

**Metal-free synthesis of cyano acrylates via cyanuric chloride-mediated
three-component reactions involving a cascade consists of Knoevenagel
condensation/cyano hydration/esterification**

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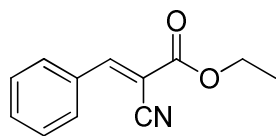
Contents

General information.....	S1
Characterization data.....	S2-S9
¹ H and ¹³ C NMR of all products.....	S10-S37

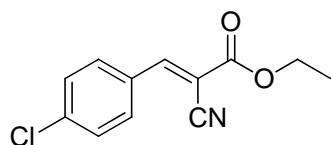
General information

All chemicals used in the experiments were obtained from commercial resource and used without further purification. Solvents used as eluent in the chromatography were distilled prior to use. The ¹H and ¹³C NMR were recorded in 400 MHz apparatus using CDCl₃, chemical shifts were reported in ppm relative to the CDCl₃ as internal standard. HMRS were tested under ESI model in a spectrometer equipped with TOF analyzer. And melting points were analyzed in an X-4A apparatus without temperature correction.

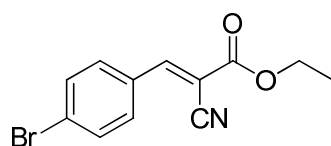
Characterization data



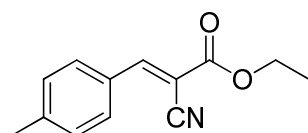
Ethyl 2-cyano-3-phenylacrylate (6a).^{1,2} ¹H NMR (400 MHz, CDCl₃): δ = 8.26 (s, 1 H), 8.00 (d, J = 7.2 Hz, 2 H), 7.59-7.49 (m, 3 H), 4.40 (q, J = 7.2 Hz, 2 H), 1.41 (t, J = 7.2 Hz, 3 H); ¹³C NMR (100 MHz, CDCl₃): δ = 162.5, 155.1, 133.4, 131.5, 131.1, 130.1, 115.5, 103.0, 62.8, 14.2.



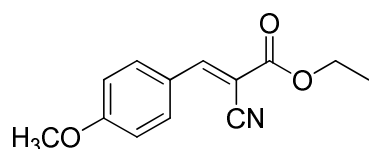
Ethyl 3-(4-chlorophenyl)-2-cyanoacrylate (6b).^{1,2} ¹H NMR (400 MHz, CDCl₃): δ = 8.20 (s, 1 H), 7.93 (d, 2 H, J = 8.0 Hz), 7.48 (d, J = 8.4 Hz, 2 H), 4.29 (q, J = 7.2 Hz, 2 H), 1.40 (t, J = 7.2 Hz, 3 H); ¹³C NMR (100 MHz, CDCl₃): δ = 162.2, 153.3, 139.6, 132.2, 129.9, 129.6, 115.2, 103.6, 62.8, 14.1.



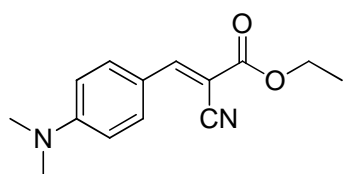
Ethyl 3-(4-bromophenyl)-2-cyanoacrylate (6c).³ ¹H NMR (400 MHz, CDCl₃): δ = 8.18 (s, 1 H), 7.85 (d, J = 7.6 Hz, 2 H), 7.64 (d, J = 8.4 Hz, 2 H), 4.39 (q, J = 7.2 Hz, 2 H), 1.40 (t, J = 7.2 Hz, 3 H); ¹³C NMR (100 MHz, CDCl₃): δ = 162.2, 153.5, 132.7, 132.2, 130.3, 128.2, 115.2, 103.7, 62.9, 14.1.



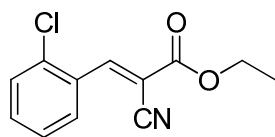
Ethyl 2-cyano-3-p-tolylacrylate (6d).^{1,2} ¹H NMR (400 MHz, CDCl₃): δ = 8.20 (s, 1 H), 7.88 (d, J = 8.0 Hz, 2 H), 7.28 (d, J = 8.0 Hz, 2 H), 4.37 (q, J = 7.2 Hz, 2 H), 2.42 (s, 3 H), 1.38 (t, J = 7.2 Hz, 3 H); ¹³C NMR (100 MHz, CDCl₃): δ = 162.2, 154.4, 144.1, 130.7, 129.5, 128.4, 115.2, 101.1, 62.0, 21.3, 13.6.



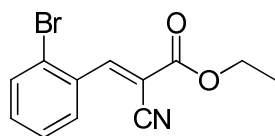
Ethyl 2-cyano-3-(4-methoxyphenyl)acrylate (6e).^{1,2} ¹H NMR (400 MHz, CDCl₃): δ = 8.15 (s, 1 H), 7.98 (d, J = 8.8 Hz, 2 H) 6.97 (d, J = 8.8 Hz, 2 H), 4.35 (q, J = 7.2 Hz, 2 H), 3.88 (s, 3 H), 1.38 (t, J = 7.2 Hz, 3 H); ¹³C NMR (100 MHz, CDCl₃): δ = 163.8, 163.1, 154.4, 133.6, 124.4, 116.2, 114.8, 99.4, 62.4, 55.6, 14.2.



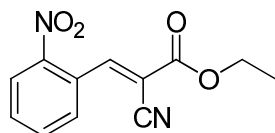
Ethyl 2-cyano-3-(4-(dimethylamino)phenyl)acrylate (6f).⁴ ¹H NMR (400 MHz, CDCl₃): δ = 8.05 (s, 1 H), 7.92 (d, J = 8.4 Hz, 2 H), 6.68 (t, J = 8.4 Hz, 2 H), 4.33 (q, J = 6.8 Hz, 2 H), 3.10 (s, 6 H), 1.37 (t, J = 6.8 Hz, 3 H); ¹³C NMR (100 MHz, CDCl₃): δ = 164.4, 154.4, 153.6, 134.0, 119.3, 117.5, 111.5, 93.8, 61.8, 39.9, 14.3.



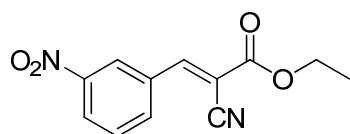
Ethyl 3-(2-chlorophenyl)-2-cyanoacrylate (6g).⁴ ¹H NMR (400 MHz, CDCl₃): δ = 8.69 (s, 1 H), 8.24-8.22 (m, 1 H), 7.52-7.41 (m, 3 H), 4.43 (q, J = 6.8 Hz, 2 H), 1.41 (t, J = 7.2 Hz, 3 H); ¹³C NMR (100 MHz, CDCl₃): δ = 161.8, 151.3, 136.4, 133.7, 130.4, 129.9, 127.5, 114.8, 106.1, 63.00, 14.0.



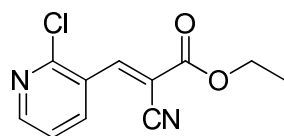
Ethyl 3-(2-bromophenyl)-2-cyanoacrylate (6h). Pale yellow solid, m.p. 68-70 °C; ¹H NMR (400 MHz, CDCl₃): δ = 8.64 (s, 1 H), 8.17 (d, J = 7.6 Hz, 1 H) 7.71 (d, J = 8.0 Hz, 1 H), 7.46 (t, J = 7.6 Hz, 1 H), 7.39 (t, J = 7.6 Hz, 1 H), 4.42 (q, J = 7.2 Hz, 2 H), 1.42 (t, J = 7.2 Hz, 3 H); ¹³C NMR (100 MHz, CDCl₃): δ = 161.7, 153.8, 133.6, 131.7, 130.1, 128.0, 126.5, 114.6, 62.9, 14.1. ESI-HRMS Calcd for C₁₂H₁₁BrNO₂ [M + H]⁺, 279.9968; found, 279.9960.



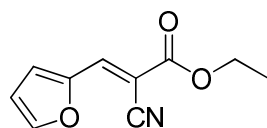
Ethyl 2-cyano-3-(2-nitrophenyl)acrylate (6i).⁵ ¹H NMR (400 MHz, CDCl₃): δ = 8.72 (s, 1 H), 8.29 (d, J = 8.4 Hz, 1 H), 7.78-7.73 (m, 2 H), 7.28 (m, 1 H), 4.45-4.40 (m, 2 H), 1.42 (t, J = 7.2 Hz, 3 H); ¹³C NMR (100 MHz, CDCl₃): δ = 161.0, 152.9, 147.4, 134.4, 132.2, 130.6, 128.1, 125.4, 113.8, 108.7, 63.1, 14.01.



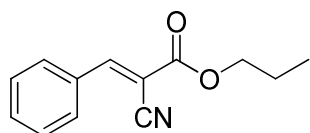
Ethyl 2-cyano-3-(3-nitrophenyl)acrylate (6j).⁴ ¹H NMR (400 MHz, CDCl₃): δ = 8.71(s, 1 H), 8.43-8.40 (m, 2 H), 8.32 (s, 1 H), 7.75 (t, 1 H, J = 8.0 Hz), 4.44 (q, 2 H, J = 7.2 Hz), 1.42 (t, J = 7.2 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃): δ = 160.9, 151.2, 148.2, 134.6, 132.5, 130.0, 126.4, 125.3, 113.9, 106.3, 62.7, 13.5.



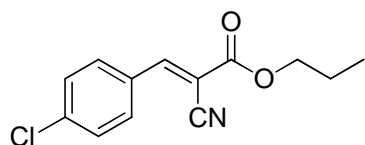
Ethyl 3-(2-chloropyridin-3-yl)-2-cyanoacrylate (6k). White solid, m.p. 68-69 °C; ¹H NMR (400 MHz, CDCl₃): δ = 8.60 (s, 1 H), 8.54 (d, J = 6.4 Hz, 2 H), 7.44 (t, J = 6.4 Hz, 1 H), 4.43 (q, J = 6.8 Hz, 2 H), 1.43 (t, J = 6.8 Hz, 3 H); ¹³C NMR (100 MHz, CDCl₃): δ = 160.6, 152.0, 151.8, 148.9, 137.7, 126.3, 122.4, 113.7, 107.9, 62.7, 13.6; ESI-HRMS Calcd for C₁₁H₁₀ClN₂O₂ [M+H]⁺, 237.0425; found, 237.0418.



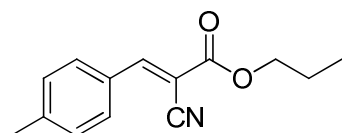
Ethyl 2-cyano-3-(furan-2-yl)acrylate (6l).⁴ ¹H NMR (400 MHz, CDCl₃): δ = 8.02 (s, 1 H), 7.75 (d, J = 8.4 Hz, 1 H), 7.40 (s, 1H), 6.64 (s, 1 H), 4.39-4.344 (q, J = 6.8 Hz, 2 H), 1.38 (t, J = 7.2 Hz, 3 H); ¹³C NMR (100 MHz, CDCl₃): δ = 162.5, 148.8, 148.2, 139.4, 121.6, 115.2, 113.8, 98.7, 62.5, 14.1.



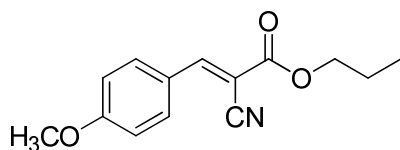
Propyl 2-cyano-3-phenylacrylate (6m). White solid, m.p. 48-50 °C; ^1H NMR (400 MHz, CDCl_3), $\delta = 8.24$ (s, 1 H), 7.98 (d, $J = 8.0$ Hz, 2 H), 7.55-7.47 (m, 3 H), 4.29 (t, $J = 6.4$ Hz, 2 H), 1.82-1.76 (m, 2 H), 1.02 (t, $J = 7.2$ Hz, 3 H); ^{13}C NMR (100 MHz, CDCl_3): $\delta = 162.5, 154.9, 133.2, 131.5, 131.0, 129.2, 115.4, 103.0, 68.1, 21.9, 10.3$; ESI-HRMS Calcd for $\text{C}_{13}\text{H}_{14}\text{NO}_2$ $[\text{M}+\text{H}]^+$, 216.1019; found, 216.1024.



Propyl 3-(4-chlorophenyl)-2-cyanoacrylate (6n). White solid, m.p. 81-83 °C; ^1H NMR (400 MHz, CDCl_3): $\delta = 8.12$ (s, 1 H), 7.86 (d, $J = 8.4$ Hz, 2 H), 7.40 (d, $J = 8.4$ Hz, 2 H), 4.21 (t, $J = 6.8$ Hz, 2 H), 1.76-1.63 (m, 2 H), 0.95 (t, $J = 7.2$ Hz, 3 H); ^{13}C NMR (100 MHz, CDCl_3): $\delta = 162.3, 153.3, 139.6, 132.2, 129.9, 129.7, 115.2, 103.6, 68.3, 21.9, 10.3$; ESI-HRMS Calcd for $\text{C}_{13}\text{H}_{13}\text{ClNO}_2$ $[\text{M}+\text{H}]^+$, 250.0629; found, 250.0628.

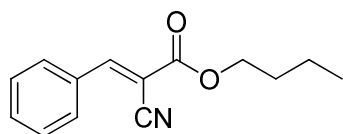


Propyl 2-cyano-3-p-tolylacrylate (6o). Colorless liquid; ^1H NMR (400 MHz, CDCl_3): $\delta = 8.20$ (s, 1 H), 7.89 (d, $J = 8.0$ Hz, 2 H), 7.30 (d, $J = 8.0$ Hz, 2 H), 4.27 (t, $J = 6.4$ Hz, 2 H), 2.43 (s, 3 H), 1.82-1.76 (m, 2 H), 1.02 (t, $J = 7.2$ Hz, 3 H); ^{13}C NMR (100 MHz, CDCl_3): $\delta = 162.80, 154.9, 144.6, 131.2, 130.0, 128.9, 115.7, 101.6, 68.0, 21.9, 21.8, 10.2$; ESI-HRMS Calcd for $\text{C}_{14}\text{H}_{16}\text{NO}_2$ $[\text{M}+\text{H}]^+$, 230.1176; found, 230.1169.

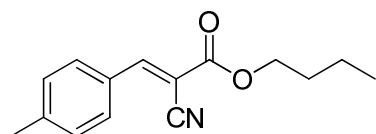


Propyl 2-cyano-3-(4-methoxyphenyl)acrylate (6p). Yellow liquid; ^1H NMR (400

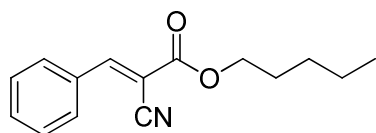
MHz, CDCl_3), $\delta = 8.15$ (s, 1 H), 7.99 (d, $J = 8.8$ Hz, 2 H) 6.98 (d, $J = 8.8$ Hz, 2 H), 4.26 (t, $J = 6.8$ Hz, 2 H), 3.89 (s, 3H), 1.80-1.75 (m, 2 H), 1.02 (t, $J = 7.2$ Hz, 3 H); ^{13}C NMR (100 MHz, CDCl_3) $\delta = 163.8, 163.1, 154.2, 133.6, 124.4, 116.1, 114.8, 99.4, 67.8, 55.6, 21.9, 10.3$; ESI-HRMS Calcd for $\text{C}_{14}\text{H}_{16}\text{NO}_3[\text{M}+\text{H}]^+$, 246.1125; found, 246.1120.



Butyl 2-cyano-3-phenylacrylate (6q). White solid, m.p. 107-109 °C; ^1H NMR (400 MHz, CDCl_3): $\delta = 8.25$ (s, 1 H), 7.99 (d, $J = 8.4$ Hz, 2 H), 7.56-7.48 (m, 3 H), 4.34 (t, $J = 6.8$ Hz, 2 H), 1.77-1.72 (m, 2 H), 1.50-1.44 (m, 2 H), 0.98 (t, $J = 7.6$ Hz, 3 H); ^{13}C NMR (100 MHz, CDCl_3): $\delta = 162.5, 154.9, 133.2, 131.5, 131.0, 129.3, 115.4, 103.2, 66.5, 30.5, 19.0, 13.6$; ESI-HRMS Calcd for $\text{C}_{14}\text{H}_{16}\text{NO}_2[\text{M}+\text{H}]^+$, 230.1176; found, 230.1162.

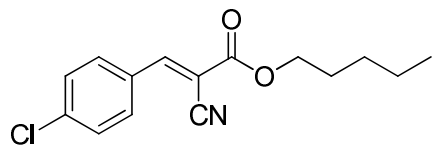


Butyl 2-cyano-3-p-tolylacrylate (6r). Yellow liquid; ^1H NMR (400 MHz, CDCl_3): $\delta = 8.20$ (s, 1 H), 7.89 (d, $J = 7.6$ Hz, 2 H), 7.30 (d, $J = 8.0$ Hz, 2 H), 4.31 (t, $J = 6.4$ Hz, 2 H), 2.43 (s, 3 H), 1.76-1.72 (m, 2 H), 1.49-1.44 (m, 2 H), 0.98 (t, $J = 7.2$ Hz, 3 H); ^{13}C NMR (100 MHz, CDCl_3): $\delta = 162.8, 154.9, 144.6, 131.2, 130.0, 128.9, 115.7, 101.6, 66.4, 30.5, 21.8, 19.0, 13.6$; ESI-HRMS Calcd for $\text{C}_{15}\text{H}_{18}\text{NO}_2[\text{M}+\text{H}]$, 244.1332; found, 244.1318.

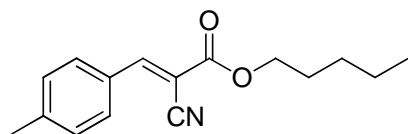


Pentyl 2-cyano-3-phenylacrylate (6s). White solid, m.p. 99-101 °C; ^1H NMR (400 MHz, CDCl_3). $\delta = 8.25$ (s, 1 H), 7.99 (d, $J = 8.4$ Hz, 2 H), 7.56-7.48 (m, 3 H), 4.32 (t, $J = 6.8$ Hz, 2 H), 1.78-1.73 (m, 2 H), 1.43-1.35 (m, 4 H), 0.93 (t, $J = 7.2$ Hz, 3 H); ^{13}C NMR (100 MHz, CDCl_3): $\delta = 162.5, 154.9, 133.2, 131.5, 131.0, 129.2, 115.4, 103.2,$

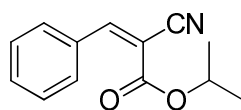
66.8, 28.2, 27.9, 22.2, 13.9; ESI-HRMS Calcd for $C_{15}H_{18}NO_2[M+H]^+$, 244.1332; found, 244.1327.



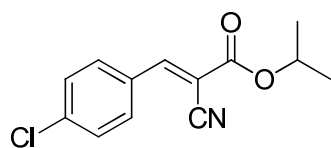
Pentyl 3-(4-chlorophenyl)-2-cyanoacrylate (6t). White solid, m.p. 78-79 °C; 1H NMR (400 MHz, $CDCl_3$): δ = 8.19 (s, 1 H), 7.94 (d, J = 8.4 Hz, 2 H), 7.48 (d, J = 8.4 Hz, 2 H), 4.32 (t, J = 6.8 Hz, 2 H), 1.79-1.73 (m, 2 H), 1.43-1.35 (m, 4 H), 0.93 (t, J = 6.8 Hz, 3 H); ^{13}C NMR (100 MHz, $CDCl_3$): δ = 162.3, 153.3, 139.6, 132.2, 129.9, 129.7, 115.2, 103.6, 66.9, 28.2, 27.9, 22.2, 13.9; ESI-HRMS Calcd for $C_{15}H_{17}ClNO_2[M+H]^+$, 278.0942; found, 278.0937.



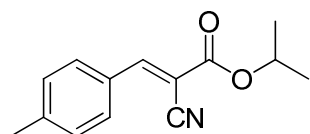
Pentyl 2-cyano-3-p-tolylacrylate (6u). Pale yellow solid, m.p. 43-45 °C; 1H NMR (400 MHz, $CDCl_3$): δ = 8.21 (s, 1 H), 7.90 (d, J = 8.0 Hz, 2 H), 7.30 (d, J = 6.8 Hz, 2 H), 4.31 (t, J = 6.8 Hz, 2 H), 2.43 (s, 3 H), 1.78-1.74 (m, 2 H), 1.41-1.37 (m, 4 H), 0.92 (t, J = 8.8, 3 H); ^{13}C NMR (100 MHz, $CDCl_3$): δ = 162.8, 154.9, 144.6, 131.2, 130.0, 128.9, 115.7, 101.6, 66.7, 28.2, 27.9, 22.2, 21.8, 13.9; ESI-HRMS Calcd for $C_{16}H_{20}NO_2[M+H]^+$, 258.1489; found, 258.1476.



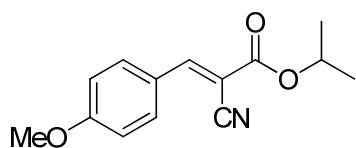
Isopropyl 2-cyano-3-phenylacrylate (6v). Yellow solid, m.p. 69-70 °C; 1H NMR (400 MHz, $CDCl_3$): δ = 8.24 (s, 1 H), 7.99 (t, J = 7.2 Hz, 2 H), 7.57-7.45 (m, 3 H), 5.24-5.17 (m, 1 H), 1.38 (d, J = 6.4 Hz, 6 H); ^{13}C NMR (100 MHz, $CDCl_3$): δ = 161.9, 154.7, 133.2, 131.6, 131.0, 129.2, 115.4, 103.5, 70.8, 21.7; ESI-HRMS Calcd for $C_{13}H_{14}NO_2[M+H]^+$, 216.1019; found, 216.1031.



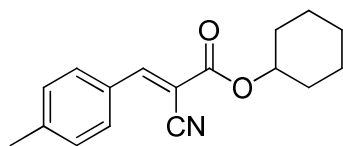
Isopropyl 3-(4-chlorophenyl)-2-cyanoacrylate (6w). White solid, m.p. 107-109 °C; ¹H NMR (400 MHz, CDCl₃): δ = 8.18 (s, 1 H), 7.93 (d, *J* = 8.4 Hz, 2 H), 7.47 (d, *J* = 8.4 Hz, 2 H), 5.24-5.17 (m, 1 H), 1.38 (d, *J* = 6.4 Hz, 6 H); ¹³C NMR (100 MHz, CDCl₃): δ = 161.7, 153.0, 139.4, 132.1, 130.0, 129.6, 115.2, 104.1, 71.0, 21.7; ESI-HRMS Calcd for C₁₃H₁₃ClNO₂[M+H]⁺, 250.0629; found, 250.0629.



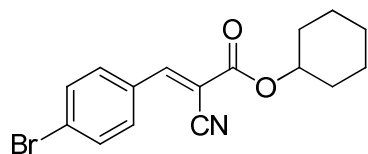
Isopropyl 2-cyano-3-*p*-tolylacrylate (6x). Yellow liquid; ¹H NMR (400 MHz, CDCl₃): δ = 8.19 (s, 1 H), 7.89 (d, *J* = 7.6 Hz, 2 H), 7.29 (d, *J* = 7.2 Hz, 2 H), 5.24-5.13 (m, 1 H), 2.43 (s, 3 H), 1.37 (d, *J* = 6.0 Hz, 6 H); ¹³C NMR (100 MHz, CDCl₃): δ = 162.2, 154.7, 144.5, 131.2, 130.0, 129.0, 115.7, 102.1, 70.6, 21.8, 21.7; ESI-HRMS Calcd for C₁₄H₁₆NO₂[M+H]⁺, 230.1176; found, 230.1181.



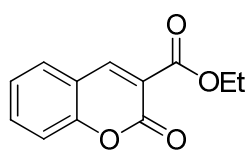
Isopropyl 2-cyano-3-(4-methoxyphenyl)acrylate (6y). Yellow solid, m.p. 112-113 °C; ¹H NMR (400 MHz, CDCl₃): δ = 8.15 (s, 1 H), 7.99 (d, *J* = 8.8 Hz, 2 H), 6.99 (d, *J* = 8.8 Hz, 2 H), 5.22-5.15 (m, 1 H), 3.89 (s, 1 H), 1.37 (d, *J* = 6.4 Hz, 6 H); ¹³C NMR (100 MHz, CDCl₃): δ = 163.7, 162.6, 154.1, 133.5, 124.4, 116.1, 114.7, 99.9, 70.3, 55.6, 21.7; ESI-HRMS Calcd for C₁₄H₁₆NO₃[M+H]⁺, 246.1125; found, 246.1129.



Cyclohexyl 2-cyano-3-(*p*-tolyl)acrylate (6z). White solid, m.p. 82-83 °C; ¹H NMR (400 MHz, CDCl₃): δ = 8.19 (s, 1 H), 7.89 (d, 2 H, *J* = 8.0 Hz), 7.29 (d, 2 H, *J* = 8.0 Hz); 5.01-4.95 (m, 1 H), 2.43 (s, 3 H), 1.92-1.89 (m, 2 H), 1.79-1.78 (m, 2 H), 1.65-1.57 (m, 3 H), 1.44-1.33 (m, 3 H); ¹³C NMR (100 MHz, CDCl₃): δ = 162.1, 154.6, 144.4, 131.2, 130.0, 129.0, 115.8, 102.2, 75.1, 31.4, 25.3, 23.4, 21.8; ESI-HRMS Calcd for C₁₇H₂₀NO₂[M+H]⁺, 270.1489; found, 270.1479.



Cyclohexyl 3-(4-bromophenyl)-2-cyanoacrylate (6aa). Yellow solid, m.p. 144-145 °C; ¹H NMR (400 MHz, CDCl₃): δ = 8.16 (s, 1 H), 7.85 (d, 2 H, J = 8.0 Hz), 7.64 (d, 2 H, J = 8.0 Hz), 5.01-4.96 (m, 1 H), 1.96-1.89 (m, 2 H), 1.81-1.78 (m, 2 H), 1.66-1.53 (m, 3 H), 1.48-1.33 (m, 3 H); ¹³C NMR (100 MHz, CDCl₃): δ = 161.6, 153.2, 132.6, 132.2, 130.4, 128.1, 115.3, 104.3, 75.5, 31.3, 25.3, 23.4; ESI-HRMS Calcd for C₁₆H₁₇BrNO₂[M+H]⁺, 334.0437; found, 334.0430.

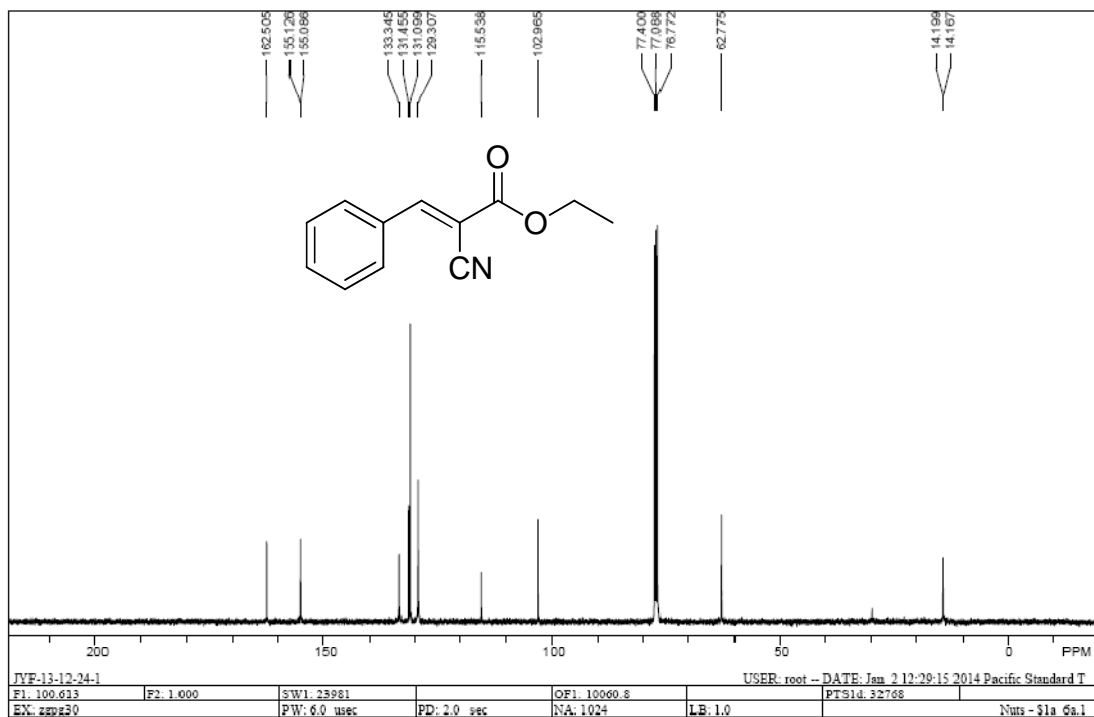
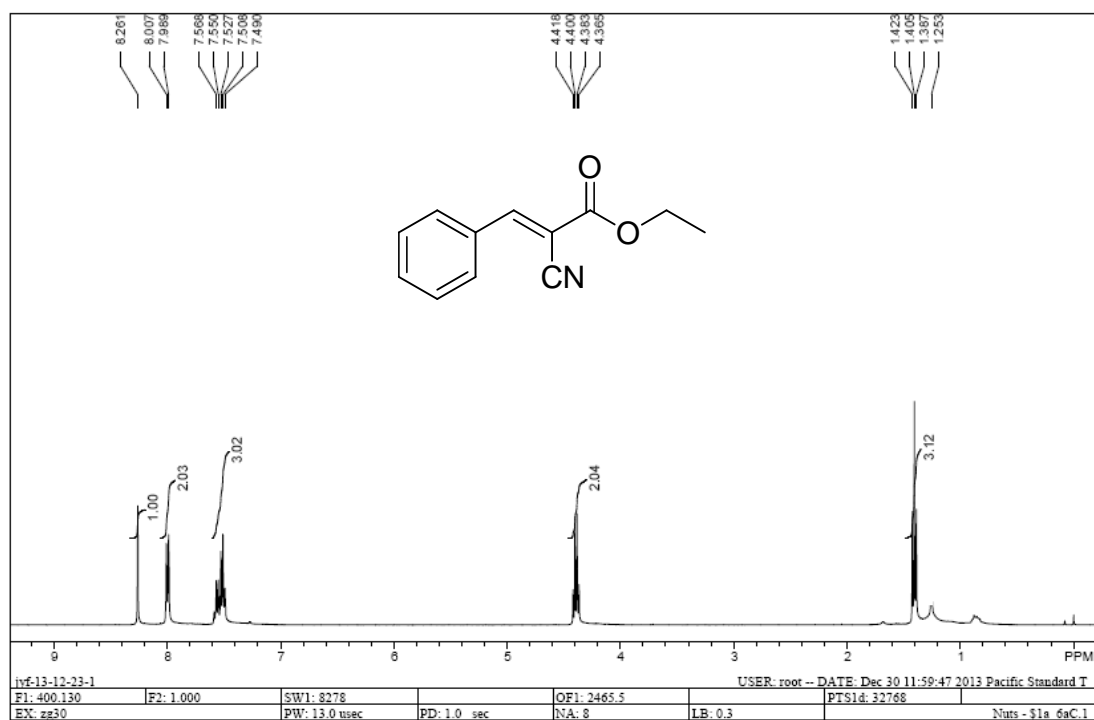


Ethyl 2-oxo-2H-chromene-3-carboxylate (7).⁶ ¹H NMR (400 MHz, CDCl₃): δ = 8.54 (s, 1 H), 7.67-7.62 (m, 2 H), 7.36-7.32 (m, 2 H), 4.44-4.39 (q, J = 7.2 Hz, 2 H), 1.41 (t, J = 7.2 Hz, 3 H); ¹³C NMR (100 MHz, CDCl₃): δ = 163.0, 156.5, 155.2, 148.4, 134.2, 129.5, 124.8, 118.4, 117.9, 116.7, 61.9, 14.0.

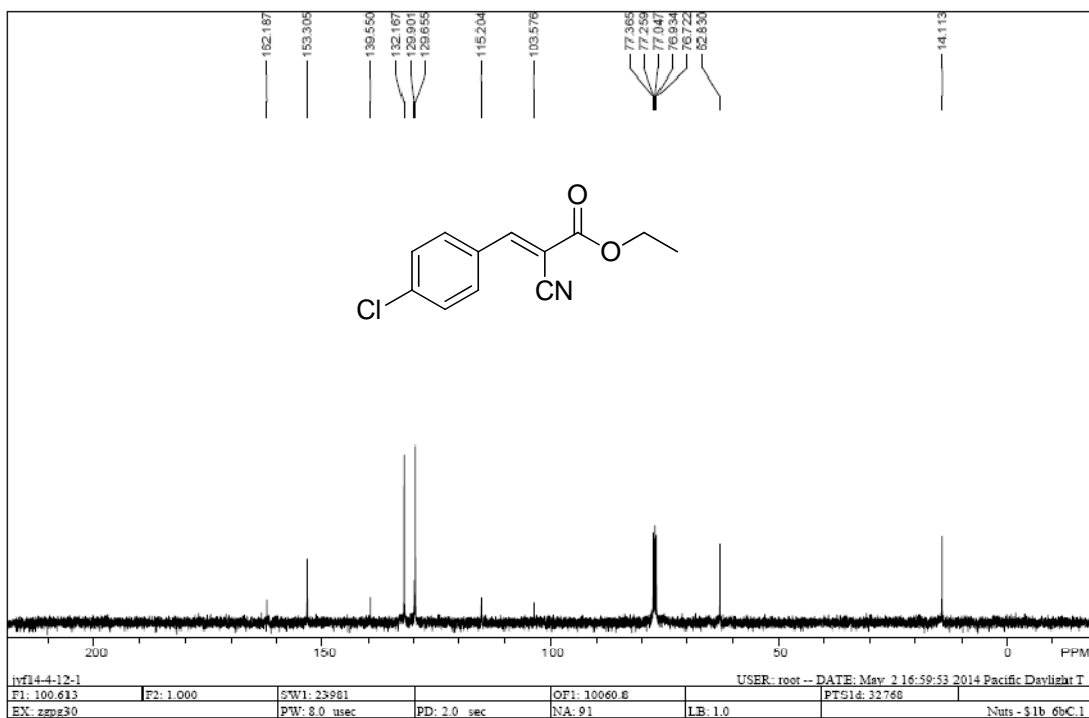
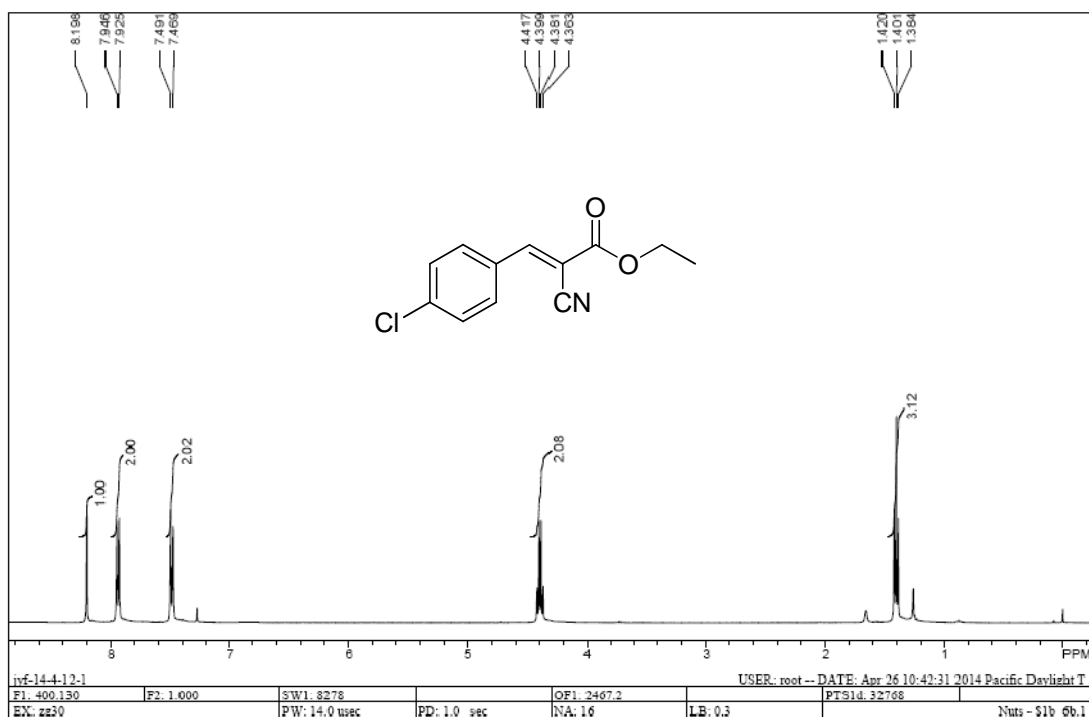
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- (2) H. Wang, L. Li, X.-F. Bai, W.-H. Deng, Z.-J. Zheng, K.-F. Yang, L.-W. Xu, *Green Chem.*, 2013, **15**, 2349.
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- (5) Y. Peng, J. Wang, J. Long, G. Liu, *Catal. Commun.*, 2011, **15**, 10.
- (6) X. He, Z. Yan, X. Hu, Y. Zuo, C. Jiang, L. Jin, Y. Shang, *Synth. Commun.*, 2014, **44**, 1507.

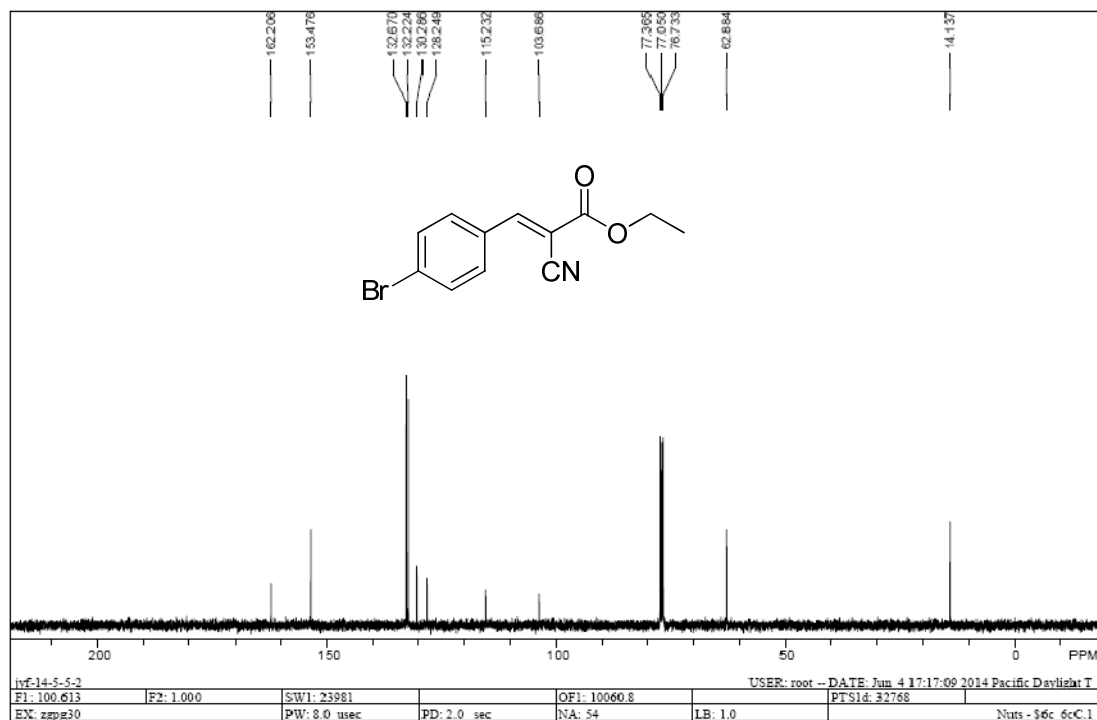
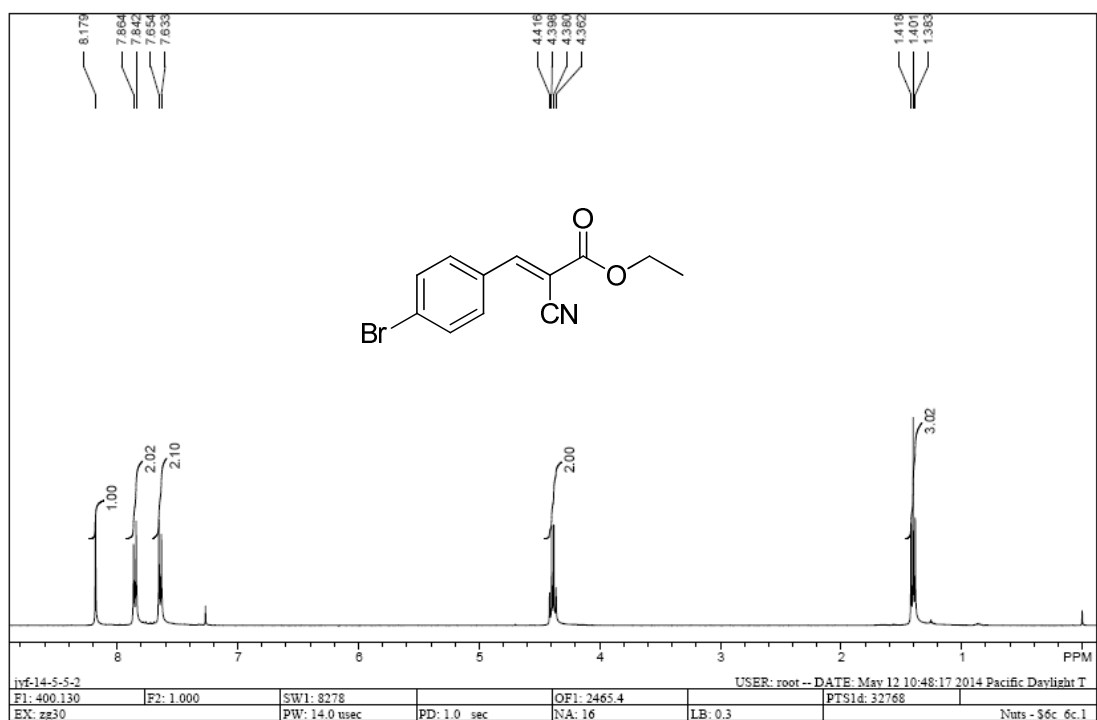
^1H and ^{13}C NMR of **6a**



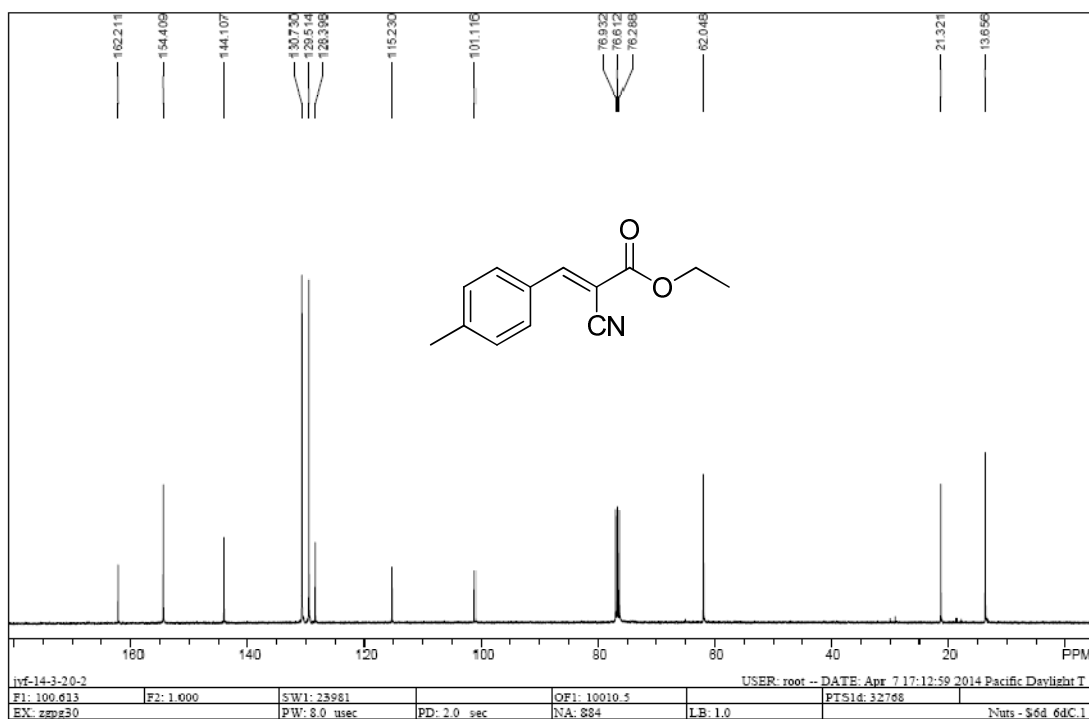
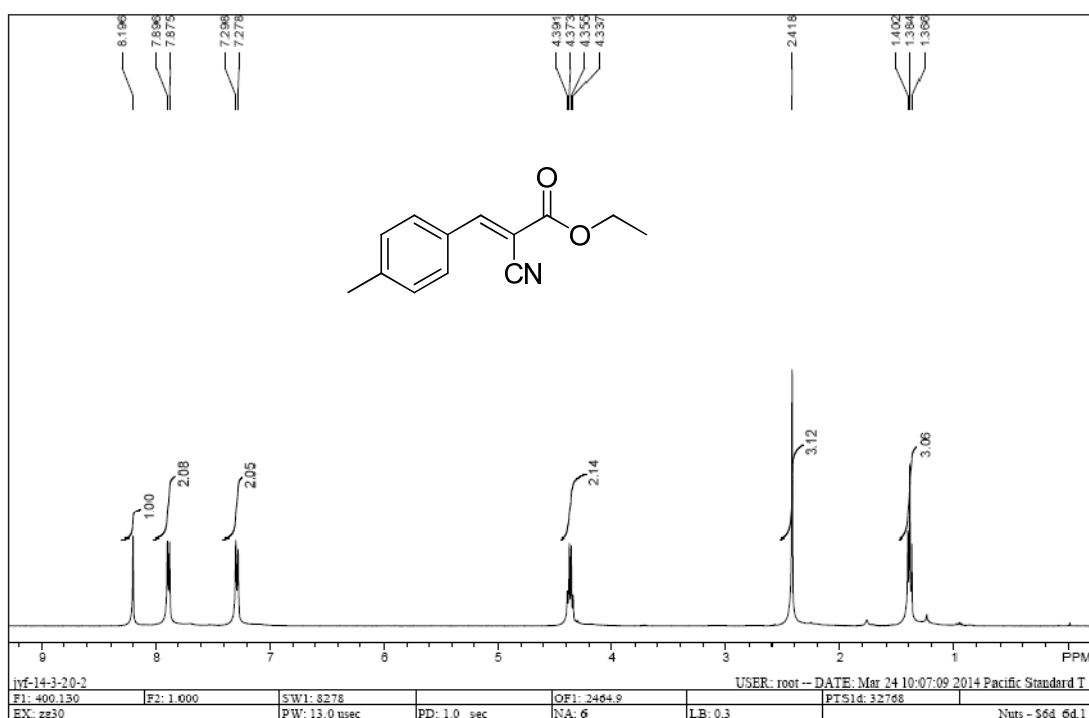
^1H and ^{13}C NMR of **6b**



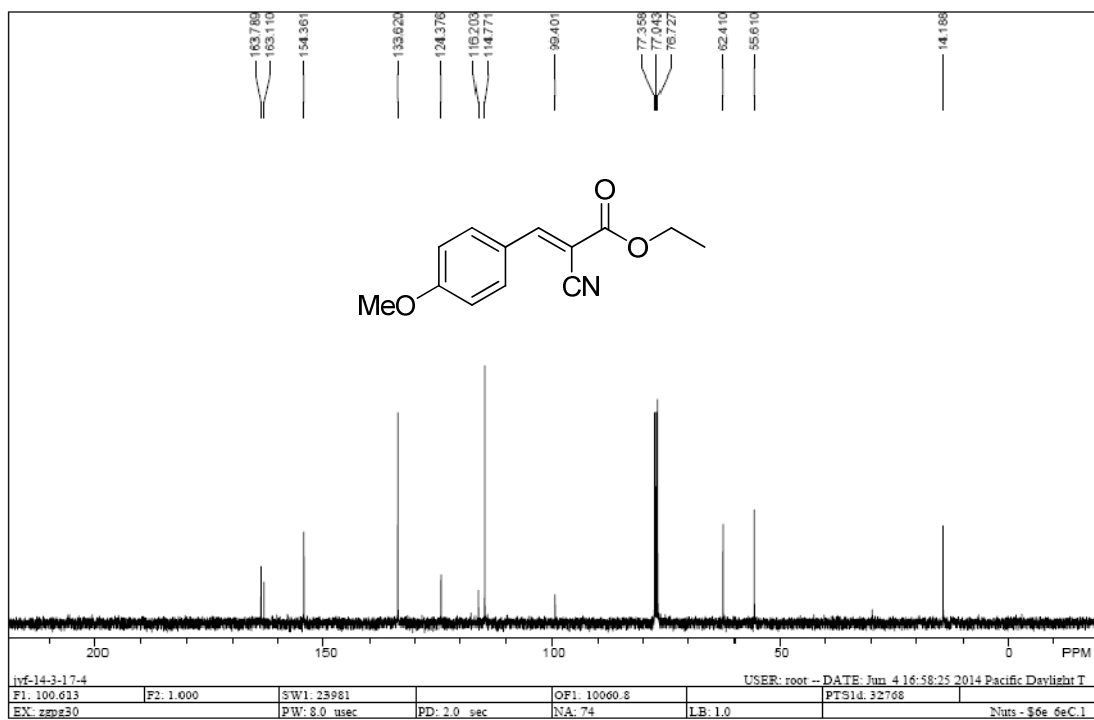
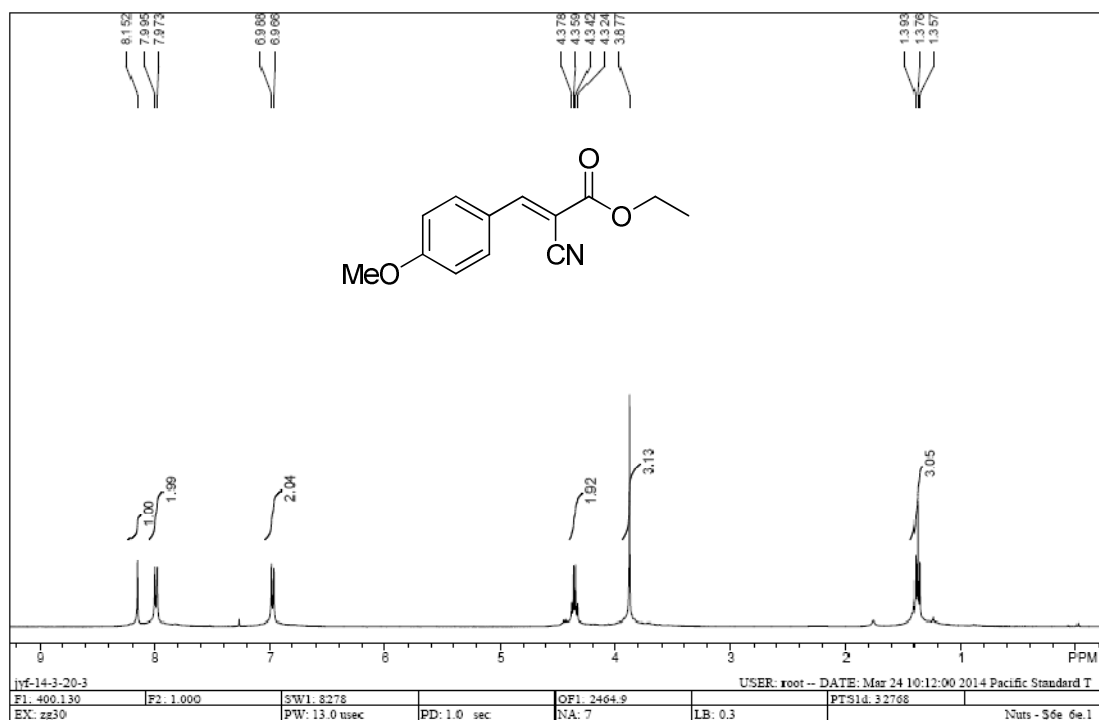
^1H and ^{13}C NMR of **6c**



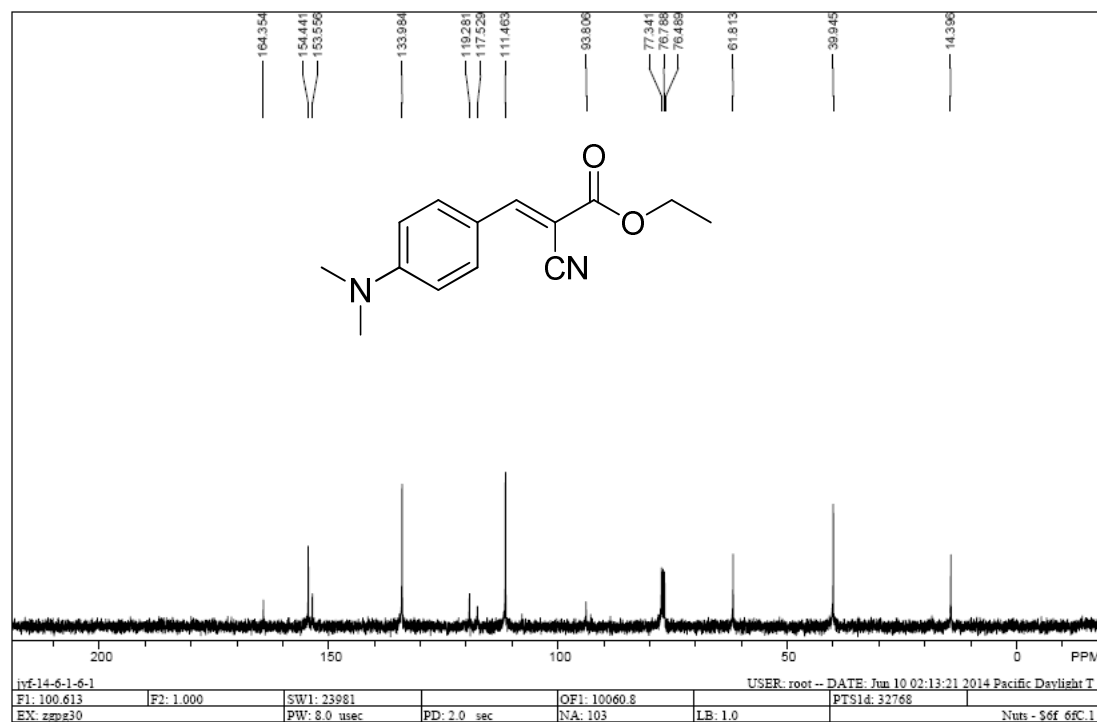
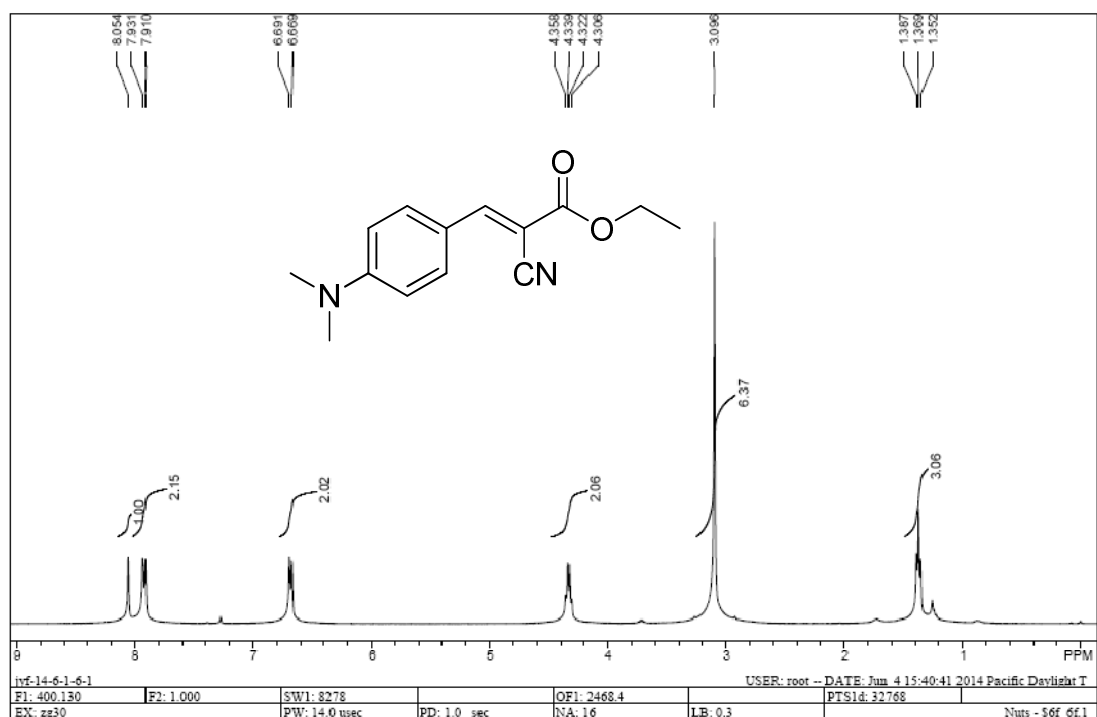
^1H and ^{13}C NMR of **6d**



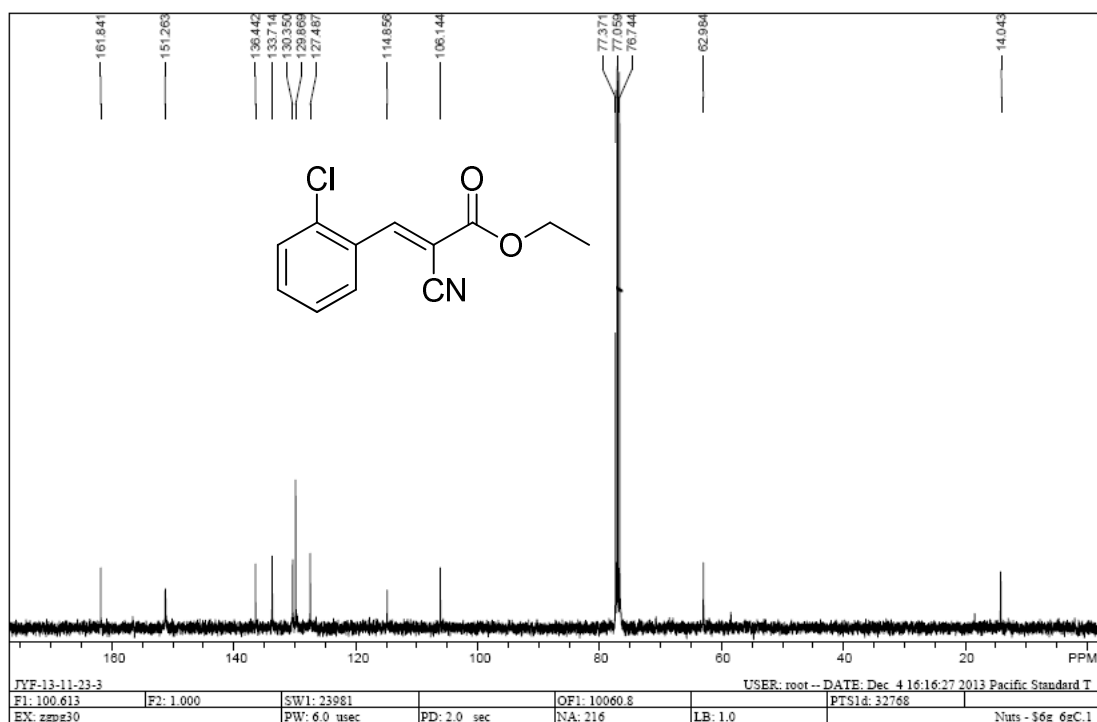
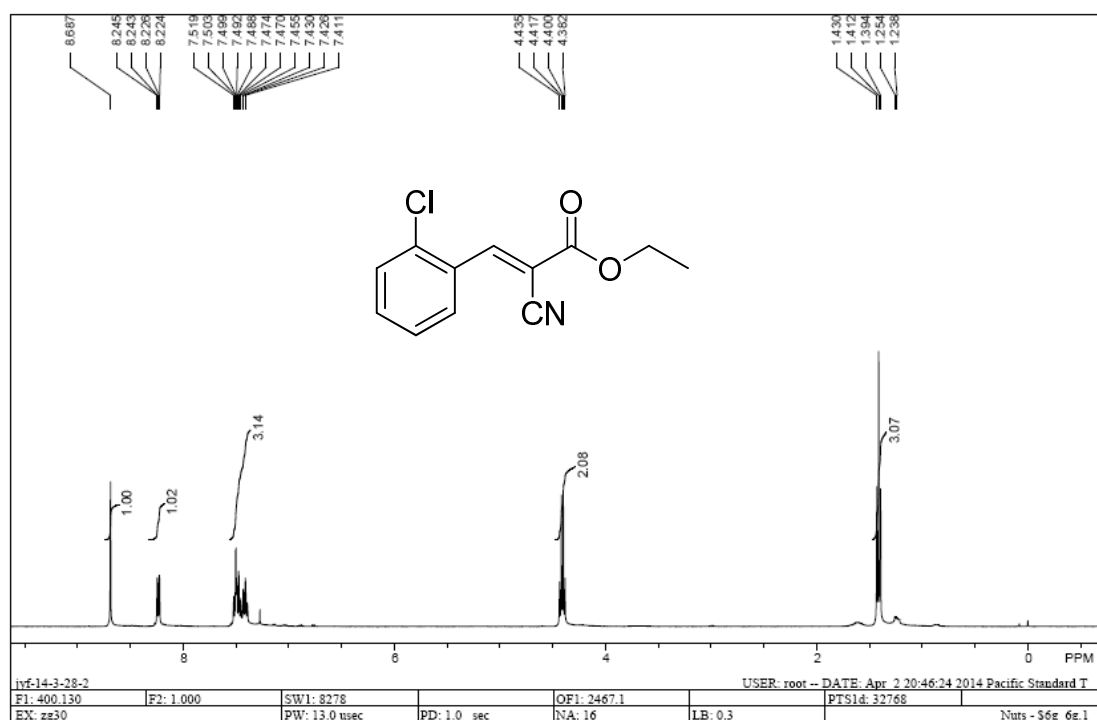
^1H and ^{13}C NMR of **6e**



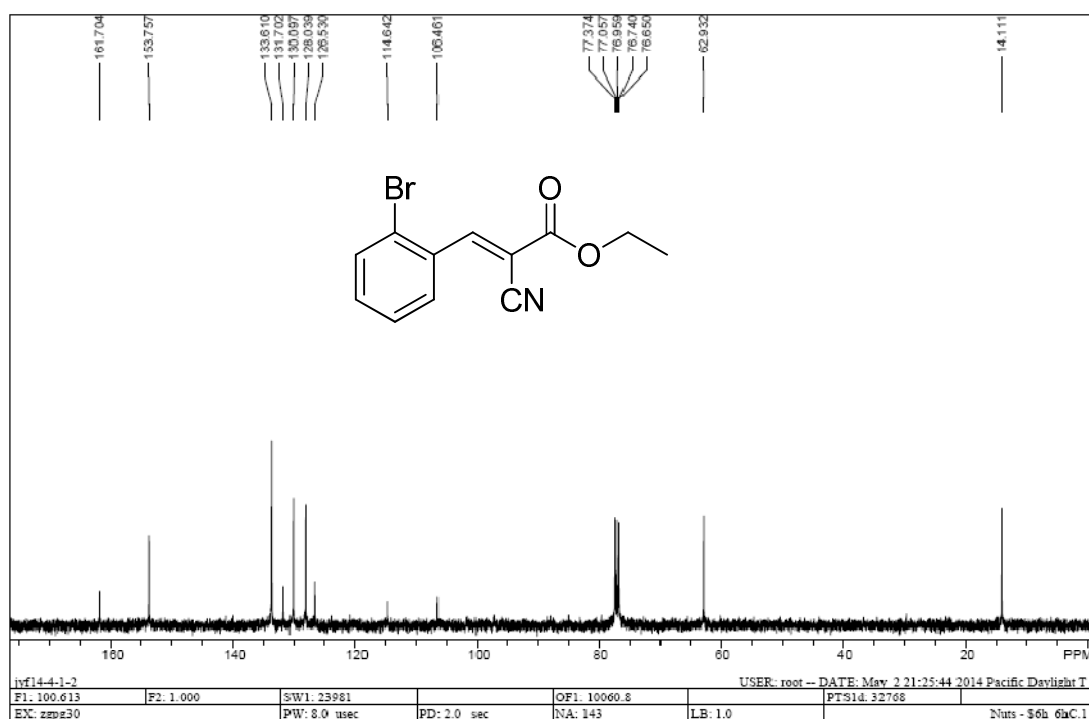
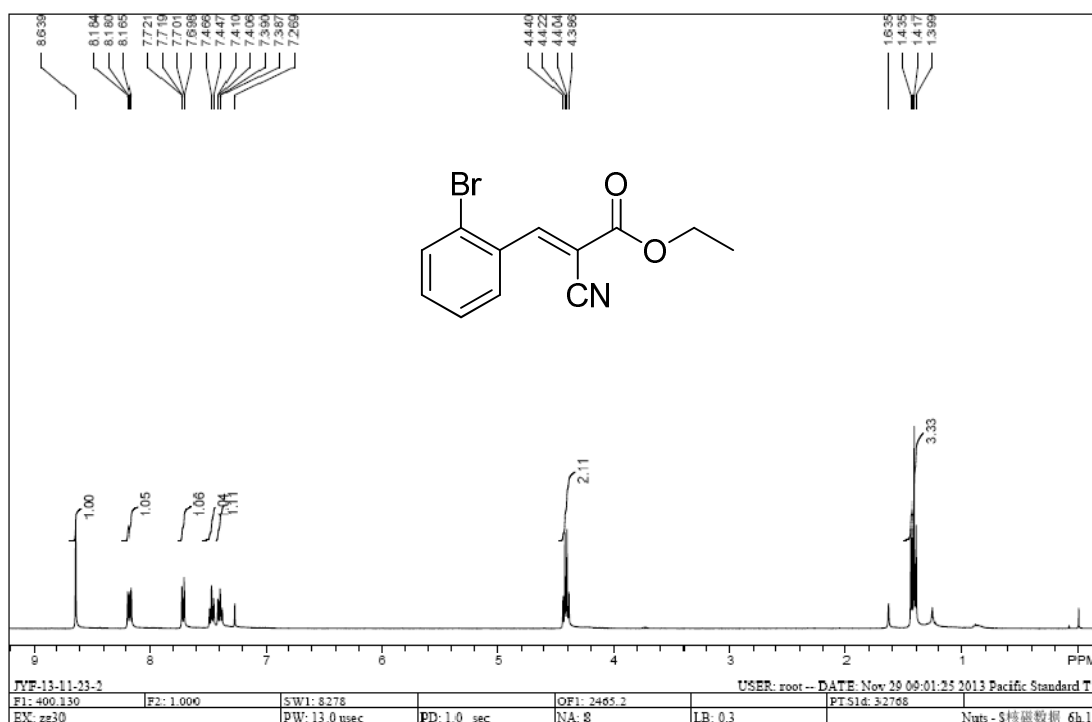
^1H and ^{13}C NMR of **6f**



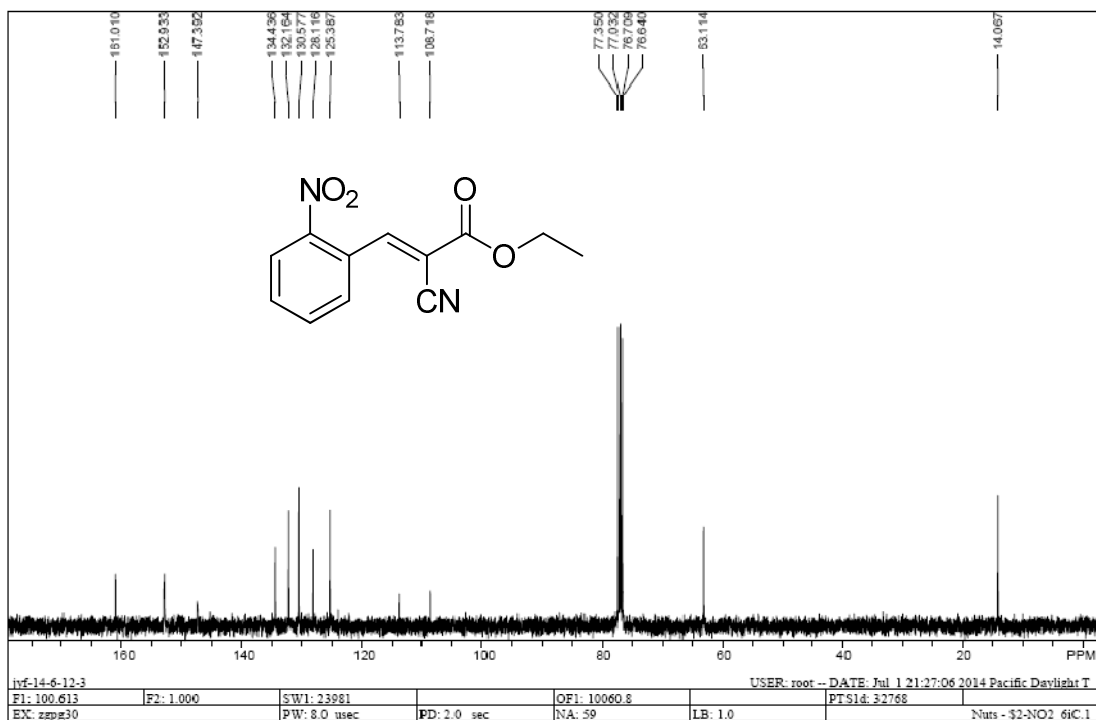
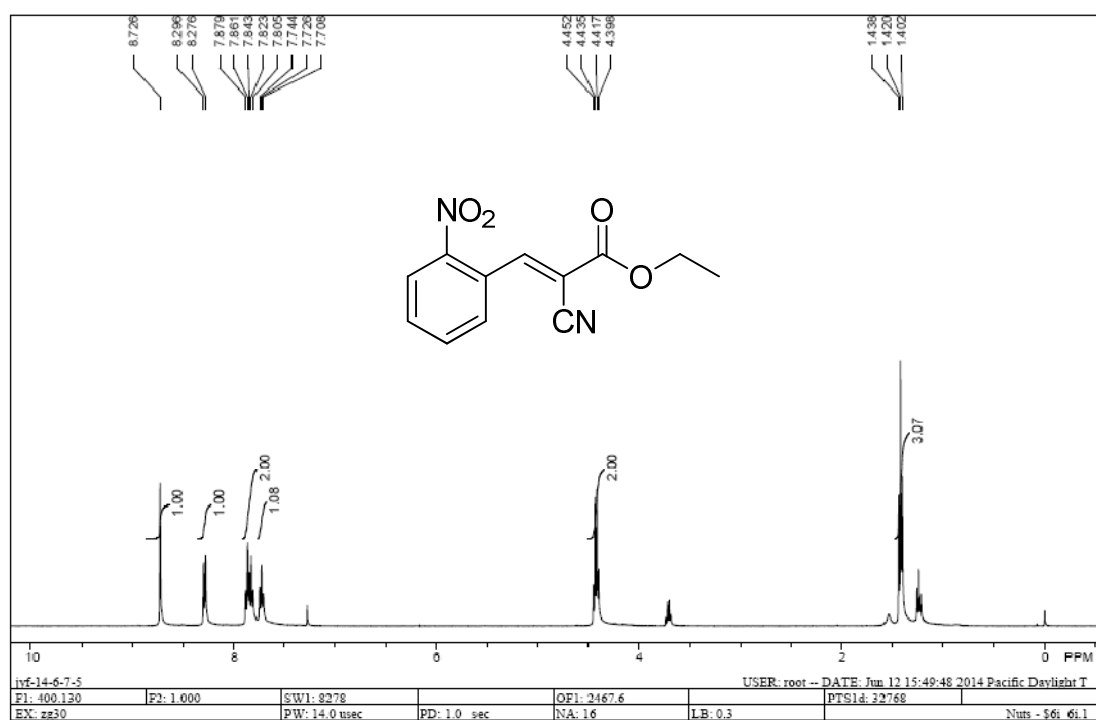
^1H and ^{13}C NMR of **6g**



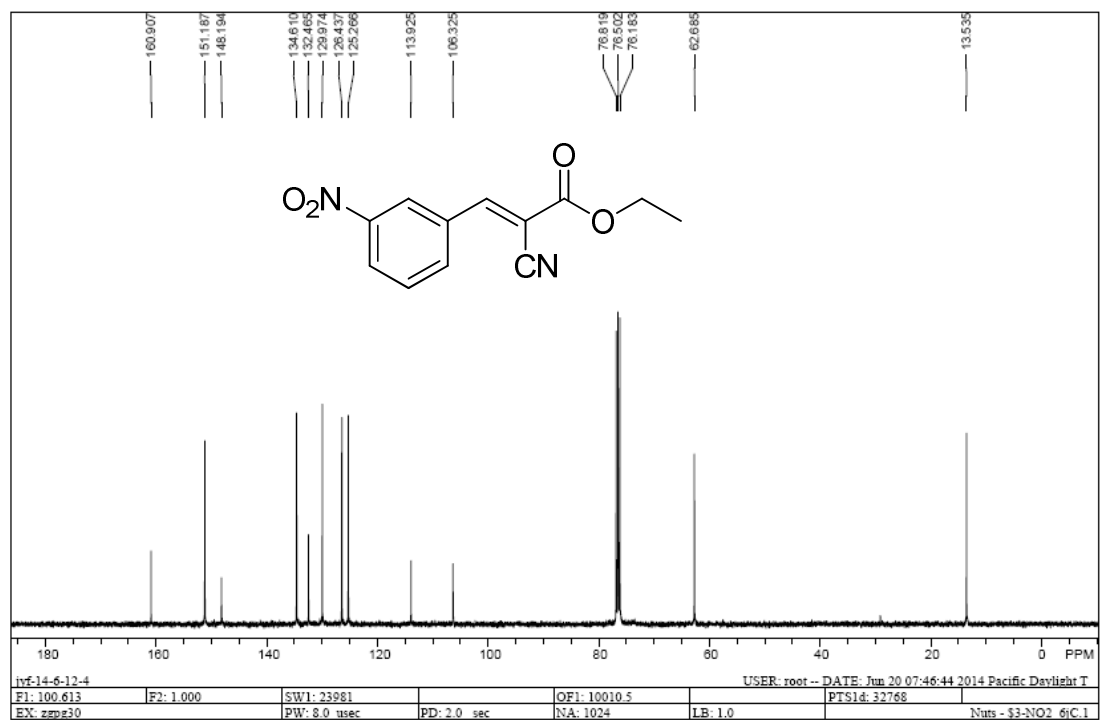
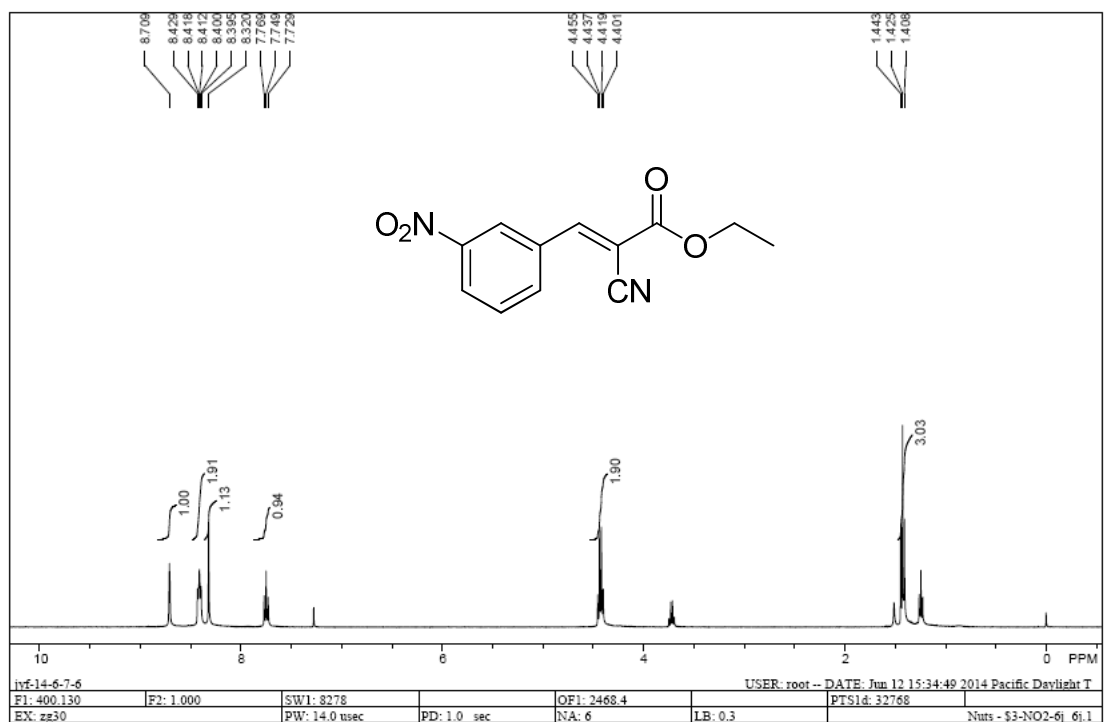
^1H and ^{13}C NMR of **6h**



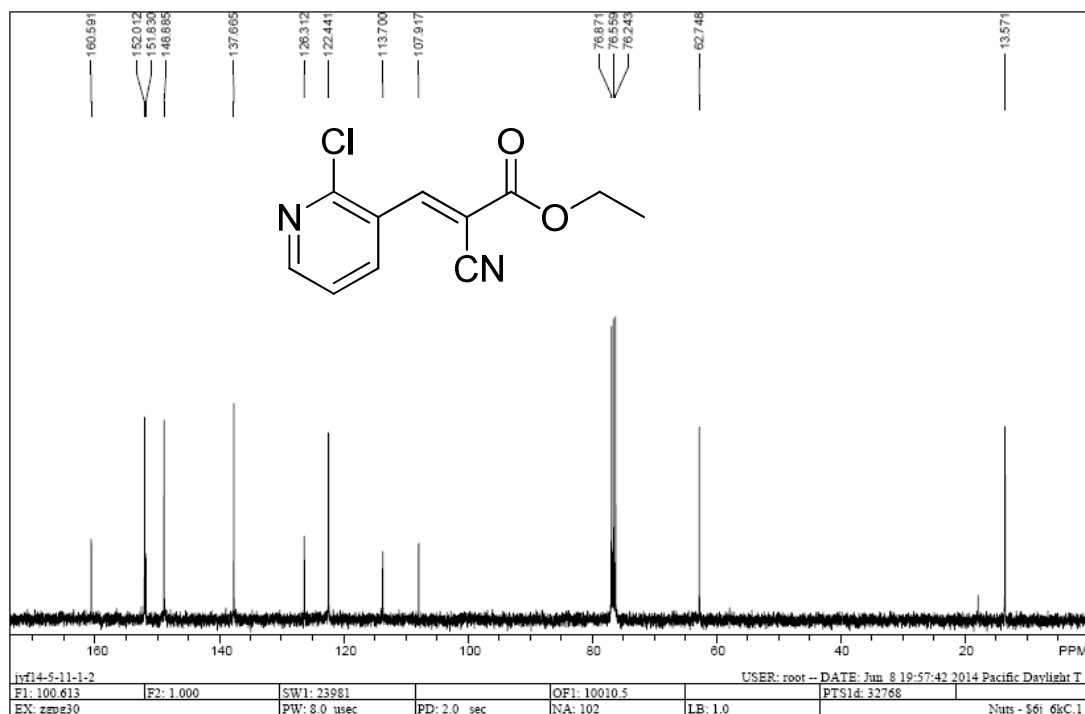
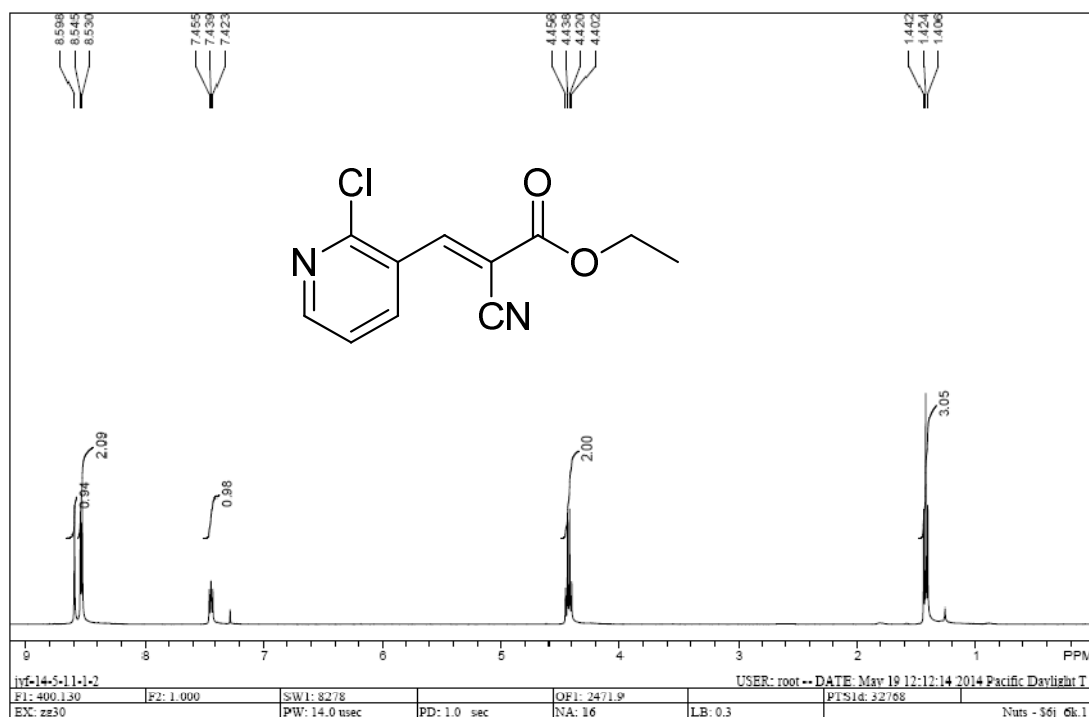
^1H and ^{13}C NMR of **6i**



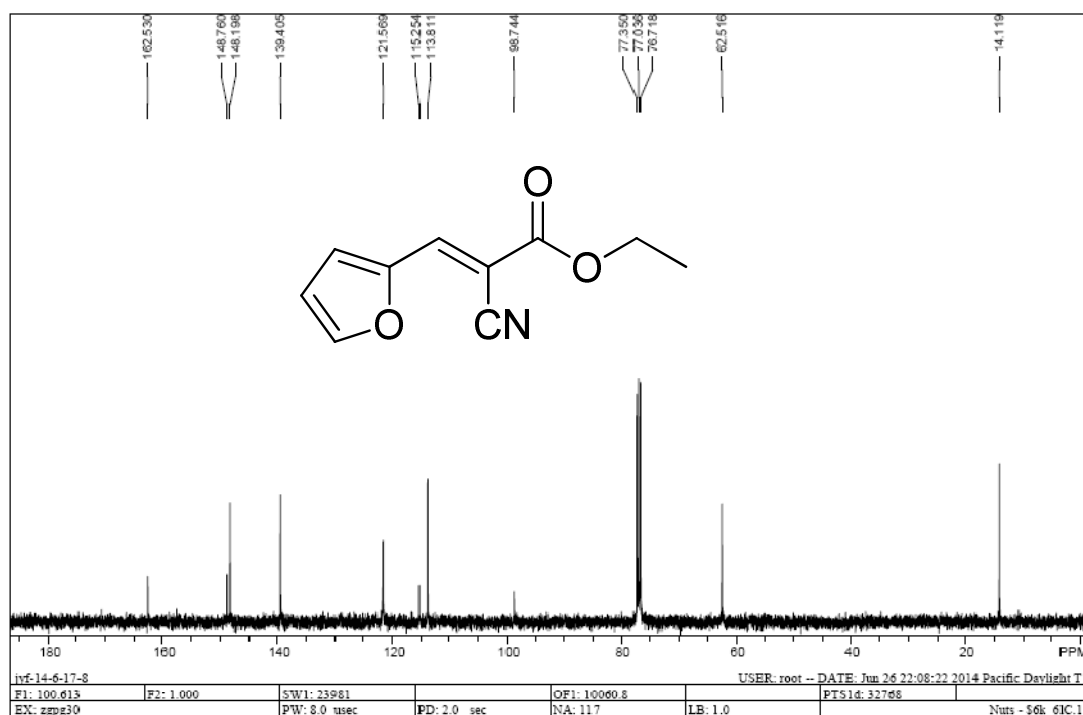
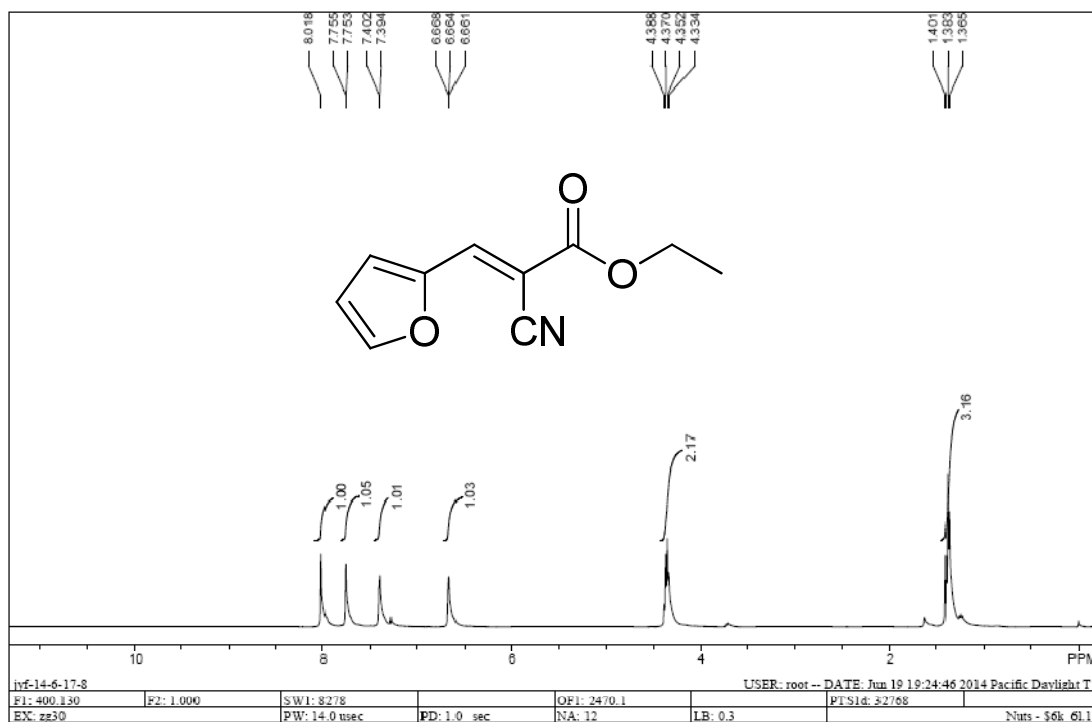
^1H and ^{13}C NMR of **6j**



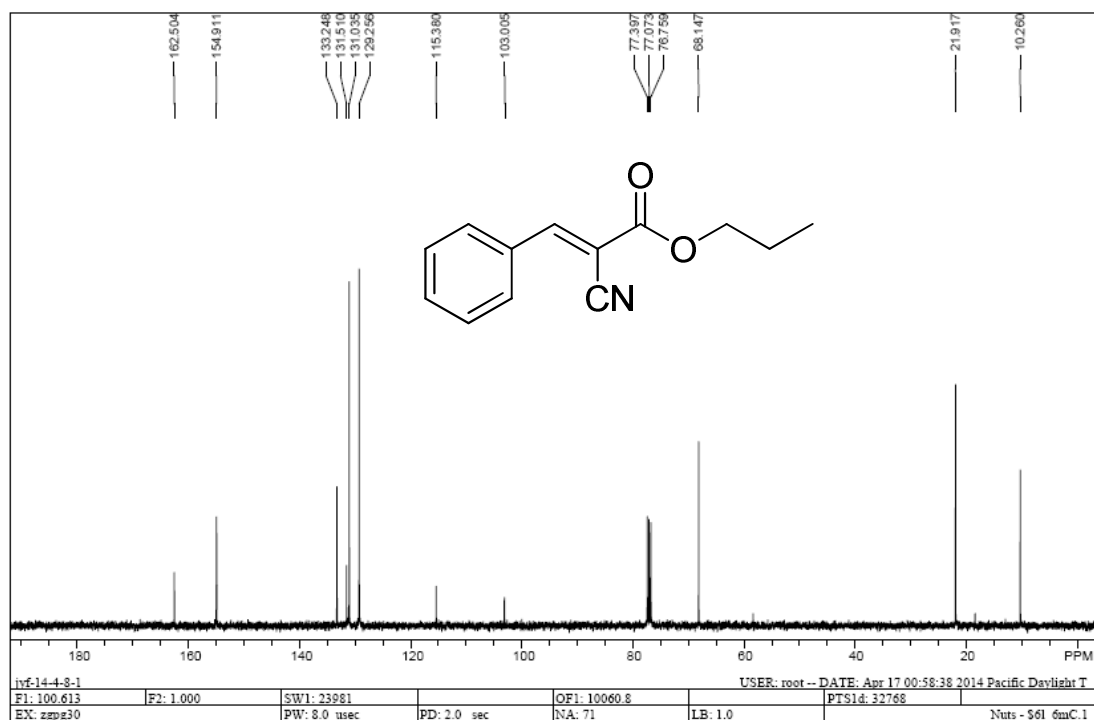
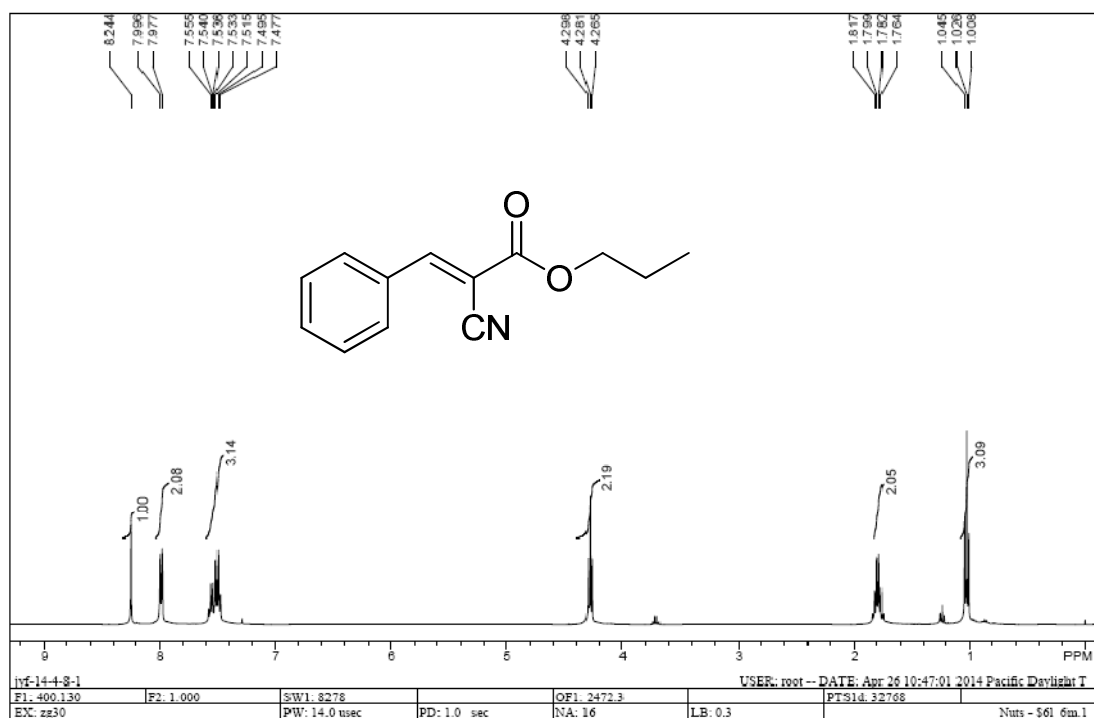
^1H and ^{13}C NMR of **6k**



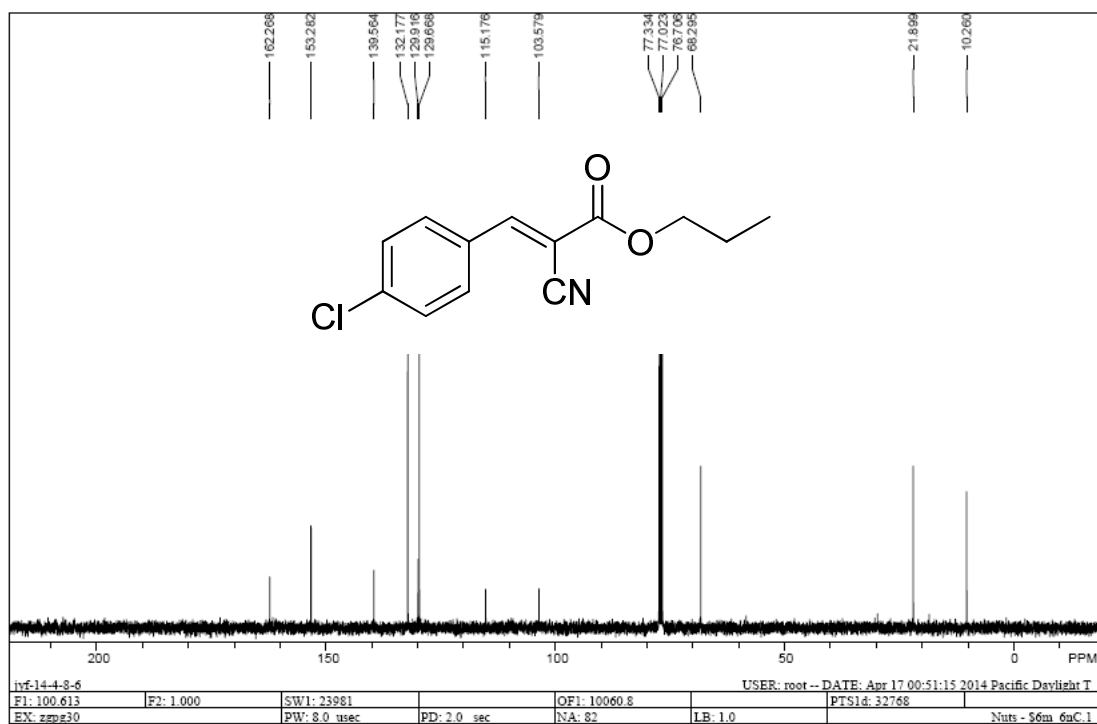
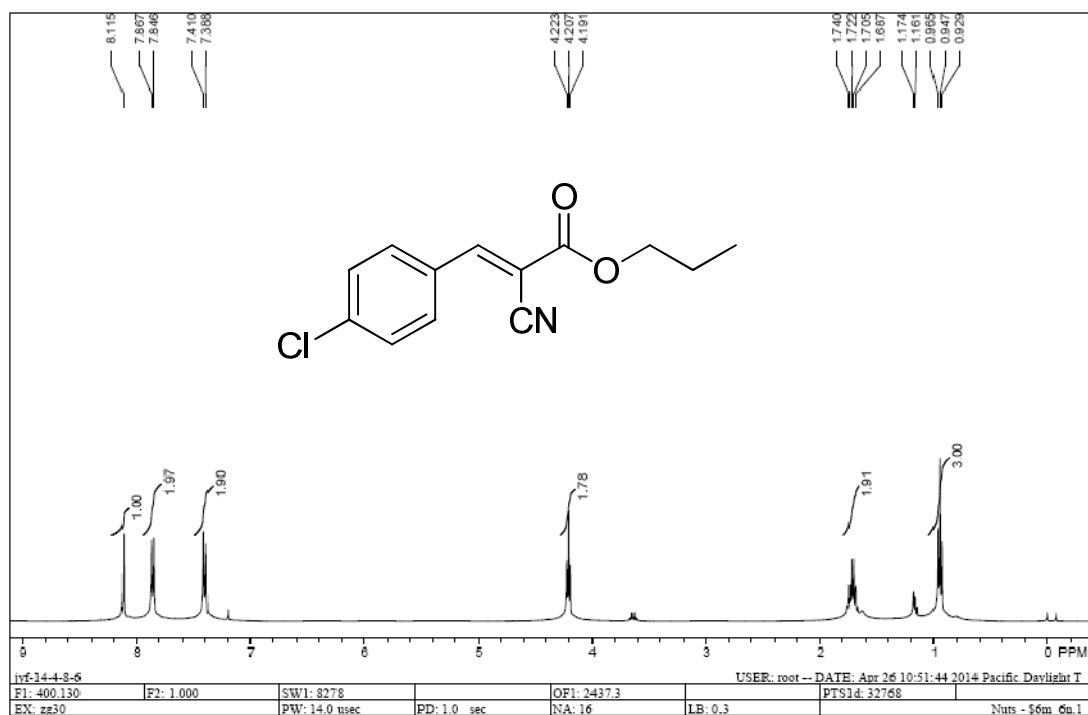
^1H and ^{13}C NMR of **6l**



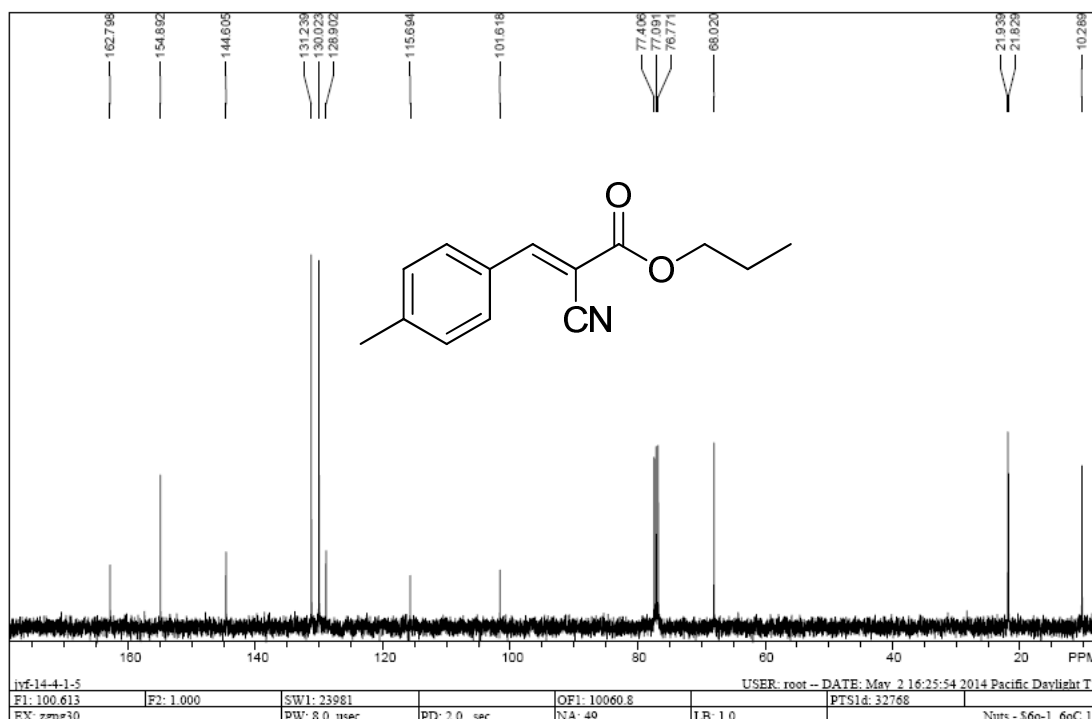
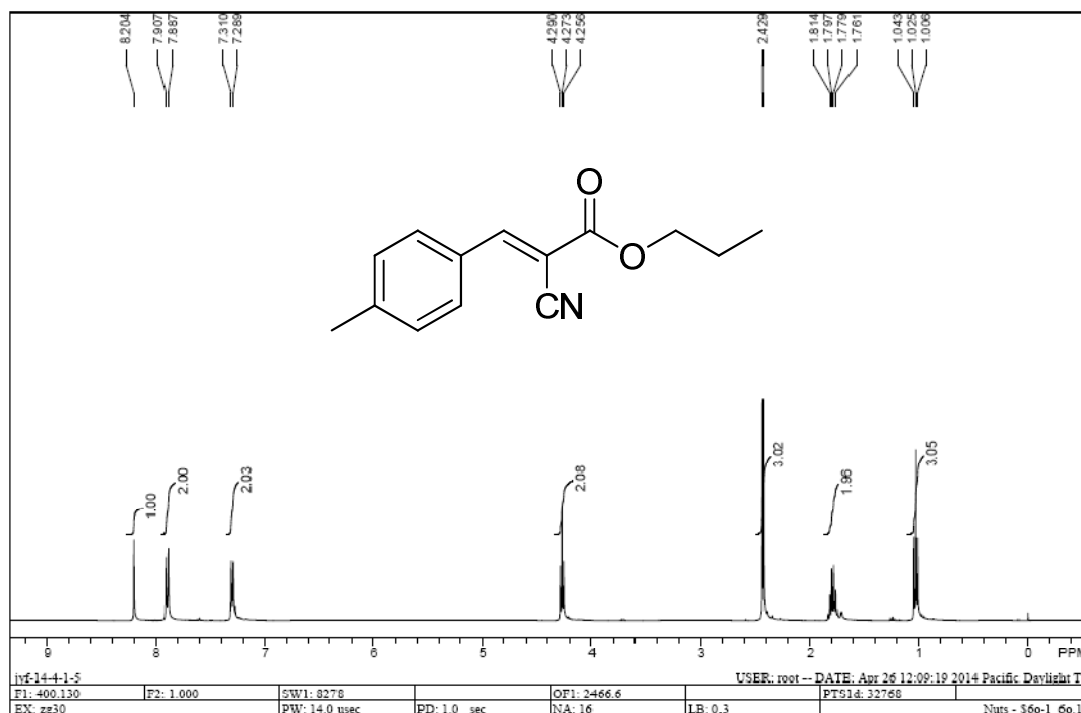
^1H and ^{13}C NMR of **6m**



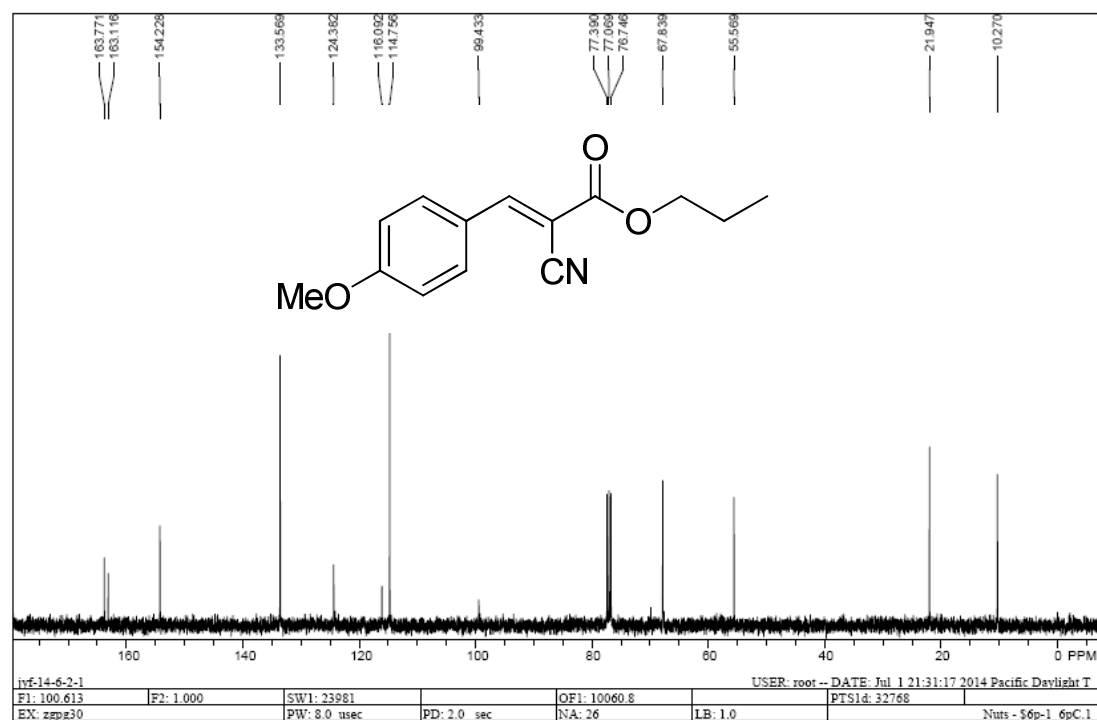
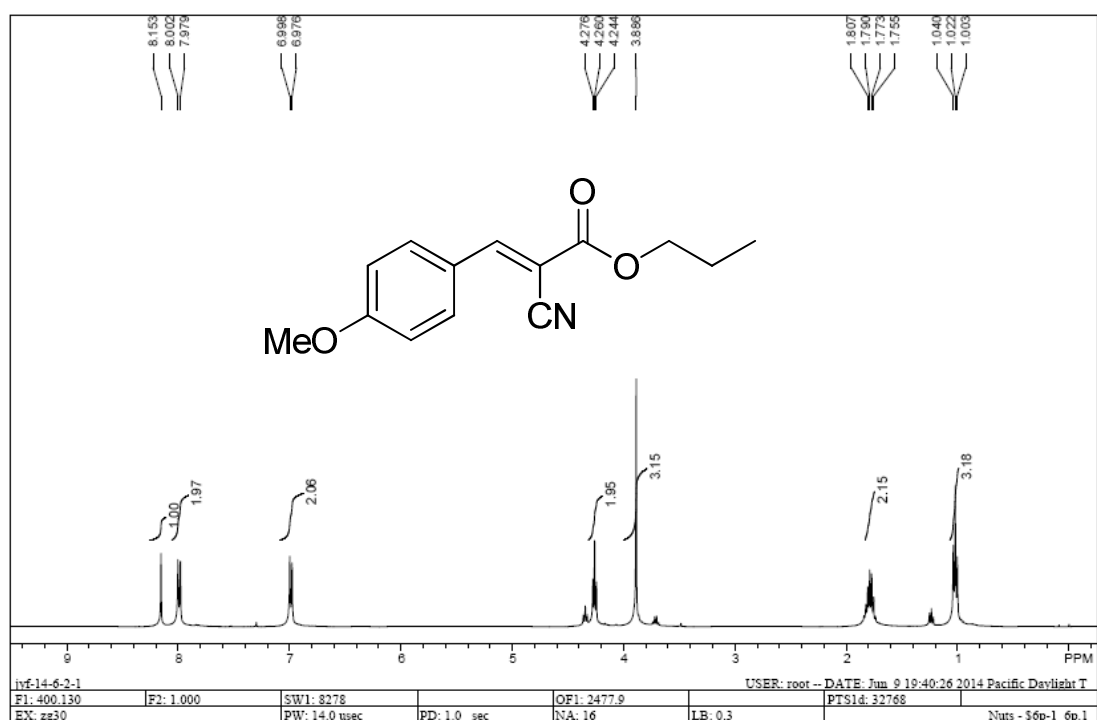
^1H and ^{13}C NMR of **6n**



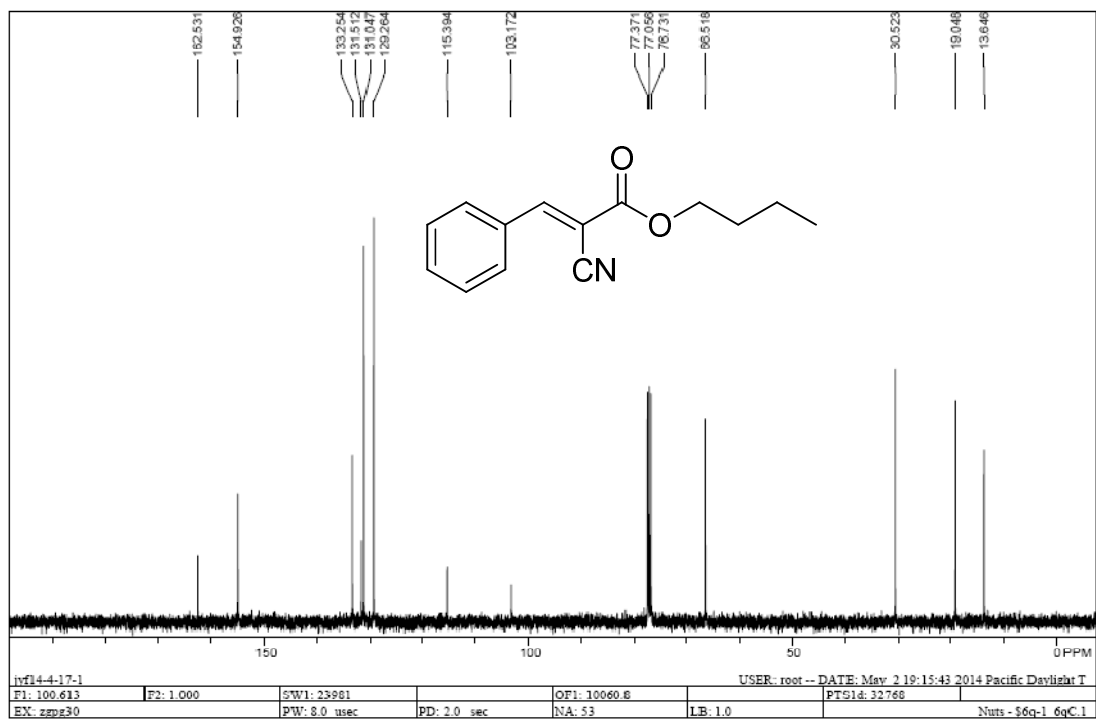
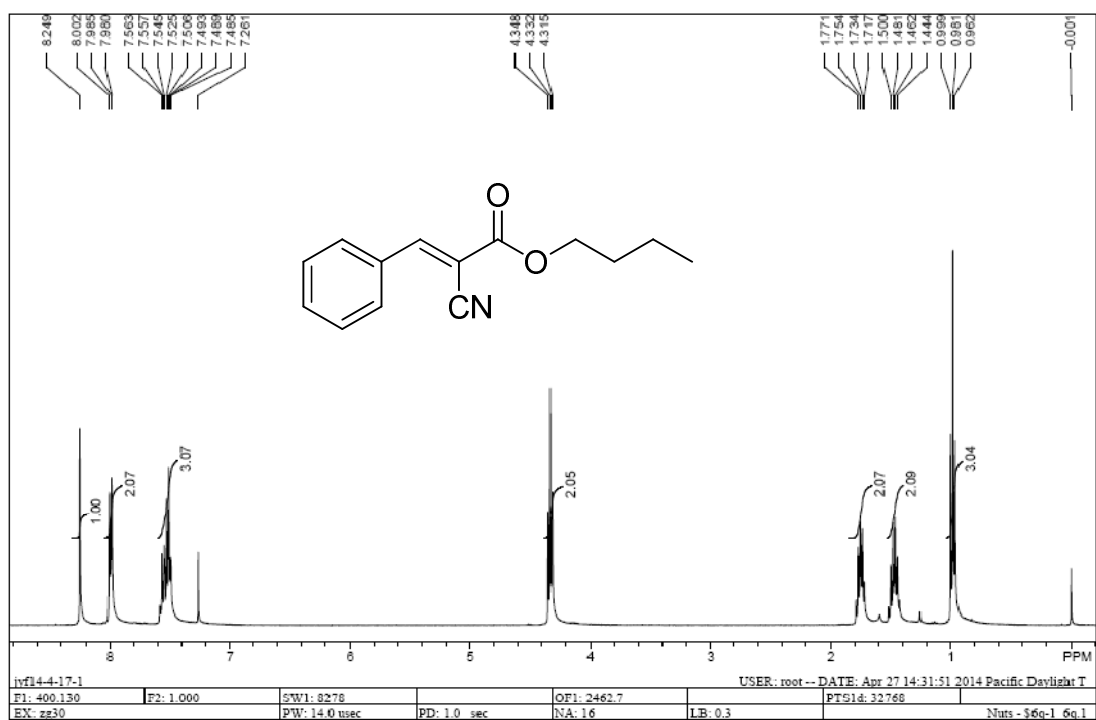
^1H and ^{13}C NMR of **60**



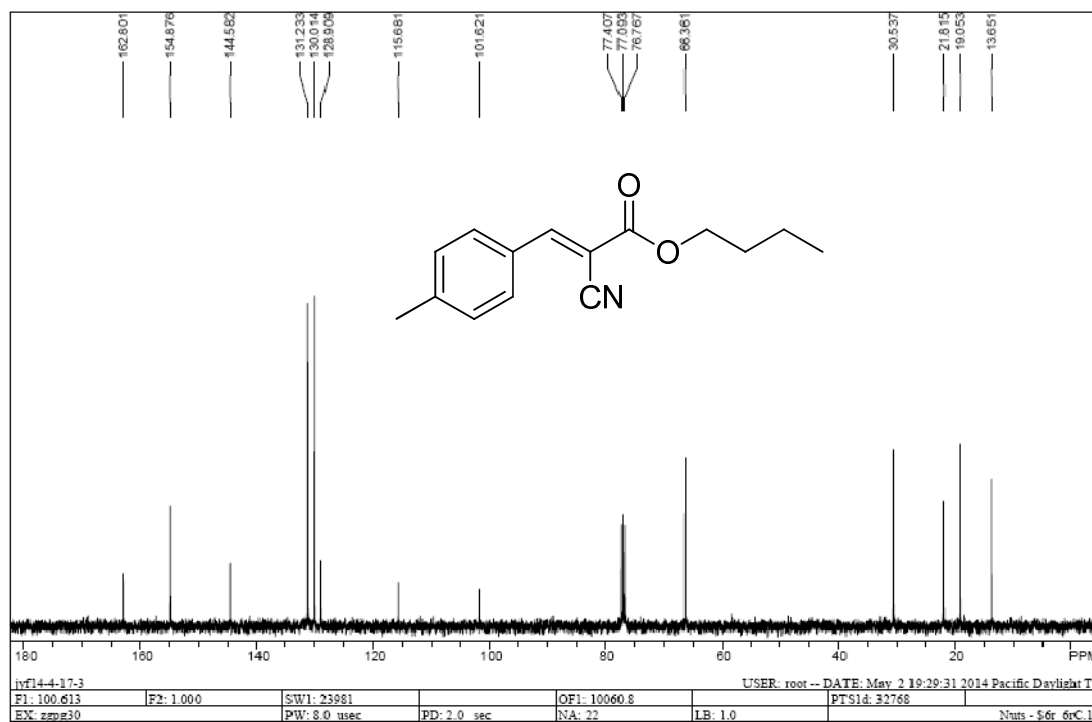
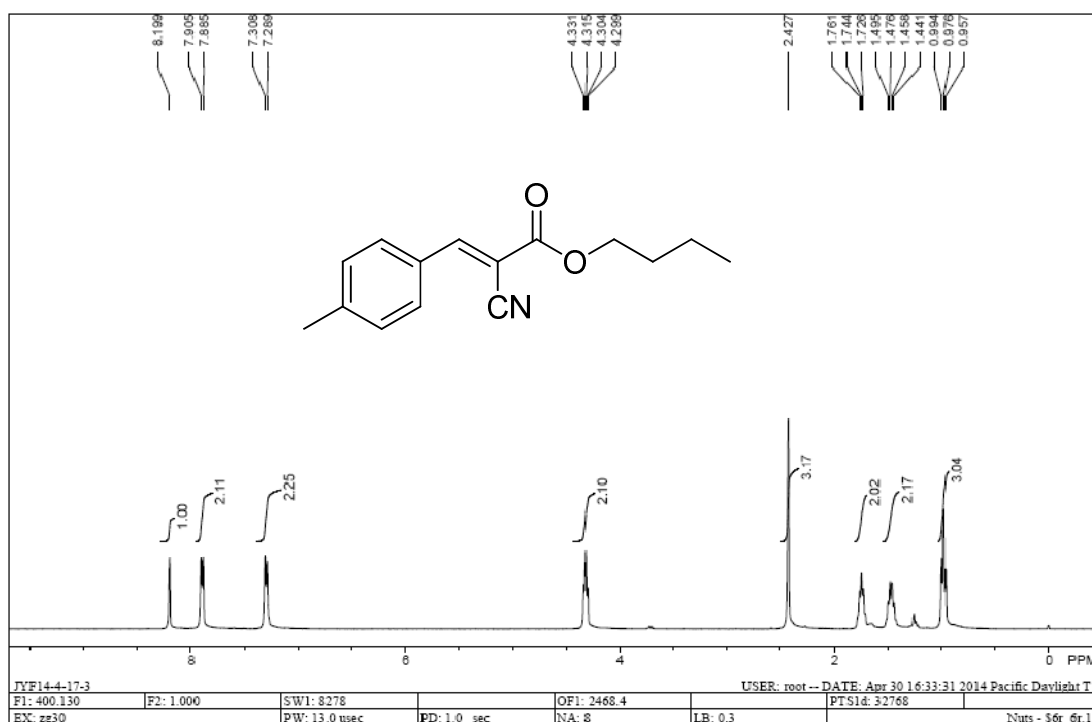
^1H and ^{13}C NMR of **6p**



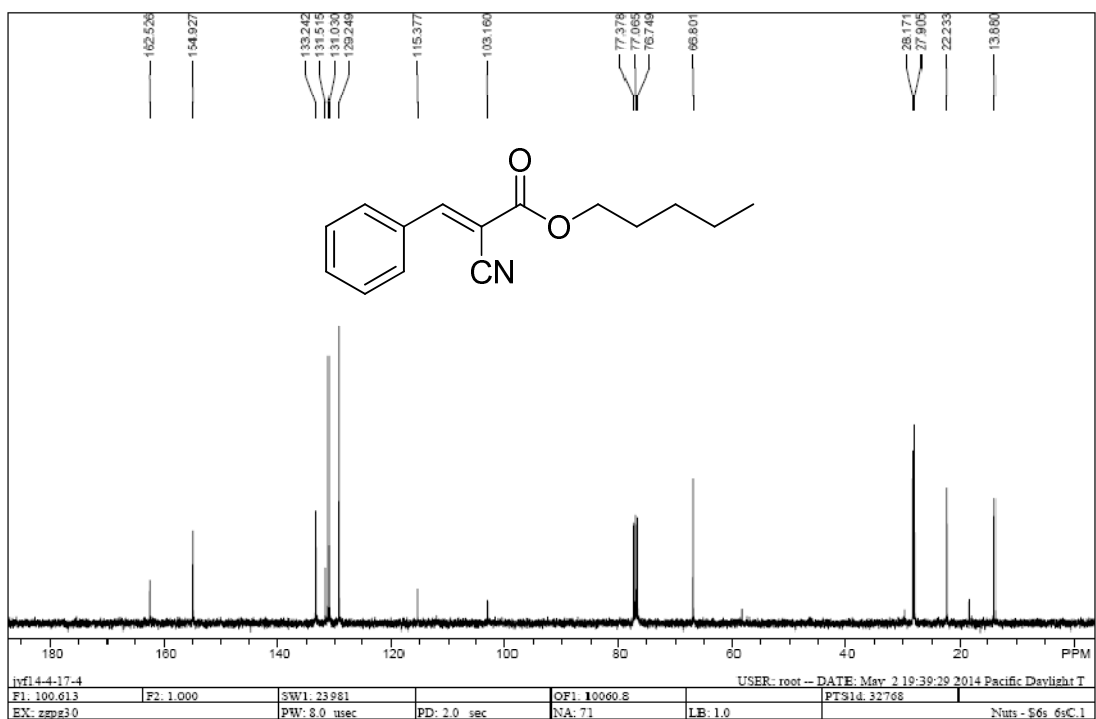
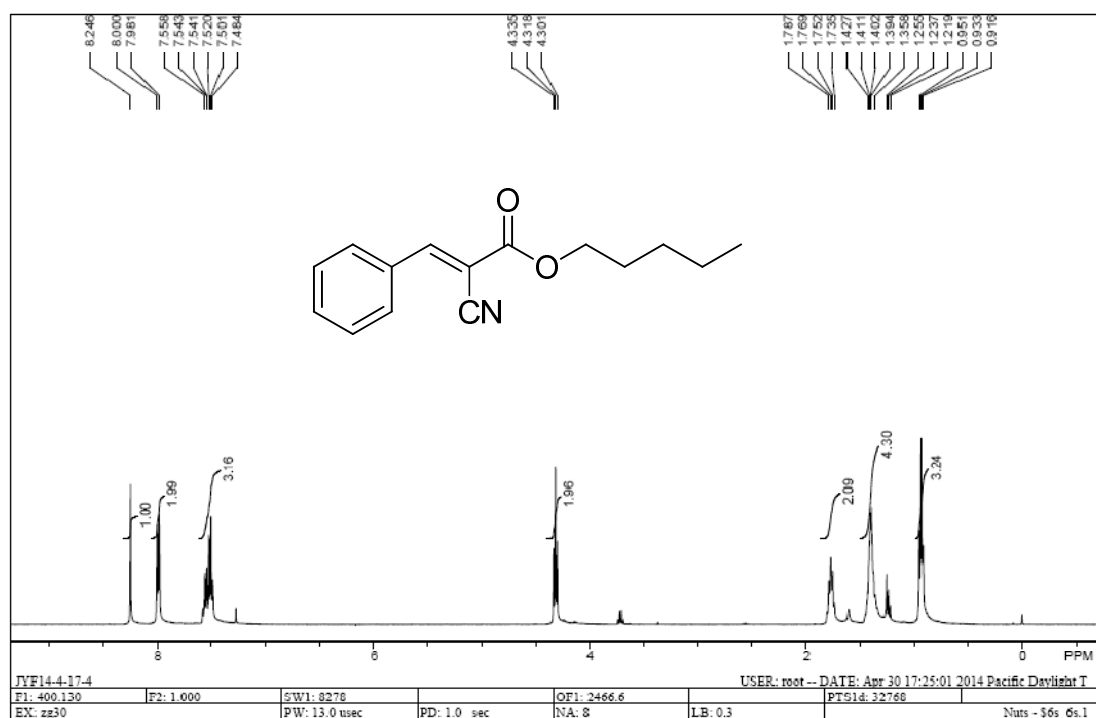
^1H and ^{13}C NMR of **6q**



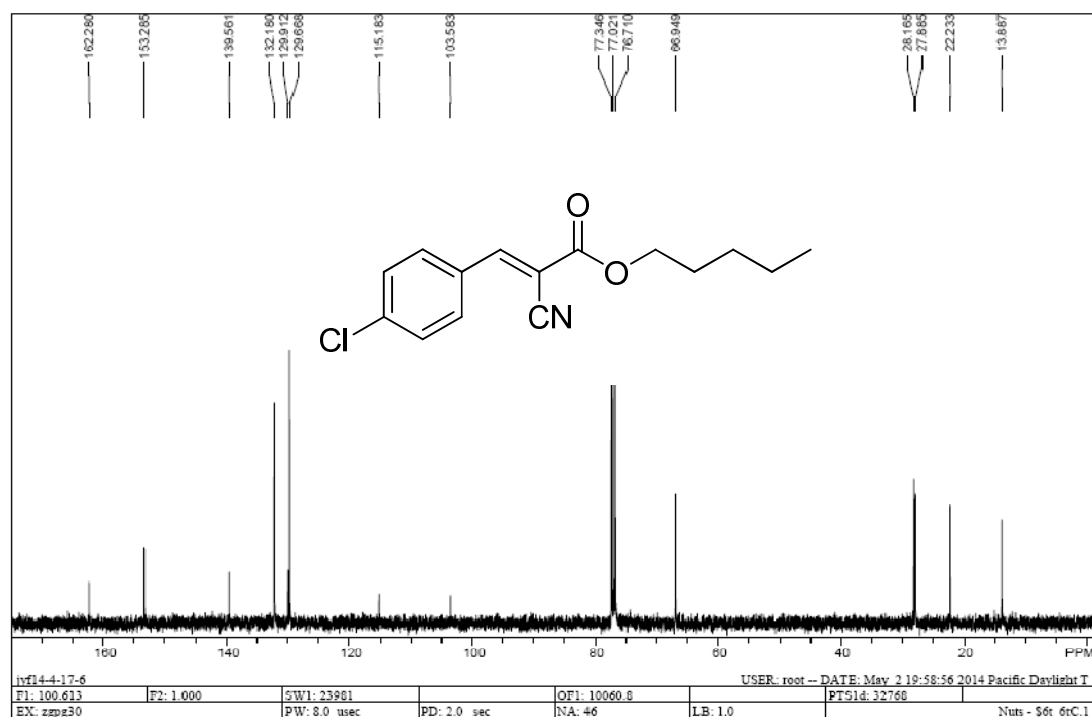
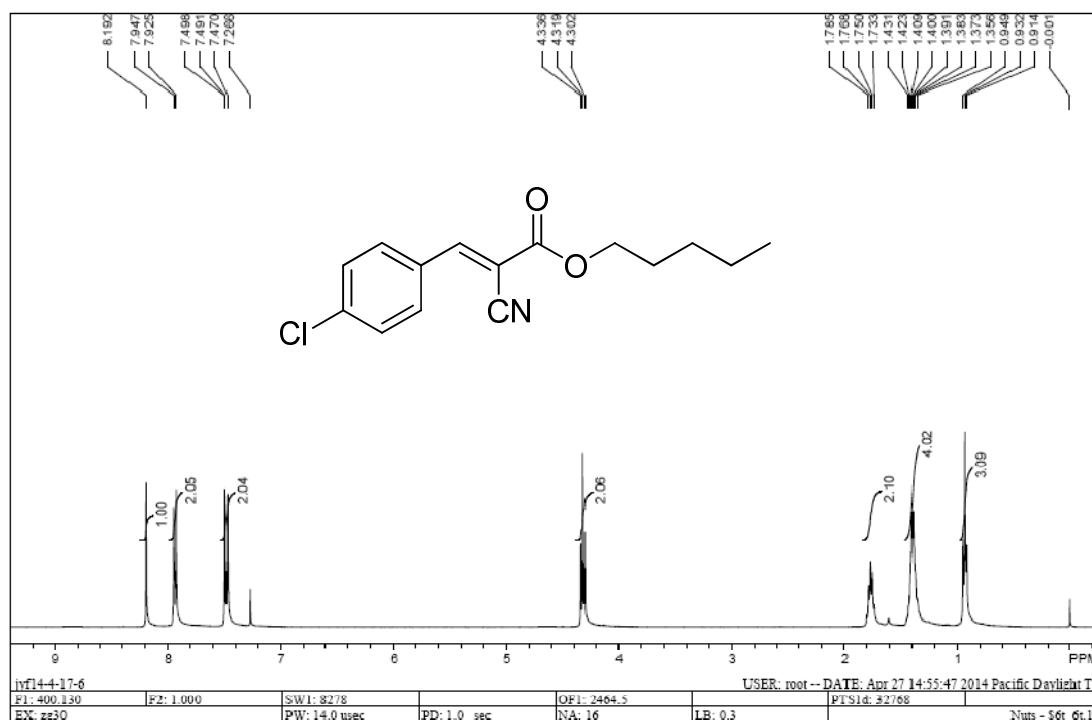
^1H and ^{13}C NMR of **6r**



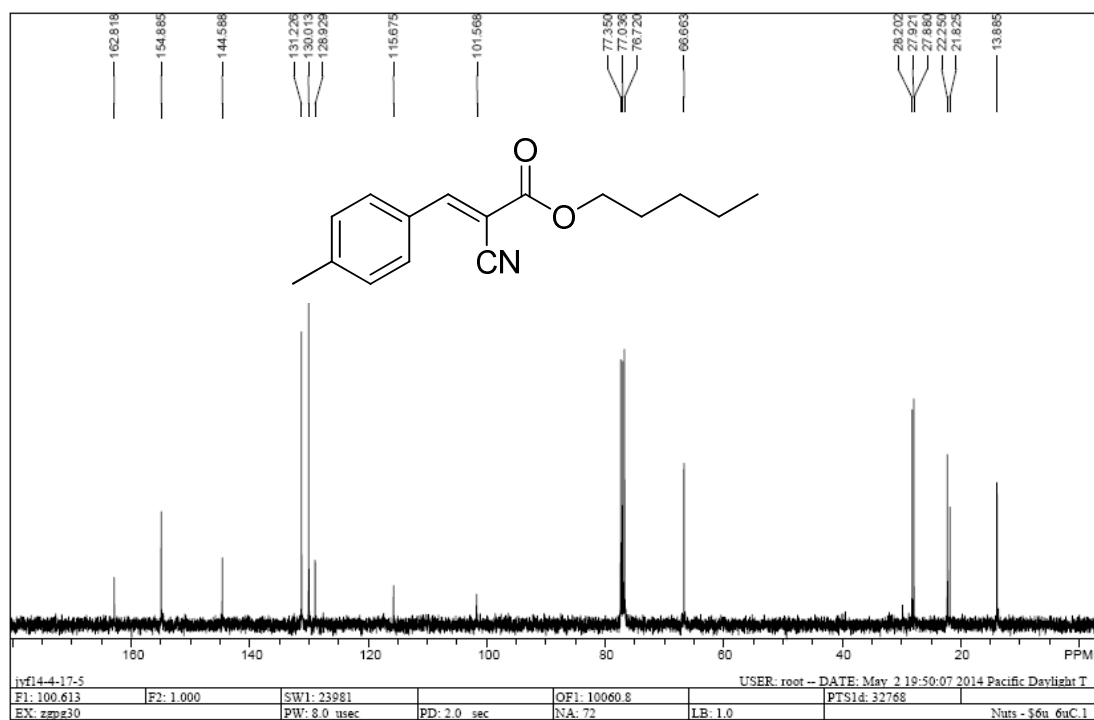
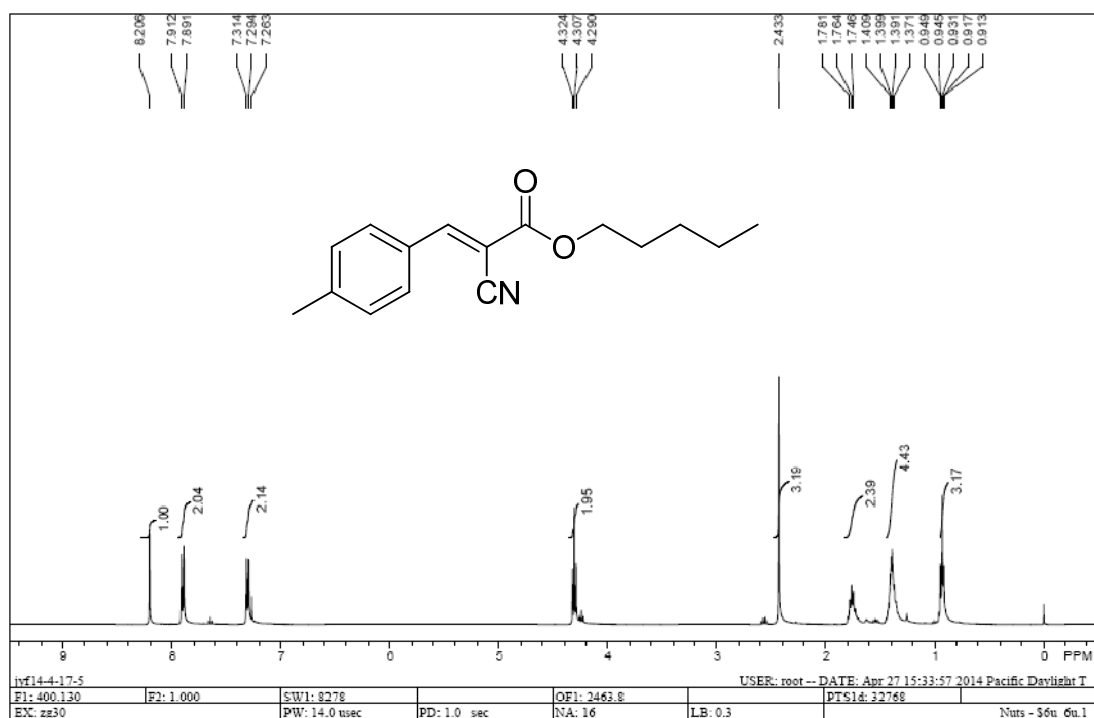
^1H and ^{13}C NMR of **6s**



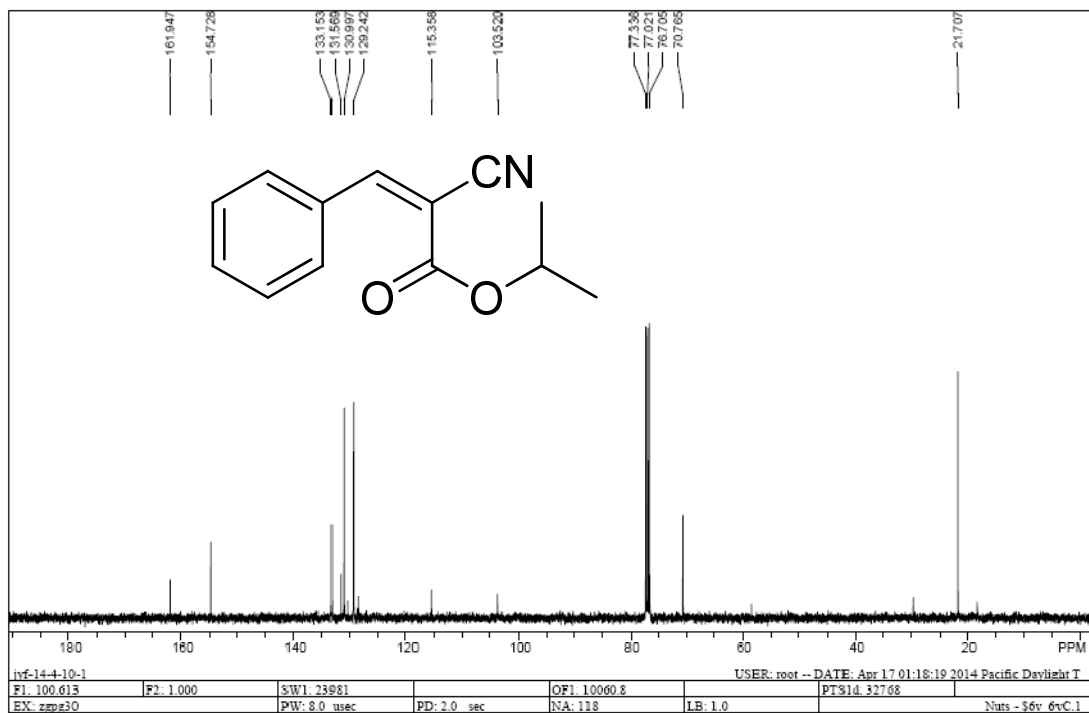
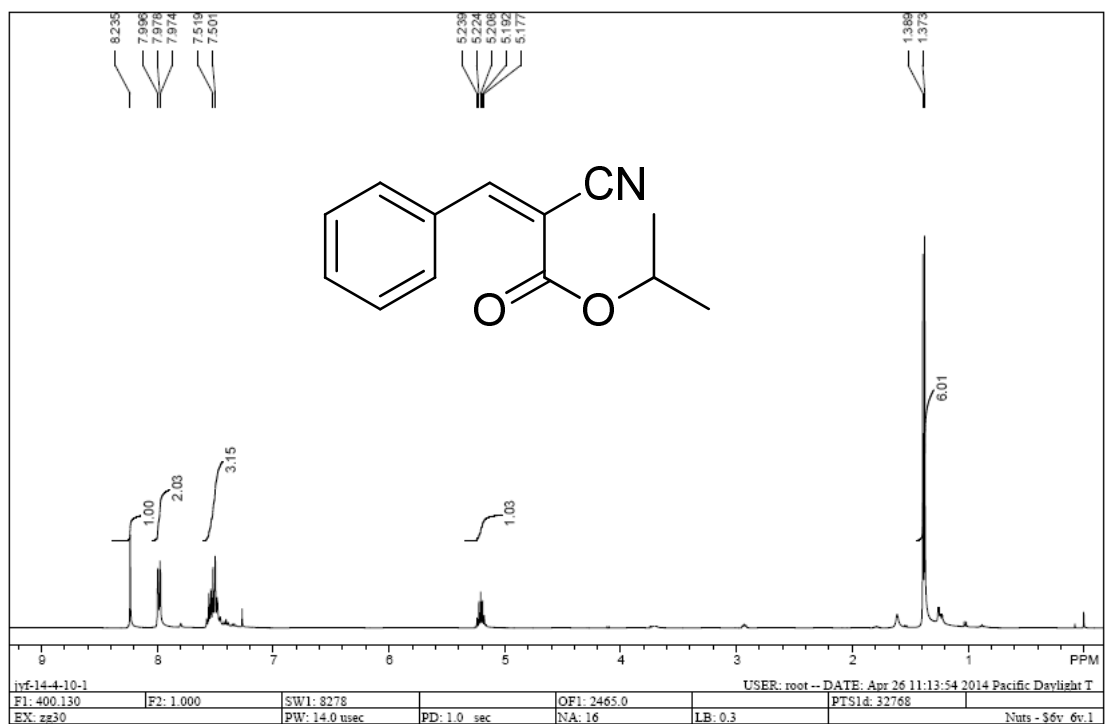
^1H and ^{13}C NMR of **6t**



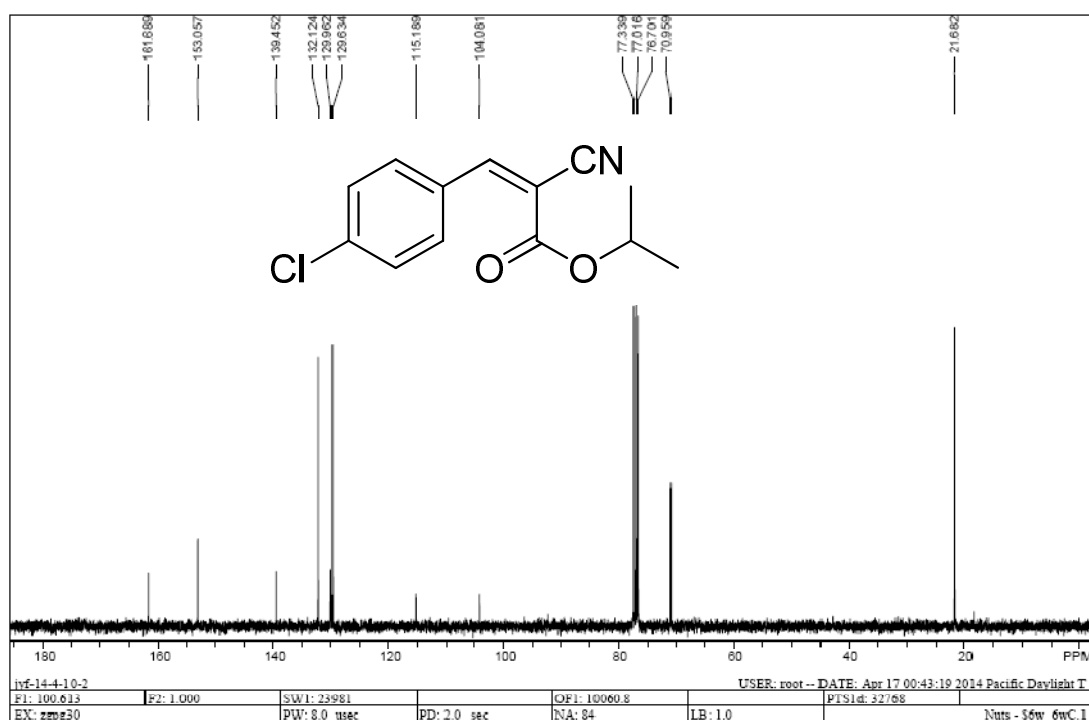
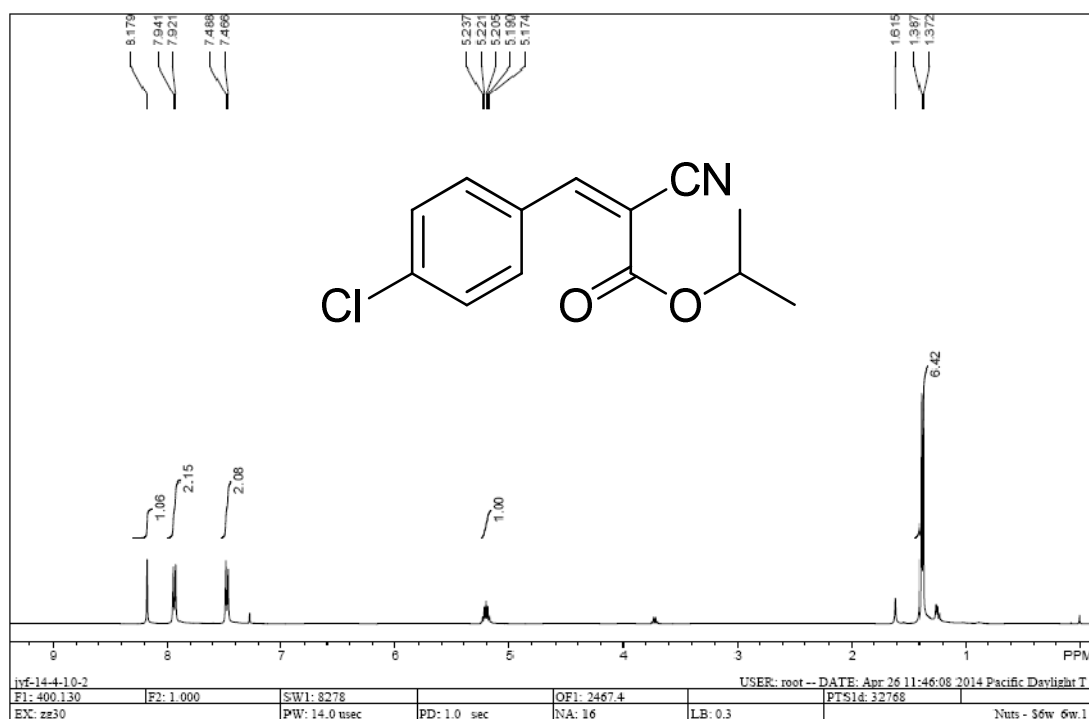
^1H and ^{13}C NMR of **6u**



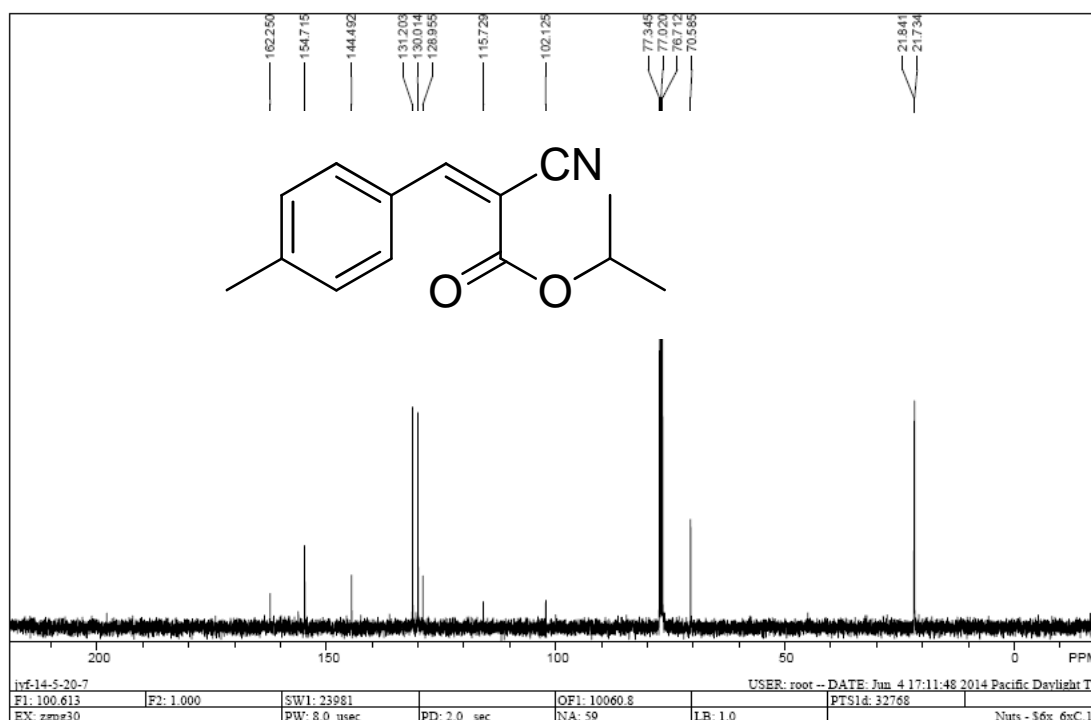
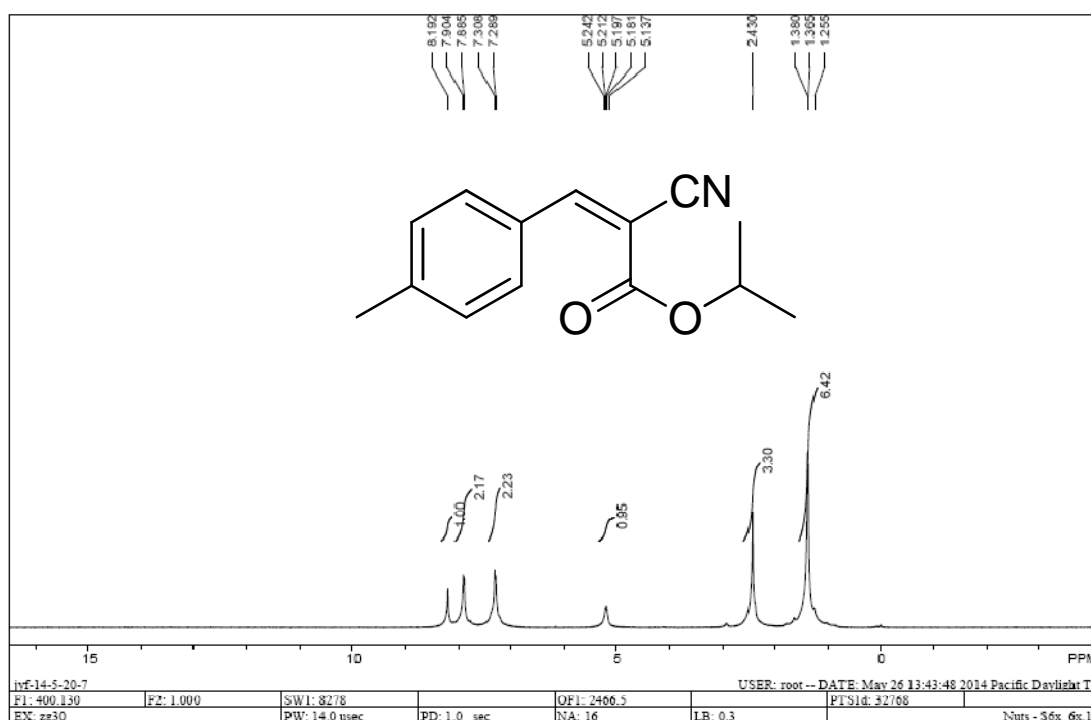
^1H and ^{13}C NMR of **6v**



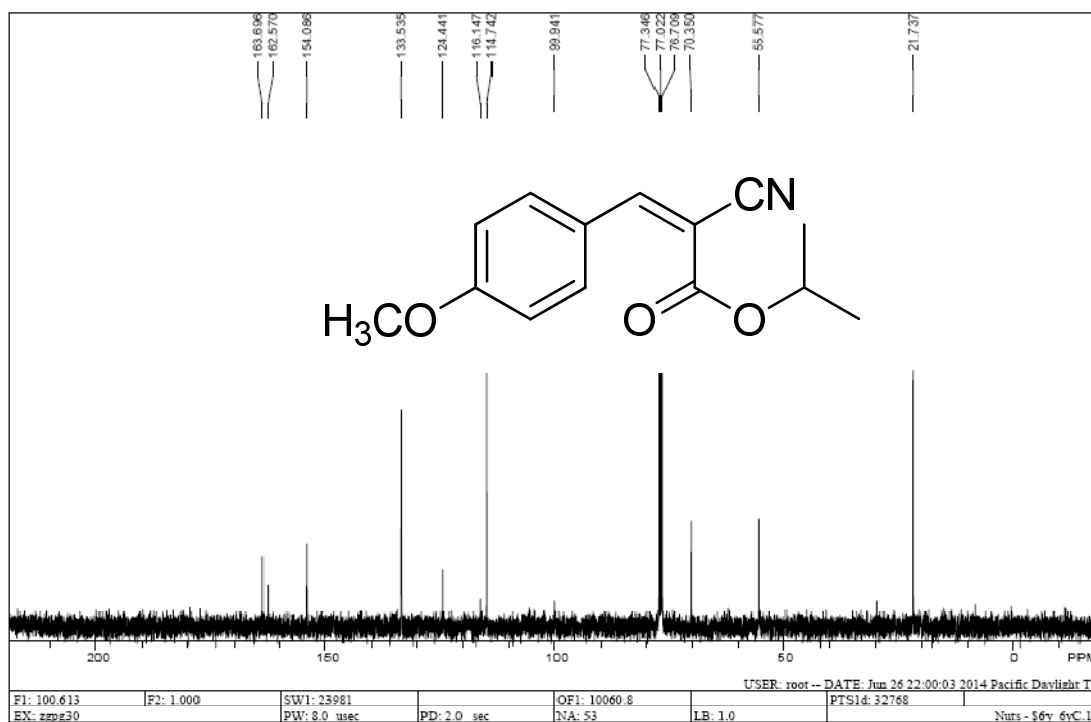
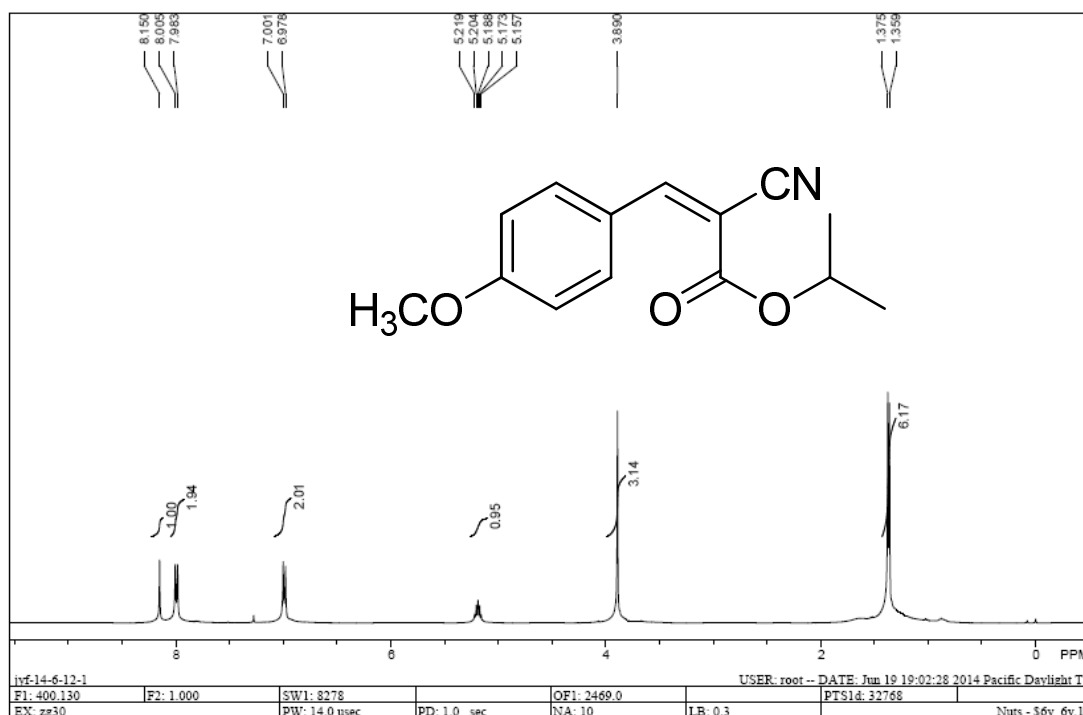
^1H and ^{13}C NMR of **6w**



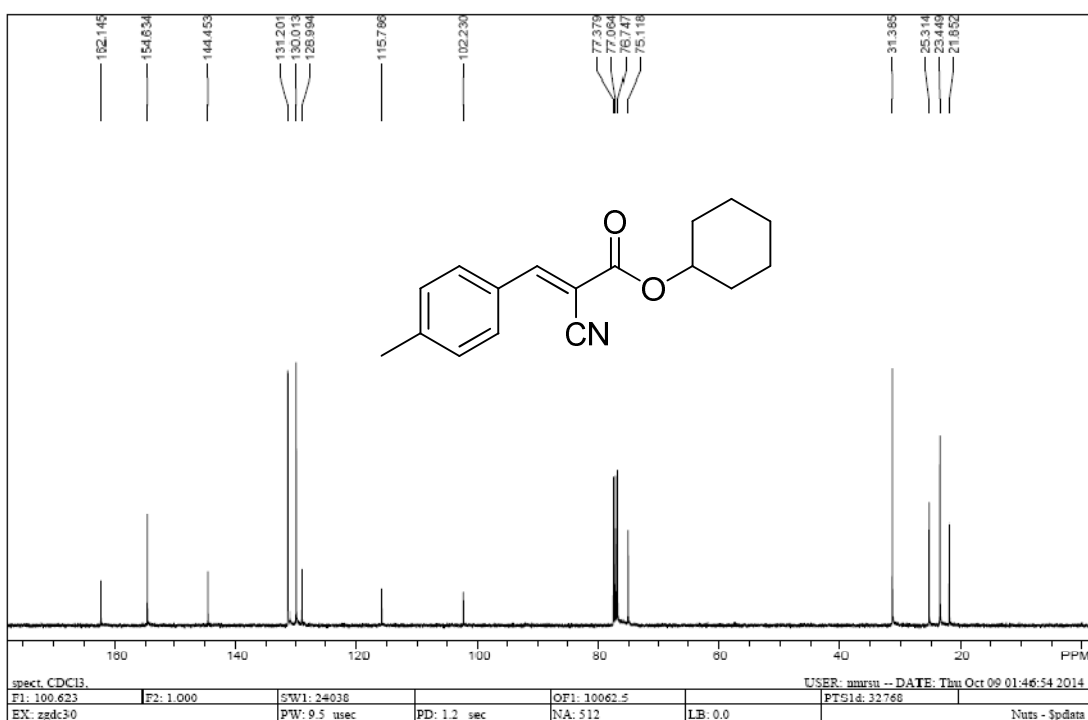
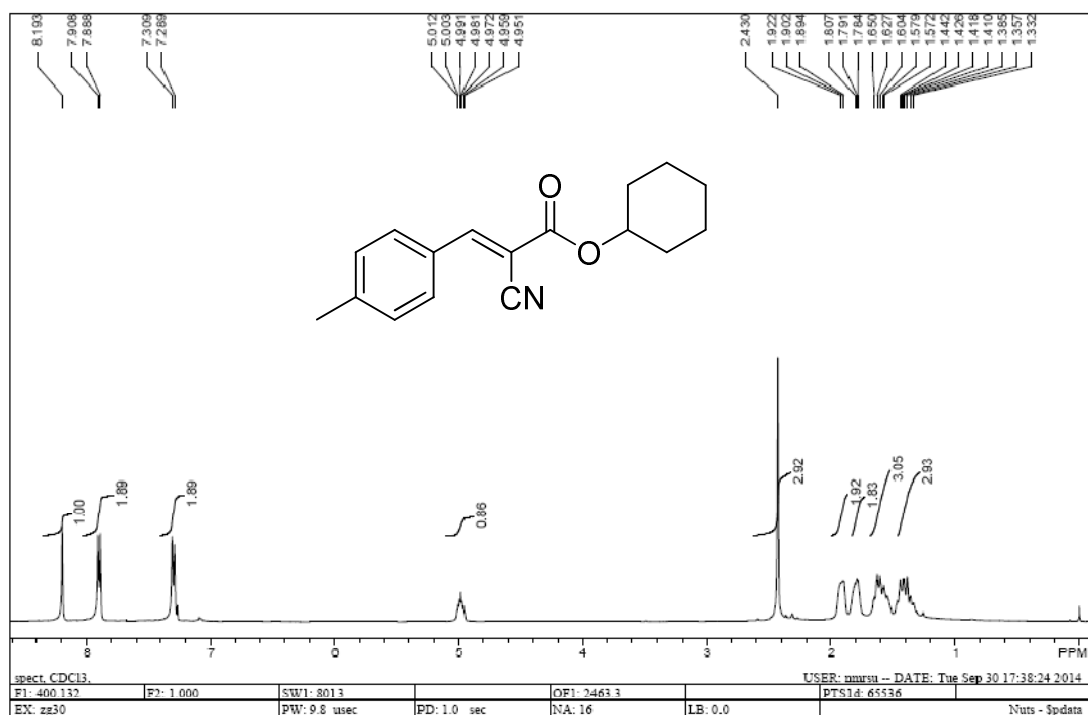
^1H and ^{13}C NMR of **6x**



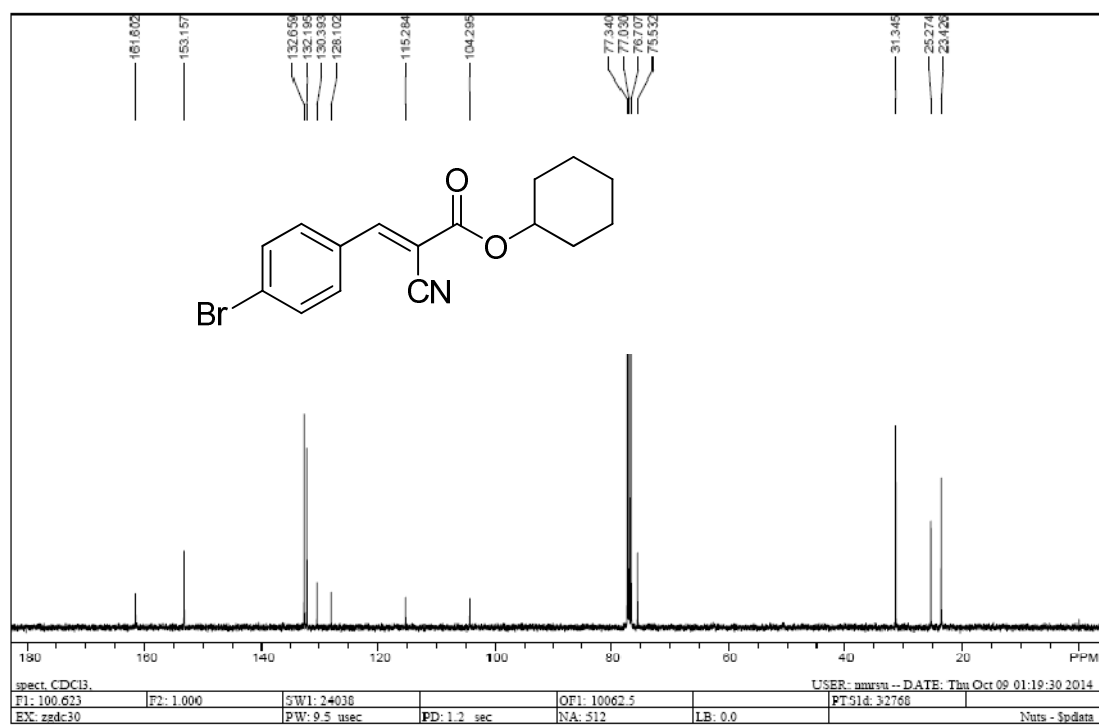
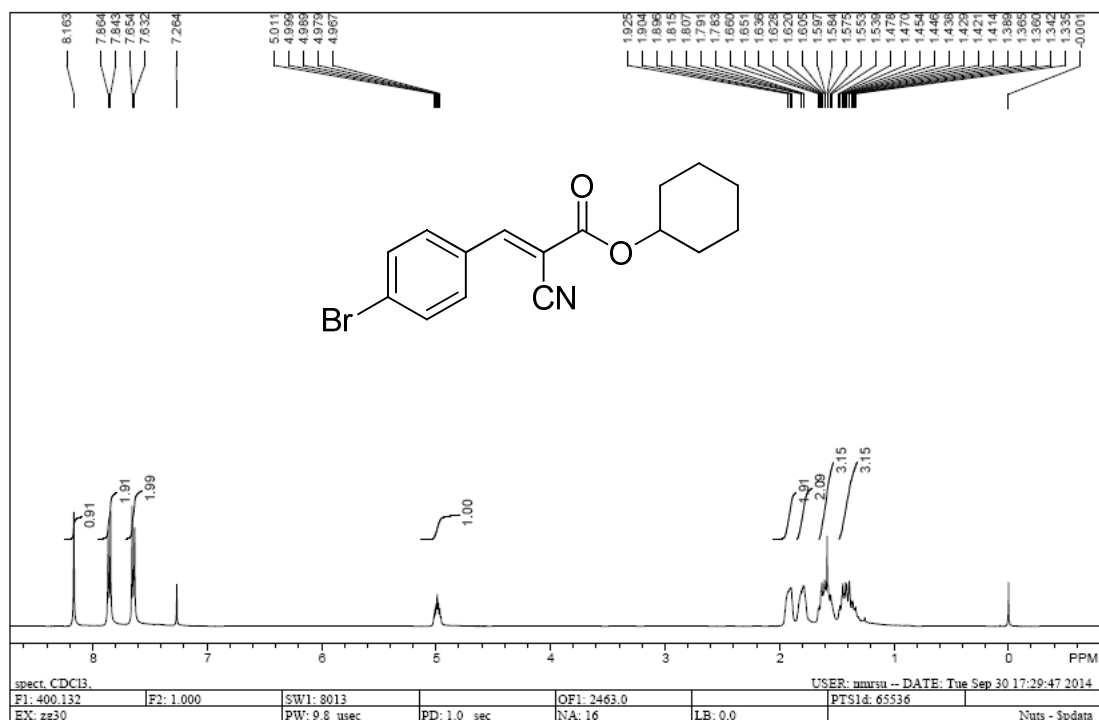
^1H and ^{13}C NMR of **6y**



^1H and ^{13}C NMR of **6z**



^1H and ^{13}C NMR of **6aa**



^1H and ^{13}C NMR of 7

