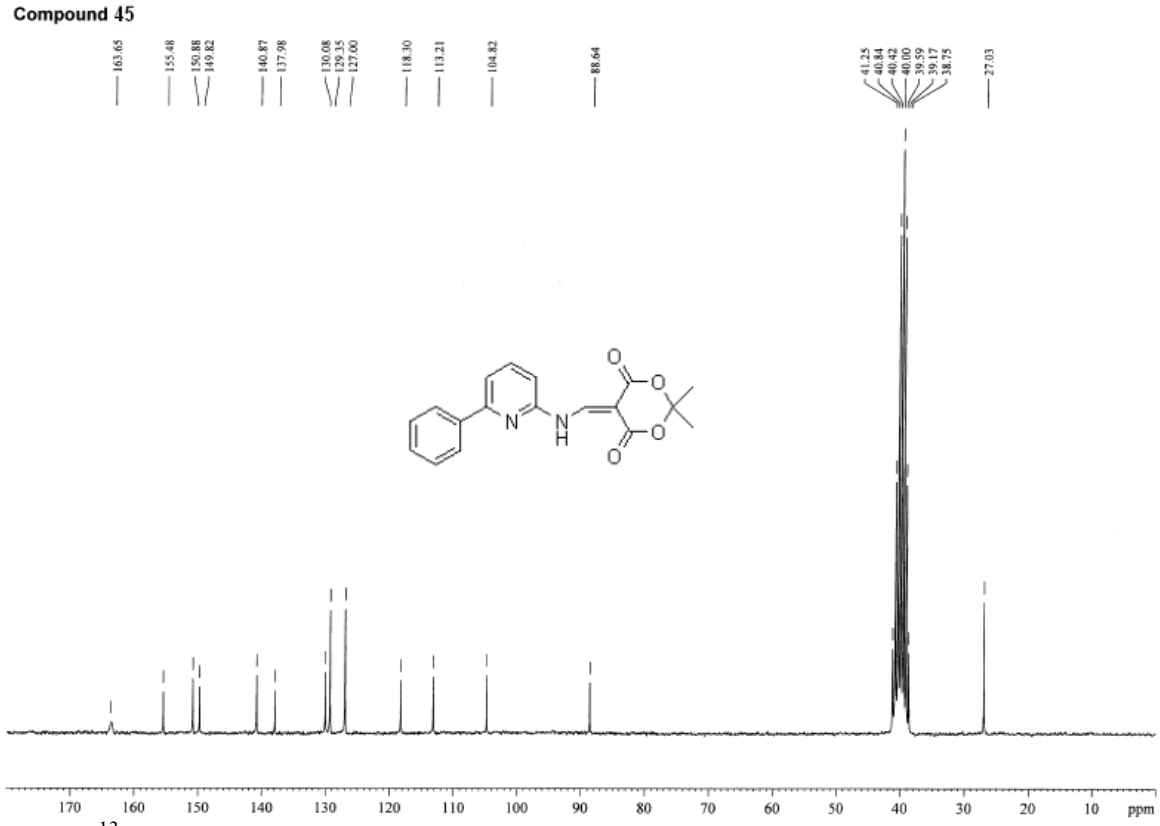

Figure S47. [13]C-NMR spectrum of isopropylidene [(6-phenyl-2-pyridinyl)aminomethylene]malonate (**46**) (200 MHz)

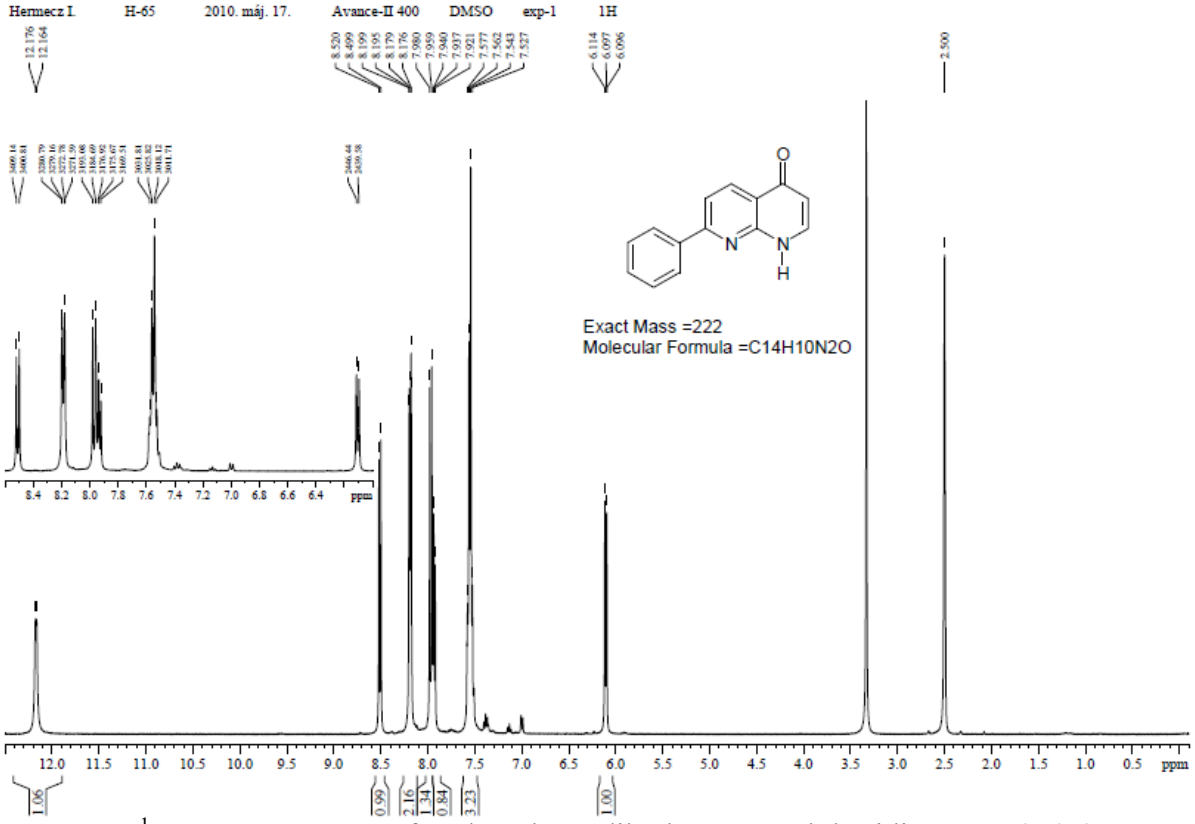

Figure S48. ^{1}H-NMR spectrum of 7-phenyl-1,4-dihydro-1,8-naphthyridin-4-one (**47**) (400 MHz)

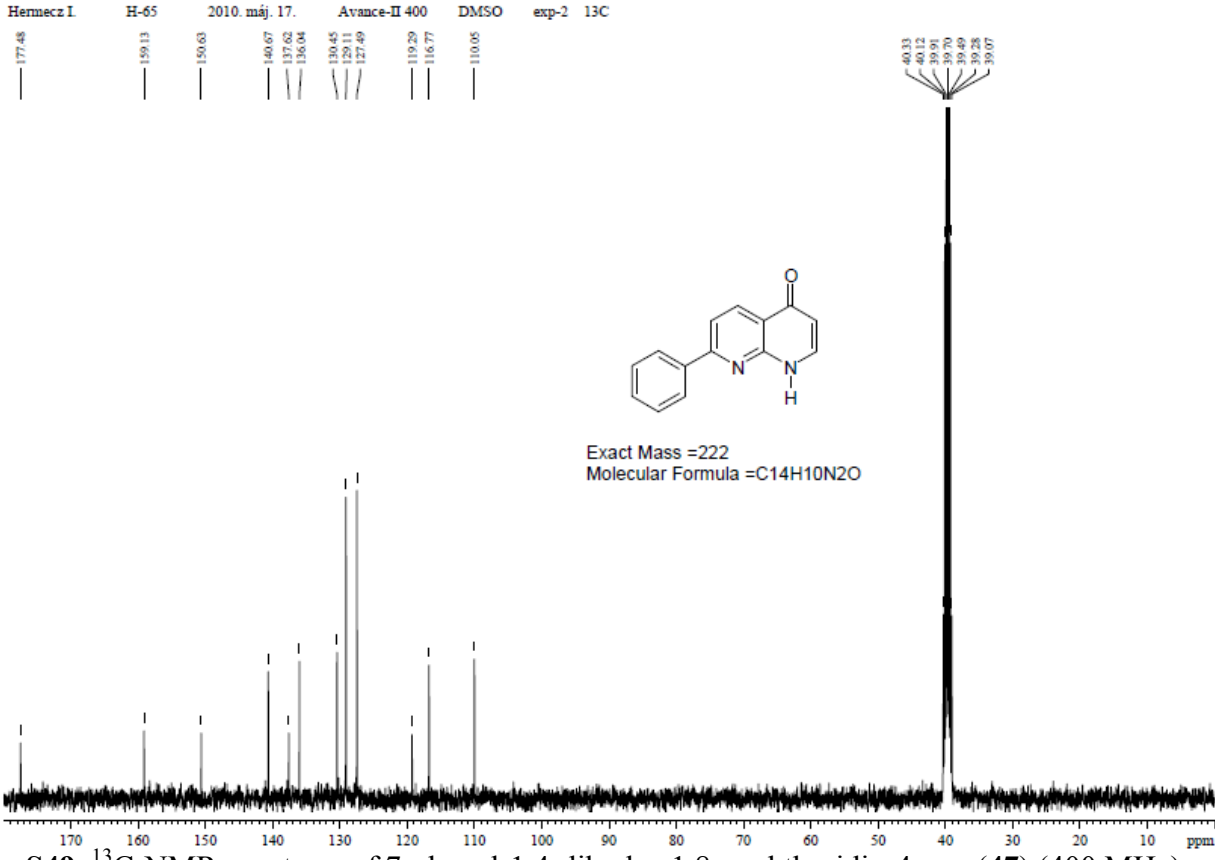

Figure S49. ^{13}C-NMR spectrum of 7-phenyl-1,4-dihydro-1,8-naphthyridin-4-one (**47**) (400 MHz)

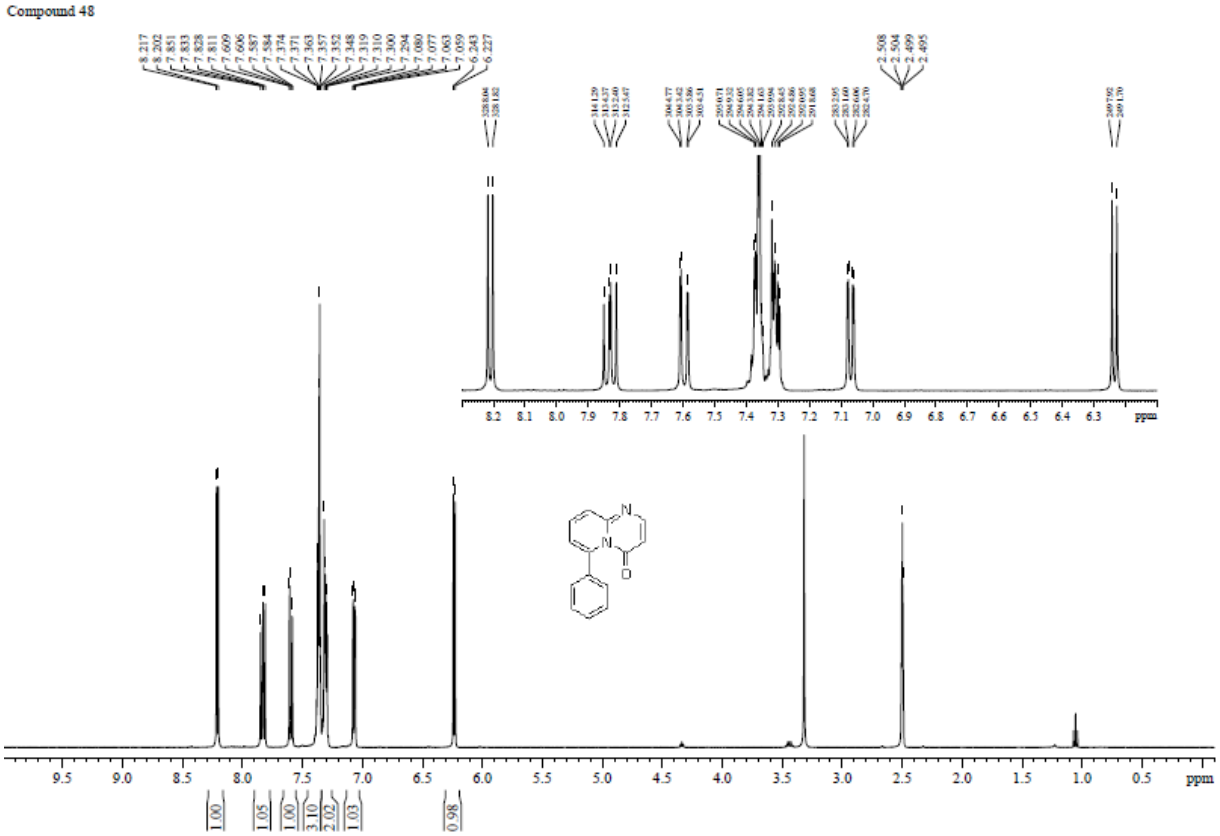

Figure S50. ^{1}H-NMR spectrum of 6-phenyl-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**48**) (200 MHz)

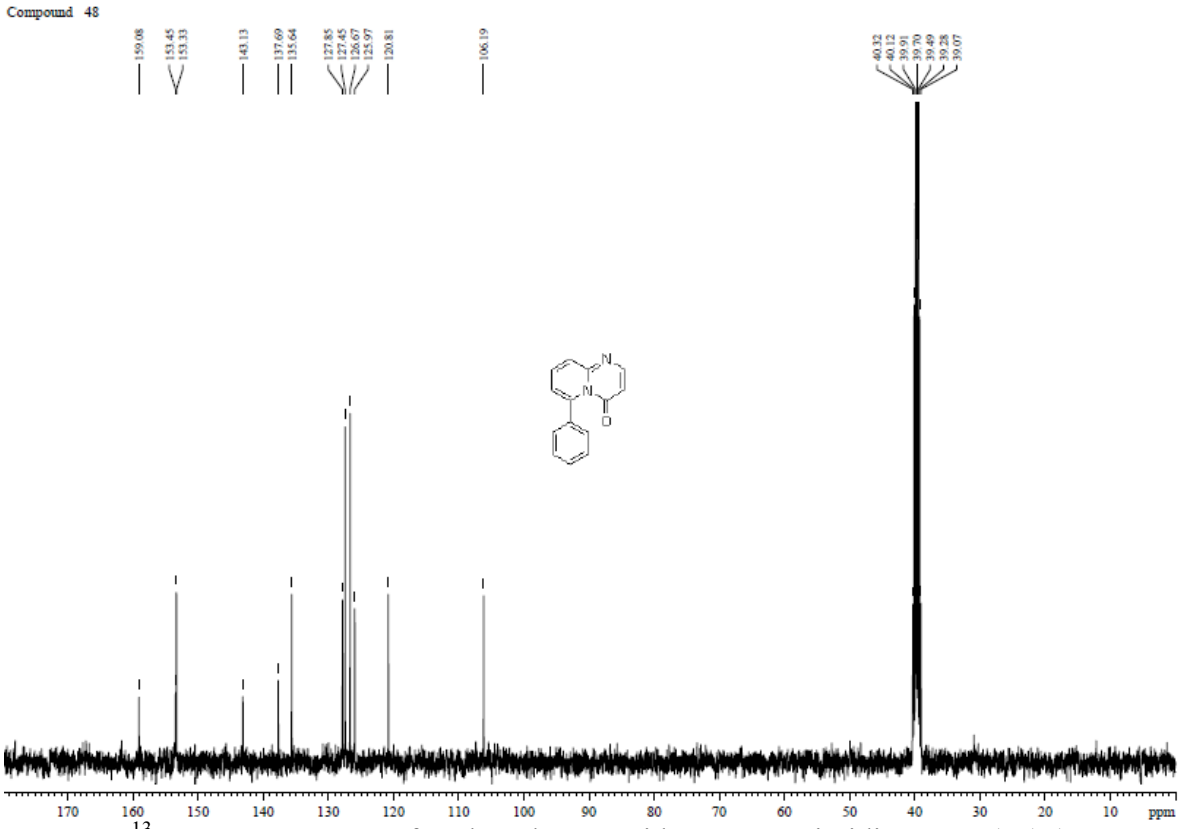

Figure S51. ^{13}C-NMR spectrum of 6-phenyl-4*H*-pyrido[1,2-*a*]pyrimidin-4-one (**48**) (200 MHz)